Lexington-Fayette Urban County Government
DEPARTMENT OF FINANCE & ADMINISTRATION

Jim Gray
Mayor

William O'Mara
Commissioner

ADDENDUM #1

Bid Number: **#177-2015**

Date: November 24, 2015

Subject: Odor and Corrosion Control Chemicals

Address inquiries to:
Brian Marcum
(859) 258-3320

TO ALL PROSPECTIVE SUBMITTERS:

Please be advised of the following clarifications to the above referenced Bid:

Question:

Biological treatment application rate is based on total flow treated (mgd, gpd, gph, gpm) not Pound H2S, therefore biological treatment process would need an addendum to meet bid spec. Total daily average flow (mgd) of all basins that are planned to be treated would need to be provided

Answer:
Application rate in gallons per pound is requested so all bids can be evaluated equally. We pay for chemical per gallon and vendors should be able to provide evidence of gallons per pound treated. And failure to provide this info (gal/lb) will invalidate the bid.

What size tanks will be required at each location?

Tank size will depend on chemical feed rate; we like to be able to hold a 30 day supply in some cases that won't work due to high feed rates.

What material have you been using for odor control in the past
Bioxide

Is ferrous chloride an option for the odor control chemical?
Yes

Bioxide Usages

2013- 242,120 gallons
2014- 197,504 gallons
2015- 130,478 gallons

Chemical Delivery Report: Bioxide By Location

	2013	2014	2015
East Hickman	26,623	20,043	23,336
Kenneland PS			1,000
Expansion PS 2A		2,639	
Glen Eagles	8,420		
Greenbriar	3,607		
Lower Cane Run	27,945	31,264	24,122
Mint Lane PS	6,005		1,047
North Elkhorn	56,394	74,132	33,496
South Elkhorn	108,176	69,426	44,227
Southland Christian Church	4,950		3,250
Chemical Total	**242,120**	**197,504**	**130,478**

Chemical Delivery Report: Bioxide AQ

	2013	2014	2015
Hamburg Farms	4,581		
Blackford PS	4380		
Chemical Total	8,961		

Todd Slatin, Director
Division of Central Purchasing

All other terms and conditions of the Bid and specifications are unchanged.
This letter should be signed, attached to and become a part of your Bid.

COMPANY NAME: Evoqua Water Technologies LLC

ADDRESS: 2650 Tallevast Road, Sarasota, FL 34243

SIGNATURE OF BIDDER:

Lexington-Fayette Urban County Government

Lexington, Kentucky
Horse Capital of the World

Division of Central Purchasing | Date of Issue: November 16, 2015

INVITATION TO BID #177-2015
Odor and Corrosion Control Chemicals

Bid Opening Date: **December 1, 2015** **Bid Opening Time: 2:00 PM**
Address: 200 East Main Street, 3rd Floor, Room 338, Lexington, Kentucky 40507

Type of Bid: Price Contract

Pre Bid Meeting: N/A Pre Bid Time: N/A
Address: N/A

Sealed bids will be received in the office of the Division of Central Purchasing, 200 East Main Street, Lexington, Kentucky, until **2:00 PM**, prevailing local time on **12/01/2015**. Bids must be received by the above-mentioned date and time. Mailed bids should be sent to:

Division of Central Purchasing
200 East Main Street, Room 338
Lexington, KY 40507, (859) 258-3320

The Lexington-Fayette Urban County Government assumes no responsibility for bids that are not addressed and delivered as indic ated above. **Bids that are not delivered to the Division of Central Purchasing by the stated time and date will be rejected.** All bids must be signed and have the company name and address, bid invitation number, and the name of the bid on the outside of the envelope.

Bids are to include all shipping costs to the point of delivery located at: VARIOUS LOCATIONS, Lexington, KY

Bid Security Required: ___Yes _X_No *Cashier Check, Certified Check, Bid Bond (Personal checks and company checks will not be acceptable).*

Performance Bond Required: ___Yes _X_No

Check One:	**Proposed Delivery:**
X Bid Specifications Met _____Exceptions to Bid Specifications. *Exceptions shall be itemized and attached to bid proposal submitted.*	3-5 days after acceptance of bid.

Procurement Card Usage—The Lexington-Fayette Urban County Government may be using Procurement Cards to purchase goods and services and also to make payments. Will you accept Procurement Cards? X Yes _____ No

Submitted by: Evoqua Water Technologies LLC
Firm Name

2650 Tallevast Road
Address

Sarasota, FL 34243
City, State & Zip

Bid must be signed: J. R. Miller V.P. & G.M.
(original signature) ***Signature of Authorized Company Representative – Title***

Jennifer R. Miller
Representative's Name (Typed or printed)

941-359-7930 941-359-7985
Area Code - Phone – Extension *Fax #*

jennifer.r.miller@evoqua.com
E-Mail Address

The Affidavit in this bid must be completed before your firm can be considered for award of this contract.

AFFIDAVIT

Comes the Affiant, Jennifer R. Miller, and after being first duly sworn under penalty of perjury as follows:

1. His/her name is Jennifer R. Miller and he/she is the individual submitting the bid or is the authorized representative of Evoqua Water Technologies LLC, the entity submitting the bid (hereinafter referred to as "Bidder")
2. Bidder will pay all taxes and fees, which are owed to the Lexington-Fayette Urban County Government at the time the bid is submitted, prior to award of the contract and will maintain a "current" status in regard to those taxes and fees during the life of the contract.
3. Bidder will obtain a Lexington-Fayette Urban County Government business license, if applicable, prior to award of the contract.
4. Bidder has authorized the Division of Central Purchasing to verify the above-mentioned information with the Division of Revenue and to disclose to the Urban County Council that taxes and/or fees are delinquent or that a business license has not been obtained.
5. Bidder has not knowingly violated any provision of the campaign finance laws of the Commonwealth of Kentucky within the past five (5) years and the award of a contract to the Bidder will not violate any provision of the campaign finance laws of the Commonwealth.
6. Bidder has not knowingly violated any provision of Chapter 25 of the Lexington-Fayette Urban County Government Code of Ordinances, known as "Ethics Act."
7. Bidder acknowledges that "knowingly" for purposes of this Affidavit means, with respect to conduct or to circumstances described by a statute or ordinance defining an offense, that a person is aware or should have been aware that his conduct is of that nature or that the circumstance exists.

Further, Affiant sayeth naught.

Jennifer R. Miller, V.P. & G.M.

STATE OF Florida

COUNTY OF Manatee

The foregoing instrument was subscribed, sworn to and acknowledged before me by Jennifer R. Miller on this the 23 day of November, 2015.

SHERI WHALEN
MY COMMISSION # EE 830482
EXPIRES. December 26, 2016
Bonded Thru Notary Public Underwriters

My Commission expires: 12/26/16

NOTARY PUBLIC, STATE AT LARGE

Please refer to Section II. Bid Conditions, Item "U" prior to completing this form.

I. GREEN PROCUREMENT

A. ENERGY

The Lexington-Fayette Urban County Government is committed to protecting our environment and being fiscally responsible to our citizens.

The Lexington-Fayette Urban County Government mandates the use of Energy Star compliant products if they are available in the marketplace (go to **www.Energystar.gov**). If these products are available, but not submitted in your pricing, your bid will be rejected as non-compliant.

ENERGY STAR is a government program that offers businesses and consumers energy-efficient solutions, making it easy to save money while protecting the environment for future generations.

Key Benefits

These products use 25 to 50% less energy
Reduced energy costs without compromising quality or performance
Reduced air pollution because fewer fossil fuels are burned
Significant return on investment
Extended product life and decreased maintenance

B. GREEN SEAL CERTIFIED PRODUCTS

The Lexington-Fayette Urban County Government is also committed to using other environmentally friendly products that do not negatively impact our environment. Green Seal is a non-profit organization devoted to environmental standard setting, product certification, and public education.

Go to **www.Greenseal.org** to find available certified products. These products will have a reduced impact on the environment and on human health. The products to be used must be pre-approved by the LFUCG prior to commencement of any work in any LFUCG facility. If a Green Seal product is not available, the LFUCG must provide a signed waiver to use an alternate product. Please provide information on the Green Seal products being used with your bid response.

C. GREEN COMMUNITY

The Lexington-Fayette Urban County Government (LFUCG) serves as a principal, along with the University of Kentucky and Fayette County Public Schools, in the Bluegrass Partnership for a Green Community. The Purchasing Team component of the Partnership collaborates on economy of scale purchasing that promotes and enhances environmental initiatives. Specifically, when applicable, each principal is interested in obtaining best value products and/or services which promote environment initiatives via solicitations and awards from the other principals.

If your company is the successful bidder on this Invitation For Bid, do you agree to extend the same product/service pricing to the other principals of the Bluegrass Partnership for a Green Community (i.e. University of Kentucky and Fayette County Schools) if requested?

Yes _____ **No** X

II. Bid Conditions

A. No bid may be withdrawn for a period of sixty (60) days after the date and time set for opening.

B. No bid may be altered after the date and time set for opening. In the case of obvious errors, the Division of Central Purchasing may permit the withdrawal of a bid. The decision as to whether a bid may be withdrawn shall be that of the Division of Central Purchasing.

C. Acceptance of this proposal shall be enactment of an Ordinance by the Urban County Council.

D. The bidder agrees that the Urban County Government reserves the right to reject any and all bids for either fiscal or technical reasons, and to award each part of the bid separately or all parts to one vendor.

E. Minor exceptions may not eliminate the bidder. The decision as to whether any exception is minor shall be entirely that of the head of the requisitioning Department or Division and the Director of the Division of Central Purchasing. The Urban County Government may waive technicalities and informalities where such waiver would best serve the interests of the Urban County Government.

F. Manufacturer's catalogue numbers, trade names, etc., where shown herein are for descriptive purposes and are to guide the bidder in interpreting the standard of quality, design, and performance desired, and shall not be construed to exclude proposals based on furnishing other types of materials and/or services. However, any substitution or departure proposed by the bidder must be clearly noted and described; otherwise, it will be assumed that the bidder intends to supply items specifically mentioned in this Invitation for Bids.

G. The Urban County Government may require demonstrations of the materials proposed herein prior to acceptance of this proposal.

H. Bids must be submitted on this form and must be signed by the bidder or his authorized representative. Unsigned bids will not be considered.

I. Bids must be submitted prior to the date and time indicated for opening. Bids submitted after this time will not be considered.

J. All bids mailed must be marked on the face of the envelope:

"Bid on #177-2015 Odor and Corrosion Control Chemicals"

and addressed to: Division of Central Purchasing
200 East Main Street, Room 338
Lexington, Kentucky 40507

The Lexington-Fayette Urban County Government assumes no responsibility for bids that are not addressed and delivered as indicated above. Bids that are not delivered to the Division of Central Purchasing by the stated time and date will be rejected.

K. Bidder is requested to show both unit prices and lot prices. In the event of error, the unit price shall prevail.

L. A certified check or Bid Bond in the amount of **XX** percent of the bid price must be attached hereto. This check must be made payable to the Lexington-Fayette Urban County Government, and will be returned when the material and/or services specified herein have been delivered in accordance with specifications. In the event of failure to perform within the time period set forth in this bid, it is agreed the certified check may be cashed and the funds retained by the Lexington-Fayette Urban County Government as liquidated damages. Checks of unsuccessful bidders will be returned when the bid has been awarded.

M. The delivery dates specified by bidder may be a factor in the determination of the successful bidder.

N. Tabulations of bids received may be mailed to bidders. Bidders requesting tabulations must enclose a stamped, self-addressed envelope with the bid.

O. The Lexington-Fayette Urban County Government is exempt from Kentucky Sales Tax and Federal Excise Tax on materials purchased from this bid invitation. Materials purchased by the bidder for construction projects are not tax exempt and are the sole responsibility of the bidder.

P. All material furnished hereunder must be in full compliance with OSHA regulations.

Q. If more than one bid is offered by one party, or by any person or persons representing a party, all such bids shall be rejected.

R. Signature on the face of this bid by the Bidder or his authorized representative shall be construed as acceptance of and compliance with all terms and conditions contained herein.

S. The Entity (regardless of whether construction contractor, non-construction contractor or supplier) agrees to provide equal opportunity in employment for all qualified persons, to prohibit discrimination in employment because of race, color, creed, national origin, sex or age, and to promote equal employment through a positive, continuing program from itself and each of its sub-contracting agents. This program of equal employment opportunity shall apply to every aspect of its employment policies and practices.

T. The Kentucky Equal Employment Opportunity Act of 1978 (KRS 45.560-45.640) requires that any county, city, town, school district, water district, hospital district, or other political subdivision of the state shall include in directly or indirectly publicly funded contracts for supplies, materials, services, or equipment hereinafter entered into the following provisions:

During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, age or national origin;

(2) The contractor will state in all solicitations or advertisements for employees placed by or on behalf of the contractors that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, age or national origin;

(3) The contractor will post notices in conspicuous places, available to employees and applicants for employment, setting forth the provisions of the non-discrimination clauses required by this section; and

(4) The contractor will send a notice to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding advising the labor union or workers' representative of the contractor's commitments under the nondiscrimination clauses.

The Act further provides:

KRS 45.610. Hiring minorities - Information required

(1) For the length of the contract, each contractor shall hire minorities from other sources within the drawing area, should the union with which he has collective bargaining agreements be unwilling to supply sufficient minorities to satisfy the agreed upon goals and timetable.

(2) Each contractor shall, for the length of the contract, furnish such information as required by KRS 45.560 to KRS 45.640 and by such rules, regulations and orders issued pursuant thereto and will permit access to all books and records pertaining to his employment practices and work sites by the contracting agency and the department for purposes of investigation to ascertain compliance with KRS 45.560 to 45.640 and such rules, regulations and orders issued pursuant thereto.

KRS 45.620. Action against contractor - Hiring of minority contractor or subcontractor

(1) If any contractor is found by the department to have engaged in an unlawful practice under this chapter during the course of performing under a contract or subcontract covered under KRS 45.560 to 45.640, the department shall so certify to the contracting agency and such certification shall be binding upon the contracting agency unless it is reversed in the course of judicial review.

(2) If the contractor is found to have committed an unlawful practice under KRS 45.560 to 45.640, the contracting agency may cancel or terminate the contract, conditioned upon a program for future compliance approved by the contracting agency and the department. The contracting agency may declare such a contractor ineligible to bid on further contracts with that agency until such time as the contractor complies in full with the requirements of KRS 45.560 to 45.640.

(3) The equal employment provisions of KRS 45.560 to 45.640 may be met in part by a contractor by subcontracting to a minority contractor or subcontractor. For the provisions of KRS 45.560 to 45.640, a minority contractor or subcontractor shall mean a business that is owned and controlled by one or more persons disadvantaged by racial or ethnic circumstances.

KRS 45.630 Termination of existing employee not required, when

Any provision of KRS 45.560 to 45.640 notwithstanding, no contractor shall be required to terminate an existing employee upon proof that that employee was employed prior to the date of the contract.

KRS 45.640 Minimum skills

Nothing in KRS 45.560 to 45.640 shall require a contractor to hire anyone who fails to demonstrate the minimum skills required to perform a particular job.

It is recommended that all of the provisions above quoted to be included as special conditions in each contract. In the case of a contract exceeding $250,000, the contractor is required to furnish evidence that his work-force in Kentucky is representative of the available work-force in the area from which he draws employees, or to supply an Affirmative Action plan which will achieve such representation during the life of the contract.

U. Any party, firm or individual submitting a proposal pursuant to this invitation must be in compliance with the requirements of the Lexington-Fayette Urban County Government regarding taxes and fees before they can be considered for award of this invitation and must maintain a "current" status with regard to those taxes and fees throughout the term of the contract. The contractor must be in compliance with Chapter 13 from the Code of Ordinances of the Lexington-Fayette Urban County Government. The contractor must be in compliance with Ordinance 35-2000 pursuant to contractor registration with the Division of Building Inspection. If applicable, said business must have a Fayette County business license.

Pursuant to KRS 45A.343 and KRS 45A.345, the contractor shall

(1) Reveal any final determination of a violation by the contractor within the previous five year period pursuant to KRS Chapters 136 (corporation and utility taxes), 139 (sales and use taxes), 141 (income taxes), 337 (wages and hours), 338 (occupational safety and health of employees), 341 (unemployment and compensation) and 342 (labor and human rights) that apply to the contractor; and

(2) Be in continuous compliance with the above-mentioned KRS provisions that apply to the contractor for the duration of the contract.

A contractor's failure to reveal the above or to comply with such provisions for the duration of the contract shall be grounds for cancellation of the contract and disqualification of the contractor from eligibility for future contracts for a period of two (2) years.

V. Vendors who respond to this invitation have the right to file a notice of contention associated with the bid process or to file a notice of appeal of the recommendation made by the Director of Central Purchasing resulting from this invitation.

Notice of contention with the bid process must be filed within 3 business days of the bid/proposal opening by (1) sending a written notice, including sufficient documentation to support contention, to the Director of the Division of Central Purchasing or (2) submitting a written request for a meeting with the Director of Central Purchasing to explain his/her contention with the bid process. After consulting with the Commissioner of Finance the Chief Administrative Officer and reviewing the documentation and/or hearing the vendor, the Director of Central Purchasing shall promptly respond in writing findings as to the compliance with bid processes. If, based on this review, a bid process irregularity is deemed to have occurred the Director of Central Purchasing will consult with the Commissioner of Finance, the Chief Administrative Officer and the Department of Law as to the appropriate remedy.

Notice of appeal of a bid recommendation must be filed within 3 business days of the bid recommendation by (1) sending a written notice, including sufficient documentation to support appeal, to the Director, Division of Central Purchasing or (2) submitting a written request for a meeting with the Director of Central Purchasing to explain his appeal. After reviewing the documentation and/or hearing the vendor and consulting with the Commissioner of Finance and the Chief Administrative Officer, the Director of Central Purchasing shall in writing, affirm or withdraw the recommendation.

III. Procurement Contract Bid Conditions

A. The terms of this agreement shall be for **3** year(s) from the date of acceptance of this contract by the Lexington-Fayette Urban County Government. This agreement may be automatically extended for an additional **3-1** year(s) renewal. This contract may be canceled by either party thirty (30) days after delivery by canceling party of written notice of intent to cancel to the other contracting party.

B. Price Changes **(Space Checked Applies)**

(xx) 1. Prices quoted in response to the Invitation shall be firm prices for the first 90 days of the Procurement Contract. After 90 days, prices may be subject to revision and such changes shall be based on general industry changes. Revision may be either increases or decreases and may be requested by either party. There will be no more than one (1) price adjustment per quarter. Requests for price changes shall be received in writing at least twenty (20) days prior to the effective date and are subject to written acceptance before becoming effective. Proof of the validity of a request for revision shall be responsibility of the requesting party. The Lexington-Fayette Urban County Government shall receive the benefit of any decline that the seller shall offer his other accounts.

( )2. No provision for price change is made herein. Prices are to be firm for the term of this contract.

() 3. Procurement Level Contract

C. If any contract item is not available from the vendor, the Lexington-Fayette Urban County Government, at its option, may permit the item to be back-ordered or may procure the item on the open market.

