STOEL RIVES LLP
ATTORNEYS AT LAW

DOCKET
06-AFC-5C
DATE NOV 25 2009
RECD. NOV 25 2009

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Sacramento, California 95814
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MELISSA A. FOSTER
Direct (916) 319-4673
mafoster@stoel.com

November 25, 2009

Mr. Dale Rundquist
Compliance Project Manager
California Energy Commission
1516 Ninth Street, MS-15
Sacramento, CA 95814

Re: Panoche Energy Center Project (06-AFC-5C)
Petition to Amend

Dear Mr. Rundquist:

As you know, on September 21, 2009, Panoche Energy Center, LLC ("PECL"), as owner of the Panoche Energy Center ("PEC"), filed a Report of Waste Discharge ("ROWD") with the Regional Water Quality Control Board, Central Valley Region ("RWQCB") for the discharge of some or all of PEC's wastewater to two on-site, unlined wastewater surface impoundments ("UWSI"). Concurrently with the submission of the ROWD, PECL filed a Petition to Amend the Panoche Energy Center Project Final Decision ("PTA") with the California Energy Commission ("CEC"), reflecting the proposed wastewater disposal changes discussed above ("Wastewater Disposal Changes"). On October 19, 2009, RWQCB staff requested PECL to provide six additional items prior to the RWQCB being able to deem the ROWD "complete."

On November 18, 2009, PECL provided the requisite additional information to the RWQCB, a copy of which is enclosed herewith. Since the submission of the ROWD and PTA, PECL determined that the westernmost unlined surface impoundment needs to be two feet deeper than originally designed to ensure adequate freeboard at all times. In addition, PECL has determined that the best way to meet freeboard requirements is to modify the proposed internal center barrier between the two impoundments to sheet piling, concrete, or another durable material. The information submitted to the RWQCB reflects these adjustments.

PECL will shortly provide CEC with adjusted drawings and details on these pond adjustments, which will slightly refine the PTA. These minor revisions do not substantially change the character of the changes proposed by the PTA. The proposed Wastewater Disposal Changes remain in compliance with all applicable laws, ordinances, regulations, and standards ("LORS"). The Wastewater Disposal Changes will also continue to not adversely affect PEC's ability to

comply with all applicable LORS. PECL expects to provide adjusted drawings and additional details regarding the pond adjustments within three weeks.

We look forward to Staff's review of and recommendation on the PTA. In the meantime, if you have any questions, please do not hesitate to contact me directly at (916) 447-0700.

Very truly yours,

Melissa A. Foster

Attachment
MAF:jmw

URS

November 18, 2009

Douglas K. Patteson, RCE
California Regional Water Quality Control Board
1685 "E" Street
Fresno, California 93706

Subject: Additional Information for Report of Waste Discharge
Unlined Wastewater Surface Impoundments
Panoche Energy Center
Fresno County, California

Dear Mr. Patteson:

URS Corporation (URS) prepared this letter on behalf of Panoche Energy Center, LLC (PECL, Client). PECL, as owner of the Panoche Energy Center (PEC), filed a Report of Waste Discharge (ROWD), dated September 21, 2009, with the Regional Water Quality Control Board, Central Valley Region (RWQCB) for the discharge of some or all of the facility's wastewater to two on-site, unlined wastewater surface impoundments (UWSI). The RWQCB staff responded with a letter dated October 19, 2009 requesting that six additional items be submitted to complete the ROWD. This letter provides the six additional items, as described below:

1. Attached in Appendix A is a completed Form 200 signed and certified by Warren MacGillivray. Also included in Appendix A is a letter describing Mr. MacGillvray's authority to sign the Form 200.

2. Attached in Appendix B is a check for the filing fee of $14,586 payable to the State Water Resources Control Board.

3. Attached in Appendix C is a monthly water balance for the UWSI, indicating that the UWSI will have at least two feet of freeboard throughout the year.

4. Attached in Appendix D is an Operation & Maintenance Plan (OMP) for the UWSI.

5. Attached in Appendix E is a conceptual grading plan that shows the locations of the two existing water supply wells, the existing water-table groundwater monitoring well MW-4, and the two proposed UWSI.

6. Attached in Appendix F is an inventory of all chemicals that are added to the process-water streams in the facility. The calculation provided in the attachment shows that the sodium added in these chemicals accounts for approximately 0.255-percent of the total sodium

URS Corporation
30 River Park Place West, Suite 180
Fresno, CA 93720
Tel: 559.256.1444
Fax: 559.256.1478

concentration in the wastewater – the remainder is naturally occurring sodium present in the facility source water pumped from the lower confined aquifer. Furthermore, these chemicals do not contain detectable concentrations of arsenic, boron, fluoride, manganese, or molybdenum. However, these constituents may be present in the potable dilution water used in the chemical manufacturing process. As demonstrated in the attachment, the contributions of these added constituents to the respective wastewater concentrations are each expected to be extremely minor (less than 0.00000001-percent).

We trust that this letter provides sufficient information to deem the ROWD complete. We look forward to obtaining a RWQCB staff determination regarding the conceptual acceptability of the UWSI at the earliest opportunity. Please do not hesitate to contact us if you have any questions or require additional information.

Sincerely,
URS Corporation

Stuart B. St. Clair, PE
Project Civil Engineer

Attachments:

Appendix A – Signed Form 200 & Letter of Authority
Appendix B – Check
Appendix C – UWSI Water Balance
Appendix D – OMP
Appendix E – Conceptual Grading Plan
Appendix F – Water-Treatment Chemical Inventory

Distribution List:

Douglas Patteson, RWQCB (original & 2 copies)
Don Burkard, PECL
David Jenkins, Apex Power Group
Maggie Fitzgerald, URS, Santa Ana
URS Fresno File

APPENDIX A

SIGNED FORM 200 & LETTER OF AUTHORITY

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE
GENERAL INFORMATION FORM FOR
WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

I. FACILITY INFORMATION

A. Facility:

Name: Panoche Energy Center			
Address: 43883 West Panoche Road			
City: Firebaugh	County: Fresno	State: CA	Zip Code: 93622
Contact Person: Don Burkard		Telephone Number: 925-759-0457	

B. Facility Owner:

Name: Panoche Energy Center, LLC			Owner Type (Check One) 1. ☐ Individual 2. ☑ Corporation
Address: 43883 West Panoche Road			3. ☐ Governmental Agency 4. ☐ Partnership
City: Firebaugh	State: CA	Zip Code: 93622	5. ☐ Other:
Contact Person: Don Burkard		Telephone Number: 925-759-0457	Federal Tax ID: 20-55522298

C. Facility Operator (The agency or business, not the person):

Name: Wood Group, LLC			Operator Type (Check One) 1. ☐ Individual 2. ☑ Corporation
Address: 43883 West Panoche Road			3. ☐ Governmental Agency 4. ☐ Partnership
City: Firebaugh	State: CA	Zip Code: 93622	5. ☐ Other:
Contact Person: Roy Campbell		Telephone Number: 559-659-2270	

D. Owner of the Land:

Name: PAO Investments, LLC			Owner Type (Check One) 1. ☐ Individual 2. ☑ Corporation
Address: 45499 West Panoche Road			3. ☐ Governmental Agency 4. ☐ Partnership
City: Firebaugh	State: CA	Zip Code: 93622	5. ☐ Other:
Contact Person: Barry Baker		Telephone Number: 559-659-3942	

E. Address Where Legal Notice May Be Served:

Address: 43883 West Panoche Road		
City: Firebaugh	State: CA	Zip Code: 93622
Contact Person: Don Burkard		Telephone Number: 925-759-0457

F. Billing Address:

Address: 43883 West Panoche Road		
City: Firebaugh	State: CA	Zip Code: 93622
Contact Person: Don Burkard		Telephone Number: 925-759-0457

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE
GENERAL INFORMATION FORM FOR
WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

II. TYPE OF DISCHARGE

Check Type of Discharge(s) Described in this Application (A or B):

☑ **A. WASTE DISCHARGE TO LAND** ☐ **B. WASTE DISCHARGE TO SURFACE WATER**

Check all that apply:

- ☐ Domestic/Municipal Wastewater Treatment and Disposal
- ☑ Cooling Water
- ☐ Mining
- ☐ Waste Pile
- ☐ Wastewater Reclamation
- ☐ Other, please describe: _____
- ☐ Animal Waste Solids
- ☐ Land Treatment Unit
- ☐ Dredge Material Disposal
- ☑ Surface Impoundment
- ☑ Industrial Process Wastewater
- ☐ Animal or Aquacultural Wastewater
- ☐ Biosolids/Residual
- ☐ Hazardous Waste (see instructions)
- ☐ Landfill (see instructions)
- ☐ Storm Water

III. LOCATION OF THE FACILITY

Describe the physical location of the facility.

1. Assessor's Parcel Number(s)	2. Latitude	3. Longitude
Facility: 027-060-78S	**Facility:** 36.65126 degrees N	**Facility:** 120.58412 degrees W
Discharge Point: 027-060-78S	**Discharge Point:** 35.65021 deg N	**Discharge Point:** 120.58412 deg W

IV. REASON FOR FILING

- ☑ New Discharge or Facility
- ☐ Changes in Ownership/Operator (see instructions)
- ☐ Change in Design or Operation
- ☐ Waste Discharge Requirements Update or NPDES Permit Reissuance
- ☐ Change in Quantity/Type of Discharge
- ☐ Other: _____

V. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

Name of Lead Agency: California Energy Commission

Has a public agency determined that the proposed project is exempt from CEQA? ☐ Yes ☑ No

If Yes, state the basis for the exemption and the name of the agency supplying the exemption on the line below.

Basis for Exemption/Agency: _____

Has a "Notice of Determination" been filed under CEQA? ☐ Yes ☑ No

If Yes, enclose a copy of the CEQA document, Environmental Impact Report, or Negative Declaration. If no, identify the expected type of CEQA document and expected date of completion.

Expected CEQA Documents:

☐ **EIR** ☐ **Negative Declaration** **Expected CEQA Completion Date:** CEQA equiv. March 2010

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

VI. OTHER REQUIRED INFORMATION

Please provide a COMPLETE characterization of your discharge. A complete characterization includes, but is not limited to, design and actual flows, a list of constituents and the discharge concentration of each constituent, a list of other appropriate waste discharge characteristics, a description and schematic drawing of all treatment processes, a description of any Best Management Practices (BMPs) used, and a description of disposal methods.

Also include a site map showing the location of the facility and, if you are submitting this application for an NPDES permit, identify the surface water to which you propose to discharge. Please try to limit your maps to a scale of 1:24,000 (7.5' USGS Quadrangle) or a street map, if more appropriate.

VII. OTHER

Attach additional sheets to explain any responses which need clarification. List attachments with titles and dates below:

Please see accompanying Report of Waste Discharge, dated September 21, 2009.

You will be notified by a representative of the RWQCB within 30 days of receipt of your application. The notice will state if your application is complete or if there is additional information you must submit to complete your Application/Report of Waste Discharge, pursuant to Division 7, Section 13260 of the California Water Code.

VIII. CERTIFICATION

"I certify under penalty of law that this document, including all attachments and supplemental information, were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated 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 and imprisonment."

Print Name: Warren MacGillivray **Title:** Director of Member Manager

Signature: **Date:** October 30, 2009

FOR OFFICE USE ONLY

Date Form 200 Received:	Letter to Discharger:	Fee Amount Received:	Check #:

EIF Management, LLC
Three Charles River Place
63 Kendrick Street
Needham, MA 02494

October 30, 2009

Mr. Douglas K. Patteson
Senior Engineer
California Regional Water Quality Control Board
Central Valley Region
1685 E Street
Fresno, California 93706

RE: Panoche Energy Center

Dear Mr. Patteson,

I am enclosing with this letter a copy of a Form 200 for Panoche Energy Center ("PEC") which has been signed by Warren MacGillivray.

The purpose of this letter is to provide assurance that Mr. MacGillivray does, indeed, meet the definition of a "duly authorized person" for purposes of the Form 200 and does indeed hold the requisite authority to execute this form on behalf of PEC.

Section 1.9(b) of the Second Amended and Restated Limited Liability Company Agreement of Panoche Energy Center, LLC, dated January 10, 2008, provides that the business and affairs of PEC are to be managed and controlled by the Member Manager. The Member Manager is defined as EIF Panoche, LLC. Thus, there are no appointed officers of PEC. The sole authorized agent for conduct of PEC business is EIF Panoche, LLC.

EIF Panoche, LLC is the sole member of PEC. EIF Panoche, LLC is governed by a Board of Directors; there are no appointed officers. Mr. MacGillivray has been duly appointed as a Director of EIF Panoche. Thus, Mr. MacGillivray holds the highest level of authority within EIF Panoche, the Member Manager of PEC, and is therefore duly authorized and holds the requisite level of authority to execute Form 200 on behalf of PEC.

If you have any questions with regard to this matter, please do not hesitate to contact me at (781) 292-7014.

Sincerely,

Alycia L. Goody
Vice President and Assistant General Counsel

APPENDIX B

CHECK (only in original letter)

APPENDIX C

UWSI WATER BALANCE

UWSI WATER BALANCE
Panoche Energy Center
Western Fresno County, CA

November 18, 2009

The Panoche Energy Center, LLC (PECL), as owner of the Panoche Energy Center (PEC), filed a Report of Waste Discharge (ROWD), dated September 21, 2009, with the Regional Water Quality Control Board, Central Valley Region (RWQCB) for the discharge of some or all of the facility's wastewater to two on-site, unlined wastewater surface impoundments (UWSI). The RWQCB responded with a letter dated October 19, 2009 requesting that six additional items be submitted to complete the ROWD. The third item requested a "month-by-month water balance". This document provides the requested information to address that item.

A water-balance spreadsheet was prepared for the two proposed UWSI. The spreadsheet printout is attached. The water-balance calculations indicate that the proposed UWSI are large enough to maintain greater than 2 feet of freeboard at all times based on the anticipated volume of wastewater. If desired, URS can provide the spreadsheet electronically to RWQCB staff for review. The water-balance input data and assumptions are described and discussed below:

1. The two proposed UWSI have pond bottom areas of 2.94 and 3.19 acres with side slopes of 3:1 (horizontal:vertical) – see attached grading plan, which is slightly revised from the grading plan submitted with the ROWD. The two UWSI will be separated by an internal barrier (constructed of sheet piling, concrete, or a similar durable material) that is approximately five feet wide and extends to a height of two to four feet above the bottom of the UWSI – this is a slight deviation from the original UWSI design. For purposes of the water balance calculation, the two UWSI were modeled as a single surface impoundment with a bottom area of 6.13 acres (334 feet by 799 feet) and side slopes of 3:1.
2. The anticipated maximum monthly wastewater discharge volumes were used, as shown in Column B of the water-balance spreadsheet.
3. Monthly average precipitation rates for the Five Points 5 SSW weather station (No. 043083), located approximately 35 miles south of the PEC, were used. These rates are based on a 58-year record of precipitation. The water balance is not very sensitive to the precipitation rates, because the peak months of UWSI discharge are in the summer when little precipitation occurs. The 100-year, 24-hour storm event is estimated to produce approximately 2.5 inches of precipitation (NOAA, 1974). This 100-year storm event was tried in each of the 12 months on the water balance, and in each case the freeboard at the end of the month was still greater than 2 feet. For the final water-balance calculation, it was placed in February, which is typically one of the wettest months.
4. Monthly average evaporation rates for the Little Panoche Detention Dam, located approximately 25 miles northwest of the PEC, were used. These rates are based on 8 years of record, and are corroborated by other similarly situated stations with

longer periods of record, such as the Los Banos Detention Reservoir station with a 38-year record. The monthly pan evaporation rates were reduced by a standard pan-coefficient of 0.7. Evapotranspiration data from the California Irrigation Management System was not used, because evapotranspiration rates would underestimate evaporation rates from a surface impoundment.

5. The long-term daily percolation rate was assumed to be 2 inches. This value was selected based on review by a geotechnical engineer of on-site percolation-test data, on-site lithologic logs, and regional percolation rates.

The water-balance calculation shows that the UWSI design provides approximately 0.3 foot of depth for accumulation of sediment in the USWI while maintaining the required two feet of freeboard at all times, including at the end of September when the freeboard is predicted to be at its minimum. The UWSI Operation & Maintenance Plan (OMP) calls for the UWSI to be cleaned of sediment in April or May of each year to restore the UWSI to full depth prior to the summer period when the wastewater discharge will be at its greatest. The UWSI will be cleaned more often than once per year, if necessary. Sediment is not expected to accumulate very quickly, as the wastewater is expected to have a relatively low suspended-solids concentration.

Attachments:

UWSI Water Balance Spreadsheet
Revised Conceptual Grading Plan

UWSI Water Balance

Panoche Energy Center

18-Nov-09

	Water Inputs to Pond				Evaporation Output from Pond				Percolation Output from Pond		Month End Values				
	Wastewater		Precipitation		Pan Evaporation	70% Pan Evaporation	Evaporation Area	Max. Volume Evaporated	Average Wetted Area	Max. Volume Percolated	Volume in Pond	Water Height in Pond	Freeboard		Initial Water Height in Pond on January 1
Month	gallons	cf	inches	cf	inches	inches	sf	cf	sf	cf	cf	ft	ft		ft
January	8,393,000	1,122,059	1.47	44,222	1.77	1.24	273,860	28,276	270,441	1,397,280	166,318	0.61	5.4		1.67
February	8,393,000	1,122,059	3.80	114,314	2.89	2.02	287,023	45,016	287,023	1,257,232	99,443	0.37	5.6		
March	8,393,000	1,122,059	1.04	31,286	5.87	4.11	287,023	91,433	287,023	1,379,618	0	0.00	6.0		
April	9,468,800	1,265,882	0.51	15,342	9.36	6.57	287,023	146,282	287,023	1,335,114	0	0.00	6.0		
May	9,468,800	1,265,882	0.27	8,122	14.56	10.19	287,023	226,791	287,023	1,379,618	0	0.00	6.0		
June	9,468,800	1,265,882	0.09	2,707	16.31	11.42	287,023	254,050	287,023	1,335,114	0	0.00	6.0		
July	14,732,800	1,969,626	0.01	301	18.45	12.92	287,023	287,393	287,023	1,379,618	302,925	1.13	4.9		
August	14,732,800	1,969,626	0.02	602	16.63	11.64	273,860	265,667	270,441	1,397,280	610,207	2.26	3.7		
September	14,732,800	1,969,626	0.19	5,716	12.46	8.72	280,768	204,072	273,898	1,369,478	1,011,996	3.69	2.3		
October	9,422,400	1,259,679	0.36	10,830	7.60	5.32	287,749	127,569	277,396	1,433,181	721,777	2.60	3.4		
November	9,422,400	1,259,679	0.70	21,058	3.04	2.13	280,768	49,790	273,898	1,369,478	583,246	2.13	3.9		
December	9,422,400	1,259,679	0.96	28,879	1.78	1.25	280,768	29,153	273,896	1,415,127	427,524	1.56	4.4		
Totals	126,051,000	16,851,738	9.42	283,379	110.75	77.53		1,755,461		16,448,118					

Total Wastewater Discharge (af)	387	Precip + WW =	17,135,117	gallons
Precipitation Area (sf)	360,992	Max. Evap + Perc =	18,203,579	gallons
Percolation Rate (inches/day)	2.0			

Depth (ft)	Height (ft)	Length (ft)	Width (ft)	Area (sf)
0	6	835	370	309,124
1	5	828	364	301,927
2	4	823	358	294,802
3	3	817	352	287,749
4	2	811	346	280,768
5	1	805	340	273,860
6	0	799	334	267,023

Assumes that none of the site's storm water enters the pond except for the rain that actually falls on the pond and surrounding berm.

Assumes average annual precipitation, plus the 100-year, 24-hour storm of 2.5 inches in February.

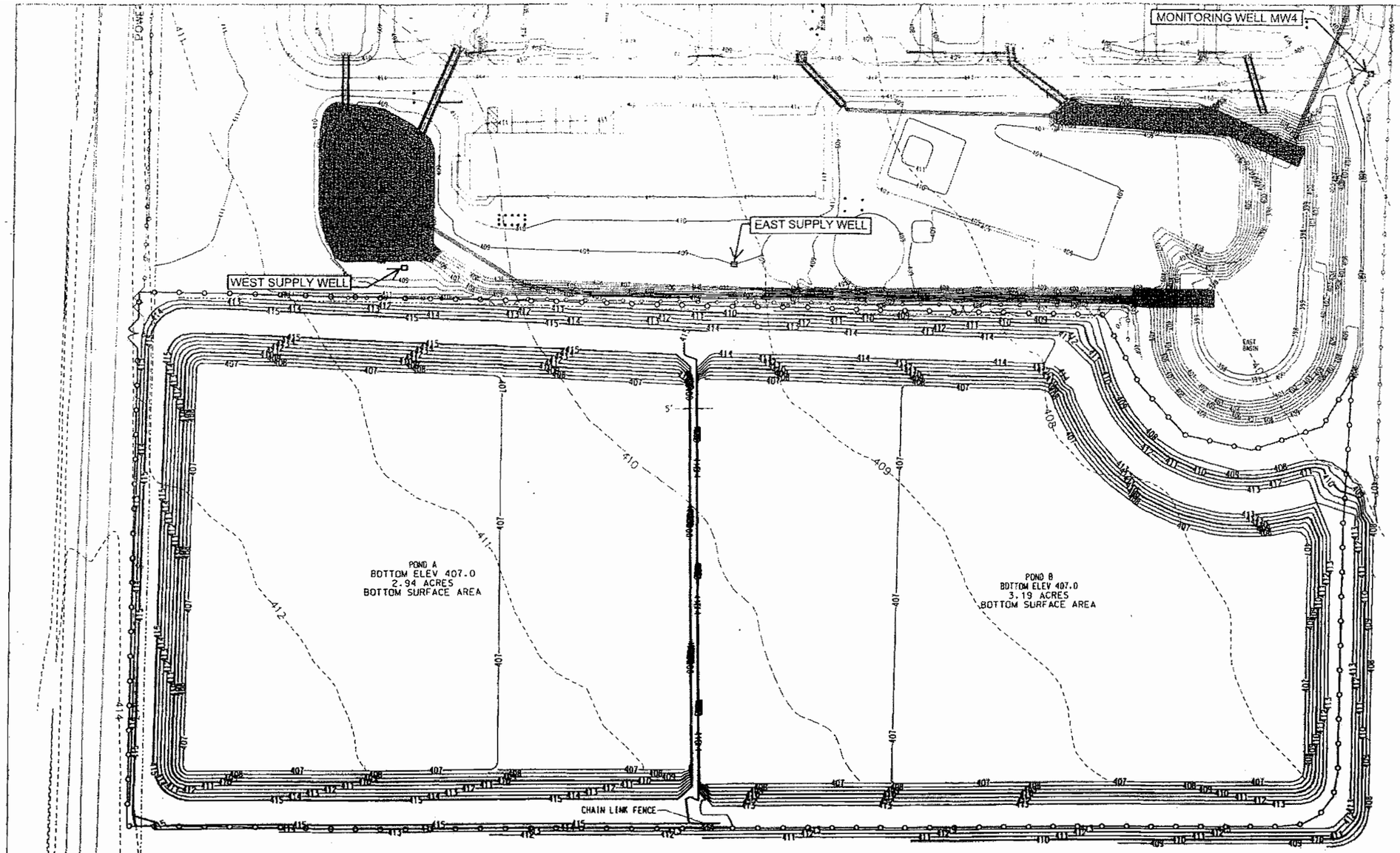
ft = feet

sf = square feet

cf = cubic feet

af = acre feet

gpm = gallons per minute



NOTES:

1. THE EAST AND WEST SUPPLY WELLS ARE SCREENED SOLELY IN THE LOWER CONFINED AQUIFER BELOW THE CORCORAN CLAY.

2. MONITORING WELL MW4 IS SCREENED ACROSS THE WATER TABLE (FROM APPROXIMATELY 150 TO 210 FEET BGS) IN THE UPPER SEMI-CONFINED AQUIFER ABOVE THE CORCORAN CLAY.

- PRELIMINARY -
NOT FOR CONSTRUCTION

REV	DESCRIPTION	ORIG	CHK	APP	DATE
A	ISSUED FOR CONCEPTUAL GRADING	MAA			11-17-09

PANOCHE ENERGY CENTER, LLC

4 X GE LMS100 PEAKING FACILITY
FRESNO COUNTY, CALIFORNIA

Kiewit

Kiewit Power
8455 Lenexa Drive
Lenexa, Kansas 66214

WASTEWATER PONDS
CONCEPTUAL GRADING

	by	date
DESIGNED	MAA	11-16-09
DRAWN	MAA	11-16-09
CHECKED		
APPROVED		

DRAWING NUMBER

SKC-2007018-CG-111709-1

APPENDIX D

OMP

OPERATION & MAINTENANCE PLAN
Unlined Wastewater Surface Impoundments
Panoche Energy Center
Western Fresno County, CA

November 18, 2009

The Panoche Energy Center, LLC (PECL), as owner of the Panoche Energy Center (PEC), filed a Report of Waste Discharge (ROWD), dated September 21, 2009, with the Regional Water Quality Control Board, Central Valley Region (RWQCB) for the discharge of some or all of the facility's wastewater to two on-site, unlined wastewater surface impoundments (UWSI). The RWQCB responded with a letter dated October 19, 2009 requesting that six additional items be submitted to complete the ROWD. The fourth item requested a "written plan for how the ponds will be managed and maintained". This Operation & Maintenance Plan (OMP) provides the requested information to address that item. This OMP is meant to be a living document that will be updated as needed throughout the operational life of the facility. In particular, after the UWSI are constructed and Waste Discharge Requirements (WDR) have been issued by the RWQCB, the OMP will be reviewed and updated, if necessary, to address any design changes or other changes that occur between now and then, including any additional requirements set forth in the WDR.

UWSI Operation

Wastewater collected in the plant's wastewater storage tank will be pumped through a pipeline to the UWSI for evaporation and percolation. The wastewater storage tank utilizes a level switch to actuate the pump whenever a pre-determined level of wastewater storage is reached. Prior to reaching the UWSI, the pipeline will split into two pipelines, each of which discharges individually to one of the two UWSI. Each of the two pipelines will have a valve to allow wastewater discharge to one UWSI to be stopped, if desired, while continuing discharge to the other UWSI. Each pipeline will also have a totalizing flow meter to record the instantaneous flow rate in the pipeline and the cumulative number of gallons that have passed through the pipeline.

Some portion of the wastewater may continue to be discharged to the four, onsite, Class 1, non-hazardous, deep injection wells operated under Permit Number CA10600001 issued by the United States Environmental Protection Agency, Region IX (USEPA) under the Underground Injection Control (UIC) Program. Alternatively, the deep injection wells may be used only as a backup wastewater discharge option, or they may be decommissioned altogether if their wastewater acceptance capacity decreases to a point where they are judged to be no longer viable.