D. All invoices must bear reference to the Lexington-Fayette Urban County Government Purchasing document numbers which are being billed.

E. This contract may be canceled by the Lexington-Fayette Urban County Government if it is determined that the Bidder has failed to perform under the terms of this agreement, such cancellation to be effective upon receipt of written notice of cancellation by the Bidder.

F. No substitutions for articles specified herein may be made without prior approval of the Division of Central Purchasing.

EQUAL OPPORTUNITY AGREEMENT

The Law

- Title VII of the Civil Rights Act of 1964 (amended 1972) states that it is unlawful for an employer to discriminate in employment because of race, color, religion, sex, age (40-70 years) or national origin.

- Executive Order No. 11246 on Nondiscrimination under Federal contract prohibits employment discrimination by contractor and sub-contractor doing business with the Federal Government or recipients of Federal funds. This order was later amended by Executive Order No. 11375 to prohibit discrimination on the basis of sex.

- Section 503 of the Rehabilitation Act of 1973 states:

  The Contractor will not discriminate against any employee or applicant for employment because of physical or mental handicap.

- Section 2012 of the Vietnam Era Veterans Readjustment Act of 1973 requires Affirmative Action on behalf of disabled veterans and veterans of the Vietnam Era by contractors having Federal contracts.

- Section 206(A) of Executive Order 12086, Consolidation of Contract Compliance Functions for Equal Employment Opportunity, states:

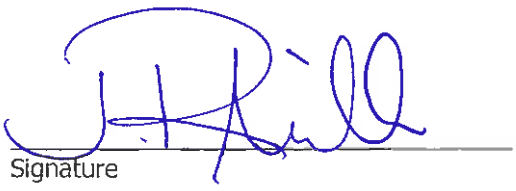
  The Secretary of Labor may investigate the employment practices of any Government contractor or sub-contractor to determine whether or not the contractual provisions specified in Section 202 of this order have been violated.

The Lexington-Fayette Urban County Government practices Equal Opportunity in recruiting, hiring and promoting. It is the Government's intent to affirmatively provide employment opportunities for those individuals who have previously not been allowed to enter into the mainstream of society. Because of its Importance to the local Government, this policy carries the full endorsement of the Mayor, Commissioners, Directors and all supervisory personnel. In following this commitment to Equal Employment Opportunity and because the Government is the benefactor of the Federal funds, it is both against the Urban County Government policy and illegal for the Government to let contracts to companies which knowingly or unknowingly practice discrimination in their employment practices. Violation of the above mentioned ordinances may cause a contract to be canceled and the contractors may be declared ineligible for future consideration.

Please sign this statement in the appropriate space acknowledging that you have read and understand the provisions contained herein. Return this document as part of your application packet.

Bidders

I/We agree to comply with the Civil Rights Laws listed above that govern employment rights of minorities, women, Vietnam veterans, handicapped and aged persons.



Signature

Evoqua Water Technologies LLC

Name of Business

GENERAL PROVISIONS OF BID CONTRACT

By signing the below, bidder acknowledges that it understands and agrees with the following provisions related to its bid response and the provision of any goods or services to LFUCG upon selection by LFUCG pursuant to the bid request:

1. Bidder shall comply with all Federal, State & Local regulations concerning this type of service or good.

2. Failure to submit ALL forms and information required by LFUCG may be grounds for disqualification.

3. Addenda: All addenda, if any, must be considered by the bidder in making its response, and such addenda shall be made a part of the requirements of the bid contract. Before submitting a bid response, it is incumbent upon bidder to be informed as to whether any addenda have been issued, and the failure of the bidder to cover any such addenda may result in disqualification of that response.

4. Bid Reservations: LFUCG reserves the right to reject any or all bid responses, to award in whole or part, and to waive minor immaterial defects in proposals. LFUCG may consider any alternative proposal that meets its basic needs.

5. Liability: LFUCG is not responsible for any cost incurred by bidder in the preparation of its response.

6. Changes/Alterations: Bidder may change or withdraw a proposal at any time prior to the opening; however, no oral modifications will be allowed. Only letters, or other formal written requests for modifications or corrections of a previously submitted proposal which is addressed in the same manner as the bid response, and received by LFUCG prior to the scheduled closing time for receipt of bids, will be accepted. The bid response when opened, will then be corrected in accordance with such written request(s), provided that the written request is contained in a sealed envelope which is plainly marked "modifications of bid response".

7. Clarification of Submittal: LFUCG reserves the right to obtain clarification of any point in a bid or to obtain additional information from any bidder.

8. Bribery Clause: By his/her signature on its response, bidder certifies that no employee of his/hers, any affiliate or subcontractor, has bribed or attempted to bribe an officer or employee of the LFUCG.

9. Additional Information: While not necessary, the bidder may include any product brochures, software documentation, sample reports, or other documentation that may assist LFUCG in better understanding and evaluating the bid response. Additional documentation shall not serve as a substitute for other documentation which is required by the LFUCG to be submitted with the bid response.

10. Ambiguity, Conflict or other Errors: If a bidder discovers any ambiguity, conflict, discrepancy, omission or other error in the bid request of LFUCG, it shall immediately notify LFUCG of such error in writing and request modification or clarification of the document if allowable by the LFUCG.

11. Agreement to Bid Terms: In submitting its bid response, the bidder agrees that it has carefully examined the specifications and all provisions relating to LFUCG's bid request, including but not limited to the bid contract. By submission of its bid response, bidder states that it understands the meaning, intent and requirements of LFUCG's bid request and agrees to the same. The successful bidder shall warrant that it is familiar with and understands all provisions herein and shall warrant that it can comply with them. No additional compensation to bidder shall be authorized for services, expenses, or goods reasonably covered under these provisions that the bidder omits from its bid response.

12. Cancellation: LFUCG may unilaterally terminate the bid contract with the selected bidder(s) at any time, with or without cause, by providing at least thirty (30) days advance written notice unless a different advance written notice period is negotiated prior to contract approval. Payment for services or goods received prior to termination shall be made by the LFUCG provided these goods or services were provided in a manner acceptable to the

LFUCG. Payment for those goods and services shall not be unreasonably withheld.

13. Assignment of Contract: The selected bidder(s) shall not assign or subcontract any portion of the bid contract with LFUCG without the express written consent of LFUCG. Any purported assignment or subcontract in violation hereof shall be void. It is expressly acknowledged that LFUCG shall never be required or obligated to consent to any request for assignment or subcontract; and further that such refusal to consent can be for any or no reason, fully within the sole discretion of LFUCG.

14. No Waiver: No failure or delay by LFUCG in exercising any right, remedy, power or privilege hereunder, nor any single or partial exercise thereof, nor the exercise of any other right, remedy, power or privilege shall operate as a waiver hereof or thereof. No failure or delay by LFUCG in exercising any right, remedy, power or privilege under or in respect of this bid proposal or bid contract shall affect the rights, remedies, powers or privileges of LFUCG hereunder or shall operate as a waiver thereof.

15. Authority to do Business: Each bidder must be authorized to do business under the laws of the Commonwealth of Kentucky and must be in good standing and have full legal capacity to provide the goods or services specified in the bid proposal. Each bidder must have all necessary right and lawful authority to submit the bid response and enter into the bid contract for the full term hereof including any necessary corporate or other action authorizing the bidder to submit the bid response and enter into this bid contract. If requested, the bidder will provide LFUCG with a copy of a corporate resolution authorizing this action and/or a letter from an attorney confirming that the proposer is authorized to do business in the Commonwealth of Kentucky. All bid responses must be signed by a duly authorized officer, agent or employee of the bidder.

16. Governing Law: This bid request and bid contract shall be governed by and construed in accordance with the laws of the Commonwealth of Kentucky. In the event of any proceedings regarding this matter, the bidder agrees that the venue shall be the Fayette County Circuit Court or the U.S. District Court for the Eastern District of Kentucky, Lexington Division and that the bidder expressly consents to personal jurisdiction and venue in such Court for the limited and sole purpose of proceedings relating to these matters or any rights or obligations arising thereunder.

17. Ability to Meet Obligations: Bidder affirmatively states that there are no actions, suits or proceedings of any kind pending against bidder or, to the knowledge of the bidder, threatened against the bidder before or by any court, governmental body or agency or other tribunal or authority which would, if adversely determined, have a materially adverse effect on the authority or ability of bidder to perform its obligations under this bid response or bid contract, or which question the legality, validity or enforceability hereof or thereof.

18. Bidder understands and agrees that its employees, agents, or subcontractors are not employees of LFUCG for any purpose whatsoever. Bidder is an independent contractor at all times related to the bid response or bid contract.

19. If any term or provision of this bid contract shall be found to be illegal or unenforceable, the remainder of the contract shall remain in full force and such term or provision shall be deemed stricken.

Signature

11/23/15
Date

WORKFORCE ANALYSIS FORM

Name of Organization: ENDQUA WATER TECHNOLOGIES

Date: 10 / 26 / 2015

Categories	Total	White		Latino		Black		Other		Total	
		M	F	M	F	M	F	M	F	M	F
Administrators											
Professionals	4	4	—								
Superintendents											
Supervisors	1	1	—								
Foremen											
Technicians											
Protective Service											
Para-Professionals											
Office/Clerical	1	—	1								
Skilled Craft	3	3	—								
Service/Maintenance											
Total:	9	8	1								

Prepared by: _____ H.R. BUSINESS CONSULTANT
Name & Title

DIRECTOR, DIVISION OF CENTRAL PURCHASING
LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT
200 EAST MAIN STREET
LEXINGTON, KENTUCKY 40507

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITIES AND DBE CONTRACT PARTICIPATION

The Lexington-Fayette Urban County Government has set a goal that not less than ten percent (10%) of the total value of this contract be subcontracted to MBE/WBE's. The goal for the utilization of certified MBE/WBE's as subcontractors are recommended goals. Contractors who fail to meet such goals will be expected to provide written explanations to the Director of the Division of Central Purchasing of efforts they have made to accomplish the recommended goals and the extent to which they are successful in accomplishing the recommended goals will be a consideration in the procurement process.

For assistance in locating MBE/WBE Subcontractors contact Marilyn Clark at 859/258-3320 or by writing the address listed below:

Marilyn Clark, Division of Central Purchasing
Lexington-Fayette Urban County Government
200 East Main Street – Room 338
Lexington, Kentucky 40507

Lexington-Fayette Urban County Government
MWDBE PARTICIPATION GOALS

A. GENERAL

1) The LFUCG request all potential contractors to make a concerted effort to include Minority-Owned (MBE), Woman-Owned (WBE) and Disadvantaged (DBE) Business Enterprises as subcontractors or suppliers in their bids.

2) Toward that end, the LFUCG has established 10% of total procurement costs as a Goal for participation of Minority-Owned, Woman-Owned and Disadvantaged Businesses on this contract.

3) **It is therefore a request of each Bidder to include in its bid, the same goal (10%) for MWDBE participation and other requirements as outlined in this section.**

B. PROCEDURES

1) The successful bidder will be required to report to the LFUCG, the dollar amounts of all payments submitted to Minority-Owned or Woman-Owned subcontractors and suppliers for work done or materials purchased for this contract. (See Subcontractor Monthly Payment Report)

2) Replacement of a Minority-Owned or Woman-Owned subcontractor or supplier listed in the original submittal must be requested in writing and must be accompanied by documentation of Good Faith Efforts to replace the subcontractor / supplier with another MWDBE Firm; this is subject to approval by the LFUCG. (See LFUCG MWDBE Substitution Form)

3) For assistance in identifying qualified, certified businesses to solicit for potential contracting opportunities, bidders may contact:

   a) The Lexington-Fayette Urban County Government, Division of Central Purchasing (859-258-3320)

4) The LFUCG will make every effort to notify interested MWDBE subcontractors and suppliers of each Bid Package, including information on the scope of work, the pre-bid meeting time and location, the bid date, and all other pertinent information regarding the project.

C. DEFINITIONS

1) A Minority-Owned Business Enterprise (MBE) is defined as a business which is certified as being at least 51% owned and operated by persons of African American, Hispanic, Asian, Pacific Islander, American Indian or Alaskan Native Heritage.

2) A Woman-Owned Business Enterprise (WBE) is defined as a business which is certified as being at least 51% owned and operated by one or more Non-Minority Females.

3) A Disadvantaged Business (DBE) is defined as a business which is certified as being at least 51% owned and operated by a person(s) that are economically and socially disadvantaged.

4) Good Faith Efforts are efforts that, given all relevant circumstances, a bidder or proposer actively and aggressively seeking to meet the goals, can reasonably be expected to make. In evaluating good faith efforts made toward achieving the goals, whether the bidder or proposer has performed the efforts outlined in the Obligations of Bidder for Good Faith Efforts outlined in this document will be considered, along with any other relevant factors.

D. OBLIGATION OF BIDDER FOR GOOD FAITH EFFORTS

1) **The bidder shall make a Good Faith Effort to achieve the Participation Goal for MWDBE subcontractors/suppliers. The failure to meet the goal shall not necessarily be cause for disqualification of the bidder; however, bidders not meeting the goal are required to furnish with their bids written documentation of their Good Faith Efforts to do so.**

2) Award of Contract shall be conditioned upon satisfaction of the requirements set forth herein.

3) The Form of Proposal includes a section entitled "MWDBE Participation Form". The applicable information must be completed and submitted as outlined below.

4) **Failure to submit this information as requested may be cause for rejection of bid.**

E. DOCUMENTATION REQUIRED FOR GOOD FAITH EFFORTS

1) Bidders reaching the Goal are required to submit only the MWDBE Participation Form." The form must be fully completed including names and telephone number of participating MWDBE firm(s); type of work to be performed; estimated value of the contract and value expressed as a percentage of the total Lump Sum Bid Price. The form must be signed and dated, and is to be submitted with the bid.

2) Bidders not reaching the Goal must submit the "MWDBE Participation Form", the "Quote Summary Form" and a written statement documenting their Good Faith Effort to do so. If bid includes no MWDBE participation, bidder shall enter "None" on the subcontractor / supplier form). In addition, the bidder must submit written proof of their Good Faith Efforts to meet the Participation Goal:

   a. Advertised opportunities to participate in the contract in at least two (2) publications of general circulation media; trade and professional association publications; small and minority business or trade publications; and publications or trades targeting minority, women and disadvantaged businesses not less than fifteen (15) days prior to the deadline for submission of bids to allow MWDBE firms to participate.

   b. Included documentation of advertising in the above publications with the bidders good faith efforts package

   c. Attended LFUCG Central Purchasing Economic Inclusion Outreach event

   d. Attended pre-bid meetings that were scheduled by LFUCG to inform MWDBEs of subcontracting opportunities

   e. Sponsored Economic Inclusion event to provide networking opportunities for prime contractors and MWDBE firms

   f. Requested a list of MWDBE subcontractors or suppliers from LFUCG Economic Engine and showed evidence of contacting the companies on the list(s).

   g. Contacted organizations that work with MWDBE companies for assistance in finding certified MWBDE firms to work on this project. Those contacted and their responses should be a part of the bidder's good faith efforts documentation.

h. Sent written notices, by certified mail, email or facsimile, to qualified, certified MWDBEs soliciting their participation in the contract not less that seven (7) days prior to the deadline for submission of bids to allow them to participate effectively.

i. Followed up initial solicitations by contacting MWDBEs to determine their level of interest.

j. Provided the interested MWBDE firm with adequate and timely information about the plans, specifications, and requirements of the contract.

k. Selected portions of the work to be performed by MWDBE firms in order to increase the likelihood of meeting the contract goals. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate MWDBE participation, even when the prime contractor may otherwise perform these work items with its own workforce.

l. Negotiated in good faith with interested MWDBE firms not rejecting them as unqualified without sound reasons based on a thorough investigation of their capabilities. Any rejection should be so noted in writing with a description as to why an agreement could not be reached.

m. Included documentation of quotations received from interested MWDBE firms which were not used due to uncompetitive pricing or were rejected as unacceptable and/or copies of responses from firms indicating that they would not be submitting a bid.

n. Bidder has to submit sound reasons why the quotations were considered unacceptable. The fact that the bidder has the ability and/or desire to perform the contract work with its own forces will not be considered a sound reason for rejecting a MWDBE quote. Nothing in this provision shall be construed to require the bidder to accept unreasonable quotes in order to satisfy MWDBE goals.

o. Made an effort to offer assistance to or refer interested MWDBE firms to obtain the necessary equipment, supplies, materials, insurance and/or bonding to satisfy the work requirements of the bid proposal.

p. Made efforts to expand the search for MWBE firms beyond the usual geographic boundaries.

q. Other--any other evidence that the bidder submits which may show that the bidder has made reasonable good faith efforts to include MWDBE participation.

Failure to submit any of the documentation requested in this section may be cause for rejection of bid. Bidders may include any other documentation deemed relevant to this requirement. Documentation of Good Faith Efforts are to be submitted with the Bid, if the participation Goal is not met.

MINORITY BUSINESS ENTERPRISE PROGRAM

Marilyn Clark
Minority Business Enterprise Liaison
Division of Central Purchasing
Lexington-Fayette Urban County Government
200 East Main Street
Lexington, KY 40507
mclark@lexingtonky.gov
859-258-3323

OUR MISSION: The mission of the Minority Business Enterprise Program is to facilitate the full participation of minority and women owned businesses in the procurement process and to promote economic inclusion as a business imperative essential to the long term economic viability of Lexington-Fayette Urban County Government.

To that end the city council adopted and implemented resolution 167-91—Disadvantaged Business Enterprise (DBE) 10% Goal Plan in July of 1991. The resolution states in part (a full copy is available in Central Purchasing):

> *"A Resolution supporting adoption of the administrative plan for a ten percent (10%) Minimum goal for disadvantaged business enterprise participation in Lexington-Fayette Urban County Government construction and professional services contracts; Providing that as part of their bids on LFUCG construction contracts, general Contractors shall make a good faith effort to award at least ten percent (10%) of All subcontracts to disadvantaged business enterprises; providing that divisions of LFUCG shall make a good faith effort to award at least ten percent of their Professional services and other contracts to disadvantaged business enterprises…"*

A Disadvantaged Business Enterprise is defined as a business that has been certified as being at least 51% owned, operated and managed by a U.S. Citizen of the following groups:

- African-American
- Hispanic-American
- Asian/Pacific Islander
- Native American/Native Alaskan
- Non-Minority Female
- Economically and Socially Disadvantaged

We have compiled the list below to help you locate certified MBE, WBE and DBE certified businesses. Below is a listing of contacts for LFUCG Certified MWDBEs in Economic Engine (https://lfucg.economicengine.com)

Business	Contact	Email Address	Phone
LFUCG	Marilyn Clark	mclark@lexingtonky.gov	859-258-3323
Commerce Lexington – Minority Business Development	Tyrone Tyra	ttyra@commercelexington.com	859-226-1625
Tri-State Minority Supplier Diversity Council	Sonya Brown	sbrown@tsmsdc.com	502-625-0137
Small Business Development Council	Dee Dee Harbut UK SBDC	dharbut@uky.edu	
	Shiree Mack	smack@uky.edu	
Community Ventures Corporation	James Coles	jcoles@cycky.org	859-231-0054
KY Department of Transportation	Melvin Bynes	Melvin.bynes@ky.gov	502-564-3601
	Shella Eagle	Shella.Eagle@ky.gov	502-564-3601
Ohio River Valley Women's Business Council (WBENC)	Rea Waldon	rwaldon@gcul.org	513-487-6534
Kentucky MWBE Certification Program	Yvette Smith, Ken Finance Cabi	Yvette.Smith@ky.gov	502-564-8099
National Women Business Owner's Council (NWBOC)	Janet Harris-Lange	janet@nwboc.org	800-675-5066
Small Business Administration	Robert Coffey	robertcoffey@sba.gov	502-582-5971
LaVoz de Kentucky	Andres Cruz	lavozdeky@yahoo.com	859-621-2106
The Key News Journal	Patrice Muhamma	paatricem@keynewsjournal.com	859-373-9428

LFUCG MWDBE PARTICIPATION FORM

Bid/RFP/Quote Reference # 177-2015

The MWDBE subcontractors listed have agreed to participate on this Bid/RFP/Quote. If any substitution is made or the total value of the work is changed prior to or after the job is in progress, it is understood that those substitutions must be submitted to Central Purchasing for approval immediately.

MWDBE Company, Name, Address, Phone, Email	MBE WBE or DBE	Work to be Performed	Total Dollar Value of the Work	% Value of Total Contract
1. All work to be done with in-house personnel, no sub-contracting opportunities exist. Evoqua is an Equal Opportunity Employer.				
2.				
3.				
4.				

The undersigned company representative submits the above list of MWDBE firms to be used in accomplishing the work contained in this Bid/RFP/Quote. Any misrepresentation may result in the termination of the contract and/or be subject to applicable Federal and State laws concerning false statements and false claims.

Evoqua Water Technologies LLC
Company

Company Representative

11/23/15
Date

V.P. & G.M.
Title

EVOQUA
WATER TECHNOLOGIES

EEO POLICY STATEMENT

It is the policy of Evoqua Water Technologies LLC (the "Company") to not discriminate against any employee or applicant for employment because of race, color, religion, national origin, gender, sexual orientation, age, genetic information, disability, or veteran status, or any other status protected by state or local law, and to provide equal employment opportunity and affirmative action for qualified individuals. This policy statement is included in this Affirmative Action Program and is posted on Company bulletin boards.

The Company will endeavor to recruit, hire, train, and promote persons in all job titles in accordance with this Affirmative Action Program. All other personnel actions are administered without regard to race, color, religion, national origin, gender, sexual orientation, age, genetic information, disability, or veteran status, or any other status protected by state or local law, and all employment decisions are based only on valid job requirements.

The Veteran and Disabled Affirmative Action Plan shall be available to any employee or employment applicant for inspection in the Human Resources Department during normal business hours.

Hope Martin-Palmer has been assigned overall responsibility for the implementation of affirmative action activities as required by law.

Hope Martin-Palmer's responsibilities include designing and implementing an audit and reporting system that will:

- Measure the effectiveness of the Company's Affirmative Action Program.
- Indicate any need for remedial action.
- Determine the degree to which our objectives have been attained.
- Determine whether individuals with known disabilities and covered veterans have had the opportunity to participate in all Company-sponsored educational, training, recreational, and social activities.
- Measure compliance with the Affirmative Action Program's specific obligations.

Employees and applicants shall not be subjected to harassment, intimidation, threats, coercion, or discrimination because they have engaged in any of the following activities:

- Filing a complaint.
- Assisting or participating in an investigation, compliance review, hearing, or any other activity related to the administration of Executive Order 11246, Section 503 of the Rehabilitation Act of 1973, as amended, Section 4212 of the Vietnam Era Veterans Readjustment Assistance Act of 1974, the Veterans Employment Opportunities Act of 1998 or any other Federal, State or local law requiring equal opportunity for individuals regardless of race, color, religion, national origin, gender, sexual orientation, age, genetic information, disability, or veteran status.
- Opposing any act or practice made unlawful by Executive Order 11246, Section 503 of the Rehabilitation Act of 1973, or its implementing regulations, Section 4212 of the Vietnam Era Veterans Readjustment Assistance Act of 1974, the Veterans Employment Opportunities Act of 1998 or any other Federal, State or local law requiring equal opportunity for individuals regardless of their race, color, religion, national origin, gender, sexual orientation, age, genetic information, disability, or veteran status.
- Exercising any other right protected by Executive Order 11246, Section 503 of the Rehabilitation Act of 1973, or its implementing regulations, or Section 4212 of the Vietnam Era Veterans Readjustment Assistance Act of 1974 or the Veterans Employment Opportunities Act of 1998.

Hope Martin-Palmer, Vice President of Human Resources

02/01/2014

LFUCG MWDBE SUBSTITUTION FORM
Bid/RFP/Quote Reference #_____

The substituted MWDBE subcontractors listed below have agreed to participate on this Bid/RFP/Quote. These substitutions were made prior to or after the job was in progress. These substitutions were made for reasons stated below and are now being submitted to Central Purchasing for approval. By the authorized signature of a representative of our company, we understand that this information will be entered into our file for this project.

SUBSTITUTED MWDBE Company Name, Address, Phone, Email	MWDBE Formally Contracted/ Name, Address, Phone, Email	Work to Be Performed	Reason for the Substitution	Total Dollar Value of the Work	% Value of Total Contract
1. N/A					
2.					
3.					
4.					

The undersigned acknowledges that any misrepresentation may result in termination of the contract and/or be subject to applicable Federal and State laws concerning false statements and false claims.

_____ _____

Company **Company Representative**

_____ _____

Date **Title**

MWDBE QUOTE SUMMARY FORM

Bid/RFP/Quote Reference #_____

The undersigned acknowledges that the minority subcontractors listed on this form did submit a quote to participate on this project.

Company Name	Contact Person
Address/Phone/Email	Bid Package / Bid Date

MWDBE Company Address	Contact Person	Contact Information (work phone, Email, cell)	Date Contacted	Services to be performed	Method of Communicatio (email, phone meeting, ad, event etc)	Total dollars $$ Do Not Leave Blank (Attach Documentation)	MBE * AA HA AS NA Female
N/A							

(MBE designation / AA=African American / HA= Hispanic American/AS = Asian American/Pacific Islander/ NA= Native American)

The undersigned acknowledges that all information is accurate. Any misrepresentation may result in termination of the contract and/or be subject to applicable Federal and State laws concerning false statements and claims.

_____ _____

Company **Company Representative**

_____ _____

Date **Title**

LFUCG SUBCONTRACTOR MONTHLY PAYMENT REPORT

The LFUCG has a 10% goal plan adopted by city council to increase the participation of minority and women owned businesses in the procurement process. In order to measure that goal LFUCG will track spending with MWDBE vendors on a monthly basis. By the signature below of an authorized company representative, you certify that the information is correct, and that each of the representations set forth below is true. Any misrepresentation may result in termination of the contract and/or prosecution under applicable Federal and State laws concerning false statements and false claims. Please submit this form monthly to the Division of Central Purchasing/ 200 East Main Street / Room 338 / Lexington, KY 40507.

Bid/RFP/Quote #_____
Total Contract Amount Awarded to Prime Contractor for this Project_____

Project Name/ Contract #	**Work Period/ From:** **To:**
Company Name:	**Address:**
Federal Tax ID:	**Contact Person:**

Subcontractor Vendor ID (name, address, phone, email	Description of Work	Total Subcontract Amount	% of Total Contract Awarded to Prime for this Project	Total Amount Paid for this Period	Purchase Order number for subcontractor work (please attach PO)	Scheduled Project Start Date	Scheduled Project End Date
N/A							

By the signature below of an authorized company representative, you certify that the information is correct, and that each of the representations set forth below is true. Any misrepresentations may result in the termination of the contract and/or prosecution under applicable Federal and State laws concerning false statements and false claims.

_____ _____
Company **Company Representative**

_____ _____
Date **Title**

LFUCG STATEMENT OF GOOD FAITH EFFORTS
Bid/RFP/Quote # 177-2015

By the signature below of an authorized company representative, we certify that we have utilized the following Good Faith Efforts to obtain the maximum participation by MWDBE business enterprises on the project and can supply the appropriate documentation.

_____ Advertised opportunities to participate in the contract in at least two (2) publications of general circulation media; trade and professional association publications; small and minority business or trade publications; and publications or trades targeting minority, women and disadvantaged businesses not less than fifteen (15) days prior to the deadline for submission of bids to allow MWDBE firms to participate.

_____ Included documentation of advertising in the above publications with the bidders good faith efforts package

_____ Attended LFUCG Central Purchasing Economic Inclusion Outreach event

_____ Attended pre-bid meetings that were scheduled by LFUCG to inform MWDBEs of subcontracting opportunities

_____ Sponsored Economic Inclusion event to provide networking opportunities for prime contractors and MWDBE firms

_____ Requested a list of MWDBE subcontractors or suppliers from LFUCG Economic Engine and showed evidence of contacting the companies on the list(s).

_____ Contacted organizations that work with MWDBE companies for assistance in finding certified MWBDE firms to work on this project. Those contacted and their responses should be a part of the bidder's good faith efforts documentation.

_____ Sent written notices, by certified mail, email or facsimile, to qualified, certified MWDBEs soliciting their participation in the contract not less that seven (7) days prior to the deadline for submission of bids to allow them to participate effectively.

_____ Followed up initial solicitations by contacting MWDBEs to determine their level of interest.

_____ Provided the interested MWBDE firm with adequate and timely information about the plans, specifications, and requirements of the contract.

_____ Selected portions of the work to be performed by MWDBE firms in order to increase the likelihood of meeting the contract goals. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate MWDBE participation, even when the prime contractor may otherwise perform these work items with its own workforce

_____ Negotiated in good faith with interested MWDBE firms not rejecting them as unqualified without sound reasons based on a thorough investigation of their capabilities. Any rejection should be so noted in writing with a description as to why an agreement could not be reached.

_____ Included documentation of quotations received from interested MWDBE firms which were not used due to uncompetitive pricing or were rejected as unacceptable and/or copies of responses from firms indicating that they would not be submitting a bid.

_____ Bidder has to submit sound reasons why the quotations were considered unacceptable. The fact that the bidder has the ability and/or desire to perform the contract work with its own forces will not be considered a sound reason for rejecting a MWDBE quote. Nothing in this provision shall be construed to require the bidder to accept unreasonable quotes in order to satisfy MWDBE goals.

_____ Made an effort to offer assistance to or refer interested MWDBE firms to obtain the necessary equipment, supplies, materials, insurance and/or bonding to satisfy the work requirements of the bid proposal

_____ Made efforts to expand the search for MWDBE firms beyond the usual geographic boundaries.

X____ Other - any other evidence that the bidder submits which may show that the bidder has made reasonable good faith efforts to include MWDBE participation.

Failure to submit any of the documentation requested in this section may be cause for rejection of bid. Bidders may include any other documentation deemed relevant to this requirement. Documentation of Good Faith Efforts are to be submitted with the Bid, if the participation Goal is not met.

All work to be done with in-house personnel, no sub-contracting opportunities exist. Evoqua is an Equal Opportunity Employer.

The undersigned acknowledges that all information is accurate. Any misrepresentations may result in termination of the contract and/or be subject to applicable Federal and State laws concerning false statements and claims.

Evoqua Water Technologies LLC
Company

Company Representative

11/23/15
Date

V.P. & G.M.
Title

RISK MANAGEMENT PROVISIONS
INSURANCE AND INDEMNIFICATION

INDEMNIFICATION AND HOLD HARMLESS PROVISION

(1) It is understood and agreed by the parties that Vendor hereby assumes the entire responsibility and liability for any and all damages to persons or property caused by or resulting from or arising out of any act or omission on the part of Vendor or its employees, agents, servants, owners, principals, licensees, assigns or subcontractors of any tier (hereinafter "Vendor") under or in connection with this agreement and/or the provision of goods or services and the performance or failure to perform any work required thereby.

(2) Vendor shall indemnify, save, hold harmless and defend the Lexington-Fayette Urban County Government and its elected and appointed officials, employees, agents, volunteers, and successors in interest (hereinafter "LFUCG") from and against all liability, damages, and losses, including but not limited to, demands, claims, obligations, causes of action, judgments, penalties, fines, liens, costs, expenses, interest, defense costs and reasonable attorney's fees that are in any way incidental to or connected with, or that arise or are alleged to have arisen, directly or indirectly, from or by Vendor's performance or breach of the agreement and/or the provision of goods or services provided that: (a) it is attributable to personal injury, bodily injury, sickness, or death, or to injury to or destruction of property (including the loss of use resulting therefrom), or to or from the negligent acts, errors or omissions or willful misconduct of the Vendor; and (b) not caused solely by the active negligence or willful misconduct of LFUCG.

(3) In the event LFUCG is alleged to be liable based upon the above, Vendor shall defend such allegations and shall bear all costs, fees and expenses of such defense, including but not limited to, all reasonable attorneys' fees and expenses, court costs, and expert witness fees and expenses, using attorneys approved in writing by LFUCG, which approval shall not be unreasonably withheld.

(4) These provisions shall in no way be limited by any financial responsibility or insurance requirements, and shall survive the termination of this agreement.

(5) LFUCG is a political subdivision of the Commonwealth of Kentucky. Vendor acknowledges and agrees that LFUCG is unable to provide indemnity or otherwise save, hold harmless, or defend the Vendor in any manner.

FINANCIAL RESPONSIBILITY

Vendor understands and agrees that it shall, prior to final acceptance of its bid and the commencement of any work, demonstrate the ability to assure compliance with the above Indemnity provisions and these other risk management provisions.

INSURANCE REQUIREMENTS

YOUR ATTENTION IS DIRECTED TO THE INSURANCE REQUIREMENTS BELOW, AAND YOU MAY NEED TO CONFER WITH YOUR INSURANCE AGENTS, BROKERS, OR CARRIERS TO DETERMINE IN ADVANCE OF SUBMISSION OF A RESPONSE THE AVAILABILITY OF THE INSURANCE COVERAGES AND ENDORSEMENTS REQUIRED HEREIN. IF YOU FAIL TO COMPLY WITH THE INSURANCE REQUIREMENTS BELOW, YOU MAY BE DISQUALIFIED FROM AWARD OF THE CONTRACT.

Required Insurance Coverage

Vendor shall procure and maintain for the duration of this contract the following or equivalent insurance policies at no less than the limits shown below and cause its subcontractors to maintain similar insurance with limits acceptable to LFUCG in order to protect LFUCG against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work or provision of goods hereunder by Vendor. The cost of such insurance shall be included in any bid:

Coverage	**Limits**
General Liability (Insurance Services Office Form CG 00 01)	$1 million per occurrence, $2 million aggregate or $2 million combined single limit
Commercial Automobile Liability (Insurance Services Office Form CA 0001)	combined single, $1 million per occurrence
Worker's Compensation	Statutory
Employer's Liability	$500,000.00

The policies above shall contain the following conditions:

a. All Certificates of Insurance forms used by the insurance carrier shall be properly filed and approved by the Department of Insurance for the Commonwealth of Kentucky. LFUCG shall be named as an additional insured in the General Liability Policy and Commercial Automobile Liability Policy using the Kentucky DOI approved forms.

b. The General Liability Policy shall be primary to any insurance or self-insurance retained by LFUCG.

c. LFUCG shall be provided at least 30 days advance written notice via certified mail, return receipt requested, in the event any of the required policies are canceled or non-renewed.

d. The General Liability Policy shall include a Products Liability endorsement unless deemed not to apply by LFUCG.

e. Said coverage shall be written by insurers acceptable to LFUCG and shall be in a form acceptable to LFUCG. Insurance placed with insurers with a rating classification of no less than Excellent (A or A-) and a financial size category of no less than VIII, as defined by the most current Best's Key Rating Guide shall be deemed automatically acceptable.

Renewals

After insurance has been approved by LFUCG, evidence of renewal of an expiring policy must be submitted to LFUCG, and may be submitted on a manually signed renewal endorsement form. If the policy or carrier has changed, however, new evidence of coverage must be submitted in accordance with these Insurance Requirements.

Deductibles and Self-Insured Programs

IF YOU INTEND TO SUBMIT A SELF-INSURANCE PLAN IT MUST BE FORWARDED TO LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT, DIVISION OF RISK MANAGEMENT, 200 EAST MAIN STREET, LEXINGTON, KENTUCKY 40507 NO LATER THAN A MINIMUM OF FIVE (5) WORKING DAYS PRIOR TO THE RESPONSE DATE. Self-insurance

programs, deductibles, and self-insured retentions in insurance policies are subject to separate approval by Lexington-Fayette Urban County Government's Division of Risk Management, upon review of evidence of Vendor's financial capacity to respond to claims. Any such programs or retentions must provide LFUCG with at least the same protection from liability and defense of suits as would be afforded by first-dollar insurance coverage. If Vendor satisfies any portion of the insurance requirements through deductibles, self-insurance programs, or self-insured retentions, Vendor agrees to provide Lexington-Fayette Urban County Government, Division of Risk Management, the following data prior to the final acceptance of bid and the commencement of any work:

a. Latest audited financial statement, including auditor's notes.

b. Any records of any self-insured trust fund plan or policy and related accounting statements.

c. Actuarial funding reports or retained losses.

d. Risk Management Manual or a description of the self-insurance and risk management program.

e. A claim loss run summary for the previous five (5) years.

f. Self-Insured Associations will be considered.

Verification of Coverage

Vendor agrees to furnish LFUCG with all applicable Certificates of Insurance signed by a person authorized by the insurer to bind coverage on its behalf prior to final award, and if requested, shall provide LFUCG copies of all insurance policies, including all endorsements.

Right to Review, Audit and Inspect

Vendor understands and agrees that LFUCG may review, audit and inspect any and all of its records and operations to insure compliance with these Insurance Requirements.

DEFAULT

Vendor understands and agrees that the failure to comply with any of these insurance, safety, or loss control provisions shall constitute default and that LFUCG may elect at its option any single remedy or penalty or any combination of remedies and penalties, as available, including but not limited to purchasing insurance and charging Vendor for any such insurance premiums purchased, or suspending or terminating the work.

00471584

SPECIAL NOTES TO BIDDERS

All boxes items on the pricing line must be filled in. References and tests must be submitted with bid.

EXAMPLE

PRICING

We propose to furnish the product known as "Sure to Fixite" (Trade Name) as a means to eliminate the odor, corrosion and safety problems associated with hydrogen sulfide in sewage.

Brand Name & Number	Required Application Rate	Unit Price FOB Lexington
Sure to Fixite	0.24 Gallons/Pound H_2S	$1.67 $/Gallon

Field test results from at least three (3) reference systems showing application rates and measured dissolved hydrogen sulfide levels in ppm before and after treatments included with Bid: X

Three (3) reference contacts and names of individuals using the proposed chemical and proposed dosing equipment included with Bid: X

Sufficient documentation must be submitted with the bid to satisfy 5.2 Submittal, Dosing/Infusion Equipment

Technical reports and/or lab tests must be submitted with the bid to satisfy Section 6.0 Bid Evaluation. Reports should describe the chemical process of how the chemical works.