Wastewater discharge to the UWSI will be controlled so as to maintain at least two feet of freeboard (i.e., the vertical distance between the water surface in the impoundment and the lowest elevation point at the top of the surrounding berm) in the UWSI at all times. Each UWSI will have a permanent vertical freeboard-measurement rod installed from the bottom

of the UWSI and extending vertically to an elevation greater than the top of the surrounding berm. To allow visual determination of freeboard in the UWSI, and of the sediment/sludge depth when the UWSI is sufficiently dry, the freeboard-measurement rods will include permanent labeled markings at intervals of 0.1 vertical foot beginning at the elevation of the lowest point at the top of the surrounding berm and continuing to the design bottom elevation of the pond. The rods will also contain a prominent marking at the two-foot freeboard level (i.e., at the design capacity of the UWSI).

The UWSI will be managed to minimize odor or other nuisance conditions, mosquito breeding, waterfowl nesting, embankment slope failure, and embankment erosion. Specific activities to minimize these potential problems are discussed below in the UWSI Maintenance section.

Inspections of the UWSI will be performed by trained facility personnel at a minimum on a daily basis whenever wastewater discharge to the UWSI is occurring, and on a weekly basis otherwise. Each inspection will include a complete walk-around of each UWSI. The inspector will document in writing the flow-meter reading of the cumulative number of gallons of wastewater discharged to each UWSI, the freeboard in each UWSI, the sediment/sludge depth if the UWSI is sufficiently dry, and the presence or absence of observations of the following items for each UWSI:

- Water seepage laterally through any of the embankments, as evidenced on the embankment or at the ground surface outside the embankment
- Erosion or slope failure (actual or potential) of any of the embankments
- Animal burrowing into any of the embankments
- Objectionable odors or other nuisance conditions
- Nesting of waterfowl on the embankments
- Large numbers of observable mosquitoes or mosquito larvae
- Weeds on the embankments
- Accumulations of dead algae, vegetation, or other debris on the water surface
- Any other potential problem conditions

If any of the above potential problem conditions are noted during an inspection, corrective action will be implemented within two weeks, or sooner if a human-safety issue is involved. A written record of each inspection, and of corrective actions implemented, will be maintained on file by PECL until the facility ceases operation.

UWSI Maintenance

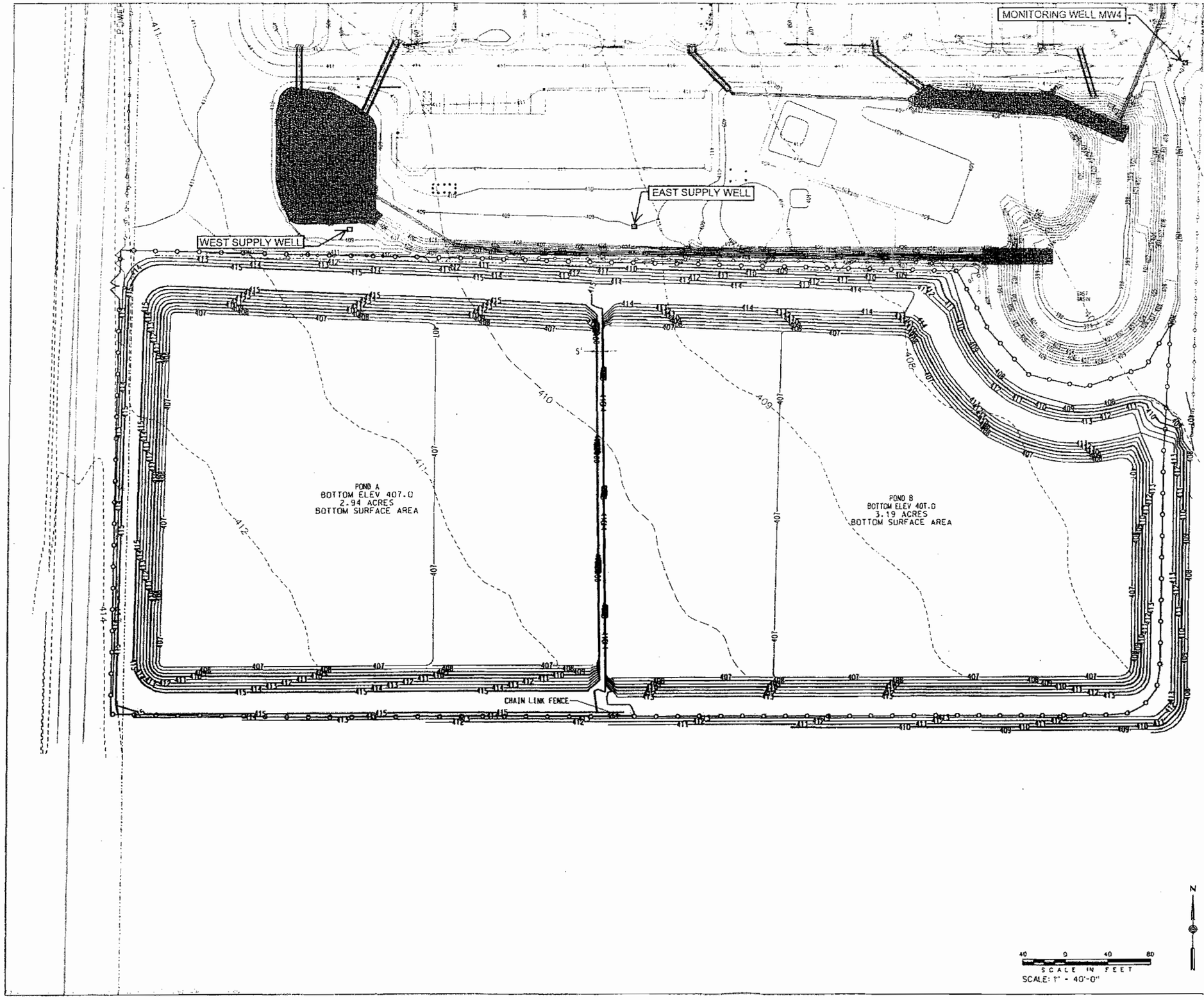
Maintenance of the UWSI will be provided on a regular basis, as needed. If necessary, wastewater will be discharged only to one UWSI for a time to allow the other UWSI to dry out for needed maintenance.

Maintenance items that will be performed on an as-needed basis include the following:

- Mechanical removal of sediment accumulated in the bottom of the UWSI to maintain sufficient wastewater capacity. This will be done each year in April or May before the period of greatest wastewater discharge to the UWSI begins. If necessary, the sediment will be removed from the UWSI more often than once per year. The sediment removed from the UWSI will be re-used or disposed of in accordance with all applicable legal requirements.
- Mechanical disruption (e.g., with a disk harrow) of the soil at the bottom of the UWSI to rejuvenate the infiltration rate. This will be performed, if necessary, after removal of sediment, and possibly at other times during the year.
- Erosion-control measures to minimize irregularities around the perimeter of the water surface that may attract egg-laying mosquitoes.
- Eradication or relocation of burrowing animals and repair of burrows in UWSI embankments.
- Minimization of weeds on the UWSI embankments through control of water depth, harvesting, or use of herbicides that meet all applicable legal requirements.

APPENDIX E

CONCEPTUAL GRADING PLAN



NOTES:

1. THE EAST AND WEST SUPPLY WELLS ARE SCREENED SOLELY IN THE LOWER CONFINED AQUIFER BELOW THE CORCORAN CLAY.

2. MONITORING WELL MW4 IS SCREENED ACROSS THE WATER TABLE (FROM APPROXIMATELY 150 TO 210 FEET BGS) IN THE UPPER SEMI-CONFINED AQUIFER ABOVE THE CORCORAN CLAY.

- PRELIMINARY -
NOT FOR CONSTRUCTION

REV	DESCRIPTION	DWN	CHK	APP	DATE
A	ISSUED FOR CONCEPTUAL GRADING	MAA			11-17-09

PANOCHE ENERGY CENTER, LLC

4 X GE LMS100 PEAKING FACILITY
FRESNO COUNTY, CALIFORNIA

Kiewit

Kiewit Power
8455 Lenexa Drive
Lenexa, Kansas 66214

WASTEWATER PONDS
CONCEPTUAL GRADING

	by	date
DESIGNED	MAA	11-16-09
DRAWN	MAA	11-16-09
CHECKED		
APPROVED		

DRAWING NUMBER

SKC-2007018-CG-111709-1

APPENDIX F

WATER-TREATMENT CHEMICAL INVENTORY

WATER-TREATMENT CHEMICAL INVENTORY
Panoche Energy Center
Western Fresno County, CA

October 29, 2009

This document provides an inventory of the chemicals used in the water-treatment process at the Panoche Energy Center. This document also includes an evaluation of the contribution from the treatment chemicals to determine a conservative estimate of the concentrations of selected constituents (arsenic, boron, fluoride, manganese, molybdenum, and sodium) that are added to the process by their use. Attached to this document are two figures – the first shows the layout of equipment at PEC, and the second shows the water-treatment chemical injection points. Also attached are the product data sheet and the Material Safety Data Sheet for each chemical additive.

The treatment chemicals used at the facility encompass several treatment processes. The processes are as follows:

1) The cooling tower (CT) treatment chemicals
2) The reverse osmosis (RO) treatment chemicals
3) The ultra filtration (UF) treatment chemicals
4) The wastewater treatment (WWT) chemicals for use in the injection wells
5) The service water (SWT) treatment chemicals
6) The potable water treatment (PWT) chemicals

The processes that will contribute treatment chemicals to the final wastewater effluent are the CT, RO, UF, and, the SWT. The potable water chemical treatment process is chlorination only, and the chlorine will be contained within the existing on-site septic system. The wastewater treatment chemicals are for use as pretreatment for the injection well only and are not intended for use in the process for the final effluent to the ponds. As such, those process applications considered to contribute to the final stream going to the ponds are the cooling tower, reverse osmosis, ultra filtration and service water treatment as outlined below.

Table #1 – Treatment chemical information.

Supplier	Product	Description	Specific Gravity	Application Point	Application Max Concentration	Application Average Concentration	Control Measure	Application Frequency
ChemTreat	CL-4125	CT-Corrosion Inhibitor	1.21	Cooling Tower	16 ppm as product	12 ppm as product	DCS control with testing	Intermittent based upon residual
ChemTreat	CI-4657	CT-Scale Inhibitor	1.06	Cooling Tower	120 ppm as product	100 ppm as product	DCS control with testing	Intermittent based upon residual
ChemTreat	CI-450	CT-Biodispersant	1.01	Cooling Tower	5 ppm as product	1.5 ppm as product	DCS control with testing	Intermittent based upon residual
ChemTreat	CI-40	CT-Biodispersant	1.42	Cooling Tower	1 ppm as product	0.5 ppm as product	DCS control with testing	Intermittent based upon residual
ChemTreat	CI-2150	CT-Nonoxidizing Biocide	1.03	Cooling Tower	200 ppm as product	120 ppm as product	Single application	Infrequent use for upset condition
ChemTreat	CT-9008	RO-Antiscalent	1.14	RO Feedwater	8 ppm as product	8 ppm as product	DCS control with testing	Continuous with operation
ChemTreat	BI-124	RO-Dechlorination	1.23	RO Feedwater	12 ppm as product	4 ppm as product	DCS control with testing	Continuous with operation
BCS	Sodium Hypochlorite	CT - 12.5% Bleach	1.20	Cooling Tower	2 ppm	1 ppm	DCS control with testing	Intermittent based upon residual
BCS	Sodium Hypochlorite	SWT - 12.5% Bleach	1.20	Service Water	2 ppm	1 ppm	DCS control with testing	Intermittent based upon residual
BCS	Sodium Hypochlorite	PWS - 12.5% Bleach	1.20	Plant Potable Water	2 ppm	1 ppm	DCS control with testing	Intermittent based upon residual
BCS	Sulfuric Acid	CT - 95% Sulfuric Acid	1.84	Cooling Tower	300 ppm	200 ppm	DCS control with testing	Intermittent based upon residual
BCS	Sulfuric Acid	WW - 95% Sulfuric Acid	1.84	WW Injection	300 ppm	200 ppm	DCS control with testing	Not to be used for Ponds
BCS	Sodium Hypochlorite	WW - 12.5% Bleach	1.20	WW Injection	12 ppm	12 ppm	DCS control with testing	Not to be used for Ponds
BCS	Citric Acid	UF - 50% Citric Acid	1.24	Ultra Filter	20,000	20,000	DCS control	Annual Cleaning - 500 gal tank
BCS	Sodium Hydroxide	UF - 50% NaOH	1.53	Ultra Filter	1000	1000	DCS control	Annual Cleaning - 500 gal tank
BCS	Sodium Hypochlorite	UF - 12.5% Bleach	1.20	Ultra Filter	2000	2000	DCS control	Annual Cleaning - 500 gal tank

Table #2 - The concentration of sodium, as such, and the contribution to the final stream for each of the treatment chemicals used is given below. Products CL-2156 is a very low use product used as an upset recovery product that will only be used in the case of a biological upset at 200 ppm application max one time per upset.

Product	Application Point	Operational Flow (Avg)	Max Conc. In Stream (ppm as product)	wt % Na, as such	Sodium Contribution for Stream (lbs/min)	Max Conc. In Stream as ppm	% Contribution Na to Total Flow, as such
CL-4125	Cooling Tower	390.90	16	7.41%	0.00387	1.188336	0.06807409%
CI-4657	Cooling Tower	390.90	120	0.60%	0.00235	0.721661538	0.04134054%
CI-450	Cooling Tower	390.90	5	0	0.00000	0	0.00000000%
CI-40	Cooling Tower	390.90	1	8.94%	0.00029	0.089606308	0.00513312%
CI-2150	Cooling Tower	390.90	200	0	0.00000	0	0.00000000%
CT-9008	RO Feedwater	362.00	8	2.06%	0.00050	0.152968205	0.00811496%
BI-124	RO Feedwater	362.00	12	6.63%	0.00240	0.73848	0.03917637%
Sodium Hypochlorite	Cooling Tower	390.90	2	5.01%	0.00033	0.100436826	0.00575355%
Sodium Hypochlorite	Service Water	1520.10	2	5.01%	0.00127	0.390570528	0.08700586%
Sodium Hypochlorite	Plant Potable Water	2.60	2	5.01%	0.00000	0.000668037	n/a
Sulfuric Acid	Cooling Tower	390.90	300	0	0.00000	0	0.00000000%
Sulfuric Acid	Wastewater Injection Well	390.90	300	0	0.00000	0	n/a
Sodium Hypochlorite	Wastewater Injection Well	390.90	12	5.01%	0.00196	0.602620956	n/a
Citric Acid	Ultra Filter	500.00	20000	0	0.00000	0	0.00000000%
Sodium Hydroxide	Ultra Filter	500.00	1000	53.25%	2.22181	682.6786457	0.00000024%
Sodium Hypochlorite	Ultra Filter	500.00	2000	5.01%	0.41811	128.4686953	0.00000005%
						Total %	**0.25459877%**

The ultra filter chemical usage is for annual cleaning using a 500-gallon supply day tank. The description of this process is given below. The standard flush cleaning is normal operation of this unit, with the chemical enhanced flush cleaning and/or the membrane soak cleaning being used as needed. We anticipate that at most annual cleanings will be necessary.

Standard Flush Cleaning
Water from the permeate tank and air scour is pumped into the permeate side of the membrane creating a back flow across the membrane lifting and removing any solids that have accumulated on the surface. The flow rate is typically 125% of the service rate. The solids flow out of the vessels into the concentrate stream for discharge.

Chemical Enhanced Flush Cleaning
Feed water, from the backflush tank is pumped at a high flow rate from top to bottom on the concentrate side of the membrane. Sodium Hypochlorite, Sodium Hydroxide, or Citric Acid is added to this flush as needed to enhance the cleaning process.

Membrane Soak Cleaning
Sodium Hypochlorite, Sodium Hydroxide, or Citric Acid is added to this flush as needed to enhance the cleaning process. Unlike the chemical enhanced flush though is once the chemical is added the vessels the system is allowed to sit for two or more hours while the membranes are allowed to soak in the chemicals.

Arsenic, boron, manganese, fluoride and molybdenum are not purposeful additives in the chemical products used at the facility. The detectable concentrations of such species in the products are attributable to background levels in potable water sources used for dilution in the manufacturing processes. The dilution process (% potable water as a component of final treatment product) for each treatment chemical varies so the contribution maximum could be considered as 100% potable water added to the waste stream at the maximum dosage levels (120 ppm) outlined in Table #2. The comparison below is given using Panoche Energy Center's water supply for comparative purposes. Each manufacturing facility will have a different potable water source for dilution, thus PEC is used for demonstration purposes of the impact on the final effluent stream for each of these components.

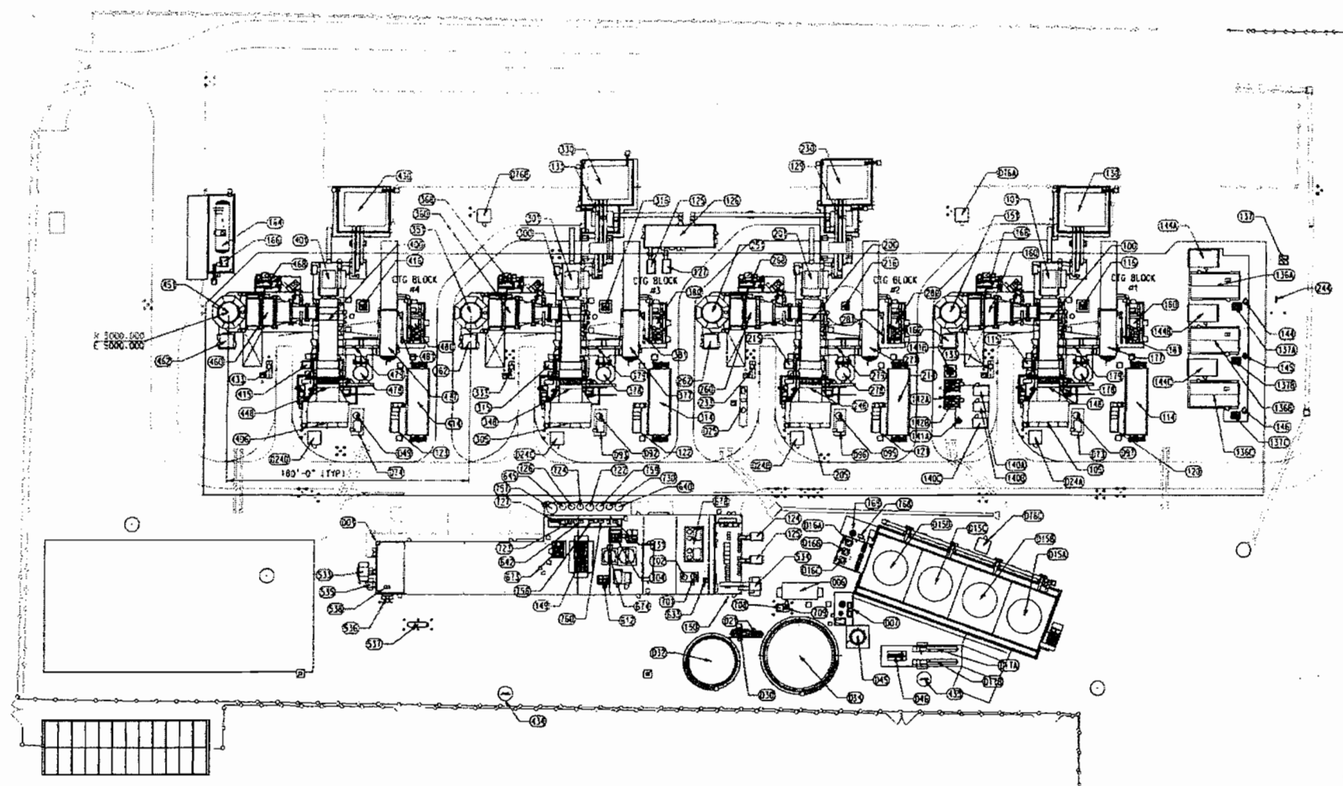
Species	Operational Flow (Avg)	ppm in PEC Water	Max ppm Addition (100% source water)	Contribution for Stream (lbs/min)	as ppm	% Mass Contribution to Total WW Flow
Molybdenum	390.90	0.051	120	1.9964E-08	6.1341E-06	0.000000002005%
Floride	390.90	0.41	120	1.6049E-07	4.9314E-05	0.000000001988%
Arsenic	390.90	0.031	120	1.2135E-08	3.7286E-06	0.000000002005%
Boron	390.90	3.5	120	1.3701E-06	0.00042097	0.000000001992%
Manganese	390.90	0.053	120	2.0747E-08	6.3747E-06	0.000000001992%

Unit App	First Quarter Chemical Usage	Gallons per quarter
CT	CL-4657	2,832.19
CT	CL-450	126.15
CT	CI-40	335.74
CT	CL-2156	901.26
CT	CL-4215	445.65
RO	BL-124	340.25
RO	CT-9008	246.19
Plant Wide	Bleach 12.5%	1,834.25
Plant Wide	Acid 93% Sulfuric	4,146.80
Unit App	Second Quarter Chemical Usage	Gallons per quarter
CT	CL-4657	3,364.52
CT	CL-450	149.86
CT	CI-40	339.47
CT	CL-2156	901.26
CT	CL-4215	470.59
RO	BL-124	344.03
RO	CT-9008	248.93
Plant Wide	Bleach 12.5%	2,097.39
Plant Wide	Acid 93% Sulfuric	4,926.23
Unit App	Third Quarter Chemical Usage	Gallons per quarter
CT	CL-4657	4,892.53
CT	CL-450	217.91
CT	CI-40	452.63
CT	CL-2156	901.26
CT	CL-4215	684.31
RO	BL-124	458.71
RO	CT-9008	331.91
Plant Wide	Bleach 12.5%	2,979.24
Plant Wide	Acid 93% Sulfuric	7,163.49
Unit App	Fourth Quarter Chemical Usage	Gallons per quarter
CT	CL-4657	2,994.32
CT	CL-450	133.37
CT	CI-40	339.47
CT	CL-2156	901.26
CT	CL-4215	418.81
RO	BL-124	344.03
RO	CT-9008	248.93
Plant Wide	Bleach 12.5%	1,912.06
Plant Wide	Acid 93% Sulfuric	4,384.18

The chemical usage at the facility is outlined here and is based upon the maximum concentrations given in Table #1 above and quarterly average flow rates for the specified stream. The usage is based upon hourly operation as outlined in the PTA water balance. The quarterly totals were calculated based upon 18 hours per day (HPD) operation in Q1,Q2, and Q4, and 24 HPD operation in Q3. The general plot plan with chemical locations, and application points for the various chemicals, are presented in the two attached figures.

PG&E GAS PIPE

PG&E METERING AND REGULATION STATION



NO	EQUIPMENT TITLE
001	ADMIN / WAREHOUSE / WATER TREATMENT BUILDING
006	FIRE WATER PUMP ENCLOSURE
007	WASTEWATER TANK TREATMENT AREA
015A	COOLING TOWER CELL A
015B	COOLING TOWER CELL B
015C	COOLING TOWER CELL C
015D	COOLING TOWER CELL D
016A	CIRCULATING WATER PUMP A
016B	CIRCULATING WATER PUMP B
016C	CIRCULATING WATER PUMP C
017A	WATER INJECTION PUMP
017B	WATER INJECTION PUMP
021	SERVICE WATER PUMP SK10
024A	AUX SK10 FIREWATER VALVE ENCLOSURE #1
024B	AUX SK10 FIREWATER VALVE ENCLOSURE #2
024C	AUX SK10 FIREWATER VALVE ENCLOSURE #3
024D	AUX SK10 FIREWATER VALVE ENCLOSURE #4
025	OIL/WATER SEPARATOR
030	DEMINERALIZED WATER PUMP SK10
032	DEMINERALIZED WATER STORAGE TANK
034	SERVICE/FIRE WATER STORAGE TANK
045	WASTE WATER COLLECTION TANK
046	WASTEWATER INJECTION CHARGE PUMP SK10
049	CONDENSATE RECOVERY TANK
073	CONDENSATE RECOVERY PUMP SK10
074	CONDENSATE RECOVERY PUMP SK10
076A	EAST TRANSFORMER DELUGE ENCLOSURE
076B	WEST TRANSFORMER DELUGE ENCLOSURE
076C	COOLING TOWER DELUGE ENCLOSURE
092	CONDENSATE RECOVERY TANK
093	CONDENSATE RECOVERY PUMP SK10
095	CONDENSATE RECOVERY TANK
096	CONDENSATE RECOVERY PUMP SK10
091	CONDENSATE RECOVERY TANK
100	LMS100 MAIN UNIT #1
101	GENERATOR
105	FILTERHOUSE
114	POWER CONTROL MODULE FOR CTG UNIT 101
115	CARBON DIOXIDE BOTTLE RACK
116	FUEL GAS FILTER/SEPARATOR #1
120	PAD MOUNT TRANSFORMER 101
121	PAD MOUNT TRANSFORMER 201
122	PAD MOUNT TRANSFORMER 301
124	PAD MOUNT TRANSFORMER 401
125	PAD MOUNT TRANSFORMER 001A
126	SKV ELECTRICAL ENCLOSURE
127	STATION SERVICE TRANSFORMER 001A
129	UNIT AUXILIARY SUPPLY TRANSFORMER 001A
130	CTG STEP-UP TRANSFORMER UNIT 1
131	UNIT AUXILIARY SUPPLY TRANSFORMER UNIT 001B
133	COMBUSTION TURBINE DRAINS TANK
136A	FUEL GAS COMPRESSOR SK10 A
136B	FUEL GAS COMPRESSOR SK10 B
136C	FUEL GAS COMPRESSOR SK10 C
137	FUEL GAS KNOCKOUT DRUM
137A	GAS COMPRESSOR DRAINS TANK A
137B	GAS COMPRESSOR DRAINS TANK B
137C	GAS COMPRESSOR DRAINS TANK C
140A	AIR COMPRESSOR A
140B	AIR COMPRESSOR B
140C	AIR COMPRESSOR C
141A	WET AIR RECEIVER
141B	DRY AIR RECEIVER
142A	AIR DRYER SK10
142B	AIR DRYER SK10
144	SUCTION ACCUMULATOR A
144A	RECYCLE GAS COOLER A
144B	RECYCLE GAS COOLER B
144C	RECYCLE GAS COOLER C
145	SUCTION ACCUMULATOR B
146	SUCTION ACCUMULATOR C
148	CT AUXILIARY SK10 #1
149	RO FIRST AND SECOND PASS SUPER SK10
150	EYE WASH STATION WT BLDG SOUTHEAST
151	EXHAUST STACK
160	SELECTIVE CATALYTIC REDUCTION UNIT
162	CONTINUOUS EMISSIONS MONITORING SYSTEMS EQUIPMENT BUILDING (CEMS)
164	AMMONIA STORAGE TANK
166	AMMONIA FORWARDING PUMP SK10
168	AQUEOUS AMMONIA DELIVERY SK10 #1
177	INTERCOOLER #1
178	VBV STACK
179	INTERCOOLER #1 INTERCONNECTING PIPING SK10
180	COOLING WATER PUMP SK10 1
181	CONDENSATION TANK
200	LMS100 MAIN UNIT #2
201	GENERATOR
205	FILTERHOUSE
214	POWER CONTROL MODULE FOR CTG UNIT 201
215	CARBON DIOXIDE BOTTLE RACK
216	FUEL GAS FILTER/SEPARATOR #2
230	CTG STEP-UP TRANSFORMER UNIT 2
233	COMBUSTION TURBINE DRAINS TANK
244	FUEL GAS CHROMATOGRAPH
248	CT AUXILIARY SK10 #2
251	EXHAUST STACK
260	SELECTIVE CATALYTIC REDUCTION UNIT
262	CONTINUOUS EMISSIONS MONITORING SYSTEMS EQUIPMENT BUILDING (CEMS)
268	AQUEOUS AMMONIA DELIVERY SK10 #2
277	INTERCOOLER #2
278	VBV STACK
279	INTERCOOLER #2 INTERCONNECTING PIPING SK10
280	COOLING WATER PUMP SK10 #2
281	CONDENSATION TANK
300	LMS100 MAIN UNIT #3
301	GENERATOR
305	FILTERHOUSE
314	POWER CONTROL MODULE FOR CTG UNIT 301
315	CARBON DIOXIDE BOTTLE RACK
316	FUEL GAS FILTER/SEPARATOR #3
330	CTG STEP-UP TRANSFORMER UNIT 3
333	COMBUSTION TURBINE DRAINS TANK
348	CT AUXILIARY SK10 #3
351	EXHAUST STACK
360	SELECTIVE CATALYTIC REDUCTION UNIT
362	CONTINUOUS EMISSIONS MONITORING SYSTEMS EQUIPMENT BUILDING (CEMS)
368	AQUEOUS AMMONIA DELIVERY SK10 #3
377	INTERCOOLER #3
378	VBV STACK
379	INTERCOOLER #3 INTERCONNECTING PIPING SK10
380	COOLING WATER PUMP SK10 #3
381	CONDENSATION TANK
400	LMS100 MAIN UNIT #4
401	GENERATOR
406	FILTERHOUSE
414	POWER CONTROL MODULE FOR CTG UNIT 401
415	CARBON DIOXIDE BOTTLE RACK
416	FUEL GAS FILTER/SEPARATOR #4
430	CTG STEP-UP TRANSFORMER UNIT 4
433	COMBUSTION TURBINE DRAINS TANK
434	INJECTION WELL 2
435	INJECTION WELL 1
436	INJECTION WELL 3
437	INJECTION WELL 4
448	CT AUXILIARY SK10 #4
451	EXHAUST STACK
460	SELECTIVE CATALYTIC REDUCTION UNIT
462	CONTINUOUS EMISSIONS MONITORING SYSTEMS EQUIPMENT BUILDING (CEMS)
468	AQUEOUS AMMONIA DELIVERY SK10 #4
477	INTERCOOLER #4
478	VBV STACK
479	INTERCOOLER #4 INTERCONNECTING PIPING SK10
480	COOLING WATER PUMP SK10 #4
481	CONDENSATION TANK
533	CONTROL ROOM/ADMIN HVAC UNIT
534	ELECTRICAL ROOM HVAC UNIT
535	CONTROL ROOM/ADMIN HVAC UNIT
536	CONTROL ROOM/ADMIN HVAC UNIT
537	PROPANE TANK
538	ADMIN/CONTROL ROOM DCS PANEL
612	RO FEED PUMP SK10
633	WATER HEATER TANK
642	CIRCULATING WATER SULFURIC ACID 98% FEED TOTE
642	CIRCULATING WATER SULFURIC ACID PUMP SK10
645	WATER TREATMENT RO CAUSTIC TOTE
673	RO CLEANING SYSTEM
674	RO PRODUCT WATER STORAGE TANK
678	MIXED BED POLISHERS
701	POTABLE WATER FEED SK10
702	POTABLE WATER FEED TANK
704	RO PRODUCT WATER FORWARDING PUMP SK10
708	WATER TREATMENT SODIUM HYPOCHLORITE TOTE
709	WATER TREATMENT SODIUM HYPOCHLORITE PUMP SK10
722	CIRCULATING WATER SODIUM HYPOCHLORITE 1X2-5% TOTE
723	CIRCULATING WATER SODIUM HYPOCHLORITE PUMP SK10
724	WATER TREATMENT RO ANTI-SCALANT TOTE
726	WATER TREATMENT SODIUM BISULFITE TOTE
727	WATER TREATMENT CHEMICAL PUMP SK10
730	CIRCULATING WATER BIO-DISPERSANT FEED TOTE
731	CIRCULATING WATER BIO-DISPERSANT PUMP SK10
757	CIRCULATING WATER CORROSION INHIBITOR TOTE
758	CIRCULATING WATER CORROSION INHIBITOR PUMP SK10
759	CIRCULATING WATER MINERAL DISPERSANT TOTE
760	CIRCULATING WATER MINERAL DISPERSANT PUMP SK10
768	CT YELLOW METAL CORROSION INHIBITOR PUMP SK10
769	COOLING TOWER YELLOW METAL CORROSION INHIBITOR

N

SCALE IN FEET
40 0 40 80
SCALE: 1" = 40'-0"

NO	DESCRIPTION	DRW	CHK	APP	DATE
3	CONFORMED TO CONSTRUCTION RECORDS	DAD	DCS	RCB	OPEN
2	CONFORMED TO CONSTRUCTION RECORDS	CMO	DCS	RCB	09-18-09
1	CONFORMED TO CONSTRUCTION RECORDS	CMO	DCS	RCB	05-29-09
0	ISSUED FOR CONSTRUCTION	TEF	WFK	RCB	10-06-08

PANOCHE ENERGY CENTER, LLC

4 X GE LMS100 PEAKING FACILITY
FRESNO COUNTY, CALIFORNIA

Kiewit

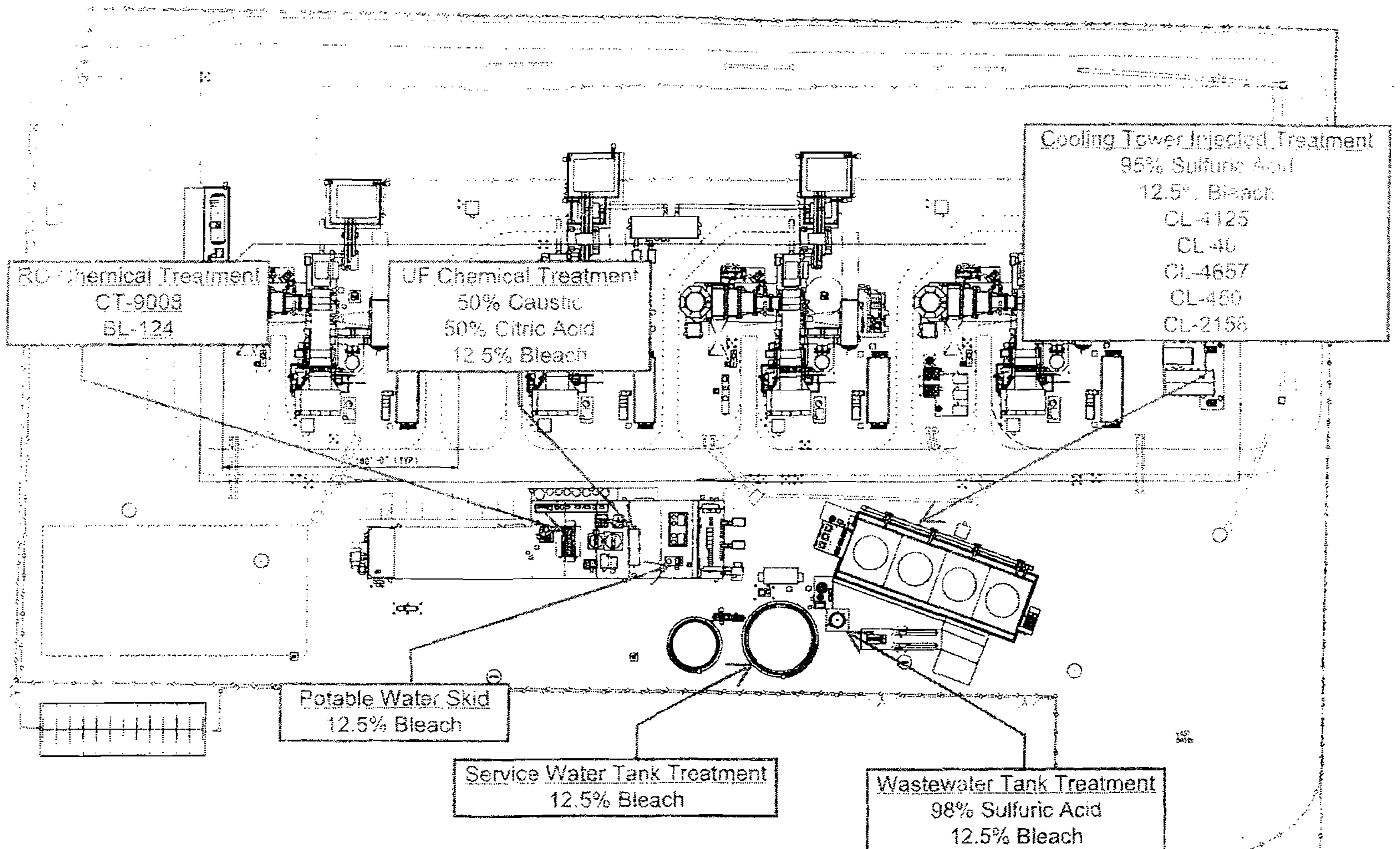
Kiewit Power
8455 Lenexa Drive
Lenexa, Kansas 66214

REGISTERED PROFESSIONAL ENGINEER
ROBERT E. BAKER
No. M 34002
Exp. 12-31-09
MECHANICAL
STATE OF CALIFORNIA

PLOT PLAN

	by	date
DESIGNED	TEF	09-16-09
DRAWN	TEF	10-01-08
CHECKED	WFK	10-01-08
APPROVED	RCB	10-01-08

DRAWING NUMBER
2007-018-PP-001



NO	EQUIPMENT TITLE
001	ADMIN / WAREHOUSE / WATER TREATMENT BUILDING
006	FIRE WATER PUMP ENCLOSURE
015A	COOLING TOWER CELL A
015B	COOLING TOWER CELL B
015C	COOLING TOWER CELL C
015D	COOLING TOWER CELL D
016A	CIRCULATING WATER PUMP A
016B	CIRCULATING WATER PUMP B
016C	CIRCULATING WATER PUMP C
017A	WATER INJECTION PUMP
017B	WATER INJECTION PUMP
021	SERVICE WATER PUMP SKID
024A	AUX SKID FIREWATER VALVE ENCLOSURE #1
024B	AUX SKID FIREWATER VALVE ENCLOSURE #2
024C	AUX SKID FIREWATER VALVE ENCLOSURE #3
024D	AUX SKID FIREWATER VALVE ENCLOSURE #4
025	OIL/WATER SEPARATOR
030	DEMINERALIZED WATER PUMP SKID
032	DEMINERALIZED WATER STORAGE TANK
034	SERVICE/FIRE WATER STORAGE TANK
045	WASTE WATER COLLECTION TANK
046	WASTEWATER INJECTION CHARGE PUMP SKID
076A	EAST TRANSFORMER DELUGE ENCLOSURE
076B	WEST TRANSFORMER DELUGE ENCLOSURE
076C	COOLING TOWER DELUGE ENCLOSURE
100	LMS100 MAIN UNIT #1
101	GENERATOR
105	FILTERHOUSE
114	POWER CONTROL MODULE FOR CTG UNIT 101
115	CARBON DIOXIDE BOTTLE RACK
116	FUEL GAS FILTER/SEPARATOR #1
120	PAD MOUNT TRANSFORMER 101

NO	EQUIPMENT TITLE
121	PAD MOUNT TRANSFORMER 201
122	PAD MOUNT TRANSFORMER 301
123	PAD MOUNT TRANSFORMER 401
124	PAD MOUNT TRANSFORMER 001A
125	PAD MOUNT TRANSFORMER 001B
126	SKV ELECTRICAL ENCLOSURE
127	STATION SERVICE TRANSFORMER 001A
129	UNIT AUXILIARY SUPPLY TRANSFORMER 001A
130	CTG STEP-UP TRANSFORMER UNIT 1
131	UNIT AUXILIARY SUPPLY TRANSFORMER UNIT 001B
133	COMBUSTION TURBINE DRAINS TANK
136A	FUEL GAS COMPRESSOR SKID A
136B	FUEL GAS COMPRESSOR SKID B
136C	FUEL GAS COMPRESSOR SKID C
137	FUEL GAS KNOCKOUT DRUM
137A	GAS COMPRESSOR DRAINS TANK A
137B	GAS COMPRESSOR DRAINS TANK B
137C	GAS COMPRESSOR DRAINS TANK C
140A	AIR COMPRESSOR A
140B	AIR COMPRESSOR B
140C	AIR COMPRESSOR C
141A	WET AIR RECEIVER
141B	DRY AIR RECEIVER
142A	AIR DRYER SKID
142B	AIR DRYER SKID
144	SUCTION ACCUMULATOR A
144A	RECYCLE GAS COOLER A
144B	RECYCLE GAS COOLER B
144C	RECYCLE GAS COOLER C
145	SUCTION ACCUMULATOR B
146	SUCTION ACCUMULATOR C
148	CT AUXILIARY SKID #1

NO	EQUIPMENT TITLE
149	RO FIRST AND SECOND PASS SUPER SKID
150	EYE WASH STATION AT BLDG SOUTHEAST
151	EXHAUST STACK
160	SELECTIVE CATALYTIC REDUCTION UNIT
162	CONTINUOUS EMISSIONS MONITORING SYSTEMS EQUIPMENT BUILDING (CEMS)
164	AMMONIA STORAGE TANK
166	AMMONIA FORWARDING PUMP SKID
164	AQUEOUS AMMONIA DELIVERY SKID #1
177	INTERCOOLER #1
178	VBV STACK
179	INTERCOOLER #1 INTERCONNECTING PIPING SKID
180	COOLING WATER PUMP SKID 1
181	CONDENSATION TANK
200	LMS100 MAIN UNIT #2
201	GENERATOR
205	FILTERHOUSE
214	POWER CONTROL MODULE FOR CTG UNIT 201
215	CARBON DIOXIDE BOTTLE RACK
216	FUEL GAS FILTER/SEPARATOR #2
230	CTG STEP-UP TRANSFORMER UNIT 2
233	COMBUSTION TURBINE DRAINS TANK
244	FUEL GAS CHROMATOGRAPH
248	CT AUXILIARY SKID #2
251	EXHAUST STACK
260	SELECTIVE CATALYTIC REDUCTION UNIT
262	CONTINUOUS EMISSIONS MONITORING SYSTEMS EQUIPMENT BUILDING (CEMS)
268	AQUEOUS AMMONIA DELIVERY SKID #2
277	INTERCOOLER #2
278	VBV STACK

NO	EQUIPMENT TITLE
279	INTERCOOLER #2 INTERCONNECTING PIPING SKID
280	COOLING WATER PUMP SKID #2
281	CONDENSATION TANK
300	LMS100 MAIN UNIT #3
301	GENERATOR
305	FILTERHOUSE
314	POWER CONTROL MODULE FOR CTG UNIT 301
315	CARBON DIOXIDE BOTTLE RACK
316	FUEL GAS FILTER/SEPARATOR #3
330	CTG STEP-UP TRANSFORMER UNIT 3
333	COMBUSTION TURBINE DRAINS TANK
348	CT AUXILIARY SKID #3
351	EXHAUST STACK
360	SELECTIVE CATALYTIC REDUCTION UNIT
362	CONTINUOUS EMISSIONS MONITORING SYSTEMS EQUIPMENT BUILDING (CEMS)
368	AQUEOUS AMMONIA DELIVERY SKID #3
377	INTERCOOLER #3
378	VBV STACK
379	INTERCOOLER #3 INTERCONNECTING PIPING SKID
380	COOLING WATER PUMP SKID #3
381	CONDENSATION TANK
400	LMS100 MAIN UNIT #4
401	GENERATOR
406	FILTERHOUSE
414	POWER CONTROL MODULE FOR CTG UNIT 401
415	CARBON DIOXIDE BOTTLE RACK
416	FUEL GAS FILTER/SEPARATOR #4
430	CTG STEP-UP TRANSFORMER UNIT 4
433	COMBUSTION TURBINE DRAINS TANK

NO	EQUIPMENT TITLE
434	INJECTION WELL 2
435	INJECTION WELL 1
436	INJECTION WELL 3
437	INJECTION WELL 4
448	CT AUXILIARY SKID #4
451	EXHAUST STACK
460	SELECTIVE CATALYTIC REDUCTION UNIT
462	CONTINUOUS EMISSIONS MONITORING SYSTEMS EQUIPMENT BUILDING (CEMS)
468	AQUEOUS AMMONIA DELIVERY SKID #4
477	INTERCOOLER #4
478	VBV STACK
479	INTERCOOLER #4 INTERCONNECTING PIPING SKID
480	COOLING WATER PUMP SKID #4
481	CONDENSATION TANK
533	CONTROL ROOM/ADMIN HVAC UNIT
534	ELECTRICAL ROOM HVAC UNIT
535	CONTROL ROOM/ADMIN HVAC UNIT
536	CONTROL ROOM/ADMIN HVAC UNIT
537	PROPANE TANK
538	ADMIN/CONTROL ROOM DCS PANEL
612	RO FEED PUMP SKID
633	WATER HEATER TANK
640	CIRCULATING WATER SULFURIC ACID (98%) FEED TOTE
642	CIRCULATING WATER SULFURIC ACID PUMP SKID
645	WATER TREATMENT RO CAUSTIC TOTE
673	RO CLEANING SYSTEM
674	RO PRODUCT WATER STORAGE TANK
678	MIXED BED POLISHERS
701	POTABLE WATER FEED SKID
702	POTABLE WATER FEED TANK

NO	EQUIPMENT TITLE
704	RO PRODUCT WATER FORWARDING PUMP SKID
708	WATER TREATMENT SODIUM HYPOCHLORITE TOTE
709	WATER TREATMENT SODIUM HYPOCHLORITE PUMP SKID
722	CIRCULATING WATER SODIUM HYPOCHLORITE (12.5%) TOTE
723	CIRCULATING WATER SODIUM HYPOCHLORITE PUMP SKID
724	WATER TREATMENT RO ANTI-SCALANT TOTE
726	WATER TREATMENT SODIUM BISULFITE TOTE
727	WATER TREATMENT CHEMICAL PUMP SKID
730	CIRCULATING WATER BIO-DISPERSANT FEED TOTE
731	CIRCULATING WATER BIO-DISPERSANT PUMP SKID
757	CIRCULATING WATER CORROSION INHIBITOR TOTE
758	CIRCULATING WATER CORROSION INHIBITOR PUMP SKID
759	CIRCULATING WATER MINERAL DISPERSANT TOTE
760	CIRCULATING WATER MINERAL DISPERSANT PUMP SKID

40 0 40 80
SCALE IN FEET
SCALE: 1" = 40'-0"

N

REV	DESCRIPTION	DRN	CHK	APP	DATE
2	CONFORMED TO CONSTRUCTION RECORDS	CMD	DES	REB	09-18-09
1	CONFORMED TO CONSTRUCTION RECORDS	CMD	DES	REB	05-29-09
0	ISSUED FOR CONSTRUCTION	TEF	WFK	REB	10-06-08

PANOCHE ENERGY CENTER, LLC

4 X GE LMS100 PEAKING FACILITY
FRESNO COUNTY, CALIFORNIA

Kiewit

Kiewit Power
8455 Lenexa Drive
Lenexa, Kansas 66214

Robert E Brown, Mechanical Engineer

REGISTERED PROFESSIONAL ENGINEER
ROBERT E. BROWN
No. M 34002
Exp. 12-31-08
MECHANICAL
STATE OF CALIFORNIA

PLOT PLAN

	by	date
DESIGNED	TEF	06-16-07
DRAWN	TEF	10-01-08
CHECKED	WFK	10-01-08
APPROVED	REB	10-01-08

DRAWING NUMBER
2007-018-PP-001

ChemTreat, Inc.

MSDS

MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Product Name:	ChemTreat CL40
Product Use:	Cooling Water Microbiocide
Manufacturer's Name:	ChemTreat, Inc.
Emergency Telephone Number:	(800) 424–9300
Address (Corporate Headquarters):	4461 Cox Road Glen Allen, VA 23060
Telephone Number for Information:	(800) 648–4579
Date of MSDS:	March 21, 2008

Section 2. Hazard(s) Identification

Signal Word: **WARNING!**

Hazard Statement(s): Causes eye irritation.
May be harmful in contact with skin.
May be harmful if inhaled.
May be harmful if swallowed.

Precautionary Statement(s): No significant health risks are expected from exposures under normal conditions of use.

Section 3. Composition/Hazardous Ingredients

Component	CAS Registry #	Wt.%
Sodium bromide	7647–15–6	40

Section 4. First Aid Measures

Inhalation: Remove to fresh air and keep at rest in a position comfortable for breathing. Call a poison center or doctor/physician if you feel unwell.

Eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.

Skin: Wash with plenty of soap and water. Call a poison center or doctor/physician if you feel unwell.

Ingestion: DO NOT INDUCE VOMITING. Rinse mouth. Call a POISON CENTER or doctor/physician if you feel unwell.

Notes to Physician:	N/A
Additional First Aid Remarks:	Have the product container, label or MSDS with you when calling a poison control center or doctor, or when going for treatment.

Section 5. Fire Fighting Measures

Flammability of the Product:	Not flammable.
Suitable Extinguishing Media:	Use extinguishing media suitable to surrounding fire.
Specific Hazards Arising from the Chemical:	None known.
Protective Equipment:	If product is involved in a fire, wear full protective clothing including a positive–pressure, NIOSH approved, self–contained breathing apparatus.

Section 6. Accidental Release Measures

Personal Precautions:	Use appropriate Personal Protective Equipment (PPE).
Environmental Precautions:	This pesticide is toxic to fish and aquatic organisms. Do not discharge effluent containing this product into lakes, ponds, streams, estuaries, oceans or public waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit, and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA.
Methods for Cleaning up:	Contain and recover liquid when possible. Flush spill area with water spray.
Other Statements:	None.

Section 7. Handling and Storage

Handling: Wear appropriate Personal Protection Equipment (PPE) when handling this product. Do not get in eyes, or on skin and clothing. Wash thoroughly after handling. Do not ingest. Avoid breathing vapors, mist or dust.

Storage: Store away from incompatible materials (see Section 10). Store at ambient temperatures. Keep container securely closed when not in use. Label precautions also apply to empty container. Recondition or dispose of empty containers in accordance with government regulations. For Industrial use only.

Section 8. Exposure Controls/Personal Protection

Exposure Limits

Component	Source	Exposure Limits
Sodium bromide		N/E

Carcinogenicity Category

Component	Source	Code	Brief Description
Sodium bromide			N/E

Engineering Controls: Use only with adequate ventilation. The use of local ventilation is recommended to control emission near the source.

Personal Protection

Eyes: Wear chemical splash goggles or safety glasses with full–face shield. Maintain eyewash fountain in work area.

Skin: Maintain quick–drench facilities in work area.
Wear butyl rubber or neoprene gloves. Wash them after each use and replace as necessary. If conditions warrant, wear protective clothing such as boots, aprons, and coveralls to prevent skin contact.

Respiratory: If misting occurs, use NIOSH approved organic vapor/acid gas dual cartridge respirator with a dust/mist prefilter in accordance with 29 CFR 1910.134.

Section 9. Physical and Chemical Properties

Physical State and Appearance:	Liquid, Colorless, Clear
Specific Gravity:	1.4250
pH:	7.3
Freezing Point:	<−11°F
Flash Point:	N/D
Odor:	Mild
Melting Point:	N/D
Boiling Point:	N/D
Solubility in Water:	Dispersible
Evaporation Rate:	N/A
Vapor Density:	N/D
Molecular Weight:	N/D
Viscosity:	N/A
Flammable Limits:	N/A
Autoignition Temperature:	N/A
Density:	11.88 lb/ga
Vapor Pressure:	N/D
% VOC	60

Section 10. Stability and Reactivity

Chemical Stability: Stable at normal temperatures and pressures.

Incompatibility with Various Substances: Strong acids, Strong oxidizers

Hazardous Decomposition Products: Hydrogen, Bromine

Possibility of Hazardous Reactions: None known.

Section 11. Toxicological Information

Chemical Name	Exposure	Type of Effect	Concentration	Species
ChemTreat CL40	Oral	LD50	>5000 mg/kg	Rat
	Dermal	LD50	>2000 mg/kg	Rabbit

Comments: None.

Section 12. Ecological Information

Species	Duration	Type of Effect	Test Results
Bluegill Sunfish	96h	LC50	>1000 mg/l
Fathead Minnow	96h	LC50	>1000 mg/l
Daphnia magna	48h	LC50	>1000 mg/l
Rainbow Trout	96h	LC50	>1000 mg/l
Ceriodaphnia dubia	48h	LC50	>1000 mg/l

Comments: None.

Section 13. Disposal Considerations

PESTICIDE DISPOSAL: Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance. CONTAINER DISPOSAL: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incineration, or if allowed by state and local authorities, by burning. If burned, stay out of smoke.

Section 14. Transport Information

DOT Classification

DOT Name: COMPOUND, INDUSTRIAL WATER TREATMENT, LIQUID
Technical Name: N/A
Hazard Class: Not D.O.T. Regulated.
UN/NA#: N/A
Packing Group: N/A

Section 15. Regulatory Information

Inventory Status

United States (TSCA): All ingredients listed.
Canada (DSL/NDSL): All ingredients listed.

Federal Regulations

SARA Title III Rules

Sections 311/312 Hazard Classes

Fire Hazard:	No
Reactive Hazard:	No
Release of Pressure:	No
Acute Health Hazard:	Yes
Chronic Health Hazard:	No

Other Sections

Component	Section 313 Toxic Chemical	Section 302 EHS TPQ	CERCLA RQ
Sodium bromide	N/A	N/A	N/A

State Regulations

California Proposition 65: None known.

Special Regulations

Component	States
Sodium bromide	None

International Regulations

Canada

WHMIS Classification: N/A

Controlled Product Regulations (CPR): N/A

Section 16. Other Information

HMIS Hazard Rating

Health:	1
Flammability:	0
Physical Hazard:	0
PPE:	X

Notes: The PPE rating depends on circumstances of use. See Section 8 for recommended PPE.
The Hazardous Material Information System (HMIS) is a voluntary, subjective alpha–numeric symbolic system for recommending hazard risk and personal protection equipment information. It is a subjective rating system based on the evaluator's understanding of the chemical associated risks. The end–user must determine if the code is appropriate for

their use.