Field test results from at least three (3) reference systems showing application rates and measured dissolved hydrogen sulfide levels in ppm before and after treatments shall also be included with Bid. Data must include evidence that treatment reduced hydrogen sulfide concentration to less than 0.1 ppm.

Alternative #4 is for Hydrogen Peroxide 50%. Field tests and references are not needed for this line item.

SPECIFICATIONS

REMOVAL OF HYDROGEN SULFIDE AND OTHER COMMON ODORS IN WASTEWATER COLLECTION AND TREATMENT PLANTS BY BIOLOGICAL AND/OR CHEMICAL PROCESS

1.0 GENERAL REQUIREMENTS

Under this contract the successful supplier(s) shall furnish and deliver a product that eliminates the odor, corrosion and safety problems associated with hydrogen sulfide in the sewage "naturally," and/or chemically. The process shall control hydrogen sulfide odors and corrosion by way of a biological process, a chemical process and/or a gas infusion process. The program shall remove dissolved hydrogen sulfide and prevent its formation.

2.0 SCOPE

The successful bidder(s) are to furnish a product capable of achieving odor control biologically and/or chemically in wastewater collection system. The cost listed on the proposal form herein shall include all costs including any equipment necessary to store and feed the chemical in a safe manner, and freight and transportation charges to various pumping stations and/or treatment plants operated by the Lexington-Fayette Urban County Government for a period of three years beginning two weeks after the date the bid is accepted. The contract will be eligible for three, one year renewals by the Lexington-Fayette Urban County Government.

Some facilities are provided with LFUCG (owner) odor control equipment (i.e. tankage, piping, and chemical feed.) Vendor shall review existing equipment and determine if it is appropriate for the product being recommended.

The successful bidder(s) are to furnish all necessary equipment needed to store and feed chemical in a safe manner. Chemical storage must be adequate to hold a thirty day supply of chemical. Any maintenance of equipment repairs or parts needed to make repairs will be the full responsibility of the vendor. The equipment will remain the property of the vendor and shall be removed from LFUCG property when notified that the equipment is no longer needed. The LFUCG will make no capital improvements.

Bids will be considered for biological and/or chemical processes. Bids based on furnishing any other product will not be considered and will be rejected as non-responsive.

Safety Data Sheets for all products bid shall be included with the bid documents.

3.0 GENERAL CONDITIONS

The successful bidder(s) are to furnish material under this specification for the period as specified in Section 2.0. The vendor shall indemnify and save harmless the Lexington-Fayette Urban County Government from all claims and liabilities of any kind or nature, including cost and expenses arising

from or occasioned by an infringement or alleged infringement of patent rights arising from or occasioned by use of material furnished in response to this specification.

4.0 APPLICATION

The product furnished under this contract will be used to treat gravity sanitary sewers or force mains. The detention time in force mains may be as much as 48 hours, with dissolved hydrogen sulfide levels up to 50 ppm. Application will be from one point. Dissolved hydrogen sulfide must be maintained at a level less than 0.1 ppm. Complete description of proposed biological and/or chemical reaction showing dosage requirements per pound of dissolved hydrogen sulfide shall be included with bid.

A flow based feed system is preferred but not required. Submit with bid how the chemical will be fed for review and approval by LFUCG.

The successful bidder must provide technical service to correct deficient treatment within 48 hours of notice.

5.0 DETAIL SPECIFICATIONS

By submission of their Bid, the Bidder guarantees that the product offered will meet the quality standards as specified in these specifications for the term of the contract. The Lexington-Fayette Urban county Government reserves the right to conduct periodic checks on the quality of material furnished under this contract or to have the product's quality checked by outside sources to determine if the material furnished is in compliance with these specifications. Failure of the supplier's product to meet the specified standards of quality will result in termination of the contract.

All material furnished under this contract shall be completely soluble, having a very rapid dissolving rate and low order of toxicity. It shall require minimal special precautions in handling. It is recommended that the product be a nonhazardous substance as defined by the EPA CERCLA list. If the product proposed is a hazardous substance as defined by the EPA CERCLA list special precautions in handling and/or storage must be submitted with the bid package.

5.1 PROCESS DESCRIPTION

The system shall provide for bulk storage of proposed chemical and metering of the chemical from a bulk storage tank to the wastewater collection system. The system shall contain controls as necessary to facilitate discrete dosing profiles that vary in 1-hour increments over a 24-hr period. Calibration equipment shall be permanently installed to facilitate calibration of feed pumps.

The material shall be chemically stable, allowing continuous removal of sulfide contributed by side streams downstream of the application point. As a result of the biochemical process, the material shall provide the additional benefit of biochemical oxygen demand (BOD) reduction in the wastewater.

5.2 SUBMITTAL

A. Dosing/Infusion Equipment

Dosing/Infusion equipment must have the capability of remote adjustment and must also have built in capability of automatically adjusting dosing rate based on temperature and flow rate.

The manufacturer shall submit complete shop drawings and engineering data to the Owner or Engineer, upon request. These submittals shall include, at a minimum:

1. Drawings showing plan and elevation views of the feed system
2. Control system layout drawing
3. Control systems electrical diagram
4. Manufacture's catalogue information on major system components including, but not limited to:
    a. Chemical Feed Pumps
    b. Liquid Storage Tanks
    c. Operator Interface
5. Statement of design conditions and performance guarantee
6. Statement of warranty
7. Reference list with a minimum of three (3) locations where the above listed equipment has been installed and is in service with reference contact names and phone numbers of individuals/organizations using the equipment.

B. Operation and maintenance manuals

Operation and maintenance manuals shall be provided by the Manufacturer prior to installation of all major equipment components. These manuals shall include at a minimum:

1. Information in hazards associated with the system and the appropriate safety precautions
2. All appropriate Safety Data Sheets
3. Equipment installation instructions
4. Equipment startup instructions
5. Equipment maintenance procedures
6. Troubleshooting guide

6.0 BID EVALUATION

The bid will be evaluated and accepted based on the product's ability to perform within the required performance parameter specified in Section 4.0 and its ability to meet all other requirements of these

specifications. The supplier shall have a minimum of three (3) years odor control experience in wastewater and provide with Bid at least three (3) references where this product has been applied successfully, including the name and telephone number of the person in responsible position.

Field test results from at least three (3) reference systems showing application rates and measured dissolved hydrogen sulfide levels in ppm before and after treatments shall also be included with Bid. Data must include evidence that treatment reduced hydrogen sulfide concentration to less than 0.1 ppm.

The unit price contract will be awarded to the lowest responsible bidder(s) who are recognized suppliers of the product offered and whose bid complies with all of the provisions of the Bid Documents, provided that the bid price is reasonable and it is to the best interest of the Lexington-Fayette Urban County Government to accept it. The Lexington-Fayette Urban County Government reserves the right to reject any or all bids and to waive any informality in bids received whenever such rejections or waiver is in the best interest of the Lexington-Fayette Urban County Government. The Lexington-Fayette Urban County Government also reserves the right to purchase from multiple vendors if and when it is in the best interest to do so.

7.0 DELIVERY FOB LEXINGTON, KENTUCKY

Deliveries shall be made upon order at any time after a formal contract has been executed by the Lexington-Fayette Urban County Government and the supplier. Orders for material will be placed for quantities as required for operation due to site restrictions and are to be shipped by truck, with pumping into the storage tank to be the responsibility of the vendor. No deliveries accepted after 3:30 p.m. Two-day response to a telephone or email order is required. The successful bidder shall certify, before award of the contract, which material will be delivered only by drivers who have had certified training in proper spill containment.

8.0 OTHER SERVICES

1. Supplier shall furnish names and phone numbers of person to contact for ordering chemical as well as name and phone numbers of persons to contact for emergency shipment or on holidays, weekends and after hours.

2. Vendor will meet with the LFUCG Division of Water Quality at the start of the contract to discuss goals for odor and corrosion prevention at each of the various sites. Vendor will assist the LFUCG Division of Water Quality in optimizing chemical doses at all sites to achieve these goals.

3. Vendor will provide technical assistance to the LFUCG Division of Water Quality as needed concerning feed rate adjustment, equipment, maintenance, testing and troubleshooting.

4. Once per month Vendor will collect samples of wastewater discharge point of each location being dosed. Vendor shall perform tests on these samples to determine concentrations of hydrogen sulfide and nitrate.

5. Once per month the Vendor shall use gas monitors to perform testing of atmospheric concentrations of hydrogen sulfide at the discharge point of each location being dosed. Atmospheric reading shall be recorded for a minimum period of 24 hours. These readings shall be included in the monthly report and include time, temperature, hydrogen sulfide readings in five (5) minute increments and average hydrogen sulfide.

6. A report of these findings will be sent by email to the LFUCG Division of Water Quality representative within seven (7) days after collection. These reports shall also include the feed rate of chemical at the time of testing, chemical usage at each location over the past month and the cumulative chemical usage to date. In lieu of written reports, this data may be posted to a web based site on an ongoing basis. The site shall provide the capability to produce multiple reports and shall have the ability to print these reports. The LFUCG shall have 24 hour access to this site. The web site must be approved by the LFUCG before substituting for the written reports.

7. The vendor may also be required to conduct gas and water analysis of situations and locations subject to spot odor and/or corrosion conditions. These spot tests shall consist of a "before" analysis, a recommendation to solve the problem, an "after" analysis (if necessary) and a final written report of the problem/findings, the correction process/recommendation and the ultimate conclusion/result of the process. The analysis shall be initiated within 48 hours of notice by the LFUCG.

8. Vendor shall provide training either on-site or at other suitable facilities. Training may consist of hands-on work with the chemical dosing equipment and the technology behind the interaction of the chemical and the targeted microorganisms. Propose curriculum shall be submitted in advance for approval.

Existing Equipment

LFUCG owns the tanks at: South Elkhorn, North Elkhorn, East Hickman, Lower Cane Run, Lower Town Branch, Kentucky Horse Park, Lower Cane Run #2, Mint Lane, Keenland, Hamburg Place, Shandon Park 1 and Armstrong Mill. LFUCG has pumps at these locations but have not been in operation for at least 7 years and none have remote location controls or automatic dose adjustment capabilities. Vendors will need to provide their own pumps.

Expansion Area 2A, Deep Springs & Wolf Run are new stations with new pumps but do not have remote location or automatic dose adjustment capabilities.

Vendors are expected to conduct analysis of all stations and situations a bid accordingly.

REMOVAL OF HYDROGEN SULFIDE AND OTHER COMMON ODORS IN WASTEWATER COLLECTION AND TREATMENT PLANTS BY BIOLOGICAL AND/OR CHEMICAL PROCESS

PRICING

We propose to furnish the product known as "Bioxide" (Trade Name) as a means to eliminate the odor, corrosion and safety problems associated with hydrogen sulfide in sewage.

Brand Name & Number	Required Application Rate	Unit Price FOB Lexington
Bioxide	0.7 - 2.1 Gallons/Pound H_2S	$2.39* $/Gallon *Evoqua can provide technical service within 24 hours

Field test results from at least three (3) reference systems showing application rates and measured dissolved hydrogen sulfide levels in ppm before and after treatments included with Bid: X

Three (3) reference contacts and names of individuals using the proposed chemical and proposed dosing equipment included with Bid: X

ALTERNATE PRICING

The Lexington-Fayette Urban County Government will accept Alternate Pricing to be submitted for additional products that may meet a wide variety of odor control needs the LFUCG may need in future odor and corrosion needs, or alternatively to optimize existing odor control applications.

Alternate #1- We propose to furnish the product known as "Bioxide Plus 71" (Trade Name) as a means to eliminate the odor, corrosion and safety problems associated with hydrogen sulfide in sewage.

Brand Name & Number	Required Application Rate	Unit Price FOB Lexington
Bioxide Plus 71	0.5 - 5.5 Gallons/Pound H_2S	$4.76* $/Gallon *Evoqua can provide technical service within 24 hours

Field test results from at least three (3) reference systems showing application rates and measured dissolved hydrogen sulfide levels in ppm before and after treatments included with Bid: X

Three (3) reference contacts and names of individuals using the proposed chemical and proposed dosing equipment included with Bid: X

Alternate #2- We propose to furnish the product known as "Bioxide-AQ" (Trade Name) as a means to eliminate the odor, corrosion and safety problems associated with hydrogen sulfide in sewage.

Brand Name & Number	Required Application Rate	Unit Price FOB Lexington
Bioxide-AQ	0.6 - 2.1 Gallons/Pound H_2S	$2.79* $/Gallon *Evoqua can provide technical service within 24 hours

Field test results from at least three (3) reference systems showing application rates and measured dissolved hydrogen sulfide levels in ppm before and after treatments included with Bid: X

Three (3) reference contacts and names of individuals using the proposed chemical and proposed dosing equipment included with Bid: X

Alternate #3- We propose to furnish the product known as "_____" (Trade Name) as a means to eliminate the odor, corrosion and safety problems associated with hydrogen sulfide in sewage.

Brand Name & Number	Required Application Rate	Unit Price FOB Lexington
	_____ Gallons/Pound H_2S	N/A $/Gallon

Field test results from at least three (3) reference systems showing application rates and measured dissolved hydrogen sulfide levels in ppm before and after treatments included with Bid: _____

Three (3) reference contacts and names of individuals using the proposed chemical and proposed dosing equipment included with Bid: _____

Alternate #4- We propose to furnish the product known as "Hydrogen Peroxide 50%" (Trade Name) as a means to eliminate the odor, corrosion and safety problems associated with hydrogen sulfide in sewage.

Brand Name & Number	Required Application Rate	Unit Price FOB Lexington
Hydrogen Peroxide 50%	0.2 - 0.8* Gallons/Pound H_2S	$2.98** $/Gallon **Evoqua can provide technical service within 24 hours

Field test results from at least three (3) reference systems showing application rates and measured dissolved hydrogen sulfide levels in ppm before and after treatments included with Bid: N/A

*NOTE. This is the theoretical use-ratio and actual use-ratios can vary widely depending on the retention time of the system, the strength of the wastewater and the side reactions occurring. The theoretical use-ratios stated above are only possible in very short retention time applications (<1 hr.)

Three (3) reference contacts and names of individuals using the proposed chemical and proposed dosing equipment included with Bid: N/A

Alternate #5- We propose to furnish the product known as "_____" (Trade Name) as a means to eliminate the odor, corrosion and safety problems associated with hydrogen sulfide in sewage.

Brand Name & Number	Required Application Rate	Unit Price FOB Lexington
	_____ Gallons/Pound H_2S	_____ $/Gallon

Field test results from at least three (3) reference systems showing application rates and measured dissolved hydrogen sulfide levels in ppm before and after treatments included with Bid: _____

Three (3) reference contacts and names of individuals using the proposed chemical and proposed dosing equipment included with Bid: _____

Alternate #6- We propose to furnish the product known as "_____" (Trade Name) as a means to eliminate the odor, corrosion and safety problems associated with hydrogen sulfide in sewage.

Brand Name & Number	Required Application Rate	Unit Price FOB Lexington
	_____ Gallons/Pound H_2S	_____ $/Gallon

Field test results from at least three (3) reference systems showing application rates and measured dissolved hydrogen sulfide levels in ppm before and after treatments included with Bid: _____

Three (3) reference contacts and names of individuals using the proposed chemical and proposed dosing equipment included with Bid: _____

Alternate #7- We propose to furnish the product known as "_____" (Trade Name) as a means to eliminate the odor, corrosion and safety problems associated with hydrogen sulfide in sewage.

Brand Name & Number	Required Application Rate	Unit Price FOB Lexington
	_____ Gallons/Pound H_2S	_____ $/Gallon

Field test results from at least three (3) reference systems showing application rates and measured dissolved hydrogen sulfide levels in ppm before and after treatments included with Bid: _____

Three (3) reference contacts and names of individuals using the proposed chemical and proposed dosing equipment included with Bid: _____

Alternate #8- We propose to furnish the product known as "_____" (Trade Name) as a means to eliminate the odor, corrosion and safety problems associated with hydrogen sulfide in sewage.

Brand Name & Number	Required Application Rate	Unit Price FOB Lexington
	_____ Gallons/Pound H_2S	_____ $/Gallon

Field test results from at least three (3) reference systems showing application rates and measured dissolved hydrogen sulfide levels in ppm before and after treatments included with Bid: _____

Three (3) reference contacts and names of individuals using the proposed chemical and proposed dosing equipment included with Bid: _____

SPECIAL CIRCUMSTANCE INSTALLATIONS

Occasional special circumstances may require temporary equipment and chemical dispersal. This may be a small portable tank with a dispersal pump or an internal confined area such as a wet well or a manhole. In either case, the vendor will be responsible for providing a pre-chemical analysis of the gas and sewer conditions. Vendor will then make recommendations as to the appropriate dosage needed to alleviate the condition. Vendor will then provide regular monitoring as needed to ensure the dosage rate is appropriate and at its most efficient rate. Reports must be delivered to the LFUCG within 24 hours of testing. Chemical refills shall be as needed to meet the projected dosage rate.

Equipment for External Chemical Dispersal

The dispensing unit shall be a double walled tank capable of being delivered in a two ton pickup truck or smaller. The tank shall be filled to its maximum capacity from a tanker truck. Chemical shall be delivered to the system via a pump connected to an external power supply. This type of configuration will generally be at a pump station with power available.

Tank Delivery and Set Up to include leveling for the tank and electrical hook up $ No Bid

Chemical cost per gallon $ No Bid

Chemical to use: _____

Field test results from at least three (3) reference systems showing application rates and measured dissolved hydrogen sulfide levels in ppm before and after treatments included with Bid: _____

Three (3) reference contacts and names of individuals using the proposed chemical and proposed dosing equipment included with Bid: _____

Equipment Specifications for Confined Area Internal Chemical Dispersal

The dispensing unit shall be a non-hazardous, self-contained and battery operated unit and may not use an external power or AC power source. The dispensing unit may be microprocessor based but must have the ability to program dosing rates and have an electronic dosing control. The dispensing unit must be able to fit inside the confines of a standard manhole or a small pump station wet well and must have the ability to be safely installed within the manhole or wet well.

Dispensing Unit and Set Up for 1 – 3 units $ No Bid

Dispensing Unit and Set Up for 4 and up units $ No Bid

Chemical cost per gallon $ No Bid

Chemical to use: _____

Field test results from at least three (3) reference systems showing application rates and measured dissolved hydrogen sulfide levels in ppm before and after treatments included with Bid: _____

Three (3) reference contacts and names of individuals using the proposed chemical and proposed dosing equipment included with Bid: _____

Company Qualifications

Evoqua Water Technologies has been providing odor control solutions for more than 37 years. In that time it has experienced many of the changes that have been introduced to wastewater management and has grown and adapted with the industry. Evoqua has built up a vast knowledge base during its time in the odor control business; a history of many different odor control applications and the best techniques to apply the correct combinations of chemicals and technologies to a myriad of unique and challenging applications. Evoqua has grown with its odor control partners over the years to develop strong working relationships in which all parties continue to develop and learn more about sulfide control and prevention.