NSF: N/A

FDA: N/A

KOSHER: This product is certified by the Orthodox Union as kosher pareve.

FIFRA: This product is an EPA registered biocide. 5185-451-15300

Other: None

Abbreviations

Abbreviation	Definition
<	Less Than
>	Greater Than
ACGIH	American Conference of Governmental Industrial Hygienists
EHS	Environmental Health and Safety Dept
N/A	Not Applicable
N/D	Not Determined
N/E	Not Established
OSHA	Occupational Health and Safety Dept
PEL	Personal Exposure Limit
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
TWA	Time Weight Average
UNK	Unknown

Prepared by: Regulatory Affairs Department

Disclaimer

50% Citric Acid Solution, FCC Grade

SPECIFICATION SHEET

Issue Date: June 6, 2008

Replaces: None

Chemical Formula: $C_6H_8O_7$ (Citric Acid), Food Chemical Codex Grade, Kosher Approved

Description Liquid Citric acid is produced by dissolving anhydrous citric acid in water. It is a clear, colorless, odorless solution with a pure, fruit-sour flavor. It is a stable, non-volatile solution and completely miscible in water.

Applications Citric acid has a wide range of uses including food and beverage, environmental, additive and compounding.

Typical Properties

Parameter:	Result:
Assay	49.00% to 51.00% by weight
Identification	Meets USP / FCC tests
R.O.I	Not more than 0.5%
Oxalate	Passes test – no turbidity
Sulfate	Passes test – no turbidity
Arsenic (as As)	Not more than 1 ppm
Heavy Metals (as Lead)	Not more than 5.0 ppm
Lead	Not more than 0.5 ppm
Readily Carbonizable Substances	Passes test
Tridodecylamine	Not more than 0.1 ppm
Ultraviolet Absorbance	280-289 nm 0.25 max. 291-299 nm 0.20 max. 300-359 nm 0.13 max. 360-400 nm 0.03 max.
Organic Volatile Impurities	Meets the requirement

Safety and Storage Individuals handing and storing citric acid should avoid breathing sprays or mists, ingesting, getting in eyes, on skin or on clothing. Citric acid should be stored in a cool (optimal 30F-85F), dry, well ventilated place away from incompatible acids or alkalis.

Packaging BCS can provide the appropriate size tank for storage and delivery service.

Contact your Basic Chemical Solutions sales representative for more information at

800-411-4227 (4BCS)

BASIC CHEMICAL SOLUTIONS, L.L.C.

Corporate Headquarters
525 Seaport Boulevard
Redwood City, California 94063

ChemTreat, Inc.	**Product Data** **REVERSE OSMOSIS MEMBRANE ANTISCALENT/ANTIFOULANT**

CHEMTREAT CT-9008

GENERAL DESCRIPTION

CHEMTREAT CT-9008 is an advanced liquid formulation containing organophosphonates and polymers, including Quadrasperse® quadpolymer designed to control hardness and silica-based deposits in reverse osmosis membranes. Application of **CHEMTREAT CT-9008** provides results superior to polyphosphate or sulfuric acid products. **CHEMTREAT CT-9008** is certified NSF/ANSI Standard 60 for use in potable water at a maximum use rate of 20 mg/L.

TYPICAL PHYSICAL PROPERTIES

Form	Clear, dark straw-colored liquid
Odor	Mild
pH	~4.2
Density	9.49 pounds/gallon
Freeze Point	32°F

APPLICATION

CHEMTREAT CT-9008 can be fed neat when possible. The preferred feed point is ahead of the 5-micron cartridge filters prior to the membrane inlet. To ensure good mixing, the product should be injected at a point of turbulent flow in the raw water system. For NSF applications, the maximum dosage of **CHEMTREAT CT-9008** is 20 mg/L as product in the feedwater to the reverse osmosis system. Consult your ChemTreat representative for specific application recommendations. **CHEMTREAT CT-9008** can be measured using the PolyTrak® test kit, Part Number PTK-3.

SAFETY PRECAUTIONS

For specific information on handling, safety and first aid, please review the product's Material Safety Data Sheet.

SHIPPING

CHEMTREAT CT-9008 is available in 55-gallon drums, 300-gallon returnable totes, and bulk.

ChemTreat, Inc.

MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Product Name:	ChemTreat CT9008
Product Use:	Reverse Osmosis Treatment
Manufacturer's Name:	ChemTreat, Inc.
Emergency Telephone Number:	(800) 424–9300
Address (Corporate Headquarters):	4461 Cox Road Glen Allen, VA 23060
Telephone Number for Information:	(800) 648–4579
Date of MSDS:	August 11, 2008

Section 2. Hazard(s) Identification

Signal Word: **WARNING!**

Hazard Statement(s): Causes eye irritation.
May be harmful in contact with skin.
May be harmful if inhaled.
Harmful if swallowed.

Precautionary Statement(s): No significant health risks are expected from exposures under normal conditions of use.

Section 3. Composition/Hazardous Ingredients

Component	CAS Registry #	Wt.%
1–Hydroxyethylidene–1,1–diphosphonic acid, dipotassium salt	21089–06–5	1–5

Section 4. First Aid Measures

Inhalation: Remove to fresh air and keep at rest in a position comfortable for breathing. Call a poison center or doctor/physician if you feel unwell.

Eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.

Skin: Wash with plenty of soap and water. Call a poison center or doctor/physician if you feel unwell.

Ingestion: DO NOT INDUCE VOMITING. Rinse mouth. Call a POISON CENTER or doctor/physician.

Notes to Physician: N/A

Additional First Aid Remarks: N/A

Section 5. Fire Fighting Measures

Flammability of the Product: Not flammable.

Suitable Extinguishing Media: Use extinguishing media suitable to surrounding fire.

Specific Hazards Arising from the Chemical: Use water spray to keep containers cool.

Protective Equipment: If product is involved in a fire, wear full protective clothing including a positive–pressure, NIOSH approved, self–contained breathing apparatus.

Section 6. Accidental Release Measures

Personal Precautions: Use appropriate Personal Protective Equipment (PPE).

Environmental Precautions: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains, and sewers.

Methods for Cleaning up: Contain and recover liquid when possible. Flush spill area with water spray.

Other Statements: None.

Section 7. Handling and Storage

Handling: Wear appropriate Personal Protection Equipment (PPE) when handling this product. Do not get in eyes, or on skin and clothing. Wash thoroughly after handling. Do not ingest. Avoid breathing vapors, mist or dust.

Storage: Store away from incompatible materials (see Section 10). Store at ambient temperatures. Keep container securely closed when not in use. Label precautions also apply to empty container. Recondition or dispose of empty containers in accordance with government regulations. For Industrial use only.

ChemTreat, Inc.

MSDS

Section 8. Exposure Controls/Personal Protection

Exposure Limits

Component	Source	Exposure Limits
1-Hydroxyethylidene-1,1-diphosphonic acid, dipotassium salt		N/E

Carcinogenicity Category

Component	Source	Code	Brief Description
1-Hydroxyethylidene-1,1-diphosphonic acid, dipotassium salt			N/E

Engineering Controls: Use only with adequate ventilation. The use of local ventilation is recommended to control emission near the source.

Personal Protection

Eyes: Wear chemical splash goggles or safety glasses with full-face shield. Maintain eyewash fountain in work area.

Skin: Maintain quick-drench facilities in work area.
Wear butyl rubber or neoprene gloves. Wash them after each use and replace as necessary. If conditions warrant, wear protective clothing such as boots, aprons, and coveralls to prevent skin contact.

Respiratory: If misting occurs, use NIOSH approved organic vapor/acid gas dual cartridge respirator with a dust/mist prefilter in accordance with 29 CFR 1910.134.

Section 9. Physical and Chemical Properties

Physical State and Appearance:	Liquid, Dark Straw, Clear
Specific Gravity:	1.1380
pH:	4.2
Freezing Point:	32°F
Flash Point:	N/D
Odor:	Mild
Melting Point:	N/A
Boiling Point:	N/D
Solubility in Water:	Complete
Evaporation Rate:	N/D
Vapor Density:	Similar to water
Molecular Weight:	N/D
Viscosity:	<100
Flammable Limits:	N/A
Autoignition Temperature:	N/A
Density:	9.49 lb/ga

Vapor Pressure:	Similar to water
% VOC	0

Section 10. Stability and Reactivity

Chemical Stability:	Stable at normal temperatures and pressures.
Incompatibility with Various Substances:	Strong bases, Strong oxidizers
Hazardous Decomposition Products:	Oxides of carbon, Oxides of nitrogen, Oxides of phosphorus
Possibility of Hazardous Reactions:	None known.

Section 11. Toxicological Information

Chemical Name	Exposure	Type of Effect	Concentration	Species
N/D				

Comments: None.

Section 12. Ecological Information

Species	Duration	Type of Effect	Test Results
N/D			

Comments: Not tested.

Section 13. Disposal Considerations

Dispose of in accordance with local, state and federal regulations.
Not a RCRA-regulated hazardous waste when disposed in the original product form.

Section 14. Transport Information

DOT Classification

DOT Name:	COMPOUND, INDUSTRIAL WATER TREATMENT, LIQUID
Technical Name:	N/A
Hazard Class:	Not D.O.T. Regulated.
UN/NA#:	N/A
Packing Group:	N/A

Section 15. Regulatory Information

Inventory Status

United States (TSCA):	All ingredients listed.
Canada (DSL/NDSL):	All ingredients listed.

Federal Regulations

SARA Title III Rules

Sections 311/312 Hazard Classes

Fire Hazard:	No
Reactive Hazard:	No
Release of Pressure:	No
Acute Health Hazard:	Yes
Chronic Health Hazard:	No

Other Sections

Component	Section 313 Toxic Chemical	Section 302 EHS TPQ	CERCLA RQ
1-Hydroxyethylidene-1,1-diphosphonic acid, dipotassium salt	N/A	N/A	N/A

State Regulations

California Proposition 65: None known.

Special Regulations

Component	States
1-Hydroxyethylidene-1,1-diphosphonic acid, dipotassium salt	None

International Regulations

Canada

WHMIS Classification: N/A

Controlled Product Regulations (CPR): N/A

Section 16. Other Information

HMIS Hazard Rating

Health:	1
Flammability:	0
Physical Hazard:	0
PPE:	X

Notes: The PPE rating depends on circumstances of use. See Section 8 for recommended PPE.
The Hazardous Material Information System (HMIS) is a voluntary, subjective alpha–numeric symbolic system for recommending hazard risk and personal protection equipment information. It is a subjective rating system based on the evaluator's understanding of the chemical associated risks. The end–user must determine if the code is appropriate for their use.

NSF: Certified to NSF/ANSI Standard 60
Maximum use rate for potable water – 20 mg/L
This product ships as NSF from:
Ashland, VA

FDA: N/A

KOSHER: This product has not been evaluated for Kosher approval.

FIFRA: N/A

Other: None

Abbreviations

Abbreviation	Definition
<	Less Than
>	Greater Than
ACGIH	American Conference of Governmental Industrial Hygienists
EHS	Environmental Health and Safety Dept
N/A	Not Applicable
N/D	Not Determined
N/E	Not Established
OSHA	Occupational Health and Safety Dept
PEL	Personal Exposure Limit
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
TWA	Time Weight Average
UNK	Unknown

Prepared by: Regulatory Affairs Department

Disclaimer

Although the information and recommendations set forth herein (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof, ChemTreat, Inc. makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will ChemTreat, Inc. be responsible for damages of any nature whatsoever resulting from the use or reliance upon information. No representation or warranties, either expressed or implied, of merchantability, fitness for a particular purpose, or of any other nature are made hereunder with respect to information or the product to which information refers.

MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Product Name:	ChemTreat CL4657
Product Use:	Cooling Water Treatment
Manufacturer's Name:	ChemTreat, Inc.
Emergency Telephone Number:	(800) 424-9300
Address (Corporate Headquarters):	4461 Cox Road Glen Allen, VA 23060
Telephone Number for Information:	(800) 648-4579
Date of MSDS:	March 26, 2008

Section 2. Hazard(s) Identification

Signal Word: WARNING!

Hazard Statement(s): May be harmful in contact with skin.
May be harmful if inhaled.
May be harmful if swallowed.

Precautionary Statement(s): No significant health risks are expected from exposures under normal conditions of use.

Section 3. Composition/Hazardous Ingredients

Component	CAS Registry #	Wt.%
There are no hazardous ingredients in this product as defined in 29 CFR 1910-1200.	Proprietary	N/A

Section 4. First Aid Measures

Inhalation: Remove to fresh air and keep at rest in a position comfortable for breathing. Call a poison center or doctor/physician if you feel unwell.

Eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.

Skin: Wash with plenty of soap and water. Call a poison center or doctor/physician if you feel unwell.

Ingestion: DO NOT INDUCE VOMITING. Rinse mouth. Call a POISON CENTER or doctor/physician if you feel unwell.

Notes to Physician:	N/A
Additional First Aid Remarks:	N/A

Section 5. Fire Fighting Measures

Flammability of the Product:	Not flammable.
Suitable Extinguishing Media:	Use extinguishing media suitable to surrounding fire.
Specific Hazards Arising from the Chemical:	None known.
Protective Equipment:	If product is involved in a fire, wear full protective clothing including a positive–pressure, NIOSH approved, self–contained breathing apparatus.

Section 6. Accidental Release Measures

Personal Precautions:	Use appropriate Personal Protective Equipment (PPE).
Environmental Precautions:	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains, and sewers.
Methods for Cleaning up:	Contain and recover liquid when possible. Flush spill area with water spray.
Other Statements:	None.

Section 7. Handling and Storage

Handling:	Wear appropriate Personal Protection Equipment (PPE) when handling this product. Do not get in eyes, or on skin and clothing. Wash thoroughly after handling. Do not ingest. Avoid breathing vapors, mist or dust.
Storage:	Store away from incompatible materials (see Section 10). Store at ambient temperatures. Keep container securely closed when not in use. Label precautions also apply to empty container. Recondition or dispose of empty containers in accordance with government regulations. For Industrial use only.

Section 8. Exposure Controls/Personal Protection

Exposure Limits

Component	Source	Exposure Limits
There are no hazardous ingredients in this product as defined in 29 CFR 1910-1200.		N/E

Carcinogenicity Category

Component	Source	Code	Brief Description
There are no hazardous ingredients in this product as defined in 29 CFR 1910-1200.			N/E

Engineering Controls: Use only with adequate ventilation. The use of local ventilation is recommended to control emission near the source.

Personal Protection

Eyes: Wear chemical splash goggles or safety glasses with full-face shield. Maintain eyewash fountain in work area.

Skin: Maintain quick-drench facilities in work area.
Wear butyl rubber or neoprene gloves. Wash them after each use and replace as necessary. If conditions warrant, wear protective clothing such as boots, aprons, and coveralls to prevent skin contact.

Respiratory: If misting occurs, use NIOSH approved organic vapor/acid gas dual cartridge respirator with a dust/mist prefilter in accordance with 29 CFR 1910.134.

Section 9. Physical and Chemical Properties

Physical State and Appearance:	Liquid, Yellow, Clear
Specific Gravity:	1.0610
pH:	4.1
Freezing Point:	34°F
Flash Point:	N/D
Odor:	Mild
Melting Point:	N/A
Boiling Point:	212°F
Solubility in Water:	Complete
Evaporation Rate:	N/D
Vapor Density:	N/D
Molecular Weight:	N/D
Viscosity:	N/A
Flammable Limits:	N/A
Autoignition Temperature:	N/A
Density:	8.85 lb/ga

Vapor Pressure:	N/D
% VOC	0

Section 10. Stability and Reactivity

Chemical Stability: Stable at normal temperatures and pressures.

Incompatibility with Various Substances: Bases, Strong oxidizers

Hazardous Decomposition Products: Oxides of nitrogen, Oxides of carbon

Possibility of Hazardous Reactions: None known.

Section 11. Toxicological Information

Chemical Name	Exposure	Type of Effect	Concentration	Species
N/D				

Comments: None.

Section 12. Ecological Information

Species	Duration	Type of Effect	Test Results
Fathead Minnow	96h	LC50	3475 mg/l
Ceriodaphnia dubia	48h	NOEC	>2500 mg/l
	48h	LC50	3415 mg/l
Fathead Minnow	96h	NOEC	1250 mg/l

Comments: NOEC effect = Survival

Section 13. Disposal Considerations

Dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information

DOT Classification

DOT Name:	COMPOUND, INDUSTRIAL WATER TREATMENT, LIQUID
Technical Name:	N/A
Hazard Class:	Not D.O.T. Regulated.
UN/NA#:	N/A
Packing Group:	N/A

Section 15. Regulatory Information

Inventory Status

United States (TSCA):	All ingredients listed.
Canada (DSL/NDSL):	All ingredients listed.

Federal Regulations

SARA Title III Rules

Sections 311/312 Hazard Classes

Fire Hazard:	No
Reactive Hazard:	No
Release of Pressure:	No
Acute Health Hazard:	Yes
Chronic Health Hazard:	No

Other Sections

Component	Section 313 Toxic Chemical	Section 302 EHS TPQ	CERCLA RQ
There are no hazardous ingredients in this product as defined in 29 CFR 1910-1200.	N/A	N/A	N/A

State Regulations

California Proposition 65: None known.

Special Regulations

Component	States
There are no hazardous ingredients in this product as defined in 29 CFR 1910-1200.	None

International Regulations

Canada

WHMIS Classification: N/A

Controlled Product Regulations (CPR): N/A

Section 16. Other Information

HMIS Hazard Rating

Health:	1
Flammability:	0
Physical Hazard:	0
PPE:	X

Notes: The PPE rating depends on circumstances of use. See Section 8 for recommended PPE.
The Hazardous Material Information System (HMIS) is a voluntary, subjective alpha–numeric symbolic system for recommending hazard risk and personal protection equipment information. It is a subjective rating system based on the evaluator's understanding of the chemical associated risks. The end–user must determine if the code is appropriate for their use.

NSF: N/A

FDA: N/A

KOSHER: This product has not been evaluated for Kosher approval.

FIFRA: N/A

Other: None

Abbreviations

Abbreviation	Definition
<	Less Than
>	Greater Than
ACGIH	American Conference of Governmental Industrial Hygienists
EHS	Environmental Health and Safety Dept
N/A	Not Applicable
N/D	Not Determined
N/E	Not Established
OSHA	Occupational Health and Safety Dept
PEL	Personal Exposure Limit
STEL	Short Term Exposure Limit

TLV	Threshold Limit Value
TWA	Time Weight Average
UNK	Unknown

Prepared by: Regulatory Affairs Department

Disclaimer

Although the information and recommendations set forth herein (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof, ChemTreat, Inc. makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will ChemTreat, Inc. be responsible for damages of any nature whatsoever resulting from the use or reliance upon information. No representation or warranties, either expressed or implied, of merchantability, fitness for a particular purpose, or of any other nature are made hereunder with respect to information or the product to which information refers.

ChemTreat, Inc.

Product Data

COOLING WATER
TREATMENT

CHEMTREAT CL-4657

GENERAL DESCRIPTION

CHEMTREAT CL-4657 is an all-organic, non-phosphorous (non-P) treatment that contains a unique Quadrasperse® quadpolymer, specifically designed for use in high hardness, high alkalinity waters with Langelier Saturation Index in the range 2.0 to 2.5. **CHEMTREAT CL-4657** effectively inhibits formation of mineral scale and deposition through a combination of crystal modification, threshold inhibition and dispersancy. **CHEMTREAT CL-4657** is particularly well suited for high cycle, non-acid feed cooling water applications with phosphate or phosphorous effluent discharge limitations.

TYPICAL PHYSICAL PROPERTIES

Form	Clear, yellow liquid
Odor	Mild
pH	~4.1
Weight per Gallon	8.85
Freeze Point	34°F

DOSAGE AND FEEDING

CHEMTREAT CL-4657 should be fed to the recirculating cooling water system at a rate sufficient to develop a residual of 100–300 ppm. The specific dosage will be dependent on the LSI scale index of the cooling water system. **CHEMTREAT CL-4657** can be measured using the PolyTrak® test kit, Part Number PTK-3. **CHEMTREAT CL-4657** should be fed directly from the drum, tote bin or bulk tank. Continuous feeding is preferable and normal materials of feed pump construction are suitable.

SAFETY PRECAUTIONS

For specific information on handling, safety and first aid, please review the product's Material Safety Data Sheet.

SHIPPING

CHEMTREAT CL-4657 is available in 55-gallon drums, 300-gallon returnable totes, and in bulk.

05/2004

ChemTreat, Inc.	**Product Data** COOLING WATER CORROSION INHIBITOR

CHEMTREAT CL-4125

GENERAL DESCRIPTION

CHEMTREAT CL-4125 is a concentrated formulation of organonitrogen compound designed to effectively inhibit corrosion of nonferrous metals in utility condensers and process cooling water systems. **CHEMTREAT CL-4125** reduces the influence of copper alloys on galvanic corrosion of adjacent ferrous metals.

TYPICAL PHYSICAL PROPERTIES

Form	Amber liquid
Odor	Mild
pH	~ 13.4
Density	10.06 lbs./gal.
Freeze Point	<-11°F

DOSAGE

CHEMTREAT CL-4125 should be fed continuously to the cooling water at a rate sufficient to develop a treatment residual of 5 to 25 ppm.

FEEDING

CHEMTREAT CL-4125 should be fed directly from the drum for optimum results. Chemical feed pumps with PVC or stainless steel liquid handling construction are recommended.

SAFETY PRECAUTIONS

For specific information on handling, safety and first aid, please review the product's Material Safety Data Sheet.

SHIPPING

CHEMTREAT CL-4125 is available in 5, 30, 55-gallon drums, totes and in bulk.

MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Product Name:	ChemTreat CL4125
Product Use:	Cooling Water Treatment
Manufacturer's Name:	ChemTreat, Inc.
Emergency Telephone Number:	(800) 424–9300
Address (Corporate Headquarters):	4461 Cox Road Glen Allen, VA 23060
Telephone Number for Information:	(800) 648–4579
Date of MSDS:	December 5, 2008

Section 2. Hazard(s) Identification

Signal Word: **DANGER!**

Hazard Statement(s):
Causes severe skin burns and eye damage.
Causes serious eye damage.
Harmful in contact with skin.
Harmful if inhaled.
Harmful if swallowed.

Precautionary Statement(s): Wear protective gloves/clothing and eye/face protection. Do not breathe dust/fume/gas/mist/vapors/spray. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Use only outdoors or in a well–ventilated area.

Section 3. Composition/Hazardous Ingredients

Component	CAS Registry #	Wt.%
Tolyltriazole, sodium salt	64665–57–2	30 – 60

Section 4. First Aid Measures

Inhalation: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a poison center or doctor/physician.

Eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician.

Skin: Immediately remove/take off all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before re–use. Immediately call a poison center or doctor/physician.

Ingestion:	DO NOT INDUCE VOMITING. Rinse mouth. Call a POISON CENTER or doctor/physician.
Notes to Physician:	N/A
Additional First Aid Remarks:	N/A

Section 5. Fire Fighting Measures

Flammability of the Product:	Not flammable.
Suitable Extinguishing Media:	Use extinguishing media suitable to surrounding fire.
Specific Hazards Arising from the Chemical:	Product may emit toxic gases or fumes under fire conditions.
Protective Equipment:	If product is involved in a fire, wear full protective clothing including a positive–pressure, NIOSH approved, self–contained breathing apparatus.

Section 6. Accidental Release Measures

Personal Precautions:	Use appropriate Personal Protective Equipment (PPE).
Environmental Precautions:	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains, and sewers.
Methods for Cleaning up:	Contain and recover liquid when possible. Flush spill area with water spray.
Other Statements:	None.

Section 7. Handling and Storage

Handling:	Wear appropriate Personal Protection Equipment (PPE) when handling this product. Do not get in eyes, or on skin and clothing. Wash thoroughly after handling. Do not ingest. Avoid breathing vapors, mist or dust.
Storage:	Store away from incompatible materials (see Section 10). Store at ambient temperatures. Keep container securely closed when not in use. Label precautions also apply to empty container. Recondition or dispose of empty containers in accordance with government regulations. For Industrial use only.

ChemTreat, Inc.

Section 8. Exposure Controls/Personal Protection

Exposure Limits

Component	Source	Exposure Limits
Tolyltriazole, sodium salt		N/E

Carcinogenicity Category

Component	Source	Code	Brief Description
Tolyltriazole, sodium salt			N/E

Engineering Controls: Use only with adequate ventilation. The use of local ventilation is recommended to control emission near the source.

Personal Protection

Eyes: Wear chemical splash goggles or safety glasses with full–face shield. Maintain eyewash fountain in work area.

Skin: Maintain quick–drench facilities in work area.
Wear butyl rubber or neoprene gloves. Wash them after each use and replace as necessary. If conditions warrant, wear protective clothing such as boots, aprons, and coveralls to prevent skin contact.

Respiratory: If misting occurs, use NIOSH approved organic vapor/acid gas dual cartridge respirator with a dust/mist prefilter in accordance with 29 CFR 1910.134.

Section 9. Physical and Chemical Properties

Physical State and Appearance:	Liquid, Amber, Clear
Specific Gravity:	1.2070
pH:	13.4
Freezing Point:	<–11°F
Flash Point:	N/D
Odor:	Mild
Melting Point:	N/A
Boiling Point:	212°F
Solubility in Water:	Complete
Evaporation Rate:	<1
Vapor Density:	N/D
Molecular Weight:	N/D
Viscosity:	N/A
Flammable Limits:	N/A
Autoignition Temperature:	N/A
Density:	10.07 lb/ga
Vapor Pressure:	N/D
% VOC	N/D

Section 10. Stability and Reactivity

Chemical Stability: Stable at normal temperatures and pressures.

Incompatibility with Various Substances: Strong oxidizers, Acids

Hazardous Decomposition Products: Oxides of carbon, Oxides of nitrogen

Possibility of Hazardous Reactions: None known.

Section 11. Toxicological Information

Chemical Name	Exposure	Type of Effect	Concentration	Species
Tolyltriazole, sodium salt	Oral	LD50	920 mg/kg	Rat
	Dermal	LD50	>2 g/kg	Rabbit

Comments: None.

Section 12. Ecological Information

Species	Duration	Type of Effect	Test Results
Fathead Minnow	96h	LC50	70 – 154 mg/l
Ceriodaphnia dubia	48h	LC50	141.789 mg/l
Bluegill Sunfish	96h	LC50	173 mg/l
Rainbow Trout	96h	LC50	25 mg/l
Daphnia magna	14d	LC50	13.2 mg/l
	21d	LC50	5.8 mg/l

Comments: None.

Section 13. Disposal Considerations

Dispose of in accordance with local, state and federal regulations.
EPA corrosivity characteristic hazardous waste D002 when disposed of in the original product form.

Section 14. Transport Information

DOT Classification

DOT Name:	CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S.
Technical Name:	(TOLYLTRIAZOLE, SODIUM SALT)
Hazard Class:	Corrosive
UN/NA#:	UN3267
Packing Group:	PGIII

Section 15. Regulatory Information

Inventory Status

United States (TSCA):	All ingredients listed.
Canada (DSL/NDSL):	All ingredients listed.

Federal Regulations

SARA Title III Rules

Sections 311/312 Hazard Classes

Fire Hazard:	No
Reactive Hazard:	No
Release of Pressure:	No
Acute Health Hazard:	Yes
Chronic Health Hazard:	No

Other Sections

Component	Section 313 Toxic Chemical	Section 302 EHS TPQ	CERCLA RQ
Tolyltriazole, sodium salt	N/A	N/A	N/A

State Regulations

California Proposition 65: None known.

Special Regulations

Component	States
Tolyltriazole, sodium salt	None

International Regulations

Canada

WHMIS Classification:	D2B (Toxic Material) E (Corrosive Material)
Controlled Product Regulations (CPR):	This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Section 16. Other Information

HMIS Hazard Rating

Health:	3
Flammability:	1
Physical Hazard:	0
PPE:	X
Notes:	The PPE rating depends on circumstances of use. See Section 8 for recommended PPE. The Hazardous Material Information System (HMIS) is a voluntary, subjective alpha–numeric symbolic system for recommending hazard risk and personal protection equipment information. It is a subjective rating system based on the evaluator's understanding of the chemical associated risks. The end–user must determine if the code is appropriate for their use.

NSF:	N/A
FDA:	N/A
KOSHER:	This product has not been evaluated for Kosher approval.
FIFRA:	N/A
Other:	None

Abbreviations

Abbreviation	Definition
<	Less Than
>	Greater Than
ACGIH	American Conference of Governmental Industrial Hygienists
EHS	Environmental Health and Safety Dept
N/A	Not Applicable
N/D	Not Determined
N/E	Not Established
OSHA	Occupational Health and Safety Dept
PEL	Personal Exposure Limit
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
TWA	Time Weight Average
UNK	Unknown

Prepared by: Regulatory Affairs Department

Disclaimer

ChemTreat, Inc.

Product Data

COOLING WATER MICROBIOCIDE

CHEMTREAT CL-2156

EPA Reg. No. 707-133-15300

GENERAL DESCRIPTION

CHEMTREAT CL-2156 is a formulation of two organosulfur antimicrobials designed to control bacteria, algae, and fungi in recirculating cooling water systems. **CHEMTREAT CL-2156** is particularly effective against those slime-forming organisms common to both open and closed cooling water systems and non-potable reverse osmosis systems. **CHEMTREAT CL-2156** is effective at low concentrations and is highly resistant to the inhibitory effects of most organic and inorganic compounds. **CHEMTREAT CL-2156** is metal-free, containing no copper- or iron-based stabilizers.

TYPICAL PHYSICAL PROPERTIES

Form	Clear, colorless to yellow liquid
Odor	Mild
pH	~3.5
Density	8.57 pounds/gallon
Freeze Point	31°F

DOSAGE AND FEEDING

Dosage levels of **CHEMTREAT CL-2156** and frequency of addition will depend on the nature and severity of contamination. Typical requirements fall within the range of 50 to 150 ppm. **CHEMTREAT CL-2156** may be pumped continuously to the recirculating water or added intermittently by slug dosage. Contact your ChemTreat representative for specific application recommendations.

SAFETY PRECAUTIONS

For specific information on handling, safety and first aid, please review the product's Material Safety Data Sheet.

SHIPPING

CHEMTREAT CL-2156 is available in 5-gallon pails, 30- and 55-gallon drums, 300-gallon returnable totes, and bulk.

Rev. 06/2007

ChemTreat, Inc.

MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Product Name:	ChemTreat CL2156
Product Use:	Cooling Water Microbiocide
Manufacturer's Name:	ChemTreat, Inc.
Emergency Telephone Number:	(800) 424–9300
Address (Corporate Headquarters):	4461 Cox Road Glen Allen, VA 23060
Telephone Number for Information:	(800) 648–4579
Date of MSDS:	June 24, 2009

Section 2. Hazard(s) Identification

Signal Word: **DANGER!**

Hazard Statement(s):

Causes severe skin burns and eye damage.
Causes serious eye damage.
Harmful in contact with skin.
Harmful if inhaled.
Harmful if swallowed.
Harmful to aquatic life.

Precautionary Statement(s):

Wear protective gloves/clothing and eye/face protection. Do not breathe dust/fume/gas/mist/vapors/spray. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Use only outdoors or in a well–ventilated area.

Section 3. Composition/Hazardous Ingredients

Component	CAS Registry #	Wt.%
5–chloro–2–methyl–4–isothiazolin–3–one	26172–55–4	1.11
2–methyl–4–isothiazolin–3–one	2682–20–4	0.39
Magnesium nitrate	10377–60–3	1.61
Magnesium chloride	7786–30–3	0.96

ChemTreat, Inc.

Section 4. First Aid Measures

Inhalation:	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a poison center or doctor/physician.
Eyes:	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician.
Skin:	Immediately remove/take off all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before re–use. Immediately call a poison center or doctor/physician.
Ingestion:	DO NOT INDUCE VOMITING. Rinse mouth. Call a POISON CENTER or doctor/physician.
Notes to Physician:	N/A
Additional First Aid Remarks:	N/A

Section 5. Fire Fighting Measures

Flammability of the Product:	Not flammable.
Suitable Extinguishing Media:	Use extinguishing media suitable to surrounding fire.
Specific Hazards Arising from the Chemical:	Use water spray to keep containers cool.
Protective Equipment:	If product is involved in a fire, wear full protective clothing including a positive–pressure, NIOSH approved, self–contained breathing apparatus.

Section 6. Accidental Release Measures

Personal Precautions:	Use appropriate Personal Protective Equipment (PPE).
Environmental Precautions:	This pesticide is toxic to fish and wildlife. Do not discharge effluent containing this product into lakes, ponds, streams, estuaries, oceans or public waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit, and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA.

Methods for Cleaning up: Contain and recover liquid when possible. Flush spill area with water spray.

Other Statements: None.

Section 7. Handling and Storage

Handling: Wear appropriate Personal Protection Equipment (PPE) when handling this product. Do not get in eyes, or on skin and clothing. Wash thoroughly after handling. Do not ingest. Avoid breathing vapors, mist or dust.

Storage: Store away from incompatible materials (see Section 10). Store at ambient temperatures. Keep container securely closed when not in use. Label precautions also apply to empty container. Recondition or dispose of empty containers in accordance with government regulations.
For Industrial use only.
Do not store in steel containers.
Do not store below 32°F.
Do not store above 131°F.

Section 8. Exposure Controls/Personal Protection

Exposure Limits

Component	Source	Exposure Limits
5–chloro–2–methyl–4–isothiazolin–3–one		N/E
2–methyl–4–isothiazolin–3–one		N/E
Magnesium nitrate		N/E
Magnesium chloride		N/E

Carcinogenicity Category

Component	Source	Code	Brief Description
5–chloro–2–methyl–4–isothiazolin–3–one			N/E
2–methyl–4–isothiazolin–3–one			N/E
Magnesium nitrate			N/E
Magnesium chloride			N/E

Engineering Controls: Use only with adequate ventilation. The use of local ventilation is recommended to control emission near the source.

Personal Protection

Eyes:	Wear chemical splash goggles or safety glasses with full–face shield. Maintain eyewash fountain in work area.
Skin:	Maintain quick–drench facilities in work area. Wear butyl rubber or neoprene gloves. Wash them after each use and replace as necessary. If conditions warrant, wear protective clothing such as boots, aprons, and coveralls to prevent skin contact.
Respiratory:	If misting occurs, use NIOSH approved organic vapor/acid gas dual cartridge respirator with a dust/mist prefilter in accordance with 29 CFR 1910.134.

Section 9. Physical and Chemical Properties

Physical State and Appearance:	Liquid, Colorless, Clear
Specific Gravity:	1.0270
pH:	3.8
Freezing Point:	34°F
Flash Point:	N/D
Odor:	Mild
Melting Point:	N/A
Boiling Point:	212°F
Solubility in Water:	Complete
Evaporation Rate:	<1
Vapor Density:	N/D
Molecular Weight:	N/D
Viscosity:	<100
Flammable Limits:	N/A
Autoignition Temperature:	N/A
Density:	8.57 lb/ga
Vapor Pressure:	0.62 mmHg
% VOC	0

Section 10. Stability and Reactivity

Chemical Stability:	Stable at normal temperatures and pressures.
Incompatibility with Various Substances:	Strong oxidizers, Strong bases
Hazardous Decomposition Products:	Oxides of nitrogen, Hydrogen chloride, Sulfur dioxide gas
Possibility of Hazardous Reactions:	None known.

Section 11. Toxicological Information

Chemical Name	Exposure	Type of Effect	Concentration	Species
ChemTreat CL2156	Oral	LD50	5500 mg/kg	Rat
	Dermal	LD50	>2000 mg/kg	Rat

Comments: None.

Section 12. Ecological Information

Species	Duration	Type of Effect	Test Results
Bluegill Sunfish	96h	LC50	23 mg/l
Daphnia magna	48h	EC50	8.4 mg/l
Rainbow Trout	96h	LC50	16 mg/l

Comments: None.

Section 13. Disposal Considerations

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance. METAL CONTAINERS: Triple rinse (or equivalent). Offer for recycling or reconditioning or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities. PLASTIC CONTAINERS: Do not reuse empty container. Triple rinse (or equivalent). Then puncture and dispose of in a sanitary landfill, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke. TOTES: Verify that the tote is empty. Do not rinse or clean. Seal tote and contact appropriate vendor for tote pickup.

Section 14. Transport Information

DOT Classification

DOT Name: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.
Technical Name: (5-CHLORO-2-METHYL-4-ISOTHIAZOLIN-3-ONE AND 2-METHYL-4-ISOTHIAZOLIN-3-ONE)
Hazard Class: Corrosive
UN/NA#: UN3265
Packing Group: PGIII

Section 15. Regulatory Information

Inventory Status

United States (TSCA): All ingredients listed.
Canada (DSL/NDSL): All ingredients listed.

Federal Regulations

SARA Title III Rules

Sections 311/312 Hazard Classes

Fire Hazard: No
Reactive Hazard: No
Release of Pressure: No
Acute Health Hazard: Yes
Chronic Health Hazard: No

Other Sections

Component	Section 313 Toxic Chemical	Section 302 EHS TPQ	CERCLA RQ
5-chloro-2-methyl-4-isothiazolin-3-one	N/A	N/A	N/A
2-methyl-4-isothiazolin-3-one	N/A	N/A	N/A
Magnesium nitrate	N/A	N/A	N/A
Magnesium chloride	N/A	N/A	N/A

State Regulations

California Proposition 65: None known.

Special Regulations

Component	States
5-chloro-2-methyl-4-isothiazolin-3-one	None
2-methyl-4-isothiazolin-3-one	None
Magnesium nitrate	MA, PA
Magnesium chloride	None

International Regulations

Canada

WHMIS Classification: N/A

Controlled Product Regulations (CPR): N/A

Section 16. Other Information

HMIS Hazard Rating

Health:	3
Flammability:	0
Physical Hazard:	0
PPE:	X

Notes: The PPE rating depends on circumstances of use. See Section 8 for recommended PPE.
The Hazardous Material Information System (HMIS) is a voluntary, subjective alpha–numeric symbolic system for recommending hazard risk and personal protection equipment information. It is a subjective rating system based on the evaluator's understanding of the chemical associated risks. The end–user must determine if the code is appropriate for their use.

NSF: N/A

FDA: N/A

KOSHER: This product is certified by the Orthodox Union as kosher pareve.

FIFRA: This product is an EPA registered biocide. 707–133–15300

Other: None

Abbreviations

Abbreviation	Definition
<	Less Than
>	Greater Than
ACGIH	American Conference of Governmental Industrial Hygienists
EHS	Environmental Health and Safety Dept
N/A	Not Applicable
N/D	Not Determined
N/E	Not Established
OSHA	Occupational Health and Safety Dept
PEL	Personal Exposure Limit
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
TWA	Time Weight Average

UNK	Unknown

Prepared by: Regulatory Affairs Department

Disclaimer

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ChemTreat, Inc.

Product Data

COOLING WATER
DISPERSANT

CHEMTREAT CL-450

GENERAL DESCRIPTION

CHEMTREAT CL-450 is a highly efficient dispersant for many of the organic contaminants common to recirculating cooling water systems. **CHEMTREAT CL-450** effectively disperses oils and grease providing improved removal through blowdown. The penetrating properties of **CHEMTREAT CL-450** provide improved contact of biocides with those micro-organisms entrapped in oils and organic debris. The low odor and foaming levels of **CHEMTREAT CL-450** make it particularly suitable for air washer treatment.

TYPICAL PHYSICAL PROPERTIES

Form	Clear colorless liquid
Odor	Mild
Functionality	Non-ionic
pH	~6.1
Density	8.41 lbs./gal.
Freeze point	36°F

DOSAGE

CHEMTREAT CL-450 may be pumped continually or manually added to the recirculating water, depending on the nature and severity of contaminants present. Your ChemTreat Technical Representative will recommend the proper product feed rate for your system.

SAFETY PRECAUTIONS

For specific information on handling, safety and first aid, please review the product's Material Safety Data Sheet.

SHIPPING

CHEMTREAT CL-450 is available in 5, 30, 55, and 275-gallon drums, and in bulk quantities.

ChemTreat, Inc.

MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Product Name:	ChemTreat CL450
Product Use:	Cooling Water Treatment
Supplier's Name:	ChemTreat, Inc.
Emergency Telephone Number:	(800) 424-9300
Address (Corporate Headquarters):	4461 Cox Road Glen Allen, VA 23060
Telephone Number for Information:	(800) 648-4579
Date of MSDS:	September 22, 2009

Section 2. Hazard(s) Identification

Signal Word: **WARNING!**

Hazard Statement(s):
Causes eye irritation.
May be harmful in contact with skin.
May be harmful if inhaled.
May be harmful if swallowed.
Harmful to aquatic life.

Precautionary Statement(s): No significant health risks are expected from exposures under normal conditions of use.

Section 3. Composition/Hazardous Ingredients

Component	CAS Registry #	Wt.%
Alcohol (C8 – 10) ethoxylated propoxylated	68603-25-8	10 – 30

Section 4. First Aid Measures

Inhalation: Remove to fresh air and keep at rest in a position comfortable for breathing. Call a poison center or doctor/physician if you feel unwell.

Eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.

Skin: Wash with plenty of soap and water. Call a poison center or doctor/physician if you feel unwell.

Ingestion: DO NOT INDUCE VOMITING. Rinse mouth. Call a POISON CENTER or doctor/physician if you feel unwell.

Notes to Physician: N/A

Additional First Aid Remarks: N/A

Section 5. Fire Fighting Measures

Flammability of the Product: Not flammable.

Suitable Extinguishing Media: Use extinguishing media suitable to surrounding fire.

Specific Hazards Arising from the Chemical: None known.

Protective Equipment: If product is involved in a fire, wear full protective clothing including a positive–pressure, NIOSH approved, self–contained breathing apparatus.

Section 6. Accidental Release Measures

Personal Precautions: Use appropriate Personal Protective Equipment (PPE).

Environmental Precautions: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains, and sewers.

Methods for Cleaning up: Contain and recover liquid when possible. Flush spill area with water spray.

Other Statements: None.

Section 7. Handling and Storage

Handling: Wear appropriate Personal Protection Equipment (PPE) when handling this product. Do not get in eyes, or on skin and clothing. Wash thoroughly after handling. Do not ingest. Avoid breathing vapors, mist or dust.

Storage: Store away from incompatible materials (see Section 10). Store at ambient temperatures. Keep container securely closed when not in use. Label precautions also apply to empty container. Recondition or dispose of empty containers in accordance with government regulations. For Industrial use only.

Section 8. Exposure Controls/Personal Protection

Exposure Limits

Component	Source	Exposure Limits
Alcohol (C8 – 10) ethoxylated propoxylated		N/E

Carcinogenicity Category

Component	Source	Code	Brief Description
Alcohol (C8 – 10) ethoxylated propoxylated			N/E

Engineering Controls: Use only with adequate ventilation. The use of local ventilation is recommended to control emission near the source.

Personal Protection

Eyes: Wear chemical splash goggles or safety glasses with full–face shield. Maintain eyewash fountain in work area.

Skin: Maintain quick–drench facilities in work area.
Wear butyl rubber or neoprene gloves. Wash them after each use and replace as necessary. If conditions warrant, wear protective clothing such as boots, aprons, and coveralls to prevent skin contact.

Respiratory: If misting occurs, use NIOSH approved organic vapor/acid gas dual cartridge respirator with a dust/mist prefilter in accordance with 29 CFR 1910.134.

Section 9. Physical and Chemical Properties

Physical State and Appearance:	Liquid, Colorless, Clear
Specific Gravity:	1.0080
pH:	6.1
Freezing Point:	36°F
Flash Point:	N/D
Odor:	Mild
Melting Point:	N/A
Boiling Point:	212°F
Solubility in Water:	Complete
Evaporation Rate:	N/D
Vapor Density:	As Water
Molecular Weight:	N/D
Viscosity:	N/A
Flammable Limits:	N/A
Autoignition Temperature:	N/A
Density:	8.41 lb/ga
Vapor Pressure:	As Water
% VOC	N/D

Section 10. Stability and Reactivity

Chemical Stability: Stable at normal temperatures and pressures.

Incompatibility with Various Substances: Strong bases, Strong oxidizers

Hazardous Decomposition Products: Oxides of carbon

Possibility of Hazardous Reactions: None known.

Section 11. Toxicological Information

Chemical Name	Exposure	Type of Effect	Concentration	Species
N/D				

Comments: None.

Section 12. Ecological Information

Species	Duration	Type of Effect	Test Results
Fathead Minnow	96h	LC50	32 mg/l
	7d	NOEC	10 mg/l
	7d	LOEC	20 mg/l
	7d	IC25	14 mg/l
Rainbow Trout	96h	LC50	37 mg/l
Ceriodaphnia dubia	48h	LC50	61 mg/l
	7d	NOEC	15 mg/l
	7d	LOEC	30 mg/l
	7d	IC25	20 mg/l

Comments: NOEC effect = Reproduction

ChemTreat, Inc.

Section 13. Disposal Considerations

Dispose of in accordance with local, state and federal regulations.
Not a RCRA–regulated hazardous waste when disposed in the original product form.

Section 14. Transport Information

DOT Classification

DOT Name:	COMPOUND, INDUSTRIAL WATER TREATMENT, LIQUID
Technical Name:	N/A
Hazard Class:	Not D.O.T. Regulated.
UN/NA#:	N/A
Packing Group:	N/A

Section 15. Regulatory Information

Inventory Status

United States (TSCA):	All ingredients listed.
Canada (DSL/NDSL):	All ingredients listed.

Federal Regulations

SARA Title III Rules

Sections 311/312 Hazard Classes

Fire Hazard:	No
Reactive Hazard:	No
Release of Pressure:	No
Acute Health Hazard:	Yes
Chronic Health Hazard:	No

Other Sections

Component	Section 313 Toxic Chemical	Section 302 EHS TPQ	CERCLA RQ
Alcohol (C8 – 10) ethoxylated propoxylated	N/A	N/A	N/A

State Regulations

California Proposition 65: None known.

Special Regulations

Component	States
Alcohol (C8 – 10) ethoxylated propoxylated	None

International Regulations

Canada

WHMIS Classification: D2B (Toxic Material)

Controlled Product Regulations (CPR): This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Section 16. Other Information

HMIS Hazard Rating

Health: 1
Flammability: 0
Physical Hazard: 0
PPE: X

Notes: The PPE rating depends on circumstances of use. See Section 8 for recommended PPE.
The Hazardous Material Information System (HMIS) is a voluntary, subjective alpha–numeric symbolic system for recommending hazard risk and personal protection equipment information. It is a subjective rating system based on the evaluator's understanding of the chemical associated risks. The end–user must determine if the code is appropriate for their use.

NSF: N/A

FDA: N/A

KOSHER: This product is certified by the Orthodox Union as kosher pareve.

FIFRA: N/A

Other: None

ChemTreat, Inc.

Abbreviations

Abbreviation	Definition
<	Less Than
>	Greater Than
ACGIH	American Conference of Governmental Industrial Hygienists
EHS	Environmental Health and Safety Dept
N/A	Not Applicable
N/D	Not Determined
N/E	Not Established
OSHA	Occupational Health and Safety Dept
PEL	Personal Exposure Limit
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
TWA	Time Weight Average
UNK	Unknown

Prepared by: Regulatory Affairs Department

Disclaimer

Although the information and recommendations set forth herein (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof, ChemTreat, Inc. makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will ChemTreat, Inc. be responsible for damages of any nature whatsoever resulting from the use or reliance upon information. No representation or warranties, either expressed or implied, of merchantability, fitness for a particular purpose, or of any other nature are made hereunder with respect to information or the product to which information refers.

ChemTreat, Inc.

Product Data

COOLING WATER MICROBIOCIDE

CHEMTREAT CL-40
EPA Registration No. 5185-451-15300

GENERAL DESCRIPTION

CHEMTREAT CL-40 is a liquid product containing 40% sodium bromide by weight. Used in conjunction with an oxidizer, such as sodium hypochlorite (NaOCL) bleach or gaseous chlorine, **CHEMTREAT CL-40** forms hypobromus acid which is an effective microbiocide for cooling water systems. **CHEMTREAT CL-40** is particularly beneficial in systems with organic contamination, or in systems operating at alkaline pH ranges.

TYPICAL PHYSICAL PROPERTIES

Form	Clear liquid
Odor	Odorless
pH	6 - 8
Density	11.88 lbs./gal.
Freeze Point	<-11°F

FEEDING AND FEEDING

CHEMTREAT CL-40 should be fed by dilution with a service water by-pass loop as shown in ChemTreat Technical Drawing #13.

SAFETY PRECAUTIONS

For specific information on handling, safety and first aid, please review the product's Material Safety Data Sheet.

SHIPPING

CHEMTREAT CL-40 is available in 55-gallon drums, in bulk and in 300-gallon tote bins.

ChemTreat, Inc.

MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Product Name:	ChemTreat BL124
Product Use:	Boiler Water Treatment
Manufacturer's Name:	ChemTreat, Inc.
Emergency Telephone Number:	(800) 424–9300
Address (Corporate Headquarters):	4461 Cox Road Glen Allen, VA 23060
Telephone Number for Information:	(800) 648–4579
Date of MSDS:	January 16, 2009

Section 2. Hazard(s) Identification

Signal Word: **WARNING!**

Hazard Statement(s): Causes eye irritation.
Causes skin irritation.
Harmful if inhaled.
May be harmful if swallowed.

Precautionary Statement(s): Wear protective gloves/clothing and eye/face protection. Do not breathe dust/fume/gas/mist/vapors/spray. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Use only outdoors or in a well–ventilated area.

Section 3. Composition/Hazardous Ingredients

Component	CAS Registry #	Wt%
Sodium bisulfite	7631–90–5	15 – 40

Section 4. First Aid Measures

Inhalation: Remove to fresh air and keep at rest in a position comfortable for breathing. Call a poison center or doctor/physician if you feel unwell.

Eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.

Skin: Wash with plenty of soap and water. Take off contaminated clothing and wash before re–use. If skin irritation occurs, seek medical advice/attention.

Ingestion:	DO NOT INDUCE VOMITING. Rinse mouth. Call a POISON CENTER or doctor/physician if you feel unwell.
Notes to Physician:	N/A
Additional First Aid Remarks:	N/A

Section 5. Fire Fighting Measures

Flammability of the Product:	Not flammable.
Suitable Extinguishing Media:	Use extinguishing media suitable to surrounding fire.
Specific Hazards Arising from the Chemical:	Use water spray to keep containers cool.
Protective Equipment:	If product is involved in a fire, wear full protective clothing including a positive–pressure, NIOSH approved, self–contained breathing apparatus.

Section 6. Accidental Release Measures

Personal Precautions:	Use appropriate Personal Protective Equipment (PPE).
Environmental Precautions:	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains, and sewers.
Methods for Cleaning up:	Contain and recover liquid when possible. Flush spill area with water spray.
Other Statements:	If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1–800–424–8802.

Section 7. Handling and Storage

Handling:	Wear appropriate Personal Protection Equipment (PPE) when handling this product. Do not get in eyes, or on skin and clothing. Wash thoroughly after handling. Do not ingest. Avoid breathing vapors, mist or dust.
Storage:	Store away from incompatible materials (see Section 10). Store at ambient temperatures. Keep container securely closed when not in use. Label precautions also apply to empty container. Recondition or dispose of empty containers in accordance with government regulations. For Industrial use only. Do not store below 30°F.

ChemTreat, Inc.

MSDS

Section 8. Exposure Controls/Personal Protection

Exposure Limits

Component	Source	Exposure Limits
Sodium bisulfite	ACGIH TLV	5 mg/m³ TWA

Carcinogenicity Category

Component	Source	Code	Brief Description
Sodium bisulfite			N/E

Engineering Controls: Use only with adequate ventilation. The use of local ventilation is recommended to control emission near the source.

Personal Protection

Eyes: Wear chemical splash goggles or safety glasses with full-face shield. Maintain eyewash fountain in work area.

Skin: Maintain quick-drench facilities in work area.
Wear butyl rubber or neoprene gloves. Wash them after each use and replace as necessary. If conditions warrant, wear protective clothing such as boots, aprons, and coveralls to prevent skin contact.

Respiratory: If misting occurs, use NIOSH approved organic vapor/acid gas dual cartridge respirator with a dust/mist prefilter in accordance with 29 CFR 1910.134.

Section 9. Physical and Chemical Properties

Physical State and Appearance:	Liquid, Yellow, Clear
Specific Gravity:	1.2350
pH:	3.9
Freezing Point:	30°F
Flash Point:	N/D
Odor:	Strong
Melting Point:	N/A
Boiling Point:	212°F
Solubility in Water:	Complete
Evaporation Rate:	<1
Vapor Density:	N/D
Molecular Weight:	N/D
Viscosity:	<100
Flammable Limits:	N/A
Autoignition Temperature:	N/A
Density:	10.30 lb/ga
Vapor Pressure:	<17.5
% VOC	N/D

Section 10. Stability and Reactivity

Chemical Stability: Stable at normal temperatures and pressures.

Incompatibility with Various Substances: Strong oxidizers, Strong bases, Strong acids

Hazardous Decomposition Products: Sulfur dioxide gas

Possibility of Hazardous Reactions: None known.

Section 11. Toxicological Information

Chemical Name	Exposure	Type of Effect	Concentration	Species
Sodium bisulfite	Oral	LD50	2000 mg/kg	Rat

Comments: None.