Theory and pure science are no substitute for the experience of treating larger municipal systems with mixed vapor and liquid phase odor control technologies. A good program requires a synergy between experience and technical know-how. Evoqua has demonstrated this synergy in the following accounts:

- Louisville, KY
- Nashville Metro Water Services, TN
- Lexington-Fayette Urban County Government, KY
- Sanitation District #1 of Northern Kentucky

The selected references below illustrate that Evoqua has the experience of managing odor control programs similar in scope and size as the program administrated by LFUCG. The remainder of the proposal shall show that Evoqua also possesses the technical abilities to meet the goals of the odor control program.

Reference #1

"ODOR CONTROL EXPERIENCE" FORM Proposer Name: Evoqua Water Technologies LLC		
Client Company Name: City of Chattanooga, TN		**Year Services First Provided** 1993
Are Services still being provided? Yes	**Contact Person Name, Position, Email Address & Phone Number:** Jimmy Spence, Maintenance Supervisor spence_j@chattanooga.gov (423) 421-4491	
Estimated Population Served: 400,000	**Number of lift stations in odor control system:** 67+	**Most Recent Annual Contract Amount ($/year):** $1,000,000

Provide Brief Description of Products/Services Provided:

Equipment Supplied

Chemical Dosing	# of units	Control Type	Dose Range (GPD)
Bioxide	3	VersaDose	50-650

Liquid Phase Odor Control equipment supplied by Evoqua

Chattanooga owns most of its own equipment, advanced dosing controllers were supplied by Evoqua as a cost reduction method at sites with higher feed rates.

Outside of the current contract, Evoqua provides sampling and optimization, maintenance and repair services upon demand at various sites located in the Chattanooga collection system and at the treatment plants.

Scope of Service

The following work is performed as part of the full service odor control program:

- Liquid and vapor phase sampling
- Odor control equipment operation, maintenance, installation, repair, optimization, and design.
- Chemical inventory monitoring and delivery scheduling
- Quarterly progress and status reports with performance review and recommendations as well as budgetary tracking.

Reference #2

"ODOR CONTROL EXPERIENCE" FORM Proposer Name: Evoqua Water Technologies LLC		
Client Company Name: Nashville, TN		**Year Services First Provided** 2007
Are Services still being provided? Yes	**Contact Person Name, Position, Email Address & Phone Number:** Walter Ashford Job Title: Wastewater Superintendant Bus: (615) 862-4600 E-mail: walter.ashford@nashville.gov	
Estimated Population Served: 1,700,000	**Number of lift stations in odor control system:** 200+	**Most Recent Annual Contract Amount ($/year):** $1,200,000

Provide Brief Description of Products/Services Provided:

Equipment Supplied

Chemical Dosing	# of units	Control Type	Dose Range (GPD)
Bioxide	6	Simplex	15-30
Bioxide	6	Standard	15-25
Bioxide	6	VersaDose	25-400
Bioxide Plus 71	1	Standard	30
Oodophos Plus	1	Standard	50
Oodophos Plus	4	Standard	50-140
VX456	1	Simplex	0-3

Liquid Phase Odor Control equipment supplied by Evoqua

Type of Unit	# of units	Control Type	Air Flow (CFM)
Biofilters	1	VFD Blower	200

Vapor Phase Odor Control equipment supplied by Evoqua.

Scope of Service

The following work is performed as part of the full service odor control program:

- Liquid and vapor phase sampling
- Odor control equipment operation, maintenance, installation, repair, optimization, and design.
- Chemical inventory monitoring and delivery scheduling
- Quarterly progress and status reports with performance review and recommendations as well as budgetary tracking.

Reference #3

"ODOR CONTROL EXPERIENCE" FORM Proposer Name: Evoqua Water Technologies LLC		
Client Company Name: Sanitation District #1 of Northern Kentucky		**Year Services First Provided** 2005
Are Services still being provided? Yes	**Contact Person Name, Position, Email Address & Phone Number:** Phil Stanken, Field Technical Supervisor pstanken@sd1.org (859) 578-7464	
Estimated Population Served: ~350,000	**Number of lift stations in odor control system:** ~150	**Most Recent Annual Contract Amount ($/year):** $1,400,000/year

Provide Brief Description of Products/Services Provided:

Equipment Supplied

Chemical Dosing	# of units	Control Type	Dose Range (GPD)
Bioxide	16	Standard	15-100
Bioxide	3	VersaDose	42-200
Bioxide	3	VersaDose LT	42
Bioxide-AQ	1	VersaDose LT	75
Peroxide	2	Custom	40-160
VX456	2	Custom	0-3

Liquid Phase Odor Control equipment supplied by Evoqua

Type of Unit	# of units	Control Type	Air Flow (CFM)
Carbon Adsorber	3	VFD blower	150
Wet Chemical Scrubber	1	VFD blower	750

Vapor Phase Odor Control equipment supplied by Evoqua.

Scope of Service

The following work is performed as part of the full service odor control program:

- Liquid and vapor phase sampling
- Odor control equipment operation, maintenance, installation, repair, optimization, and design.
- Chemical inventory monitoring and delivery scheduling
- Monthly progress and status reports with performance review and recommendations as well as budgetary tracking.

Additional References for Alternates:

Bioxide Plus 71

1. **Manatee County, Florida**
   5101 65th Street
   Bradenton, FL 34210
   Contacts: Mr. Nickolas A. Wagner, Utilities Superintendent
   E-Mail: nick.wagner@mymanatee.org
   Telephone: 941-755-1853
   Fax: 941- 792-8811 X5377

2. **Emerald Coast Utility Authority**
   2980 Old Chemstrand Rd.
   Cantonment, FL
   Contact: Mr. Joe Tindall
   (850) 969-3375
   Email: Joe.Tindall@ecua.fl.gov

3. **Nashville Metro**
   See above

Bioxide-AQ

1. **West Manchester Township**
   380 East Berlin Road
   York, PA 17408
   Contact: Mr. Stephen Callahan
   E-Mail: scallahan@westmanchestertownship.com
   (717) 792-3505

2. **Mount Laurel Township Municipal Utilities Authority**
   1201 South Church Street
   Mount Laurel, NJ 08054
   Contact: Mr. Frank J. Deyhle

   E-Mail: fdeyhle@mltmua.com
   (856) 722-5910

3. **Sanitation District #1**
   See above

Personnel Qualifications

Core Odor Control Program Team

The five-member core odor control team offered to LFUCG combines for scores of years of wastewater and odor control experience. Detailed qualifications of each team member are summarized in the following pages, including the approximate number of hours allocated to managing and supporting the odor control program. Evoqua shall make no change to the personnel without express written consent from LFUCG.

Extended Odor Control Support Team

In addition to the local core odor control program team, Evoqua offers an extended support team capable of providing additional support to the odor control program. The team structure and contact information is presented below.

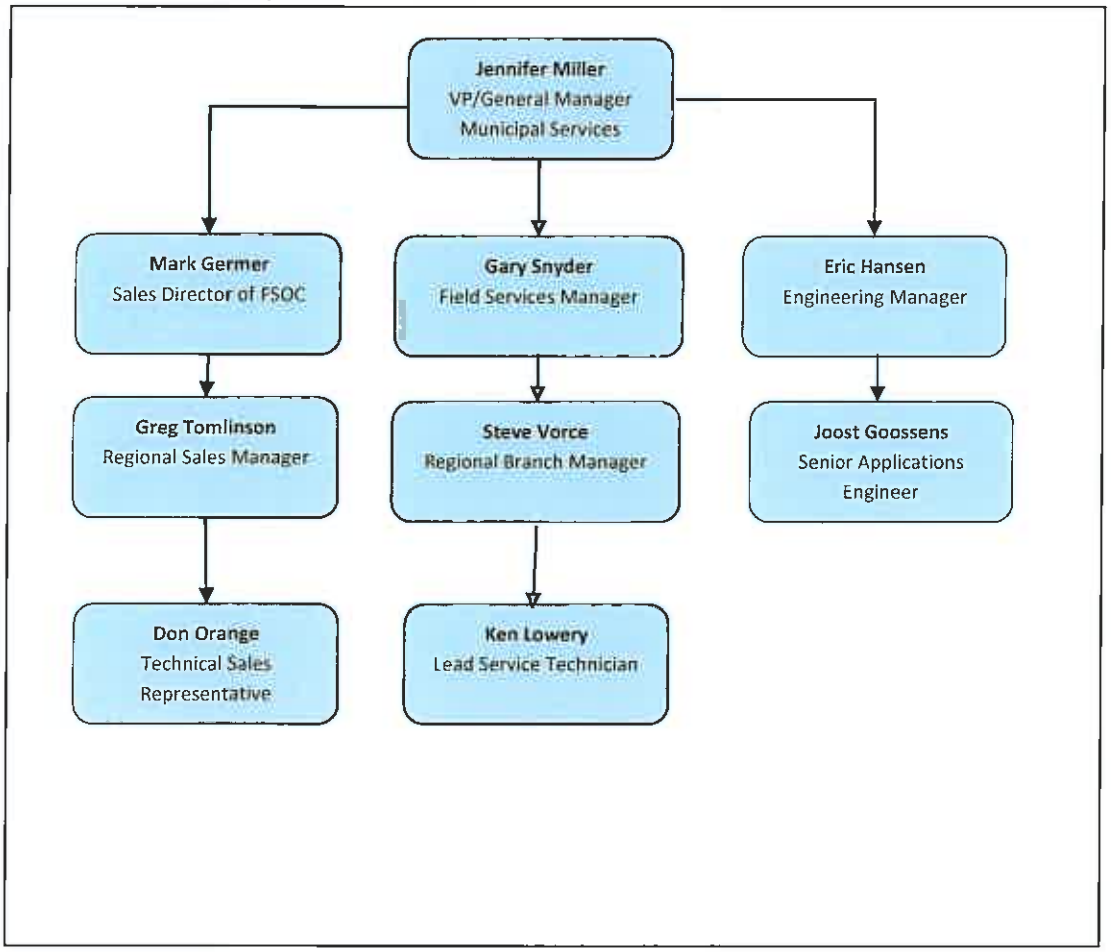


Figure 1 – Odor Control Team Structure

Team Member	Telephone Number	Email
Don Orange	(941) 928-5093	donald.orange@Evoqua.com
Steve Vorce	(770) 335-2047	stephen.vorce@Evoqua.com
Gary Snyder	(941) 369-7916	gary.a.snyder@Evoqua.com
Ken Lowery	(502) 480-6704	kenneth.lowery@Evoqua.com
Joost Goossens	(770) 900-1066	joost.goossens@Evoqua.com
Eric Hansen	(941) 359-7911	eric.c.hansen@Evoqua.com
Mark Germer	(314) 623-8714	mark.germer@Evoqua.com
Jennifer Miller	(941) 359-7930	jennifer.r.miller@Evoqua.com

Table 1 – Odor Control Team Contact Information

NAME:	**Donald D. Orange**
CURRENT POSITION:	**Technical Sales Representative III**
EDUCATION:	**High School Diploma**

PROFESSIONAL EXPERIENCE

EVOQUA Water Technologies, Sarasota, FL — **1987 - Present**
Technical Sales Representative — *1987 to Present*

City of Madisonville, KY — **1970-1987**
Wastewater Systems Manager

Technical Sales Representative – Locate, develop, and maintain relationships that allow customers the opportunity to optimize their wastewater operations while ensuring the necessary level of odor control.
Program managed the following large accounts in the Kentucky/Tennessee region:

- Sanitation District #1 of Northern Kentucky
- Lexington-Fayette Urban County Government
- Nashville Metro Water Services
- Harpeth Valley Utility District

Wastewater Systems Manager – Managed every aspect of the wastewater collection and treatment systems, from the sewer taps, pump stations, to overseeing the operation of the wastewater treatment facility.

NAME: **Ken Lowery**

CURRENT POSITION: **Lead Field Service Technician**

EDUCATION: **US Air Force Environmental Support Specialization**

PROFESSIONAL EXPERIENCE

EVOQUA Water Technologies, Canton, GA. **2005 to Present**
Field Service Technician

NTS Corporation **1992 to 2005**
Director of Wastewater Treatment Operations

Field Service Technician (Canton, GA) – Install, service, and maintain liquid and vapor phase equipment for Full Service Odor Control Customers. Responsible for the collection of samples both atmospheric and liquid at 50+ chemical feed sites and their discharge points.

Licenses-
Class 3 Wastewater Operator's Certification in the Commonwealth of Kentucky.
Class 2 Wastewater Laboratory Analyst License in the Commonwealth of Kentucky.
Training-
Proper use of the LaMotte test kit used for dissolved sulfide detection from a liquid sample.
Proper use of the pH test meter.
Proper use of the HACH bubbler used for atmospheric H_2S detection from a liquid sample.
Use and maintenance of the Odalog atmospheric H_2S detection meter.

5 Star Driver Training, Hazmat, OSHA, Hazmat handling and shipping, Proper use of the MSDS manual, and Safety Training.

NAME:	**Joost Goossens**
CURRENT POSITION:	**Senior Applications Engineer**
EDUCATION:	**B.S. Chemical Engineering** **University of South Florida** **December 2001**

PROFESSIONAL EXPERIENCE

EVOQUA Water Technologies - Sarasota, FL **2005 - Present**

Applications Engineer/Project Manager

Manage projects involving design, fabrication, installation and start up of liquid and vapor phase odor control technologies for the U.S. municipal wastewater treatment industry. Unit process experience includes liquid phase chemical addition, wet scrubbing, biofiltration, grease control and carbon adsorption. Write and present proposals including technical content, cost estimation, and return on investment calculations. Correctly specify odor and grease control equipment including water chemistry evaluation, sizing calculations, and site layout. Support service operations with customer base including equipment troubleshooting, water testing, and operations recommendations.

Program managed the following large accounts in the Southeast region:

- Sanitation District #1 of Northern Kentucky
- Lexington-Fayette Urban County Government
- Harpeth Valley Utility District
- Nashville Metro Water Services
- Peachtree City, GA
- Cape Fear Public Utility, NC
- Raleigh-Durham, NC
- Charleston, SC

NAME:	**Stephen J. Vorce**
CURRENT POSITION:	**Service Center Manager**
EDUCATION:	**General Education Degree**

PROFESSIONAL EXPERIENCE

Evoqua Water Technologies, Sarasota, FL **1998 - Present**

Service Center Manager	*2003 to Present*
Field Service Technician III	*2002 to 2003*
Odor Control Product Specialist	*2000 to 2002*
Driver	*3/98 to 2000*

Service Center Manager (Canton, GA) – Management of personnel and projects. Oversee all installations, service, and maintenance of liquid phase applications. Schedule and dispatch technicians for field operations. Maintain close relationships with current customers and establish new relationships with new customers.

Field Service Technician III – Install, Service, and maintain, and optimize both liquid and vapor phase equipment throughout the country. Train lower level personnel in all aspects of odor control products and procedures. Worked closely with Research, and Development Department on new equipment and procedures. Instrumental in the development, and technology of a new style data logger.

Odor Control Product Specialist – Responsible for all odor control products utilized by USFilter. Aid in development of Poly Stage Scrubbers, Modular Bio filters, and Chemical Feed Systems. Assist Project Management with Standards and Standard Bill of Materials.

Driver – Transport liquid products to customer locations in safe and timely manner. Responsible for reports and paperwork corresponding with loads.

Scope of Services

At the core of every good odor control program is the people with the knowledge, understanding, and expertise to recognize, quantify, and solve problems in the most efficient way possible. Evoqua recognizes that premier odor control chemicals and reliable equipment alone are not enough to support a complete odor control program. As a central part of the comprehensive odor control package offered in this proposal is the service plan. The service plan exemplifies excellence in the following areas:

- Sampling Service
- Operation and Maintenance Service
- Chemical Delivery Service
- Optimization Service
- Reporting Services
- Odor Complaint Response Services

Sampling Service

Experience has shown that a well-managed program will yield a high level of satisfaction. A key factor in a well-managed odor control program is a regular and methodical survey of the system, a strong partnership between Evoqua and the wastewater collection and treatment system, and effective and frequent exchange of information.

The sampling service offered by Evoqua for liquid phase systems is as follows:

- The following parameters shall be measured at the control point of each liquid phase odor control installation:
  - Total Dissolved Sulfide
  - Wastewater Temperature
  - Wastewater pH
  - Odor chemical residual
  - Atmospheric sulfide at 5-minute intervals for a period of at least 24 hours.

All liquid phase sulfide testing shall be performed using the Pomeroy method for liquid sulfide assessment. Nitrate residual testing shall be performed using Hach nitrate strips. OdaLog hydrogen sulfide gas monitors shall be used to test for H_2S at the control points.

Operation and Maintenance Service

The objective of the operation and maintenance service is to ensure optimal functionality of odor control equipment with zero equipment down-time. Experience and technical knowledge of each piece of liquid phase equipment is critical to success. Evoqua shall accomplish the goals of the operation and service component of the full service odor control program by:

- Executing installation and demobilization work in a safe, professional, and timely manner.

- Maintaining inventory of parts designed to require replacement, such as bellows, pumps, tubing, and PVC valves, pipe, and other components.
- Replacing and repairing equipment only with parts precisely matching, or exceeding in quality, the original manufacturer's equipment.
- Repairing defective equipment within 3 days of an emergency request or installing a temporary system should repairs require more than 3 days.
- Maintaining all equipment and work areas to the highest cleanliness standard.

Optimization Service

Evoqua advocates a data-driven approach to optimization coupled with technological and technical innovation. As data is collected the performance of an odor control system can be quantified and a mass balance of sulfide and chemical residual can be calculated. Based on the physical data a direct correlation between feed rate and performance can be established.

Optimizing chemical dosing systems with a dual pump and timer combination is accomplished with the aid of atmospheric sampling data and wastewater flow information. The data is used to back-calculate the time of day during which only one or the other pump, or both pumps should be operational to provide the correct level of chemical dosing.

Seasonally the systems shall be optimized by reducing chemical dose rates after summer and increasing the dose rates after winter.

Chemical Delivery Service

When chemical storage tanks run dry, the result is odor complaints. Well-timed and safe chemical deliveries are a critical component to guaranteeing continuous odor control.

All of the delivery personnel shall be capable of, and responsible for, the following:

- Safe and timely chemical delivery
- Recording the starting and ending level of the chemical storage tanks
- Inspection of chemical feed systems, including:
    - Checking chemical pump status
    - Visually inspecting chemical feed system
    - Checking fill and discharge lines
    - Reporting spills
- Making a site assessment

Delivery Procedure

Evoqua shall have odor control chemical delivered on an as needed basis, or within 2 days of notification by email or telephone. All deliveries shall be made before 3:30pm. Prior to delivery, Evoqua shall notify LFUCG of the delivery schedule.