Section 12. Ecological Information

Species	Duration	Type of Effect	Test Results
Fathead Minnow	96h	LC50	>1000 mg/l
Sheepshead Minnow	96h	LC50	100 mg/l
Ceriodaphnia dubia	48h	LC50	390.4 mg/l
Mysid Shrimp	48h	LC50	70.7 mg/l

Comments: None.

Section 13. Disposal Considerations

Dispose of in accordance with local, state and federal regulations.

ChemTreat, Inc.

Section 14. Transport Information

DOT Classification

DOT Name:	BISULFITES, AQUEOUS SOLUTIONS, N.O.S.
Technical Name:	(SODIUM BISULFITE)
Hazard Class:	Corrosive
UN/NA#:	UN2693
Packing Group:	PGIII

Section 15. Regulatory Information

Inventory Status

United States (TSCA):	All ingredients listed.
Canada (DSL/NDSL):	All ingredients listed.

Federal Regulations

SARA Title III Rules

Sections 311/312 Hazard Classes

Fire Hazard:	No
Reactive Hazard:	No
Release of Pressure:	No
Acute Health Hazard:	Yes
Chronic Health Hazard:	No

Other Sections

Component	Section 313 Toxic Chemical	Section 302 EHS TPQ	CERCLA RQ
Sodium bisulfite	N/A	N/A	5000

State Regulations

California Proposition 65: None known.

Special Regulations

Component	States
Sodium bisulfite	MA, MN, NY, PA, WA

International Regulations

Canada

WHMIS Classification:	D2B (Toxic Material) E (Corrosive Material)
Controlled Product Regulations (CPR):	This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Section 16. Other Information

HMIS Hazard Rating

Health:	2
Flammability:	0
Physical Hazard:	0
PPE:	X

Notes: The PPE rating depends on circumstances of use. See Section 8 for recommended PPE.
The Hazardous Material Information System (HMIS) is a voluntary, subjective alpha–numeric symbolic system for recommending hazard risk and personal protection equipment information. It is a subjective rating system based on the evaluator's understanding of the chemical associated risks. The end–user must determine if the code is appropriate for their use.

NSF: N/A

FDA: All ingredients in this product are authorized in 21 CFR 173.310 for use as "Boiler Water Additives" where the steam may contact food.

KOSHER: This product has not been evaluated for Kosher approval.

FIFRA: N/A

Other: None

ChemTreat, Inc.

Abbreviations

Abbreviation	Definition
<	Less Than
>	Greater Than
ACGIH	American Conference of Governmental Industrial Hygienists
EHS	Environmental Health and Safety Dept
N/A	Not Applicable
N/D	Not Determined
N/E	Not Established
OSHA	Occupational Health and Safety Dept
PEL	Personal Exposure Limit
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
TWA	Time Weight Average
UNK	Unknown

Prepared by: Regulatory Affairs Department

Disclaimer

ChemTreat, Inc.	**Product Data** **BOILER WATER TREATMENT** **OXYGEN SCAVENGER**

CHEMTREAT BL-124

GENERAL DESCRIPTION

CHEMTREAT BL-124 is a noncatalyzed, liquid sulfite oxygen scavenger designed to remove chlorine from a variety of water streams. This includes water being processed by reverse osmosis (R.O.) membranes, cooling water bleedoff streams, etc. **CHEMTREAT BL-124** can also be used for elimination of oxygen in boiler feedwater. **CHEMTREAT BL-124** is composed of ingredients cleared by the FDA as "Boiler Water Additives" which may be used in the preparation of steam that may contact food. Clearance is given at 21 CFR 173.310 or by letter of No Objection from the FDA. **CHEMTREAT BL-124** is not acceptable at USDA regulated facilities.

TYPICAL PHYSICAL PROPERTIES

Form	Clear, colorless to straw-colored liquid
Odor	Strong
pH	~3.9
Density	10.30 pounds/gallon
Freeze point	30°F

DOSAGE AND FEEDING

CHEMTREAT BL-124 should be continuously fed for either chlorine or oxygen removal. Acid resistant feeding equipment is required. **CHEMTREAT BL-124** compatibilities with materials of construction are available upon request from a ChemTreat representative. For optimum performance, **CHEMTREAT BL-124** should be applied in accordance with the control parameters established by a ChemTreat representative for the specific application.

SAFETY PRECAUTIONS

For specific information on handling, safety and first-aid, please review the product's Material Safety Data Sheet.

SHIPPING AND STORAGE

CHEMTREAT BL-124 must be shipped and stored above 30°F. CHEMTREAT BL-124 is available in 55-gallon drums, 250-gallon nonreturnable and 300-gallon returnable totes, and bulk.

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

BASIC CHEMICAL SOLUTIONS

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED): **BCS SULFURIC ACID (>51%)**

CHEMICAL NAME/CLASS: Sulfuric Acid Solution

PRODUCT USE: Neutralization, metal processing, battery acid.

SUPPLIER/MANUFACTURER'S NAME: **BASIC CHEMICAL SOLUTIONS**

ADDRESS: **Corporate Office**
525 Seaport Blvd.
Redwood City, CA 94063

BUSINESS PHONE: 800-411-4227

EMERGENCY PHONE: **CHEMTREC**: 800-424-9300

DATE OF PREPARATION: February 16, 2004

Si usted no entiende las Hojas de Informacion de Seguridad sobre Materials, busque a alguien para que se la explique a usted en detalle.
(If you do not understand the Material Safety Data Sheet, find someone to explain it to you in detail.)

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	%w/w	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV mg/m^3	STEL mg/m^3	PEL mg/m^3	STEL mg/m^3	IDLH	OTHER mg/m^3
Sulfuric Acid	7664-93-9	>51	1 mg/m^3	10	1 mg/m^3	3 mg/m^3	15 mg/m^3	NA
Water and other ingredients. The other ingredients are each present in less than 1 percent concentration in this product.		Balance	The components present in the balance of this product do not contribute any significant, additional hazards. All hazard information pertinent to this product has been presented in the remaining sections of this Material Safety Data Sheet, per the requirements of Federal Occupational Safety and Health Hazard Communication Standard (29 CFR 1910.1200).					

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used.
NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a clear solution. Danger! Extremely corrosive. Causes sever burns. Reacts with water. Harmful if ingested or inhaled, can be fatal. In the event of fire or spill, adequate precautions must be taken. This product may decompose to produce a variety of compounds (i.e. carbon monoxide, carbon dioxide and oxides of sulfur). Flammable hydrogen gas can evolve when in contact with most metals. Emergency responders must wear the proper personal protective equipment suitable for the situation to which they are responding. Transport in approved vehicles and containers.

3. HAZARD IDENTIFICATION (Continued)

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of occupational overexposure are inhalation and contact with skin and eyes. The symptoms of overexposure to this product are as follows:

INHALATION: If mists or sprays of this solution are inhaled, this product may cause pulmonary irritation, irritation of the mucus membranes, coughing, and a sore throat. Inhalation of high concentrations of this product may cause damage to the tissues of the respiratory system, producing potentially fatal lung disorders (chemical pneumonitis and pulmonary edema) and erosion of the tooth enamel.

CONTACT WITH SKIN or EYES: Contact with the eyes can cause severe irritation, eye burns and permanent eye damage. Contact with the skin can cause severe irritation, skin burns and permanent skin damage. Prolonged exposure may result in ulcerating burns which could leave scars.

SKIN ABSORPTION: Skin absorption is not anticipated to be a significant route of over-exposure to any component of this product.

INGESTION: Though ingestion is not anticipated to be a significant route of over-exposure to this product, if ingestion does occur burning and irritation of the mouth, throat, esophagus, and other tissues of the digestive system will occur immediately upon contact. Ingestion of large quantities may be fatal.

INJECTION: Though injection is not anticipated to be a significant route of over-exposure to this product, if it occurs, may cause local reddening, tissue swelling, and discomfort.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE	3
FLAMMABILITY	(RED	0
REACTIVITY	(YELLOW	2
PROTECTIVE		D

EYES	RESPIRATOR	HAND	BODY
	SEE SECTION		

For routine industrial applications

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**.

ACUTE: This solution is corrosive, and can burn and damage eyes, skin, mucous membranes, and any other exposed tissue. If inhaled, irritation of the respiratory system may occur, with coughing, and breathing difficulty. Though unlikely to occur during occupational use, ingestion or injection of large quantities may be fatal.

CHRONIC: This product contains ingredients that are considered to be probable or suspected human carcinogens (see Section 11).

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

SKIN EXPOSURE: If the product contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove contaminated clothing, taking care not to contaminate eyes. Victim must seek medical attention.
EYE EXPOSURE: If this product enters the eyes, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention.
INHALATION: If vapors, mists, or sprays of this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers. If shortness of breath occurs, evaluate the possibility of bronchitis or pneumonitis. Chest x-ray and arterial blood gasses can be used to determined the presence of pulmonary edema. In severe causes, use of humidified oxygen and assisted ventilation including positive end expiratory pressure (PEEP) may be needed. Parenteral steroids may be useful in limiting the extent of pulmonary damage.
INGESTION: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, **do not induce vomiting.** Victim should rinse mouth with large amounts of water. Victim should drink 2-3 glasses of water to dilute the ingested material. Never induce vomiting or give diluents (water) to someone who is unconscious, having convulsions, or who cannot swallow. The use of gastric lavage is controversial. The removal of acid must be weighed against the risk of perforation or bleeding. If a large amount of acid (greater than 1ml /kg body weight) has been ingested , cautious gastric lavage is generally advised if the patient is alert and there is little risk of convulsions. Consultation with a gastroenterologist and/or surgeon is advised. Serious complications such as perforation or stricture of the esophagus may occur requiring care by specialist. Laryngeal edema may develop requiring intubation or tracheostomy.

Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with victim.

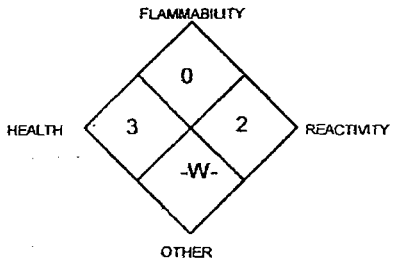
5. FIRE-FIGHTING MEASURES

FLASH POINT, °C (method): Not flammable.
AUTOIGNITION TEMPERATURE, °C: Not flammable.
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS:

Water Spray: YES (Expect reaction) Carbon Dioxide: YES
Foam: YES Dry Chemical: YES
Halon: YES Other: NO.

NFPA RATING



UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is corrosive, and presents a significant contact hazard to fire-fighters. For large fires, flood fire area from a distance. Expect a reaction with water. Do not let solid stream of water contact spilled materials. When involved in a fire, this material may decompose and produce irritating fumes and toxic gases (including carbon monoxide, carbon dioxide and oxides of sulfur).

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment. If possible, prevent run-off water from entering storm drains, bodies of water, or other environmentally sensitive areas.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel.

The proper personal protective equipment for incidental releases (e.g.-1 L of the product released in a well-ventilated area) use impermeable gloves, specific for the material handled, goggles, face shield, and appropriate body protection. In the event of a large release, use impermeable gloves, specific for the material handled, chemically resistant suit and boots, and hard-hat. Self Contained Breathing Apparatus or respirator may be required where engineering controls are not adequate or conditions for potential exposure exist. When respirators are required, Select NIOSH/MSHA approved based on actual or potential airborne concentrations in accordance with latest OSHA and/or ANSI recommendations.
Absorb spilled liquid with polypads or other suitable absorbent materials. Neutralize residue with lime or soda ash or other acid neutralizing agent. Decontaminate the area thoroughly. Test area with litmus paper to confirm neutralization. Place all spill residue in a suitable container. Dispose of in accordance with Federal, State and local hazardous waste disposal regulations (see Section 13 – Disposal Considerations.)

PART III *How can I prevent hazardous situations from occurring*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash hands after handling this product. Do not eat or drink while handling this material. Remove contaminated clothing immediately. Use ventilation and other engineering controls to minimize potential exposure to this product.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Avoid breathing mists or sprays generated by this product. Use in a well-ventilated location.

For Non-Bulk Containers: Cannot be handled in metal containers. Open containers slowly, on a stable surface. Containers of this product must be properly labeled. 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. Keep container tightly closed when not in use. Wash thoroughly after using this material. Storage areas should be made of fire-resistant materials. If appropriate, post warning signs in storage and use areas. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged.

Empty containers may contain residual liquid. Therefore, empty containers should be handled with care.

7. HANDLING and STORAGE (Continued)

Bulk Containers: Cannot be handled in metal containers. All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

Tank Car Shipments: *Cannot be transported in unlined cold rolled, stainless steel or rubber lined tank cars. Determine compatibility with the vessel prior to shipment.* Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cars must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tank (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be clean and free of incompatible chemicals, prior to connection to the tank car or vessel. Valves and hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment before maintenance begins by a triple-rinse with water followed, if necessary, by using acid neutralizing agent and an additional rinse. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: If required use a corrosion-resistant ventilation system separate from other exhaust ventilation systems to ensure that there is no potential for overexposure to sprays, or mists of this product and that exposures are below those in section 2. Ensure eyewash/safety shower stations are available near areas where this product is used.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below exposure limits listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed, use only protection authorized in 29 CFR 1910.134, or applicable State regulations. If adequate ventilation is not available or if there is potential for airborne exposure above the exposure limits (listed in Section 2) a respirator may be worn up to respirator exposure limitations, check with respirator equipment manufactures recommendations/limitations. For a higher level of protection use positive pressure supplied air respiration protection or Self Contained Breathing Apparatus or if oxygen levels are below 19.5% or are unknown.

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:
Positive pressure, full-facepiece Self Contained Breathing Apparatus; or positive pressure, full-facepiece Self Contained Breathing Apparatus with an auxiliary positive pressure Self Contained Breathing Apparatus.

EYE PROTECTION: Splash goggles or safety glasses. Face-shields are recommended when the operation can generate splashes, sprays or mists.

HAND PROTECTION: Wear appropriate gloves for routine industrial use. Use appropriate gloves for spill response, as stated in Section 6 of this MSDS (Accidental Release Measures).

BODY PROTECTION: Use body protection appropriate for task. Cover-all, rubber aprons, or chemical protective clothing made from natural rubber or other appropriate materials are generally acceptable, depending upon the task.

9. PHYSICAL and CHEMICAL PROPERTIES

Physical and chemical properties for Sulfuric Acid.

Appearance: Clear oily liquid.
Odor: Odorless.
Solubility: Miscible with water, liberates much heat.
Specific Gravity: 1.84 (98%), 1.71 (78%), 1.40 (50%)
pH: 1 N solution (ca. 5% w/w) = 0.3; 0.1 N solution (ca. 0.5% w/w) = 1.2; 0.01 N solution (ca. 0.05% w/w) = 2.1.
% Volatiles by volume @ 21C (70F): No information found.
Boiling Point: ca. 290C (ca. 554F) (decomposes at 340C)
Melting Point: 3C (100%), -32C (93%), -38C (78%), -64C (65%).
Vapor Density (Air=1): 3.4
Vapor Pressure (mm Hg): 1 @ 145.8C (295F)
Evaporation Rate (BuAc=1): No information found.

ODOR THRESHOLD: Not available.
APPEARANCE AND COLOR: No odor.
HOW TO DETECT THIS SUBSTANCE (warning properties): Litmus paper will turn red upon contact with even low concentrations of this solution.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Thermal decomposition products of this solution can include carbon monoxide, carbon dioxide and oxides of sulfur.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This product reacts with bases, reducing agents, alkali metals, carbides, cyanides, sulfides and metal powders. Do not mix this product with sodium hypochlorite, sodium bisulfite, Chlorine Sanitizers or Chlorinated Cleaners – a deadly gas can be formed.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid exposure or contact to extreme temperatures and incompatible chemicals.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Additional toxicology information for components greater than 1 percent in concentration is provided below.
SULFURIC ACID:
LD_{50} (oral, rat) 2140 mg/kg LC_{50} (rat) 510 mg/m2 /2 hrs LC_{50} (rat) 347 ppm/1 hr

SUSPECTED CANCER AGENT: The components of this product are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA; and are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

BCS,LLC only adds water to produce lower concentrations of sulfuric acid. The following quote is from a 93% sulfuric acid MSDS dated 5/7/97 from Rhodia Inc., who is a producer of sulfuric acid and is regarding cancer and strong acid mists. "The International Agency for Research on cancer (IARC) has classified strong inorganic acid mists containing sulfuric as a known human carcinogen (IARC Category 1). This classification applies to sulfuric acid when it is generated as a mist. There is still debate in the scientific community whether the studies reviewed by IARC adequately controlled for confounding occupational exposures and personal habits such as smoking and alcohol consumption. A few epidemiology studies have suggested a possible association between sulfuric acid exposure and laryngeal or lung cancer; however, in all these studies, workers were exposed to many other chemicals, some of which are recognized carcinogens, such as diethylsulfate and nickel. Considering the multiple chemical exposures and other limitations of the studies we (Rhodia Inc.) disagree with IARC's conclusions that a cause and effect relationship between cancer and exposure to strong inorganic acid mist containing sulfuric acid has been demonstrated."

11. TOXICOLOGICAL INFORMATION (Continued)

IRRITANCY OF PRODUCT: This product is severely irritating to contaminated tissue.

SENSITIZATION TO THE PRODUCT: No component of this product is known to be a sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: This product is not reported to produce mutagenic effects in humans.
Embryotoxicity: This product is not reported to produce embryotoxic effects in humans.
Teratogenicity: This product is not reported to cause teratogenic effects in humans.
Reproductive Toxicity: This product is not reported to cause reproductive effects in humans.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES: Currently there are no Biological Exposure Indices (BEIs) associated with the components of this product.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE Skin disorders can be aggravated by over-exposure to this product. Inhalation of this products mists may aggravate respiratory conditions.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate over-exposure to this product.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: No chemical fate data found.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: This product is harmful or fatal to plant and animal life if released into the environment. As with all chemicals, work practices should be aimed at eliminating environmental releases. Refer to Section 11 (Toxicological Information) for further toxicological data.

EFFECT OF CHEMICAL ON AQUATIC LIFE The toxicity of sulfuric acid to fish is dependent on the resulting pH of the water. lethality at a ph of 5.0 or below. Required to cause lethality varies depending on the hardness of the water (hard water has some buffering capacity) and the species of fish (some fish are more resistant to the effects of acidity) McKee, JE, and Wolf, HA (Editors) Water Quality Criteria, 2nd ed., Publications No. 3-A, p. 279, California State Water Quality Resources Control Board, Sacramento, CA (Rev. 1963).

As with all chemicals, work practices should be aimed at eliminating environmental releases.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority.

EPA WASTE NUMBER: D002 (Characteristic, Corrosivity), applicable to wastes consisting only of this solution.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:	Sulfuric Acid with more than 51% acid
HAZARD CLASS NUMBER and DESCRIPTION:	8 (Corrosive Material)
UN IDENTIFICATION NUMBER:	UN 1830
PACKING GROUP:	II
DOT LABEL(S) REQUIRED:	Corrosive

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 137

14. TRANSPORTATION INFORMATION—(Continued)

MARINE POLLUTANT: This product does not contain any components which are designated by the Department of Transportation to be Marine Pollutants. (49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

Note: The latest DOT information is provided, please verify all DOT information as it is subject to change without notice.

15. REGULATORY INFORMATION

SARA REPORTING REQUIREMENTS: The components of this product subject to the reporting requirements of Section 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act are as follows.

COMPONENT	SARA 302	SARA 304	SARA 313
Sulfuric Acid	Yes	Yes	No

SARA Threshold Planning Quantity: NA

TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY (RQ): Sulfuric Acid = 1000 lbs,
OTHER FEDERAL REGULATIONS: Not applicable.

STATE REGULATORY INFORMATION: Not determined.

CALIFORNIA PROPOSITION 65: No component of this product is on the California Proposition 65 lists.

LABELING (Precautionary Statements): **DANGER!** CORROSIVE MATERIAL! LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. MAY CAUSE LUNG DAMAGE. Do not get into eyes, on skin or clothing. Avoid breathing spray or mist. Do not take internally. Use with adequate ventilation and employ respiratory protection when exposed to the mist or spray. When handling, wear chemical splash goggles, face shield, rubber gloves and protective clothing. Do not transfer to unlabeled containers. Wash thoroughly after handling. Keep container closed when not in use. FIRST AID: In case of contact, immediately flush skin or eyes for at least 15 minutes. If inhaled, move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Do not induce vomiting. IN CASE OF FIRE: Use water, dry chemical, CO_2, or alcohol foam. IN CASE OF SPILL: Neutralize residue with acid neutralizing agent. Refer to MSDS for additional information.

TARGET ORGANS: Skin, eyes and respiratory system.
WHMIS SYMBOLS:

D1A- Poisonous and Infectious Materials
Very Toxic Materials

E- Corrosive Material

16. OTHER INFORMATION

INFORMATION SOURCE: CHEMICAL SAFETY ASSOCIATES, Inc.
Rhodia Inc.

PREPARED BY: BASIC CHEMICAL SOLUTIONS

DEFINITIONS OF TERMS

15. OTHER INFORMATION (Continued)

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:
ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits.
TLV - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour **Time Weighted Average (TWA)**, the 15-minute **Short Term Exposure Limit**, and the instantaneous **Ceiling Level**. Skin adsorption effects must also be considered.
OSHA - U.S. Occupational Safety and Health Administration.
PEL - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.
IDLH - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called Recommended Exposure Levels (**RELs**). When no exposure guidelines are established, an entry of **NE** is made for reference.

FLAMMABILITY LIMITS IN AIR:
Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:
Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m^3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause death. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.

REGULATORY INFORMATION:
This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Other acronyms used are: **Superfund Amendments and Reauthorization Act (SARA)**; the **Toxic Substance Control Act (TSCA)**; Marine Pollutant status according to the **DOT**; California's Safe Drinking Water Act **(Proposition 65)**; the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund)**; and various state regulations. This section also includes information on the precautionary warnings which appear on the materials package label.

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

BASIC CHEMICAL SOLUTIONS

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED): **BCS SODIUM HYPOCHLORITE SOLUTION (5 - 12.5%)**

CHEMICAL NAME/CLASS: Hypochlorous acid salt

PRODUCT USE: Bleach, disinfectant, waste water treatment additive.

SUPPLIER/MANUFACTURER'S NAME: **BASIC CHEMICAL SOLUTIONS**

ADDRESS: **Corporate Office**
525 Seaport Blvd.
Redwood City, CA 94063

BUSINESS PHONE: 800-411-4227

EMERGENCY PHONE: **CHEMTREC**: 800-424-9300

DATE OF PREPARATION: November 13, 2003

Si usted no entiende las Hojas de Informacion de Seguridad sobre Materials, busque a alguien para que se la explique a usted en detalle.
(If you do not understand the Material Safety Data Sheet, find someone to explain it to you in detail.)

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA		NIOSH	
			TWA mg/m^3	STEL mg/m^3	PEL mg/m^3	STEL mg/m^3	IDLH mg/m^3	OTHER mg/m^3
Sodium Hypochlorite Solution	7681-52-9	5-15	0.5 ppm as Cl_2	1 ppm as Cl_2	0.5 ppm as Cl_2	1 ppm as Cl_2	10 ppm as Cl_2	NE
Water and other ingredients. The other ingredients are each present in less than 1 percent concentration in this product.		Balance	The components present in the balance of this product do not contribute any significant, additional hazards. All hazard information pertinent to this product has been presented in the remaining sections of this Material Safety Data Sheet, per the requirements of Federal Occupational Safety and Health Hazard Communication Standard (29 CFR 1910.1200).					

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used.
NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is light-yellow to green solution with a strong chlorine-like smell. This solution is corrosive to skin. Causes burns to skin, eyes, respiratory tract and mucous membranes. Harmful or fatal if swallowed. In the event of fire or spill, adequate precautions must be taken. This product will react with acids to release toxic chlorine gas. If involved in a fire, this product may decompose to produce a variety of compounds (i.e. chlorine, sodium oxide, oxygen). Emergency responders must wear the proper personal protective equipment suitable for the situation to which they are responding.

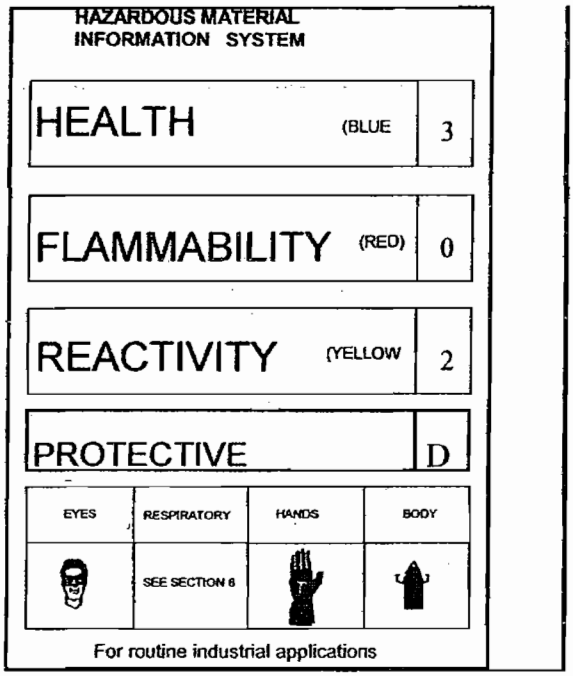
SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of occupational overexposure are inhalation and contact with skin and eyes. The symptoms of overexposure to this product are as follows:

INHALATION: If mists or sprays of this solution are inhaled, this product may cause pulmonary irritation, irritation of the mucus membranes, coughing, and a sore throat. Inhalation of this product may cause damage to the tissues of the respiratory system producing potentially fatal lung disorders (chemical pneumonitis and pulmonary edema). If mixed with acids, hypochlorite solutions release large amounts of chlorine gas. This gas can cause severe irritation of the nose and throat. Exposure to high levels of chlorine gas may result in severe lung damage.

CONTACT WITH SKIN or EYES: Severe irritation and/or burns can occur following eye exposure. Contact may cause impairment of vision and corneal damage possibly blindness. Sodium hypochlorite mist and solutions can cause skin irritation. In severe cases, chemical burns may result. This product is a skin sensitizer; prolonged or repeated over-exposures can result in allergic contact dermatitis.

SKIN ABSORPTION: Skin absorption is not anticipated to be a significant route of over-exposure to any component of this product.

INGESTION: Though ingestion is not anticipated to be a significant route of over-exposure to this product. If ingestion does occur, hypochlorite solutions release hypochlorous acid on contact with gastric juices, and ingestion causes irritation and corrosion of mucous membranes, pain, vomiting, and edema of the pharynx and larynx; reduced blood pressure, delirium and coma may occur. Ingestion of large quantities may be fatal.



INJECTION: Though injection is not anticipated to be a significant route of over-exposure to this product, if it occurs, local reddening, tissue swelling, and discomfort may result.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**.