The following main points outline Evoqua Standard Operating Procedures for chemical delivery procedures:

- All delivery vehicles shall comply with all local, state, and federal road and highway weight restrictions and labeling.
- All deliveries shall be accompanied by a U.S. Department of Labor Material Safety Data Sheet for the product.
- A COA shall accompany all shipments
- Deliveries shall be made with transfer pumps from trucks to tanks.
- The deliverer shall have all hoses and fittings necessary for proper unloading.
- Delivery personnel shall use the following safety equipment while unloading Bioxide®:
    - If conditions are likely to generate chemical mist then a respirator with acid gas cartridges shall be used.
    - Safety glasses with side shields shall be used at a minimum. If splashing is likely to occur, then chemical goggles shall be used.
    - Protective gloves shall be used to prevent contact of chemical with skin.
- Chemical shall only be loaded into tanks that are properly labeled with HMIS or NFPA label and chemical identifier label on fill line.
- Tanks shall never be filled through the manway
- If inventory overfill devices are installed, these shall be tested prior to offloading chemical.
- All hoses and fittings shall be thoroughly examined before each delivery.
- The unloading will be physically monitored by delivery person regardless of weather or other circumstances.
- While uncoupling hoses and fittings containers shall be used to ensure that all drips and small spills are contained.
- After offloading and prior to leaving the site, each driver shall:
    - Verify chemical pumps are running
    - All fittings on chemical dosing and storage systems are tight
    - Verify no chemical leaks are present
    - Leave the dosing site in a clean condition.

<u>Reporting Services</u>

Monthly reporting is a cornerstone to building a great odor control program. Reports not only provide a document of accountability for vendor performance, but also serve as a historical record of the program against which future decisions and actions can be taken. Service reports shall contain the following sections:

- Summary of service activities
- Liquid phase performance summary showing:
    - Atmospheric sulfide data and treatment goals
    - Dissolved sulfide totals and treatment goals
    - Chemical residual totals and goals
    - All data outside of acceptable ranges shall be clearly indicated by using bold red font and a summary explaining the data shall be provided.

- Odor complaint summary and resolution table
    - Location and date of odor complaint shall be summarized as well as actions taken to address the conditions that generated the complaint.
- Feed rate summary
    - To include current dose rates, dose rates of the previous month, as well as the dose rates of the same period during the previous year.
- Feed rate adjustment
    - Any manual adjustments made to the dose rates shall be clearly indicated and a brief description of the driver for action shall be provided.

- Vapor phase equipment summary
    - Critical operational parameters and service activities shall be summarized.
- Project List
    - A summary of service work that is of a non-routine nature shall be listed including a task description and completion date.
- Invoice Summary
    - Detailed delivery totals including site name, invoice number, delivery date and quantities shall be tabulated.
- Cost and Budget Graphs
    - An annual budget estimate shall be provided prior to the beginning of Metro's fiscal year, the budget estimate shall be broken down on a monthly basis and a rolling annual total.
    - Graphs shall be provided to allow for a transparent and convenient illustration of invoiced cost relative to budget in order to ensure that costs are controlled.
- Appendices with detailed survey information and hydrogen sulfide graphs

The written monthly report shall be sent by email to the LFUCG Division of Water Quality representative within seven (7) days after collection.

A series of regularly scheduled meetings will be held on a monthly and annual basis to review specific odor control items as well as broad odor control strategies.

Monthly meetings shall be held with the following general agenda:

- Review of monitoring data for each site
- Review of chemical dose rates and deliveries
- Discussion of odor complaints and resolutions.
- Budgetary review for the month and year to date.
- Presentation of up-coming work, deliveries, and projects.
- New odor and corrosion control projects.
- Chemical and equipment safety awareness.

Odor Response Services

Correct and effective odor complaint response and resolution procedures separate a good odor and corrosion control program from a bad program. The proposed procedure for reacting to odor complaints is as follows.

- Complaints to be called in to LFUCG
- LFUCG communicates the details of the call to Evoqua. The information shall include:
  - Time of complaint
  - Location of complaint
  - Nature of complaint.
- Evoqua shall respond to the complaint within forty-eight (48) hours by:
  - Making the appropriate modifications to the relevant odor control system
  - Completing a notification report and submitting it to MSD
  - Following up with the complainant.

Furthermore, Evoqua shall maintain a complaint and resolution log and present the information at every monthly meeting.

Liquid Phase Hydrogen Sulfide Control Products

There are many factors that contribute to odor generation and odor release in a wastewater collection and treatment system. Evoqua's philosophy is to provide the right treatment approach to fit a given application. Evoqua therefore has a wide variety of products to eliminate odors as a result of hydrogen sulfide and/or volatile organic compounds in the wastewater collection and processing network.

The liquid phase odor control products offered to LFUCG are summarized as follows:

- **Bioxide**
- **Bioxide Plus 71**
- **Bioxide-AQ**
- **50% Hydrogen Peroxide**

Bioxide® - a process developed by Evoqua to biochemically treat dissolved hydrogen sulfide and other odor compounds produced in the wastewater under septic conditions. Bioxide® is primarily used in moderate detention time force mains via metering treatment solution at pump stations. The Bioxide® process prevents sulfide formation by providing a thermodynamically favorable terminal electron recipient to the sulfate ion while also oxidizing sulfides in the wastewater to elemental sulfur.

The following three application summaries illustrate the effectiveness of Bioxide in eliminating hydrogen sulfide in collection systems.

Case #1 – Lower Cane Run PS – Lexington, KY

- System Flow Rate: 1.7 MGD
- FM Length: 24,133 feet
- FM Diameter: 30 inches
- Average Daily Retention Time: 12.6 hours
- Untreated Dissolved sulfide concentration: 6.5 mg/l
- Total pounds of untreated sulfide: 92 lbs
- Product application rate: 110 GPD
- Dissolved sulfide concentrations after treatment: <0.1 mg/l
- Gallons of Product per lb of sulfide: 1.2 gallons/1 lb of sulfide

Case #2 – Bromley PS - Sanitation District #1 of Northern Kentucky

- System Flow Rate: 10 MGD
- FM Length: 18,938 feet
- FM Diameter: 42 inches
- Average Daily Retention Time: 3.3 hours
- Untreated Dissolved sulfide concentration: 3.2 mg/l
- Total pounds of untreated sulfide: 267 lbs
- Product application rate: 240 GPD

- Dissolved sulfide concentrations after treatment: <0.1 mg/l
- Gallons of Product per lb of sulfide: 0.9 gallons/1 lb of sulfide

Case #3 – Broadwater II – Henrico County, VA.

- System Flow Rate: 0.58 MGD
- FM Length: 4,100 feet
- FM Diameter: 20 inches
- Average Daily Retention Time: 2.8 hours
- Untreated Dissolved sulfide concentration: 9 mg/l
- Total pounds of untreated sulfide: 43.5 lbs.
- Product application rate: 76 GPD
- Dissolved sulfide concentrations after treatment: <0.1 mg/l
- Gallons of Product per lb. of sulfide: 1.75 Gallons/1 lb. of sulfide

Bioxide® Plus 71 - combines the effectiveness of the Bioxide® process with a proprietary oxidizer. The active ingredient in this product provides point source odor control and synergistically improves the functional chemistry of nitrate induced sulfide oxidation and prevention. The chemical basis for odor control of Bioxide® Plus 71 is similar to that of Bioxide® in that it provides a more favorable terminal electron acceptor to the facultative sulfate reducing bacteria. Additionally, the proprietary component specifically oxidizes odorous compounds.

The following three application summaries illustrate the effectiveness of Bioxide Plus 71 in eliminating hydrogen sulfide in collection systems.

Case #1 – PS 7 – Emerald Coast Utility Authority, FL

- System Flow Rate: 2.2 MGD
- FM Length: 24,133 feet
- FM Diameter: 24 inches
- Average Daily Retention Time: 6.3 hours
- Untreated Dissolved sulfide concentration: 4 mg/l
- Total pounds of untreated sulfide: 73 lbs
- Product application rate: 100 GPD
- Dissolved sulfide concentrations after treatment: <0.1 mg/l
- Gallons of Product per lb of sulfide: 1.4 gallons/1 lb of sulfide

Case #2 – South Shores LS – Nashville Metro Water Service, TN

- System Flow Rate: 0.06 MGD
- FM Length: 12,000 feet
- FM Diameter: 4 inches
- Average Daily Retention Time: 3.5 hours
- Untreated Dissolved sulfide concentration: 11 mg/l
- Total pounds of untreated sulfide: 5.5 lbs
- Product application rate: 30 GPD

- Dissolved sulfide concentrations after treatment: <0.1 mg/l
- Gallons of Product per lb of sulfide: 5.5 gallons/1 lb of sulfide

Case #3 – Memphis Rd – Manatee County, FL

- System Flow Rate: 0.97 MGD
- FM Length: 3,798 feet
- FM Diameter: 12 inches
- Average Daily Retention Time: 0.5 hours
- Untreated Dissolved sulfide concentration: 3 mg/l
- Total pounds of untreated sulfide: 24 lbs
- Product application rate: 13 GPD
- Dissolved sulfide concentrations after treatment: 0.1 mg/l
- Gallons of Product per lb of sulfide: 0.5 gallons/1 lb of sulfide

Bioxide-AQ® - combines the Bioxide® Process for dissolved sulfide removal with the patented AQuit® microbial metabolic inhibition process for a synergized dissolved sulfide prevention product. Bioxide-AQ® is primarily used in small diameter force mains with longer detention times. The additional active component in this Bioxide® blend uses the inactivation of the slime-layer on the interior walls of the forcemain as its chemical basis. Stoichiometric dose rates for this product are typically 10% less than that of regular Bioxide®, therefore about 0.6 to 1.9 gallons of Bioxide-AQ® are required per pound of sulfide.

The following three application summaries illustrate the effectiveness of Bioxide-AQ in eliminating hydrogen sulfide in collection systems.

Case #1 – New Riley Road PS – Sanitation District #1 of Northern Kentucky

- System Flow Rate: 0.185 MGD
- FM Length: 8,298 feet
- FM Diameter: 20 inches
- Average Daily Retention Time: 17.6 hours
- Untreated Dissolved sulfide concentration: 12.5 mg/l
- Total pounds of untreated sulfide: 19 lbs
- Product application rate: 40 GPD
- Dissolved sulfide concentrations after treatment: <0.1 mg/l
- Gallons of Product per lb of sulfide: 2.1 gallons/1 lb of sulfide

Case #2 – Market Street PS – West Manchester Township, PA

- System Flow Rate: 0.38 MGD
- FM Length: 4,700 feet
- FM Diameter: 12 inches
- Average Daily Retention Time: 1.74 hours
- Untreated Dissolved sulfide concentration: 12 mg/l
- Total pounds of untreated sulfide: 38.0 lbs.

- Product application rate: 60 GPD
- Dissolved sulfide concentrations after treatment: <0.1 mg/l
- Gallons of Product per lb. of sulfide: 1.58 gallons/1 lb of sulfide

Case #3 – Mason Creek PS – Mount Laurel Township MUA, NJ.

- System Flow Rate: 0.087 MGD
- FM Length: 5,840 feet
- FM Diameter: 6 inches
- Average Daily Retention Time: 2.38 hours
- Untreated Dissolved sulfide concentration: 7 mg/l
- Total pounds of untreated sulfide: 5.1 lbs.
- Product application rate: 7 GPD
- Dissolved sulfide concentrations after treatment: <0.1 mg/l
- Gallons of Product per lb. of sulfide: 1.37 gallons/1 lb of sulfide

Hydrogen Peroxide – an oxidizing solution used for chemical oxidation of odor causing compounds in liquid-phase applications. Hydrogen peroxide is well suited to lines with short retention times, lines containing large amounts of additional volatile organic compounds, and lines with significantly elevated BOD concentrations. The primary reaction mechanism for Hydrogen Peroxide is to oxidize sulfide to sulfur. Additionally, Hydrogen Peroxide may oxidize the microbiology responsible for oxygen uptake and sulfate reduction, thereby lowering the BOD concentration of the wastewater. Hydrogen Peroxide, when used alone for odor control, is dosed at 1/2 gallon for each pound of sulfide treated for removal and up to one gallon per pound sulfide for prevention.

SDS documentation for the above odor control products is provided as a separate attachment.

Chemical Dosing Equipment

Standard Odor Control Product Dosing Equipment

Dosing of products for odor control has steadily evolved in the last 30 years. The first dosing systems used a single pump running 24 hours a day 7 days a week. This method, while effective for its time, was not very efficient, leading to over/under dosing, poor or erratic performance and most importantly did not offer any way to dose economically.

The next generation, which was first introduced by Evoqua, incorporated timers, soon followed inclusion of a second pump, each controlled with a timer. This method provided the tools to improve performance and cost of operation if properly set up by someone with knowledge of dosing curves.

The latest generation of feed equipment, also developed by Evoqua, is the dose to demand type controllers. These systems can be configured to dose exacting amounts of product to achieve the optimal result for the least cost. Evoqua has invested years and hundreds of thousands of dollars developing dose to demand systems like the VersaDose®. The VersaDose® feed system features a programmable logic controller with an embedded logic that uses specific BOD, collection system configuration information and real time inputs like flow, and temperature to produce an optimal dose every day of the year.

A more in depth description of the two timer and VersaDose® feed systems can be found later in this section.

Evoqua has standard equipment packages refined through years of experience to properly and reliably feed liquid products. These systems have the following advantages:

- Dual pump and dual timer improve the ability to eliminate overfeed of product.
- A calibration column is included to ensure precise feed of product.
- Two bellows pumps will be provided to introduce product to the collection system, and provide a built in backup system.
- Pumps and calibration column are housed in a stainless steel enclosure.
- Bellows pumps are reliable and do not require flooded suction.
- No bottom penetrations on storage tanks are installed and minimize potential for spills on low pressure feed applications.
- Electrical service lines are installed according to all applicable codes; the use of extension cords is not permitted.
- Suction and discharge piping shall be schedule 80 PVC, and shall be properly anchored or buried to minimize trip hazards. The use of tubing exposed to sunlight is not acceptable as it does not meet minimum engineering standards.

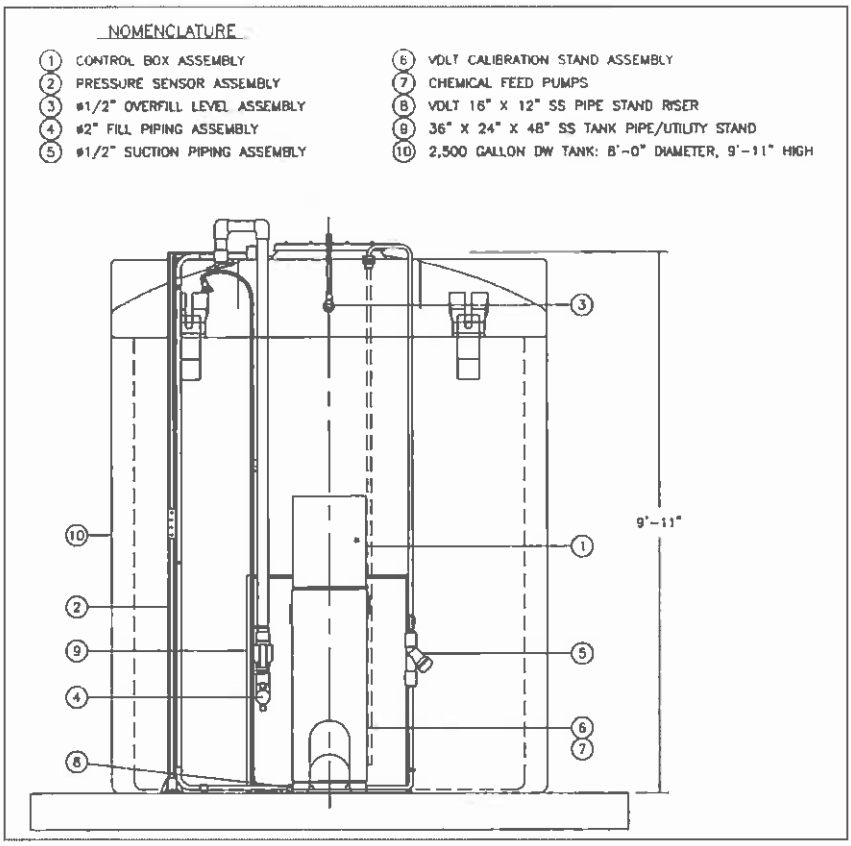


Figure 2 – Standard Dosing System with Double Walled Tank

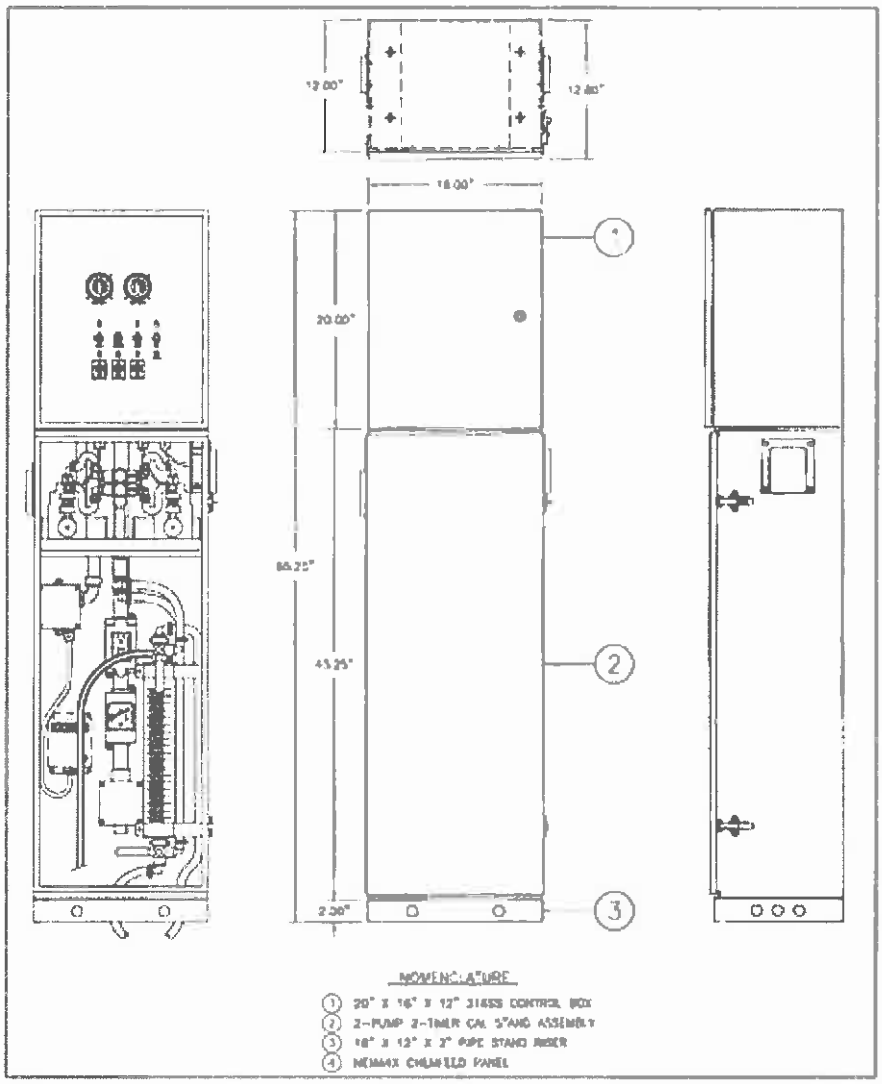


Figure 3 – Calibration and Control Package

Figure 3 shows a low pressure basic feed system with a two pump and timer based control system.