ACUTE: This solution is corrosive, and can burn and damage eyes, skin, mucous membranes, and any other exposed tissue. If inhaled, irritation of the respiratory system may occur, with coughing, and breathing difficulty. Though unlikely to occur during occupational use, ingestion or inhalation of large quantities may be fatal.

CHRONIC: Repeated skin contact with this product may result in dermatitis (inflammation and reddening of the skin). Sodium Hypochlorite, a component of this product, is a skin sensitizer; prolonged or repeated over-exposures can result in allergic contact dermatitis.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

SKIN EXPOSURE: If the product contaminates the skin, Rinse skin immediately with plenty of water for 15-20 minutes. Take off contaminated clothing, taking care not to contaminate eyes. Washing with large amounts of clean water should continue until affected skin surface no longer feels slippery. Victim must seek medical attention.
Call a poison control center or doctor for treatment advice.

4. FIRST-AID MEASURES (Continued)

EYE EXPOSURE: If this product enters the eyes, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Do not attempt to neutralize. Oils or ointments should not be used at this time. Call a poison control center or doctor for treatment advice. Victim must seek immediate medical attention.
INHALATION: If vapors, mists, or sprays of this product are inhaled, remove victim to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Remove or cover gross contamination to avoid exposure to rescuers. Do not give anything by mouth to an unconscious person.

INGESTION: If this product is swallowed, call a poison control center or doctor immediately for treatment advice. Do not induce vomiting unless told to do so by a poison control center or doctor. Have person sip a glass of water if able to swallow. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water.

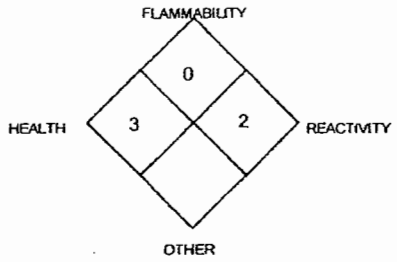
Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take a copy of label and MSDS to health professional with victim.

Note to Physicians: Symptomatic. Treatment and supportive therapy as indicated. Do NOT give acidic antidotes such as juice, soft drink, vinegar, etc. This product contains materials that may cause severe pneumonitis if aspirated. If ingestion has occurred less than 2 hours earlier, carry out careful gastric lavage; use endotracheal cuff if available, to prevent aspiration. Observe patient for respiratory difficulty from aspiration pneumonitis. Give artificial resuscitation and appropriate chemotherapy if respiration is depressed. Following exposure the patient should be kept under medical review for at least 48 hours as delayed pneumonitis may occur. Pulmonary edema is likely and may be delayed. Steroid therapy, if given early, may be effective in preventing or alleviating edema.

5. FIRE-FIGHTING MEASURES

FLASH POINT, °C (method): Not flammable.
AUTOIGNITION TEMPERATURE, °C: Not flammable.
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

NFPA RATING



FIRE EXTINGUISHING MATERIALS:

Water Spray: YES
Foam: YES
Halon: YES
Carbon Dioxide: YES
Dry Chemical: YES
Other: Any "ABC" Class.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Sodium hypochlorite is a strong chemical oxidant, but solutions do not support combustion. Not considered flammable or combustible. Reaction with nitrogen compounds, chloroorganic compounds, or easily oxidizable compounds (reducing agents) may be explosive. This material is non-flammable but is decomposed by heat and light, causing a pressure build-up, which could result in an explosion. When heated, it may release chlorine gas. Vigorous reaction with oxidizable or organic materials may result in fire. Contact with aluminum, tin or zinc will result in the generation of heat and release of hydrogen gas. Run-off from fire control may cause pollution. Keep fire-exposed containers cool with water spray to prevent rupture due to excessive heat. High pressure water hose may spread product from broken containers increasing contamination. If involved in a fire, this product may decompose to produce a variety of compounds (i.e. chlorine, sodium oxide, oxygen). Emergency responders must wear the proper personal protective equipment suitable for the situation to which they are responding. Products of combustion are irritating to the respiratory tract and may cause breathing difficulty. Symptoms may be delayed several hours or longer depending upon the extent of exposure

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move fire-exposed containers, if it can be done without risk to firefighters. If possible, prevent run-off water from entering storm drains, bodies of water, or other environmentally sensitive areas. If necessary, discard or decontaminate fire response equipment using water and sodium bicarbonate before returning such equipment to service.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel.

The proper personal protective equipment for incidental releases (e.g.-1 L of the product released in a well-ventilated area) use impermeable gloves, specific for the material handled, goggles, face shield, and appropriate body protection. In the event of a large release, use impermeable gloves, specific for the material handled, chemically resistant suit and boots, and hard-hat. Self Contained Breathing Apparatus or respirator may be required where engineering controls are not adequate or conditions for potential exposure exist. When respirators are required, Select NIOSH/MSHA approved based on actual or potential airborne concentrations in accordance with latest OSHA and/or ANSI recommendations.
Absorb spilled liquid with polypads or other suitable absorbent materials. Neutralize residue with sodium bicarbonate and water rinse. Decontaminate the area thoroughly. Test area with litmus paper to confirm neutralization. Place all spill residue in a suitable container. Dispose of in accordance with Federal, State, and local hazardous waste disposal regulations (see Section 13, Disposal Considerations).

Deactivation For Small Spills: Hypochlorite can be broken down by covering it with a reducing agent such as sodium sulfite or sodium thiosulfate.

PART III *How can I prevent hazardous situations from occurring*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash hands after handling this product. Do not eat or drink while handling this material. Remove contaminated clothing immediately. Discard contaminated clothing items, or launder before re-use. Inform anyone handling such contaminated laundry of the hazards associated with this product. Use ventilation and other engineering controls to minimize potential exposure to this product.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Avoid breathing mists or sprays generated by this product. Use in a well-ventilated location.

For Non-Bulk Containers: Open containers slowly, on a stable surface. Containers of this product must be properly labeled. 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. Keep container tightly closed when not in use. Wash thoroughly after using this material. Storage areas should be made of fire-resistant materials. If appropriate, post warning signs in storage and use areas. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged. Empty containers may contain residual liquid, therefore, empty containers should be handled with care.

Bulk Containers: All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

Tank Car Shipments: Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cars must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tank (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be clean and free of incompatible chemicals, prior to connection to the tank car or vessel. Valves and hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment before maintenance begins by a triple-rinse with water followed, if necessary, by using sodium bicarbonate and an additional rinse. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: If required use a corrosion-resistant ventilation system separate from other exhaust ventilation systems to ensure that there is no potential for overexposure to sprays, or mists of this product and that exposures are below those in section 2 (Composition and Information on Ingredients). Ensure eyewash/safety shower stations are available near areas where this product is used.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below exposure limits listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed, use only protection authorized in 29 CFR 1910.134, or applicable State regulations. If adequate ventilation is not available or if there is potential for airborne exposure above the exposure limits (listed in Section 2) a respirator may be worn up to respirator exposure limitations, check with respirator equipment manufactures recommendations/limitations. For a higher level of protection use positive pressure supplied air respiration protection or Self Contained Breathing Apparatus or if oxygen levels are below 19.5% or are unknown.

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:
Positive pressure, full-facepiece Self Contained Breathing Apparatus; or positive pressure, full-facepiece Self Contained Breathing Apparatus with an auxiliary positive pressure Self Contained Breathing Apparatus.

EYE PROTECTION: Splash goggles or safety glasses. Face-shields are recommended when the operation can generate splashes, sprays or mists.

HAND PROTECTION: Wear appropriate gloves for routine industrial use. Use appropriate gloves for spill response, as stated in Section 6 of this MSDS (Accidental Release Measures).

BODY PROTECTION: Use body protection appropriate for task. Cover-all, rubber aprons, or chemical protective clothing made from natural rubber are generally acceptable, depending upon the task.

9. PHYSICAL and CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air = 1): Not available.
SPECIFIC GRAVITY (water = 1): 1.198
SOLUBILITY IN WATER: Completely soluble.
VAPOR PRESSURE, mm Hg @ 21 °C: 12 mmHg.
ODOR THRESHOLD: 0.06 ppm (detection), for Chlorine.
LOG WATER/OIL DISTRIBUTION COEFFICIENT: Not available.

EVAPORATION RATE (n-BuAc=1): Similar to water.
MELTING/FREEZING POINT: -13.6°C (7.5°F).
BOILING POINT: Decomposes above 40°C (104°F).
pH: 11-13

APPEARANCE AND COLOR: This product is light-yellow to green solution with a strong chlorine-like smell.
HOW TO DETECT THIS SUBSTANCE (warning properties): Litmus paper will turn blue-purple upon contact with this solution.

10. STABILITY and REACTIVITY

STABILITY: Stable at room temperature.

DECOMPOSITION PRODUCTS: Thermal decomposition products of this solution can include: Chlorine, sodium oxide, oxygen, oxides of chlorine, sodium chlorate, and hydrogen.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This product reacts with strong acids producing heat and chlorine gas, which is toxic. Other incompatibles include organic material, cellulose, oxidizable materials, ammonia, urea, ammonium salts, ethyleneimine, cyanides, nitrogen compounds, alcohols, metals, and metal oxides. Reacts with metals to produce flammable hydrogen gas. Metal and metal oxide catalysts decompose hypochlorites, evolving oxygen and often causing explosions. May react explosively with nitrogen containing compounds or form chloroamines, which are explosive. Alkaline hypochlorite solutions may react explosively with some chloroorganic compounds.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid exposure or contact to extreme temperatures and incompatible chemicals.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Additional toxicology information for components greater than 1 percent in concentration is provided below.

SODIUM HYPOCHLORITE:
Eye effects-Rabbit, adult 10 mg Moderate irritation effects
Microsomal Mutageniticity Assay-*Salmonella typhimurium* 1 mg/plate
Cytogenetic Analysis-Human: lymphocyte, 100 ppm/24 hours
Oral-Woman TDLo: 1 g/kg: Central nervous system effects, Blood pressure effects,
Intravenous-Man TDLo: 45 mg/kg: Pulmonary system effects
Oral-Mouse LD_{50}: 5800 mg/kg
Oral-Rat LD_{50}: 8910 mg/kg

SUSPECTED CANCER AGENT: The major components of this product are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA; and are therefore not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: This product is severely irritating and corrosive to contaminated tissue.

SENSITIZATION TO THE PRODUCT: Sodium Hypochlorite, a component of this product, is a sensitizer. Prolonged or repeated skin contact can result in the development of rashes, welts, and other allergy-like symptoms.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: This product is not reported to produce mutagenic effects in humans. Sodium hypochlorite caused mutations in several short-term studies using bacteria and cultured mammalian cells. The significance of these tests is unclear. It was not mutagenic in tests (chromosome aberration and micronucleus) on live animals.

Embryotoxicity: This product is not reported to produce embryotoxic effects in humans.
Teratogenicity: This product is not reported to cause teratogenic effects in humans.
Reproductive Toxicity: This product is not reported to cause reproductive effects in humans.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES: Currently there are no Biological Exposure Indices (BEIs) associated with the components of this product.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE Skin disorders can be aggravated by over-exposure to this product. Inhalation of this products mists may aggravate respiratory conditions.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate over-exposure to this product.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The components of this product are relatively stable in the environment; they may degrade, after time, into other organic and inorganic constituents. Additional environmental data are available as follows:

SODIUM HYPOCHLORITE: Water solubility = 29.4 g/ 100 mL (25• C).

EFFECT OF MATERIAL ON PLANTS or ANIMALS: This product is harmful or fatal to plant and animal life if this product is released into the environment. Refer to Section 11 (Toxicological Information) for further data on the effects of this product's components on test animals.
Invertebrate and Microbial Toxicity: LOEC Oncorhynchus kisutch 0.02 mg/ l.

12. ECOLOGICAL INFORMATION (Continued)

EFFECT OF CHEMICAL ON AQUATIC LIFE: This product can substantially raise the pH of an aquatic environment and can be extremely toxic to fish and aquatic plants. As with all chemicals, work practices should be aimed at eliminating environmental releases.

Fish Toxicity: LC50 (48 hr) rainbow trout 0.07 mg/ l.
LC50 (96 hr) fathead minnow 5.9 mg/l.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority.

EPA WASTE NUMBER: D002 (Characteristic, Corrosivity), applicable to wastes consisting only of this solution.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:	Hypochlorite solution
HAZARD CLASS NUMBER and DESCRIPTION:	8 (Corrosive Material)
UN IDENTIFICATION NUMBER:	UN 1791
PACKING GROUP:	III
DOT LABEL(S) REQUIRED:	Corrosive

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 154

MARINE POLLUTANT: This product does not contain any components which are designated by the Department of Transportation to be Marine Pollutants. (49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

Note: The latest DOT information is provided, please verify all DOT information as it is subject to change without notice.

15. REGULATORY INFORMATION

SARA REPORTING REQUIREMENTS: The components of this product subject to the reporting requirements of Section 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act are as follows.

COMPONENT	SARA 302	SARA 304	SARA 313
Sodium Hypochlorite	No	Yes	No

SARA Threshold Planning Quantity: Not applicable.

TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY (RQ): Sodium Hypochlorite = 100 lbs.

OTHER FEDERAL REGULATIONS: Not applicable.

STATE REGULATORY INFORMATION: Components of this product are covered under specific State regulations, as denoted below:

Illinois - Toxic Substance List: Sodium Hypochlorite.
New Jersey - Right to Know Hazardous Substance List: Sodium Hypochlorite
North Dakota - List of Hazardous Chemicals, Reportable Quantities: Sodium Hypochlorite.

CALIFORNIA PROPOSITION 65 No component of this product is on the California Proposition 65 lists.

15. REGULATORY INFORMATION (Continued)

If this product is used for the purpose of a pesticide it would be a violation of federal law to use this product in a manner inconsistent with its labeling. Call BCS to see if your required use is covered by our label. The following labeling section is taken from our pesticide label but has no directions for use. It does not constitute a pesticide label. It is for information only.

LABELING (Precautionary Statements): KEEP OUT OF REACH OF CHILDREN - DANGER - PELIGRO

HAZARDS TO HUMANS AND DOMESTIC ANIMALS: DANGER: Corrosive, may cause severe skin or chemical burns to broken skin. Causes eye damage. May be fatal if swallowed. Avoid breathing vapors. Do not get in eyes, on skin, or on clothing. Wear goggles or face shield and rubber gloves when handling this product. Wash hands after handling. Vacate poorly ventilated areas as soon as possible. Do not return until odors have dissipated.

ENVIRONMENTAL HAZARDS: This product is toxic to fish and aquatic organisms. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NDPES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA.

PHYSICAL OR CHEMICAL HAZARDS: STRONG OXIDIZIING AGENT: Mix only with water according to label directions. Mixing this product with chemicals (e.g. ammonia. acids, detergents, etc.) or organic matter (e.g. urine, feces, etc.) will release chlorine gas which is irritating to eyes, lungs and mucous membranes.

STORAGE AND DISPOSAL: Store this product in a cool dry area, away from direct sunlight and heat to avoid deterioration. In case of spill, flood areas with large quantities of water. Product or rinsates that cannot be used should be diluted with water before disposal in sanitary sewer (see Environmental Hazards). Do not contaminate food or feed by storage, disposal or cleaning of equipment.

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

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

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

If inhaled: If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Do not give anything by mouth to an unconscious person.

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

In case of fire: Use dry chemical, CO_2 , or alcohol foam. In case of spill: Neutralize residue with sodium bicarbonate and rinse area. Place in suitable container. Refer to MSDS for additional information.

TARGET ORGANS: Skin, eyes and respiratory system.

WHMIS SYMBOLS:

E- Corrosive Material

D2B- Poisonous and Infectious Materials/Other Effects I

16. OTHER INFORMATION

INFORMATION SOURCE: CHEMICAL SAFETY ASSOCIATES, Inc.

PREPARED BY: BASIC CHEMICAL SOLUTIONS

THIS INFORMATION IS DRAWN FROM RECOGNIZED SOURCES BELIEVED TO BE RELIABLE. BASIC CHEMICAL SOLUTIONS MAKES NO GUARANTEES NOR ASSUMES ANY LIABILITY IN CONNECTION WITH THIS INFORMATION. THE USER SHOULD BE AWARE OF CHANGING TECHNOLOGY, RESEARCH, REGULATIONS AND ANALYTICAL PROCEDURES THAT MAY REQUIRE CHANGES HEREIN. THE ABOVE DATA IS SUPPLIED UPON THE CONDITION THAT PERSONS WILL EVALUATE THIS INFORMATION AND THEN DETERMINE ITS SUITABILITY FOR THEIR USE.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits.

TLV - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour **Time Weighted Average (TWA)**, the 15-minute **Short Term Exposure Limit**, and the instantaneous **Ceiling Level**. Skin adsorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration.

PEL - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.

IDLH - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called Recommended Exposure Levels (**RELs**). When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime over-exposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime over-exposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]). Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury). Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoigntion Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m^3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause death. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.

REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Other acronyms used are: **Superfund Amendments and Reauthorization Act (SARA)**; the **Toxic Substance Control Act (TSCA)**; Marine Pollutant status according to the **DOT**; California's Safe Drinking Water Act (**Proposition 65**); the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund)**; and various state regulations. This section also includes information on the precautionary warnings which appear on the materials package label.

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

BASIC CHEMICAL SOLUTIONS

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED): **BCS SODIUM HYDROXIDE LIQUID**
(1% - 50%)

CHEMICAL NAME/CLASS: Sodium Hydroxide Solution

PRODUCT USE: Metal finishing, neutralization, industrial cleaners, chemical processing.

SUPPLIER/MANUFACTURER'S NAME: **BASIC CHEMICAL SOLUTIONS**

ADDRESS: **Corporate Office**
525 Seaport Blvd.
Redwood City, CA 94063

BUSINESS PHONE: 800-411-4227

EMERGENCY PHONE: **CHEMTREC**: 800-424-9300

DATE OF PREPARATION: May 7, 2003
DATE OF REVISION: July 21, 2006

Si usted no entiende las Hojas de Informacion de Seguridad sobre Materials, busque a alguien para que se la explique a usted en detalle.
(If you do not understand the Material Safety Data Sheet, find someone to explain it to you in detail.)

2. COMPOSITION AND INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	%w/w	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV mg/m^3	STEL mg/m^3	PEL mg/m^3	STEL mg/m^3	IDLH mg/m^3	OTHER mg/m^3
Sodium Hydroxide	1310-73-2	1-50	2, C	NE	2, C (Vacated 1989 PELs)	NE	10	NIOSH REL: 2 DFG MAKs: 2
Water and other ingredients. The other ingredients are each present in less than 1 percent concentration in this product.		Balance	The components present in the balance of this product do not contribute any significant, additional hazards. All hazard information pertinent to this product has been presented in the remaining sections of this Material Safety Data Sheet, per the requirements of Federal Occupational Safety and Health Hazard Communication Standard (29 CFR 1910.1200).					

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used.
NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a clear to turbid liquid solution. This solution is corrosive, and can be damaging to contaminated tissue. Ingestion of large quantities can be fatal. In the event of fire or spill, adequate precautions must be taken. This solution reacts with water to generate heat. If involved in a fire, this product may decompose to produce sodium oxides and a variety of other compounds (i.e. carbon monoxide and carbon dioxide). Emergency responders must wear the proper personal protective equipment suitable for the situation to which the are responding.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: This solution can damage skin, eyes, mucous membranes, and other contaminated tissue. Burns may not be immediately painful or visible.

INHALATION: If mists or sprays of this solution are inhaled, this product may cause pulmonary irritation, irritation of the mucus membranes, coughing, and a sore throat. Damage to the tissues of the respiratory system may occur.

CONTACT WITH SKIN or EYES: Severe irritation and/or burns can occur following eye exposure. Contact may cause impairment of vision and corneal damage possibly blindness. Skin contact may result in a "soapy" feel and cause reddening, discomfort, and irritation. Prolonged exposure may result in ulcerating burns which could leave scars.

SKIN ABSORPTION: Skin absorption is not anticipated to be a significant route of over-exposure to any component of this product.

INGESTION: Though ingestion is not anticipated to be a significant route of over-exposure to this product, if ingestion does occur burning and irritation of the mouth, throat, esophagus, and other tissues of the digestive system will occur immediately upon contact. Ingestion of large quantities may be fatal.

INJECTION: Though injection is not anticipated to be a significant route of over-exposure to this product, if it occurs, may cause local reddening, tissue swelling, and discomfort.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**.

ACUTE: This solution is corrosive, and can burn and damage eyes, skin, mucous membranes, and any other exposed tissue. If inhaled, irritation of the respiratory system may occur, with coughing, and breathing difficulty. Though unlikely to occur during occupational use, ingestion of large quantities may be fatal.

CHRONIC: Repeated skin contact with this product may result in dermatitis (inflammation and reddening of the skin).

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	3
FLAMMABILITY	(RED)	0
REACTIVITY	(YELLOW)	1
PROTECTIVE EQUIPMENT		D

EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		

For routine industrial applications

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

SKIN EXPOSURE: If the product contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove contaminated clothing, taking care not to contaminate eyes. Washing with large amounts of clean water should continue until affected skin surface no longer feels slippery. Victim must seek medical attention.

EYE EXPOSURE: If this product enters the eyes, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Do not attempt to neutralize. Oils or ointments should not be used at this time. Victim must seek immediate medical attention.

INHALATION: If vapors, mists, or sprays of this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

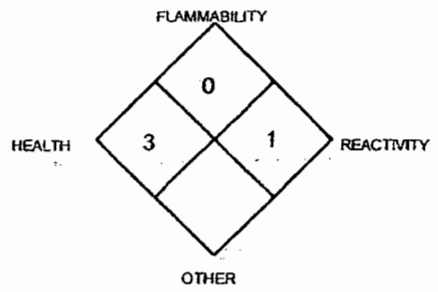
INGESTION: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, do not induce vomiting. Victim should drink milk, egg whites, or large quantities of water. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow.

Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with victim.

5. FIRE-FIGHTING MEASURES

FLASH POINT, °C (method): Not flammable.
AUTOIGNITION TEMPERATURE, °C: Not flammable.
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

NFPA RATING



FIRE EXTINGUISHING MATERIALS:

Water Spray: YES
Carbon Dioxide: YES
Foam: YES
Dry Chemical: YES
Halon: YES
Other: Any "ABC" Class.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Not considered flammable or combustible. Does not support combustion. However, contact with water or acids may generate sufficient heat to ignite nearby combustible materials. Contact with aluminum, tin or zinc will result in the generation of heat and release of hydrogen gas. Run-off from fire control may cause pollution. Keep fire-exposed containers cool with water spray to prevent rupture due to excessive heat. High pressure water hose may spread product from broken containers increasing contamination. When involved in a fire, this material may decompose and produce irritating fumes and toxic gases (including carbon monoxide, carbon dioxide and sodium oxides). Products of combustion are irritating to the respiratory tract and may cause breathing difficulty. Symptoms may be delayed several hours or longer depending upon the extent of exposure.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment. If possible, prevent run-off water from entering storm drains, bodies of water, or other environmentally sensitive areas.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel.

The proper personal protective equipment for incidental releases (e.g.-1 L of the product released in a well-ventilated area) use impermeable gloves, specific for the material handled, goggles, face shield, and appropriate body protection. In the event of a large release, use impermeable gloves, specific for the material handled, chemically resistant suit and boots, and hard-hat. Self Contained Breathing Apparatus or respirator may be required where engineering controls are not adequate or conditions for potential exposure exist. When respirators are required, Select NIOSH/MSHA approved based on actual or potential airborne concentrations in accordance with latest OSHA and/or ANSI recommendations.
Absorb spilled liquid with polypads or other suitable absorbent materials. Neutralize residue with citric acid or other caustic neutralizing agent. Decontaminate the area thoroughly. Test area with litmus paper to confirm neutralization. Place all spill residue in a suitable container. Dispose of in accordance with Federal, State, and local hazardous waste disposal regulations (see Section 13, Disposal Considerations).

PART III *How can I prevent hazardous situations from occurring*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash hands after handling this product. Do not eat or drink while handling this material. Remove contaminated clothing immediately. Discard contaminated clothing items, or launder before re-use. Inform anyone handling such contaminated laundry of the hazards associated with this product. Use ventilation and other engineering controls to minimize potential exposure to this product.

7. HANDLING and STORAGE (Continued)

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Avoid breathing mists or sprays generated by this product. It is best to never add water to this product, always add product, with constant stirring, slowly to surface of lukewarm (80-100 °F, 27-38 °C) water, to assure product is being completely dispersed as it is added. Only trained personnel can add water to this product. Never add more product than can be absorbed by solution while maintaining temperatures below 200 °F(93 °C) to prevent boiling and spattering of caustic solution. Use in a well-ventilated location.
For Non-Bulk Containers: Open containers slowly, on a stable surface. Containers of this product must be properly labeled. 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. Keep container tightly closed when not in use. Wash thoroughly after using this material. Storage areas should be made of fire-resistant materials. If appropriate, post warning signs in storage and use areas. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged. Empty containers may contain residual liquid, therefore, empty containers should be handled with care.

Bulk Containers: All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

Tank Car Shipments: Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cars must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tank (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be clean and free of incompatible chemicals, prior to connection to the tank car or vessel. Valves and hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment before maintenance begins by a triple-rinse with water followed, if necessary, by using caustic neutralizing agent and an additional rinse. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: If required use a corrosion-resistant ventilation system separate from other exhaust ventilation systems to ensure that there is no potential for overexposure to sprays, or mists of this product and that exposures are below those in section 2 (Composition and Information on Ingredients). Ensure eyewash/safety shower stations are available near areas where this product is used.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below exposure limits listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed, use only protection authorized in 29 CFR 1910.134, or applicable State regulations. If adequate ventilation is not available or if there is potential for airborne exposure above the exposure limits (listed in Section 2) a respirator may be worn up to respirator exposure limitations, check with respirator equipment manufactures recommendations/limitations. For a higher level of protection use positive pressure supplied air respiration protection or Self Contained Breathing Apparatus or if oxygen levels are below 19.5% or are unknown.

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:
Positive pressure, full-facepiece Self Contained Breathing Apparatus; or positive pressure, full-facepiece Self Contained Breathing Apparatus with an auxiliary positive pressure Self Contained Breathing Apparatus.

EYE PROTECTION: Splash goggles or safety glasses. Face-shields are recommended when the operation can generate splashes, sprays or mists.

HAND PROTECTION: Wear appropriate gloves for routine industrial use. Use appropriate gloves for spill response, as stated in Section 6 of this MSDS (Accidental Release Measures).

BODY PROTECTION: Use body protection appropriate for task. Cover-all, rubber aprons, or chemical protective clothing made from natural rubber are generally acceptable, depending upon the task.