Advanced Dosing – VersaDose®

Evoqua offers the VersaDose® advanced dosing package for the efficient delivery liquid phase products. The VersaDose® has the following benefits above the basic two pump two timer dosing method.

The VersaDose® or VersaDose® LT dosing package can save 10-25% in chemical applied with no performance degradation. Several case studies are available demonstrating these results technically. Several advanced features shall be explained further as follows:

- Temperature Controlled Dosing
- Flowrate Dosing Control – Raincurve or High flowrate dosing

- 24 Point Dosing Control

Temperature Controlled Feed Rate

Temperature controlled feed rate can account for a sizable increase in performance with lower overall program cost. Automatic adjustment of product dose occurs as water temperature changes with the season. The underlying mechanism shall be described further as follows:

The amount of sulfide occurring in a septic wastewater system is modeled by the Pomeroy equation[1]

$$S\ (lbs) = RT\ (M)\ (BOD_5 * 1.07^{\wedge\ (T-20)})\ (4/d + 1.57)$$

S – Sulfide in lbs RT – Residence time
M – Sulfide Flux T – Temperature
D – Pipe diameter BOD – Biological oxygen demand

Pomeroy predicts a temperature influence on the amount of sulfide present in a wastewater collection system in the amount of 7% per degree Celsius. The VersaDose® control system can utilize a sensor to measure wastewater temperature and automatically adjust the dosage by a setpoint ratio depending on the region of the United States to match the system demand. Site testing is used to verify setpoints and minimize the amount of odor control product utilized. Figure 4 shows a real time plot of system dose adjustment versus temperature.

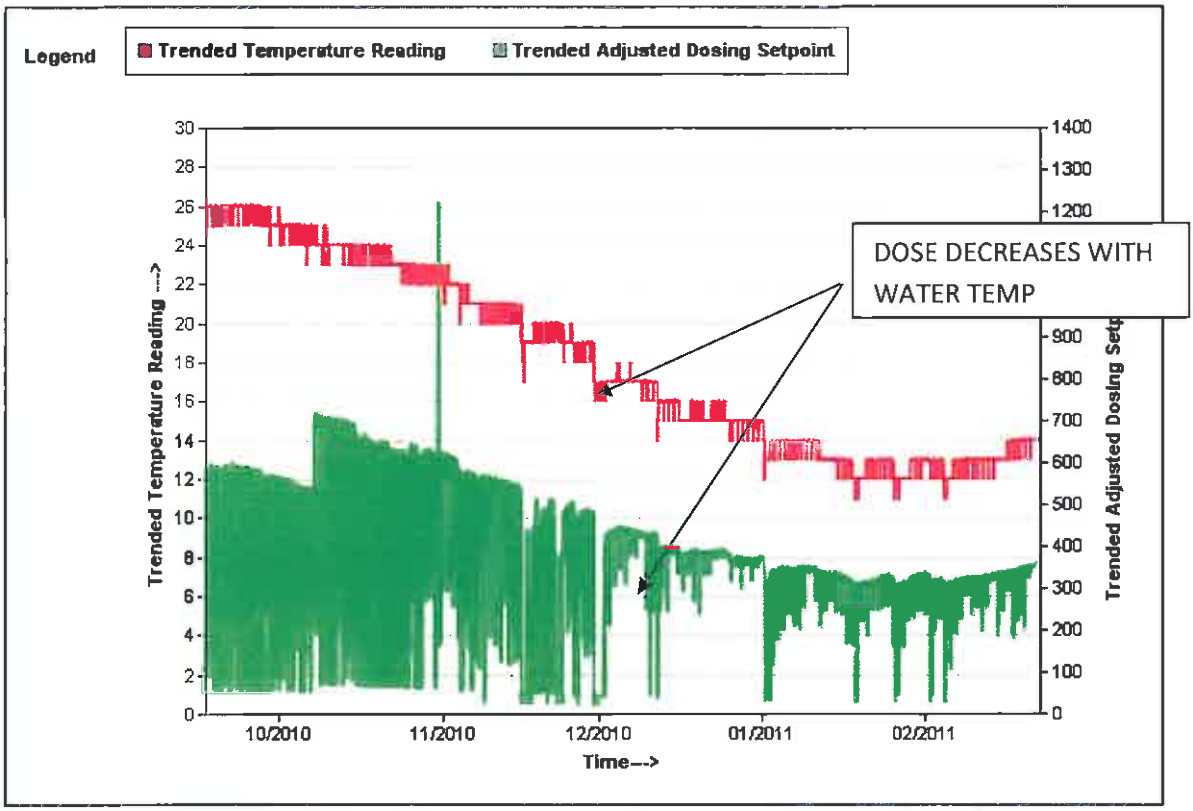


Figure 4 – Temperature Controlled Feed Rate

Flowrate Product Control

Turn down product feed during high flow events (waste flow input required)

Rainwater dilutes wastewater, lowering the concentration of BOD and sulfate, as well as reducing the retention time. As a result, not as much odor control product is required to control odors. Figure 5 shows the control plot from reducing the dose rate on high flow days by 51%, 17%, and 34% respectively.

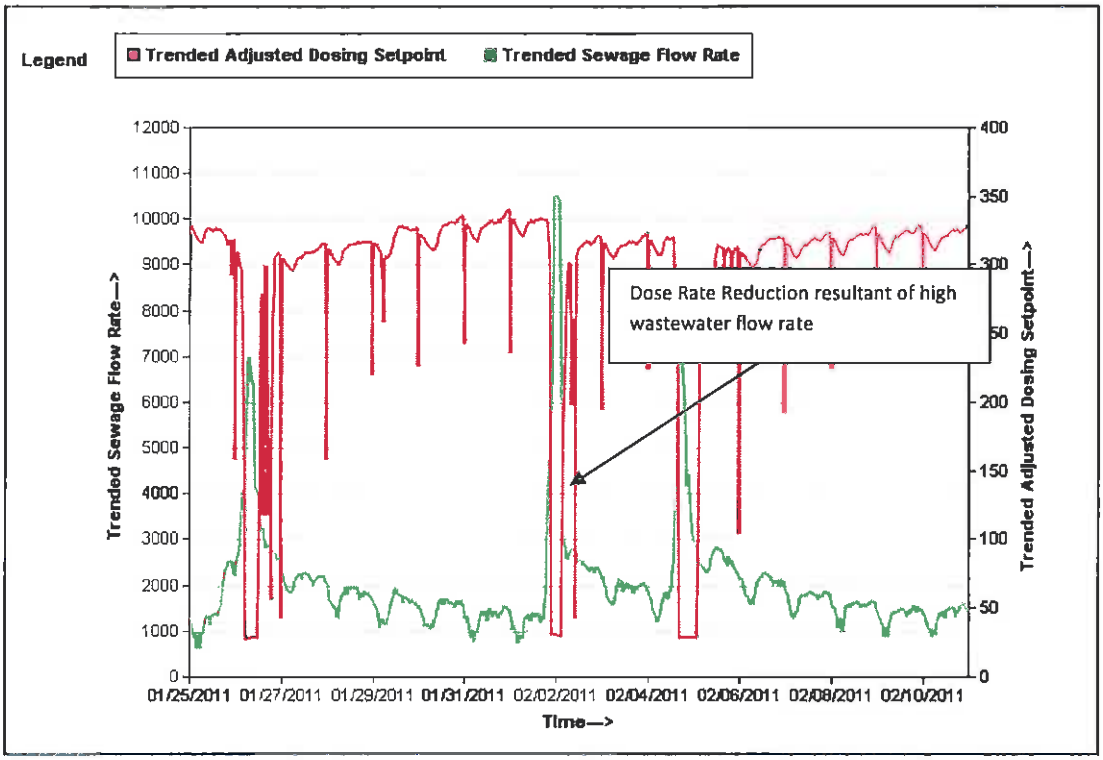


Figure 5 – Wastewater Flowrate with Product Dose Versus Time

Feed product on a Variable 24 hour – 7 day basis to match the demand curve

Odor control product dosage can be set up to dose on a variable basis versus 3 points. An hourly product dose "curve" can be configured with the Versadose® and Versadose® LT system to approximate the optimum product dosage. Figure 21 shows this concept.

If a wastewater collection system shows a periodic demand curve, the same as measured from day to day, then it is possible to match the system high and low demand time periods with increased or decreased product.

The demand curve ideally represents the concentration of dissolved sulfide in the wastewater stream on a continuous basis. Since no online analyzer exists to precisely measure the concentration of dissolved sulfide versus time, the demand curve must be measured by hand. A demand curve can be developed using a wet test and periodically testing dissolved sulfide over the course of several days. This method can be supplemented with gas data. Hydrogen sulfide data monitors are available to measure gas concentration every 5 minutes (time interval is configurable). Experience has shown that an hourly adjustment in dosage provides the most optimum dosage with the least amount of adjustment.

Wastewater systems are not perfectly periodic therefore an hourly precision in dose adjustment achieves optimum savings. Dose frequencies higher than once per hour are typically not

practical and do not result in product savings. Online sulfide measurement could make a better dose curve fit possible and achievable in the near future.

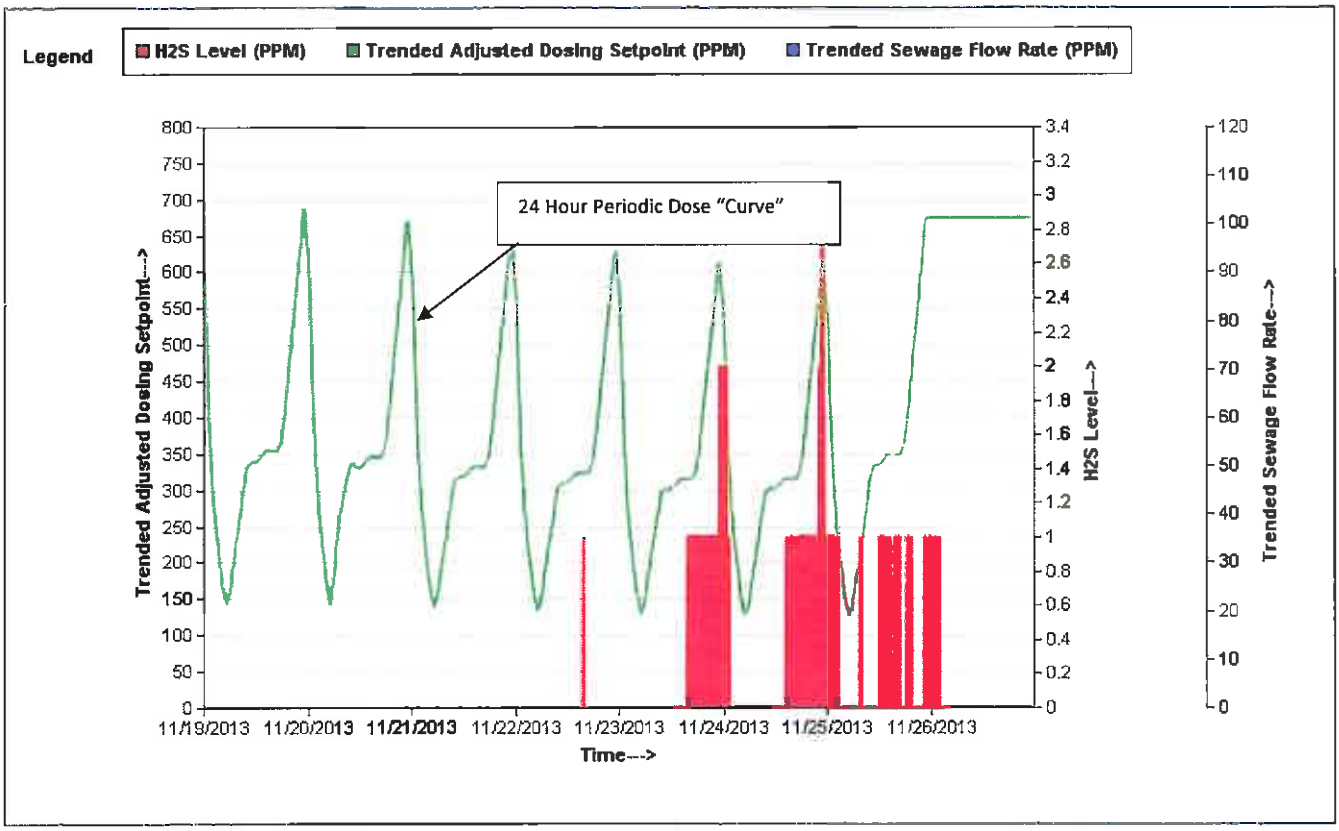


Figure 6 – 24 hour Dose curve with Hydrogen Sulfide Gas Plotted Versus 7 days

It is important to note several items:

1. Versadose® LT allows a plot of dose curve versus hydrogen sulfide gas level (when the VaporLink® system is employed). This configuration allows for easier system optimization and is not available by any other odor control vendor.

2. It is noted that while the dose curve is variable during a 24 hour period, hydrogen sulfide gas emissions are not constant as shown in Figure 6 due to system variations in the every wastewater system such as wastewater flowrates, nutrient level and rainwater infiltration.

3. Hydrogen sulfide vapor concentration levels are maintained below 3 ppmv peaks in this instance and an average below 1 ppmv is obtained as measured inside the wastewater collection system vapor space.

<u>Other Important VersaDose® LT Features</u>

- Remote access to monitor and adjust chemical dosage from internet (if desired)

- User friendly pump calibration procedure
- User friendly interface
- Measure tank level change and compare to pump rate (alarm if out of spec)
- Remote access to tank level via internet

The Versadose® LT package is a microprocessor based unit designed for optimal product dosage. The controller uses inputs for: sewage flow, and temperature to dose precisely to the system.

The Versadose® LT package has built in flexibility to provide optimum dose to most types of system configurations. The controller utilizes a temperature input to automatically adjust chemical dosage by a pre-determined factor to account for seasonal changes in sulfide load. The VersaDose® LT package utilizes several control modes to provide the optimum dosing profile. Control schemes include: dose proportional to flow, dose to retention time, constant dose, or a custom profile matched to the system configuration.

The Versadose® LT package is presented for future use by the JWSC as an overall cost reduction measure and included in offering. A Versadose® LT panel is shown in Figure 22.

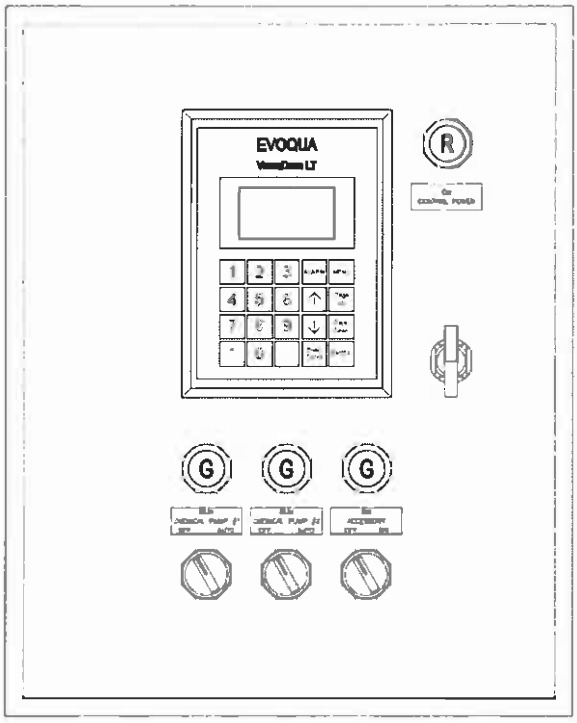


Figure 7 - VersaDose® LT Control Panel

Remote Level Monitoring and Long Term Use Rate Tracking

Evoqua shall provide all equipment, material, and supplies required for remote monitoring of systems. The inventory of each chemical tank shall be monitored using either a pressure transducing or ultra-sonic sensor. The signal from the sensors shall be relayed via a wireless

cellular signal for display on a customer accessible website, www.Link2Site.com. The features of this inventory and remote monitoring system provide the following capabilities:

- Notify the appropriate odor control team members immediately via text or email if one or more of the following conditions occur:
  - A storage tank requires chemical within a preset number of days.
  - A storage tank is overfilled
  - A storage tank no longer contains any chemical.
  - A chemical feed rate change has occurred.
  - A tank, pump, or chemical feed line is leaking, or any other condition that may cause the tank level to drop faster than the preset dosing rate.
  - A pump or dosing line is plugged, a suction line is cracked, or any other condition that may cause the tank level to remain constant.
- Long term tracking of chemical use rates
- Accountability and verification of chemical deliveries
- At-a-glance chemical inventory levels from any computer or wireless device capable of accessing the internet.
- Improved chemical usage forecasting
- Minimized discontinuity in odor control program

In addition to monitoring inventory, the Link2Site website can communicate with the VersaDose® LT controller, enabling the user to:

- View the following parameters:
  - Wastewater temperature profile
  - Wastewater flow profile
  - Adjusted dose rate based on temperature and flow
  - A record of alarm conditions
  - Current dose rate
  - Current variation of dose rate relative tank level

- Adjust the following parameters:
  - Overall dose rate
  - Individual dose rates for each day of the week
  - Individual dose rates for each hour per day of the week

A screenshot of the Link2Site chemical inventory website is shown below in Figure 8.

Figure 8 – Link2Site Screenshot Showing Dose Site Summary

Atmospheric Hydrogen Sulfide Monitoring

The VaporLink® monitor is equipped with a cellular modem that communicates the logged data to Evoqua's Link2Site website. VaporLink® has the following capabilities:

- Remote access to site specific data from any location with an internet connection.
- The VaporLink® monitor can be programmed to log as frequently as once a second, or as infrequently as once an hour.
- Logged data can be transmitted to the Link2Site interface on a daily basis.
- The VaporLink® monitor can also send instantaneous alarms when the hydrogen sulfide concentration exceeds the high level or average alarm set point or, when the gas concentration is less than the low level alarm set point.
- The system also includes an alarm to replace the VaporLink® monitor and a low battery alarm.