9. PHYSICAL and CHEMICAL PROPERTIES

Physical and chemical properties for various concentrations of **Sodium Hydroxide**, the main component of this product are as follows:

	Series			
	10	20	30	50
PHYSICAL STATE:	Liquid			
BOILING POINT @ 760 mm Hg:	110°C	113°C	119°C	140°C
FREEZING POINT:	-12°C 10°F	-26°C -14°F	0°C 32°F	12°C 53.6°F
VAPOR PRESSURE mm Hg @ 60°C:	135	110	76	13
SPECIFIC GRAVITY @ 15.6° C	1.11	1.22	1.33	1.53
DENSITY – lb-gal @ 15.6°C:	9.26	10.17	11.09	12.76
VAPOR DENSITY:	Not Determined			
EVAPORATION RATE (water = 1):	Similar to or slower than water depending upon weight percent.			
pH:	14.0 pH @ 7.5% solution			
SOLUBILITY in H_2O - % by wt:	Completely Soluble			

ODOR THRESHOLD: Not available.

APPEARANCE AND COLOR: This product is a clear light straw to turbid liquid solution.
HOW TO DETECT THIS SUBSTANCE (warning properties): Litmus paper will turn blue-purple upon contact with this solution even with low concentrations.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Thermal decomposition products of this solution can include carbon monoxide, carbon dioxide, and sodium compounds.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This product reacts with strong acids. Additionally, it is incompatible with organic halogen compounds, organic nitro compounds, aluminum, zinc, tin, and other metals. Avoid contact with leather and wool. **Reactions with various food sugars may form carbon monoxide.**

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid exposure or contact to extreme temperatures and incompatible chemicals.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Additional toxicology information for components greater than 1 percent in concentration is provided below.

SODIUM HYDROXIDE:
Eye Irritancy (monkey) = 1% solution, 24 hr, Severe.
Skin Irritancy (rabbit) = 500 mg, 24 hr, Severe.
Eye Irritancy (rabbit) = 4 g, 24 hr, Mild.
Eye Irritancy (rabbit) = 1% solution, 24 hr, Severe.
Eye Irritancy (rabbit) = 50 g, 24 hr, Severe.
Eye Irritancy (rabbit) = 1 mg, 24 hr, Severe.
Eye Irritancy (rabbit) = 100 mg with rinse, 24 hr, Severe.
Cytogenic Analysis System (grasshopper, parenteral) = 20 mg
LD_{50} (intraperitoneal, mouse) = 40 mg/kg.
LDLo (oral, rabbit) = 500 mg/kg.

11. TOXICOLOGICAL INFORMATION (Continued)

SUSPECTED CANCER AGENT: The components of this product's ingredients are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA; and therefore are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: This product is severely irritating to contaminated tissue.

SENSITIZATION TO THE PRODUCT: No component of this product is known to be a sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: This product is not reported to produce mutagenic effects in humans. Mutation data is available for the Sodium Hydroxide (component of this product), obtained during clinical studies on animal tissues exposed to high doses of this compound.
Embryotoxicity: This product is not reported to produce embryotoxic effects in humans.
Teratogenicity: This product is not reported to cause teratogenic effects in humans.
Reproductive Toxicity: This product is not reported to cause reproductive effects in humans.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES: Currently there are no Biological Exposure Indices (BEIs) associated with the components of this product.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE Skin disorders can be aggravated by over-exposure to this product. Inhalation of this products mists may aggravate respiratory conditions.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate over-exposure to this product.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The components of this product are relatively stable in the environment; they may degrade, after time, into other organic and inorganic constituents. Additional environmental data is available for the components of this product as follows:

SODIUM HYDROXIDE: K_{ow} = too low to be measured. Water solubility = 9 g/0.9 ml water. BOD: None.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: This product is harmful to plant and animal life if this product is released into the environment. As with all chemicals, work practices should be aimed at eliminating environmental releases.

EFFECT OF CHEMICAL ON AQUATIC LIFE This product can substantially raise the pH of an aquatic environment and can be extremely toxic to fish and aquatic plants. As with all chemicals, work practices should be aimed at eliminating environmental releases. Additional aquatic data for the components of this product is available as follows:

SODIUM HYDROXIDE:
LC_{100} (*Cyprimus carpio*) = 180 ppm/24 hr/25 °C
TL_m (mosquito fish) = 125 ppm/96 hr (fresh water)
TL_m (bluegill) = 99 mg/L/48 hr (tap water)

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority.

EPA WASTE NUMBER: D002 (Characteristic, corrosive), applicable to wastes consisting only of this solution.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:	Sodium Hydroxide solution
HAZARD CLASS NUMBER and DESCRIPTION:	8 (Corrosive Material)
UN IDENTIFICATION NUMBER:	UN 1824
PACKING GROUP:	II
DOT LABEL(S) REQUIRED:	Corrosive

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 154

MARINE POLLUTANT: This product does not contain any components which are designated by the Department of Transportation to be Marine Pollutants. (49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

Note: The latest DOT information is provided, please verify all DOT information as it is subject to change without notice.

15. REGULATORY INFORMATION

SARA REPORTING REQUIREMENTS: The components of this product subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act are as follows.

COMPONENT	SARA 302	SARA 304	SARA 313
Sodium Hydroxide	No	Yes	No

SARA Threshold Planning Quantity: Not applicable.

TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY (RQ): Sodium Hydroxide = 1000 lbs.

OTHER FEDERAL REGULATIONS: Not applicable.

STATE REGULATORY INFORMATION: Components of this product are covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Sodium Hydroxide.
California - Permissible Exposure Limits for Chemical Contaminants: Sodium Hydroxide.
Florida - Substance List: Sodium Hydroxide.
Illinois - Toxic Substance List: Sodium Hydroxide.
Kansas - Section 302/313 List: Sodium Hydroxide.
Minnesota - List of Hazardous Substances: Sodium Hydroxide.
Missouri - Employer Information/Toxic Substance List: Sodium Hydroxide.
New Jersey - Right to Know Hazardous Substance List: Sodium Hydroxide.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: Sodium Hydroxide.
Pennsylvania - Hazardous Substance List: Sodium Hydroxide.
Rhode Island - Hazardous Substance List: Sodium Hydroxide.
Texas - Hazardous Substance List: Sodium Hydroxide.
West Virginia Substance List: Sodium Hydroxide.
Wisconsin - Toxic and Hazardous Substances: Sodium Hydroxide.

CALIFORNIA PROPOSITION 65 No component of this product is on the California Proposition 65 lists.

LABELING (Precautionary Statements): **DANGER!** CORROSIVE MATERIAL! LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. MAY CAUSE LUNG DAMAGE. REACTS VIOLENTLY WITH ACIDS. REACTS WITH WATER TO GENERATE HEAT. AVOID SPATTERING BY SLOWLY ADDING TO SOLUTION. Do not get into eyes, on skin or clothing. Avoid breathing spray or mist. Do not take internally. Use with adequate ventilation and employ respiratory protection when exposed to the mist or spray. When handling, wear chemical splash goggles, face shield, rubber gloves and protective clothing. Do not transfer to unlabeled containers. Use with adequate ventilation. Wash thoroughly after handling, Keep container closed when not in use. FIRST-AID: In case of contact, immediately flush skin or eyes for at least 15 minutes. If inhaled, move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Do not induce vomiting. IN CASE OF FIRE: Use water, dry chemical, CO_2, or alcohol foam. IN CASE OF SPILL: Dike area to contain spill. Only trained personnel equipped full acid- protective gear should be permitted in this area. Spilled material may be absorbed into an appropriate absorbent material. Spills should be removed using a vacuum truck. Neutralize remaining traces of material with any dilute inorganic acid or citric acid and then flush with water. If necessary a liberal covering of sodium bicarbonate should then be applied and then rinsed with water. Do not wash into storm or sanitary sewer system.

TARGET ORGANS: Skin, eyes and respiratory system.

15. REGULATORY INFORMATION (Continued)

WHMIS SYMBOLS: E- Corrosive Material

16. OTHER INFORMATION

INFORMATION SOURCE: CHEMICAL SAFETY ASSOCIATES, Inc.

PREPARED BY: BASIC CHEMICAL SOLUTIONS

THIS INFORMATION IS DRAWN FROM RECOGNIZED SOURCES BELIEVED TO BE RELIABLE. BASIC CHEMICAL SOLUTIONS MAKES NO GUARANTEES NOR ASSUMES ANY LIABILITY IN CONNECTION WITH THIS INFORMATION. THE USER SHOULD BE AWARE OF CHANGING TECHNOLOGY, RESEARCH, REGULATIONS AND ANALYTICAL PROCEDURES THAT MAY REQUIRE CHANGES HEREIN. THE ABOVE DATA IS SUPPLIED UPON THE CONDITION THAT PERSONS WILL EVALUATE THIS INFORMATION AND THEN DETERMINE ITS SUITABILITY FOR THEIR USE.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:
ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits.
TLV - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour **Time Weighted Average (TWA)**, the 15-minute **Short Term Exposure Limit**, and the instantaneous **Ceiling Level**. Skin adsorption effects must also be considered.
OSHA - U.S. Occupational Safety and Health Administration.
PEL - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.
IDLH - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called Recommended Exposure Levels (**RELs**). When no exposure guidelines are established, an entry of **NE** is made for reference.

FLAMMABILITY LIMITS IN AIR:
Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:
Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m^3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause death. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.

REGULATORY INFORMATION:
This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Other acronyms used are: **Superfund Amendments and Reauthorization Act (SARA)**; the **Toxic Substance Control Act (TSCA)**; Marine Pollutant status according to the **DOT**; California's Safe Drinking Water Act (**Proposition 65**); the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund)**; and various state regulations. This section also includes information on the precautionary warnings which appear on the materials package label.

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

BASIC CHEMICAL SOLUTIONS

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED): **BCS CITRIC ACID**

CHEMICAL NAME/CLASS: Organic Acid

PRODUCT USE: Food additive

SUPPLIER/MANUFACTURER'S NAME: **BASIC CHEMICAL SOLUTIONS**

ADDRESS: **Corporate Office**
525 Seaport Blvd.
Redwood City, CA 94063

BUSINESS PHONE: 800-411-4227

EMERGENCY PHONE: **CHEMTREC**: 800-424-9300

DATE OF PREPARATION: May 24, 2004

Si usted no entiende las Hojas de Informacion de Seguridad sobre Materials, busque a alguien para que se la explique a usted en detalle.
(If you do not understand the Material Safety Data Sheet, find someone to explain it to you in detail.)

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	%w/w	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			OTHER
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	
Citric Acid	77-92-9	50	NE	NE	NE	NE	NE	NE
Water and other ingredients. The other ingredients are each present in less than 1 percent concentration in this product.			Balance	The components present in the balance of this product do not contribute any significant, additional hazards. All hazard information pertinent to this product has been presented in the remaining sections of this Material Safety Data Sheet, per the requirements of Federal Occupational Safety and Health Hazard Communication Standard (29 CFR 1910.1200).				

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used. NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a clear to pale yellow to amber liquid with an odor that ranges between none to a very slightly sugar odor. Skin contact with citric acid can irritate the skin and can cause the skin to redden, sting, and swell at the point of contact. Severe irritation characterized by stinging, reddening, tearing, and swelling may occur following eye exposure. Contact may cause damage to the eye if not treated immediately. Inhalation of this material can be irritating to the nose, mouth, throat and lungs. Emergency responders must wear the proper personal protective equipment suitable for the situation to which they are responding.

3. HAZARD IDENTIFICATION (Continued)

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of occupational overexposure are inhalation and contact with skin and eyes. The symptoms of overexposure to this product are as follows:

INHALATION: Inhalation of this material can be irritating to the nose, mouth, throat and lungs. Low inhalation hazard for usual industrial handling or commercial handling by trained personnel.

CONTACT WITH SKIN or EYES: Skin contact with citric acid can irritate the skin and can cause the skin to redden, sting, and swell at the point of contact. Individuals with preexisting skin disorders may be more susceptible to the effects of this product. Severe irritation characterized by stinging, reddening, tearing, and swelling can occur following eye exposure. Contact may cause damage to the eye if not treated immediately. Individuals with preexisting eye disorders may be more susceptible to the effects of this product.

SKIN ABSORPTION: Skin absorption is not anticipated to be a significant route of over-exposure for any component of this product.

INGESTION: Ingestion is not anticipated to be a significant route of over-exposure to this product. Expected to be a low ingestion hazard, when small amounts are ingested. May cause gastrointestinal irritation if excess amounts are consumed seek emergency medical attention immediately.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	1
FLAMMABILITY	(RED)	0
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		B

EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		

For routine industrial applications

See Section 16 for Definition of Ratings

INJECTION: Though injection is not anticipated to be a significant route of over-exposure to this product, if it occurs, it may cause local reddening, tissue swelling, and discomfort.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**.

ACUTE: Severe irritation characterized by stinging, reddening, tearing, and swelling can occur following eye exposure. Contact may cause damage to the eye if not treated immediately. Skin contact with citric acid can irritate the skin and can cause the skin to redden, sting, and swell at the point of contact. CHRONIC: The effects of long-term, low-level exposures to this product have not been determined. Safe handling of this material on a long-term basis should emphasize the avoidance of all effects from repetitive acute exposure. This chemical is food grade material and is considered to have a low order of toxicity.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

SKIN EXPOSURE: If the product contaminates the skin, immediately begin decontamination by flush all affected areas with large amounts of soap and running water. Minimum flushing is for 15 minutes. Remove contaminated clothing, taking care not to contaminate eyes. Do not attempt to neutralize with chemical agents. Victim must seek medical attention if irritation develops.

EYE EXPOSURE: If this product enters the eyes, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Do not attempt to neutralize. Oils or ointments should not be used at this time. Victim must seek immediate medical attention.

INHALATION: If mists or sprays of this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Victim must seek immediate medical attention.

4. FIRST-AID MEASURES (Continued)

INGESTION: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, victim should drink water and seek medical attention. Never induce vomiting or give water to someone who is unconscious, having convulsions, or unable to swallow.

Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take a copy of the label and MSDS to health professional with victim.

5. FIRE-FIGHTING MEASURES

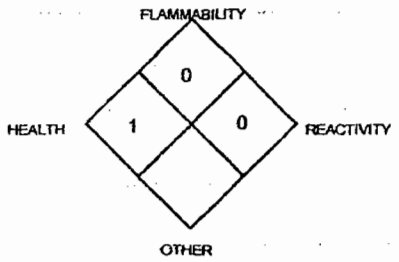
FLASH POINT: Not flammable.
AUTOIGNITION TEMPERATURE: NE.
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): NE. Upper (UEL): NE.

FIRE EXTINGUISHING MATERIALS:
Water Spray: YES Carbon Dioxide: YES
Foam: YES Dry Chemical: YES
Halon: YES Other: Any "ABC" Class.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Not considered to be a fire or an explosion hazard. Use standard fire fighting techniques to extinguish surrounding materials. Aqueous citric acid does not pose a fire or explosion hazard. Combustion of citric acid produces carbon dioxide (CO_2) and carbon monoxide (CO).

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

NFPA RATING



See Section 16 for Definition of Ratings

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment appropriate for the surrounding fire. Move fire-exposed containers, if it can be done without risk to firefighters. If possible, prevent run-off water from entering storm drains, bodies of water, or other environmentally sensitive areas. If necessary, discard or decontaminate fire response equipment using water before returning such equipment to service.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: In case of a release, clear the affected area, protect people, and respond with trained personnel. Uncontrolled releases should be responded to by appropriately trained personnel in proper personal protective equipment, using pre-planned procedures.

The proper personal protective equipment for incidental releases (e.g.-1 L of the product released in a well-ventilated area) use impermeable gloves, specific for the material handled, goggles, face shield, and appropriate body protection. In the event of a large release, use impermeable gloves, specific for the material handled, chemically resistant suit and boots, and hard-hat. Self Contained Breathing Apparatus or respirator may be required where engineering controls are not adequate or conditions for potential exposure exist. When respirators are required, Select NIOSH/MSHA approved based on actual or potential airborne concentrations in accordance with latest OSHA and/or ANSI recommendations.
Absorb spilled liquid with polypads or other suitable absorbent materials. Neutralize residue with lime or soda ash or other acid neutralizing agent. Decontaminate the area thoroughly. Test area with litmus paper to confirm neutralization. Place all spill residue in a suitable container. Dispose of in accordance with Federal, State and local hazardous waste disposal regulations (see Section 13 – Disposal Considerations.)

PART III *How can I prevent hazardous situations from occurring*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Avoid breathing mists or sprays generated by this product. Use in a well-ventilated location. Wash thoroughly after using this material. Do not eat, drink, or smoke while handling this material. Remove contaminated clothing immediately. Use ventilation and other engineering controls to minimize potential exposure to this product.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Avoid breathing mists or sprays generated by this product. Use in a well-ventilated location.

7. HANDLING and STORAGE (Continued)

For Non-Bulk Containers: Open containers slowly, on a stable surface. Containers of this product must be properly labeled. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Store containers away from incompatible chemicals. Keep container tightly closed when not in use. Wash thoroughly after using this material. Storage areas should be made of fire-resistant materials. If appropriate, post warning signs in storage and use areas. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged. Empty containers may contain residual liquid, therefore, empty containers should be handled with care.

Bulk Containers: All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

Tank Car Shipments: Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cars must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tank (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be clean and free of incompatible chemicals, prior to connection to the tank car or vessel. Valves and hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment before maintenance begins by a triple-rinse with water followed, if necessary, by using acid neutralizing agent and an additional rinse. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: If required use local ventilation systems to ensure that there is no potential for overexposure to sprays, or mists of this product and that exposures are below those in section 2 (Composition and Information on Ingredients). Ensure eyewash/safety shower stations are available near areas where this product is used.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below exposure limits listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed, use only protection authorized in 29 CFR 1910.134, or applicable State regulations. If adequate ventilation is not available or if there is potential for airborne exposure above the exposure limits (listed in Section 2) a respirator may be worn up to respirator exposure limitations, check with respirator equipment manufactures recommendations/limitations. For a higher level of protection use positive pressure supplied air respiration protection or Self Contained Breathing Apparatus or if oxygen levels are below 19.5% or are unknown.

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:
Positive pressure, full-facepiece Self Contained Breathing Apparatus; or positive pressure, full-facepiece Self Contained Breathing Apparatus with an auxiliary positive pressure Self Contained Breathing Apparatus.

EYE PROTECTION: Splash goggles or safety glasses. Face-shields are recommended when the operation can generate splashes, sprays or mists.

HAND PROTECTION: Wear appropriate gloves for routine industrial use. Use appropriate gloves for spill response, as stated in Section 6 of this MSDS (Accidental Release Measures).

BODY PROTECTION: Use body protection appropriate for task. Cover-all, rubber aprons, or chemical protective clothing made from natural rubber are generally acceptable, depending upon the task.

9. PHYSICAL and CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air = 1): NE
SPECIFIC GRAVITY (water = 1): 1.24@ 15.6°C(68°F)
SOLUBILITY IN WATER: Completely soluble.
VAPOR PRESSURE, mm Hg @ 25°C: NE
ODOR THRESHOLD: Not available.
EVAPORATION RATE (n-BuAc=1): NE
MELTING/FREEZING POINT: NE
BOILING POINT: 104°C (219°F)
pH: 2
LOG WATER/OIL DISTRIBUTION COEFFICIENT: Not applicable.

APPEARANCE AND COLOR: This product is a clear to pale yellow to amber liquid with an odor that ranges between none to a very slightly sugar odor.

9. PHYSICAL and CHEMICAL PROPERTIES (Continued)

HOW TO DETECT THIS SUBSTANCE (warning properties): The appearance and odor may be a distinguishing characteristic of this product. Litmus paper will turn red upon contact with this solution.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Thermal decomposition products of this mixture can include carbon monoxide and carbon dioxide.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Reactions with bases will produce excessive heat. Metal nitrates (potentially explosive reaction), alkali carbonates and bicarbonates, potassium tartrate. Will corrode copper, zinc, aluminum and their alloys.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Heat flames ignition sources and incompatibles.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology Information is for this product:

LD_{50} (oral, rat) 3 g/kg
Irritation(skin, rabbit) 500 mg/24H mild
Irritation (eye, rabbit) 750 mg/24H severe

SUSPECTED CANCER AGENT: The product's components are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA and are, therefore, not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: Severe irritation characterized by stinging, reddening, tearing, and swelling can occur following eye exposure. Contact may cause damage to the eye if not treated immediately. Skin contact with citric acid can irritate the skin and can cause the skin to redden, sting, and swell at the point of contact.

SENSITIZATION TO THE PRODUCT: This product is not known to cause skin or respiratory sensitization reactions in humans after prolonged or repeated exposures.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: This product is not reported to produce mutagenic effects in humans.
Embryotoxicity: This product is not reported to produce embryotoxic effects in humans.
Teratogenicity: This product is not reported to cause teratogenic effects in humans.
Reproductive Toxicity: This product is not reported to cause reproductive effects in humans.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Skin disorders can be aggravated by over-exposure to this mixture. Inhalation of this product may aggravate respiratory conditions.

BIOLOGICAL EXPOSURE INDICES: Currently, Biological Exposure Indices (BEIs) are not applicable to components of this product.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The components of this product are relatively stable in the environment. The following environmental data are available for the components of this product over 1 percent by weight:

No information found.

12. ECOLOGICAL INFORMATION (Continued)

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No information found.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No information found. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or other waters unless in accordance with the requirements of the National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without notifying the local sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA. The following aquatic toxicity data are available for the product and its components of this product over 1 percent by weight: Not available.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority.

EPA WASTE NUMBER: Not applicable.

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

Metal Container: Triple rinse (or equivalent), then offer for recycling or reconditioning, or dispose of in a sanitary landfill, or by other procedures approved by state or local authorities.

Containers Under 1-Gallon or Less in Size: Do not reuse empty container (bottle, can, bucket). Wrap container and put in trash.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:	Not regulated.
HAZARD CLASS NUMBER and DESCRIPTION:	Not regulated.
UN IDENTIFICATION NUMBER:	Not regulated.
PACKING GROUP:	Not regulated.
DOT LABEL(S) REQUIRED:	Not regulated.

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): Not regulated.

MARINE POLLUTANT: This product does not contain any components which are designated by the Department of Transportation to be Marine Pollutants. (49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS NOT CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

SARA REPORTING REQUIREMENTS: The components of this product are not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

CANADIAN DSL INVENTORY: The components of this product are listed on the DSL Inventory.

U.S. TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Not applicable.

STATE REGULATORY INFORMATION: Components of this product are covered under specific State regulations, as denoted below:

None determined.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): No component of this product is on the California Proposition 65 lists.

LABELING (Precautionary Statements): WARNING! CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. Do not get into eyes, on skin or clothing. Avoid breathing mists or sprays. Do not

15. REGULATORY INFORMATION (Continued)

take internally. Use with adequate ventilation and employ respiratory protection when exposed to mists or sprays. When handling, wear chemical splash goggles, face shield, rubber gloves and protective clothing. Do not transfer to unlabeled containers. Wash thoroughly after handling. Keep container closed when not in use. FIRST-AID: In case of contact, immediately flush skin or eyes for at least 15 minutes. Remove contaminated clothes and shoes. If inhaled, move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If ingested, get medical attention. IN CASE OF FIRE: Use water, dry chemical, CO_2 or alcohol foam. IN CASE OF SPILL: Absorb with an inert material. Refer to MSDS for additional information.

CANADIAN WHMIS SYMBOLS: Not Regulated.

16. OTHER INFORMATION

INFORMATION SOURCE: CHEMICAL SAFETY ASSOCIATES, Inc.

PREPARED BY: BASIC CHEMICAL SOLUTIONS

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:
ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits.
TLV - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour **Time Weighted Average (TWA)**, the 15-minute **Short Term Exposure Limit**, and the instantaneous **Ceiling Level**. Skin adsorption effects must also be considered.
OSHA - U.S. Occupational Safety and Health Administration.
PEL - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.
IDLH - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called Recommended Exposure Levels (**RELs**). When no exposure guidelines are established, an entry of **NE** is made for reference.

FLAMMABILITY LIMITS IN AIR:
Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:
Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m^3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo, LDLo**, and **LDo**, or **TC, TCo, LCLo**, and **LCo**, the lowest dose (or concentration) to cause death. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.

REGULATORY INFORMATION:
This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Other acronyms used are: **Superfund Amendments and Reauthorization Act (SARA)**; **the Toxic Substance Control Act (TSCA)**; Marine Pollutant status according to the **DOT**; California's Safe Drinking Water Act **(Proposition 65)**; **the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund)**; and various state regulations. This section also includes information on the precautionary warnings which appear on the materials package label.

Bleach (Sodium Hypochlorite)

National Sanitary Foundation (NSF) or equivalent certification

SPECIFICATION SHEET

Issue Date: March 1, 2009 **Replaces: All Previous**

Chemical Formula: Sodium Hypochlorite (NaOCl)

PROPERTY	BASIS	SPECIFICATION
NaOCl	Wt %	12.5 min
Total Alkalinity as NaOH	Wt %	2.0 max
Iron (Fe)	ppm	3.0 max
Specific Gravity @ 20° C (68° F)	1.2	
Appearance	Clear, pale yellow-green liquid	
Odor	Faint chlorine odor	

Contact your Basic Chemical Solutions sales representative for more information at

800-411-4227 (4BCS)

BASIC CHEMICAL SOLUTIONS, L.L.C.

Corporate Headquarters
525 Seaport Boulevard
Redwood City, California 94063

50% Sodium Hydroxide
Diaphragm Grade

SPECIFICATION SHEET

Issue Date: March 1, 2009 **Replaces: All Previous**

Chemical Formula: NaOH (Caustic Soda, Liquid Caustic, Lye)

Property	Specification
Sodium Hydroxide(NaOH), wt %	48.5 - 52.0
Sodium Oxide(Na_2O), wt %	37.6 - 40.3
Sodium Chloride(NaCl), wt %	1.10 Max
Sodium Carbonate(Na_2CO_3), wt %	0.2 Max
Sodium Chlorate($NaClO_3$), wt %	0.3 Max
Sodium Sulfate(Na_2SO_4),. wt %	0.075 Max
Iron(Fe), PPM by wt.	10 Max

Contact your Basic Chemical Solutions sales representative for more information at

800-411-4227 (4BCS)

BASIC CHEMICAL SOLUTIONS, L.L.C.

Corporate Headquarters
525 Seaport Boulevard
Redwood City, California 94063

Sulfuric Acid
Technical Grade

SPECIFICATION SHEET

Issue Date: March 1, 2009 Replaces: All Previous

Description: Sulfuric Acid is a strong acidic, colorless, corrosive, oily liquid.

Component	Basis	Specification
H2SO4 concentration	wt %	93 min.
Iron (Fe)	ppm by wt.	100.0
SO2	ppm by wt.	50.0
Color	APHA	100

Typical Properties:	Freezing Point:	- 31 °F
	Specific Gravity @ 60 °F:	1.8354
	Weight Per Gallon:	15.302 lbs.
	Molecular Weight:	98.08

DOT Hazard Class: Corrosive Material

CAS Number: 7664-93-9

Contact your Basic Chemical Solutions sales representative for more information at

800-411-4227 (4BCS)

BASIC CHEMICAL SOLUTIONS, L.L.C.

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