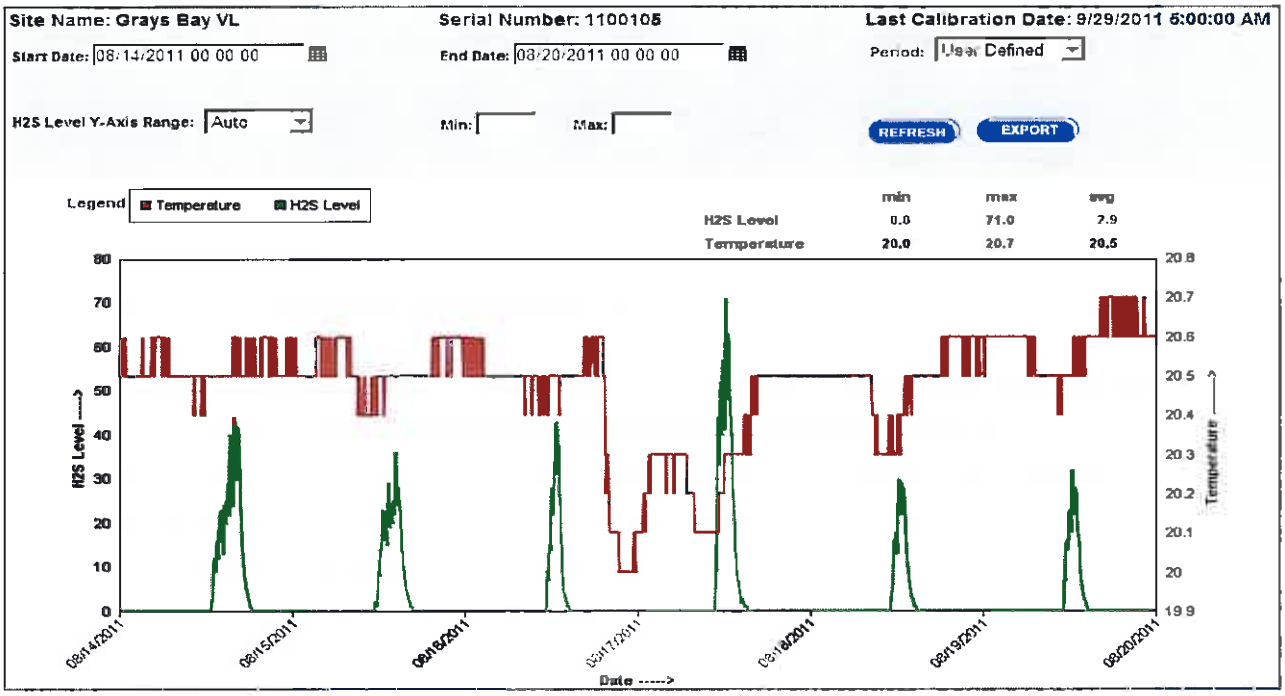


Figure 9 – Link2Site Screenshot Showing VaporLink® Data

EVOQUA
WATER TECHNOLOGIES

Bioxide® Product Specifications

	SPECIFICATIONS
Description	Aqueous solution of stable, inorganic salts for biological enhancement, calcium ammonium nitrate double salt
H_2S Dosage Requirement	0.7 gallon/lb. dissolved H_2S
Weight/Gallon	12.1 - 12.2 lbs./gallon
Pounds of Nitrate Oxygen	3.5 pounds of nitrate-oxygen (NO3-O) per gallon
pH	5 – 8
Crystallization Point	<-20° F
Color	Clear to slightly turbid tan
CERCLA Listing	Contains no CERCLA listed hazardous substances. BIOXIDE® is exempt from Federal DOT placard requirements.
Equipment Requirements	Compatible with storage tanks, piping and pumping equipment mode of polyethylene, PVC, FRP or stainless steel.

BIOXIDE® ....THE NATURAL SOLUTION

BIOXIDE® is a biochemical process solution which controls odors and corrosion caused by hydrogen sulfide and other compounds in wastewater systems. It is safe to handle, and effective dosage will prevent atmospheric hydrogen sulfide from reaching toxic levels.

Proper dosage of BIOXIDE treatment solution to a sludge or a wastewater stream, as determined by Evoqua Water Technologies LLC, provides for a population of beneficial bacteria which oxidize dissolved hydrogen sulfide and other reduced sulfur compounds as part of their metabolism.

By treating the hydrogen sulfide in the wastewater stream, the process prevents release of hydrogen sulfide into the air, reducing odors and corrosion.

The BIOXIDE process has proven effective in many types of wastewater facilities, in widely varying flows, and in any kind of weather. Treatment is typically dosed into a collection system upstream from the problem facility. From a few selected points, the benefits will spread throughout the collection system. The process has been documented to reduce dissolved hydrogen sulfide from over 50 ppm to < 0.1 ppm in numerous wastewater collection force mains, wet wells and gravity interceptors. Similar results have been achieved with BIOXIDE treatment in sludge lagoons and storage tanks. Due to the biochemical nature of this process, complete sulfide removal is extremely cost effective in applications where extended detention times produce septic conditions. Regional distribution and service locations are in Temecula, CA; Wilmington, DE; Sarasota, FL; Canton, GA; Granite City, IL and Cedar Park, TX.

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Sarasota, FL 34243 USA

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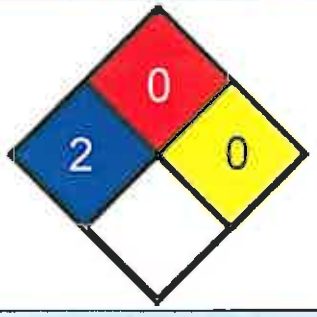
www.evoqua.com

evoqua
WATER TECHNOLOGIES

SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY INFORMATION			
PRODUCT TYPE:	Inorganic Salt Solution		
PRODUCT NAME:	**Bioxide®**		
COMPANY ID:	Evoqua Water Technologies LLC 181 Thorne Hill Drive, Warrendale, PA 15086		
TELEPHONE NUMBER:	**INFORMATION:**	**CORPORATE**	866.926.8420
	MEDICAL EMERGENCY:	**CHEMTREC**	800.424.9300
	TRANSPORTATION EMERGENCY:	**CHEMTREC**	800.424.9300
DATE PREPARED:	9 June 2015	**REVISION: 1**	

SECTION 2: HAZARD(S) IDENTIFICATION

HMIS RATINGS		NFPA RATINGS	GUIDE
HEALTH	2		4 – EXTREME/SEVERE 3 – HIGH/SERIOUS 2 – MODERATE 1 - SLIGHT 0 – MINIMUM W – WATER REACTIVE OX - OXIDIZER
FLAMMABILITY	0		
PHYSICAL HAZARD	0		
PERSONAL PROTECTION	D		

PICTOGRAM	SIGNAL WORD	HAZARD STATEMENT
	WARNING	H302: Harmful if swallowed. H315: Causes skin irritation. H320: Causes eye irritation. H335: May cause respiratory irritation.

PRECAUTIONARY STATEMENT(S)	
PREVENTION	P264: Wash…..thoroughly after handling. P270: Do not eat, drink or smoke when using this product. P280: Wear protective gloves/protective clothing. P261: Avoid breathing dust/fume/gas/mist/vapors/spray.

	P271: Use only outdoors or in a well-ventilated area.
RESPONSE	P301+P312: IF SWALLOWED: Call a POISON CENTER/doctor/….if you feel unwell. P330: Rinse Mouth. P302+P352: IF ON SKIN: Wash with plenty of water. P332+P313: If skin irritation occurs: Get medical advice/attention. P362+P364: Take off contaminated clothing and wash it before reuse. P305+P351+P338: IF IN EYES: Rinse cautiously with water for 15 - 20 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P337+P313: If eye irritation persists: Get medical advice/attention. P304+P340: Remove person to fresh air and keep comfortable for breathing. P312: Call a POISON CENTER/doctor/….if you feel unwell.
STORAGE	P402: Store in a dry place. P403+P233: Store in a well-ventilated place. Keep container tightly closed. P404: Store in a closed container. P405: Store locked up.
OTHER HAZARDS	
NONE	

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

PERCENT BY WEIGHT	COMMON NAME (Ingredient / Component)	CAS NO.	IMPURITIES
50-60	Ammonium Calcium Nitrate Double Salt	15245-12-2	none
Balance	Water	7732-18-5	none

SECTION 4: FIRST-AID MEASURES

NECESSARY FIRST AID INSTRUCTIONS	
INHALATION FIRST AID	Remove affected person from area to fresh air. Give artificial respiration ONLY if breathing has stopped. Obtain medical attention if individual shows symptoms of exposure.
SKIN CONTACT FIRST AID	Immediately remove clothing from affected area and wash skin with flowing water and soap. Clothing must be washed before reuse. DO NOT instruct person to neutralize affected skin area. Obtain medical attention if irritation occurs.
EYE CONTACT FIRST AID	Immediately irrigate eyes with flowing water 15-20 minutes while holding eyes open. Contacts should be removed before or during flushing. DO NOT instruct person to neutralize. Obtain medical attention if irritation occurs.
INGESTION FIRST AID:	If victim is alert and not convulsing rinse mouth with water and give water to drink. Do not induce vomiting. If spontaneous vomiting occurs, have affected person lean forward with head down to maintain breathing passage. Obtain medical attention.
DESCRIPTION OF MOST IMPORTANT SYMPTOMS	
No Additional Information Available	
RECOMMENDATIONS FOR IMMEDIATE MEDICAL CARE	
Treat Symptomatically.	

SECTION 5: FIRE-FIGHTING MEASURES

SUITABLE EXTINGUISHING MEDIA	**Use an extinguishing media suitable for the surrounding fire.**
UNSUITABLE EXTINGUISHING MEDIA	None
SPECIFIC HAZARDS	May support **combustion at** high **temperature.**
PERSONAL PROTECTIVE EQUIPMENT	In the **event** of fire, **wear** full protective clothing and NIOSH **approved self-contained breathing apparatus with full face** piece, operated **in positive** pressure **mode.**

SECTION 6: ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES	
PERSONAL PRECAUTIONS	Handle in accordance with good industrial hygiene and safety practices. These practices include avoiding unnecessary exposure and removal of material from eyes, skin, and clothing.
ENVIRONMENTAL PRECAUTIONS	DO NOT DUMP ON THE GROUND OR INTO ANY BODY OF WATER.
CONTAINMENT AND CLEAN-UP	Mop up and containerize for subsequent recycling or disposal. Triple rinse empty containers with water prior to reconditioning.
OTHER INFORMATION	All disposal methods must be in compliance with all Federal, State, Local and Provincial laws, and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator.

SECTION 7: HANDLING AND STORAGE

PRECAUTIONS FOR SAFE HANDLING	Wash thoroughly after handling, immediately remove and dispose of any spillage. Immediately rinse contaminated clothing thoroughly with water. Rinse containers with water only.
CONDITIONS FOR SAFE STORAGE	Store in dry place at ambient temperatures apart from combustible and other readily oxidizable materials, food, beverage, and excessive heat. Rinse empty containers with water only.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS	Adequate general and mechanical exhaust ventilation.		
RESPIRATORY PROTECTION	None required under normal use conditions. If use conditions generate mists, wear a respirator with acid gas cartridges.		
SKIN PROTECTION	Wear protective gloves and other protective clothing as appropriate to prevent skin contact.		
EYE/FACE PROTECTION	Wear safety glasses with side shields. Wear chemical goggles if splashing is likely.		
EXPOSURE LIMITS/GUIDELINES	No occupational exposure limits have been established for this material.		
	RESULT	**OSHA 8 HR** mg/m^3	**ACGIH TLV 8 HR** mg/m^3
PARTICULATES NOT OTHERWISE REGULATED (PNOR)			
PARTICULATES NOT OTHERWISE CLASSIFIED (PNOC)			

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

COLOR	Clear, colorless to slightly turbid tan	MOLECULAR WEIGHT	NA
ODOR	None	ODOR THRESHOLD	None
pH VALUE	5-8	VAPOR PRESSURE	NA
MELTING POINT	NA	VAPOR DENSITY	Liquid
FREEZING POINT	≤ -10 F (-23 C)	RELATIVE DENSITY	1.39 – 1.48 @ 20 C
INITIAL BOILING POINT	218 F – 221 F	SOLUBILITY	Complete

FLASHPOINT	NA	PARTITION COEFFICIENT	NA
EVAPORATION RATE	NA	AUTO IGNITION TEMP.	None
FLAMMABILITY	NA	DECOMP. TEMP.	NA
UEL	NA	VISCOSITY	NA
LEL	NA		

SECTION 10: STABILITY AND REACTIVITY

REACTIVITY	NA
CHEMICAL STABILITY	Stable
POSSIBILITY OF HAZARDOUS REACTIONS	This product is incompatible with organic materials, reducing agents, chlorine or hypochlorite products, and caustic products.
CONDITIONS TO AVOID	Avoid evaporation to dryness. If allowed to dry, product residue is incompatible with flammable organic materials, reducing agents, and chlorine or hypochlorite products. This product is incompatible with caustic materials.
HAZARDOUS DECOMPOSITION PRODUCTS	Nitrogen oxides, ammonia

SECTION 11: TOXICOLOGICAL INFORMATION

INHALATION	ACUTE	Spray or mist may irritate respiratory tract.
	CHRONIC	There are no known chronic inhalation effects.
SKIN	ACUTE	May irritate the skin.
	CHRONIC	There are no known chronic dermal effects.
EYE	ACUTE	May irritate the eyes.
INGESTION	ACUTE	Ingestion of large amounts may cause violent gastroenteritis.
	CHRONIC	There are no known chronic ingestion effects.
LD50		>2000 mg/kg, oral (rat)
LC50		Not applicable
Acute Toxicity Estimate		>3900 mg/kg
CARCINOGENICITY/MUTAGENICITY		There are no known carcinogenic or mutagenic properties
REPRODUCTIVE EFFECTS		There are no known reproductive effects
NEUROTOXICITY		There are no known neurotoxic effects
OTHER EFFECTS		No other effects are known
TARGET ORGANS		Target organs include skin and eyes

SECTION 12: ECOLOGICAL INFORMATION

California Title 22 Acute Toxicity Screening Protocol:

Fish bioassay (96 hr.):

Test concentration, ppm	Survival, %
0	100
250	95
750	100

The products of biodegradation are non-toxic. This product does not show any bioaccumulation phenomena.

SECTION 13: DISPOSAL CONSIDERATIONS

SPILL/LEAK **PROCEDURES**	Only properly protected personnel should remain in the spill area; dike and contain spill; absorb or scrape up excess into suitable container for disposal; wash area with water. Stop or reduce discharge if it can be done safely.
CLEANUP	Mop up and containerize for subsequent recycling or disposal. Triple rinse empty containers with water prior to reconditioning.
REGULATORY **REQUIREMENTS**	Generators of waste material are required to evaluate all waste for compliance with RCRA and any local disposal procedures and regulations. NOTE: State and local regulations may be more stringent than federal regulations.
DISPOSAL	Material that cannot be used, or reprocessed for use, and empty containers should be disposed of in accordance with all applicable regulations. Product containers should be thoroughly emptied before disposal.

SECTION 14: TRANSPORT INFORMATION

LAND – DOT	**UN/NA IDENTIFICATION NUMBER:**	Not Applicable to unused finished product
	UN-PROPER SHIPPING NAME:	Not Applicable to unused finished product
	TRANSPORT HAZARD CLASS:	Not Applicable to unused finished product
	PACKING GROUP:	Not Applicable to unused finished product
	MARINE POLLUTANT:	Not Applicable to unused finished product
	HAZARD CLASS:	Not Applicable to unused finished product
WATER – IMO/IMDG	**UN/NA IDENTIFICATION NUMBER:**	Not Applicable to unused finished product
	UN-PROPER SHIPPING NAME:	Not Applicable to unused finished product
	TRANSPORT HAZARD CLASS:	Not Applicable to unused finished product
	PACKING GROUP:	Not Applicable to unused finished product
	MARINE POLLUTANT:	Not Applicable to unused finished product
AIR – ICAO/IATA *For product quantities less than 0.5 Kg*	**UN/NA IDENTIFICATION NUMBER:**	Not Applicable to unused finished product
	UN-PROPER SHIPPING NAME:	Not Applicable to unused finished product
	TRANSPORT HAZARD CLASS:	Not Applicable to unused finished product
	PACKING GROUP:	Not Applicable to unused finished product
	MARINE POLLUTANT:	Not Applicable to unused finished product

SECTION 15: REGULATORY INFORMATION

OSHA	Hazard Communication Standard: Not regulated.
OSHA	Process Safety Standard: No
CAA	Section 112r: No
CERCLA	Section 103: No RQ: None
SARA	Section 302: No; SARA Section 304: No; SARA Section 313: No
SARA HAZARD CATEGORIES 311/312	Not listed.
TSCA	The ingredients of this product are on the TSCA Inventory List.

SECTION 16: OTHER INFORMATION

DISCLAIMER:	The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the user thereof. It is the buyer's responsibility to ensure that its activities comply with federal, state, provincial and local laws.
REVISION INDICATOR:	Revision 0: (This SDS replaces the former MSDS for this product pursuant to OSHA 1910.1200(g) Appendix D. The MSDS for this product should be considered obsolete).

Municipal Services Original 06/14/10 Rev 2 - 01/31/14	**Bioxide® Solutions** **(Calcium Nitrate Tetrahydrate Solution and Ammonium Calcium Nitrate Solution)** **Spill Response Procedures**

MS-SRP-003 **Emergency Response Guide 140**

PURPOSE

The purpose of this procedure is to ensure that the correct guidelines and information are available for handling an accidental spill or release of Bioxide® Solutions. Products included in this procedure are: calcium nitrate tetrahydrate solution (CAS No: 13477-34-4), ammonium calcium nitrate double salt solution and Calcium Nitrate SB Solution (CAS No: 15245-12-2). It is intended to be available to all Evoqua employees that are involved in the operation of dosing sites where this chemical is stored.

A copy of this document should be made available at each chemical storage location and kept in a weather proof container with ease of access for operators and emergency response organizations.

SCOPE

This procedure will be maintained in accordance with Evoqua Water Technologies - Municipal Services Business Unit procedures.

RESPONSIBILITY

Evoqua Water Technologies - Municipal Services (EWT-Municipal Services)

EMERGENCY OVERVIEW

COLOR: Clear, colorless solution.

ODOR: Odorless.

SIGNAL WORD: Caution.

MAJOR HEALTH HAZARDS: May be harmful if ingested. May cause irritation to the skin, eyes, or respiratory tract.

PHYSICAL HAZARDS: Product may be slippery when wet. Do not allow spilled material to evaporate to dryness.

PRECAUTIONARY STATEMENTS: Wash thoroughly after handling, immediately remove, and dispose of any spillage. Immediately rinse contaminated clothing thoroughly with water. Rinse containers with water only.

NFPA: Health = 1 Fire = 0 Reactivity = 0

FIRE FIGHTING MEASURES: Use extinguishing agents appropriate for surrounding area. Consult the product MSDS/SDS for additional Information.

REPORTING REQUIREMENTS:

Evoqua Water Technologies requires that all spills and accidental releases be reported. An internal investigation will be conducted for all reported incidents.

1. **Evoqua Employees**
   Employees are required to report all spills of any magnitude to their supervisor immediately. The EWT-Municipal Services EHS Manager must be notified within six hours of the incident.

   NOTE! At a customer site the customer must be the one to call 911 or the local emergency response organization.

2. **Customers and Contractors**
   During normal working hours (8.00 – 5.00 local time) call the closest EWT-Municipal Services branch listed below or your local Evoqua Water Technologies representative if a number has been provided:

BRANCH LOCATION	CONTACT PHONE NUMBER
Canton, GA	(800) 445-4771
Cedar Park, TX	(800) 224-2450
Granite City, IL	(800) 887-8710
Sarasota, FL	(800) 345-3982
Temecula, CA	(800) 566-1568
Wilmington, DE	(800) 566-4208

AFTER HOURS ASSISTANCE: Call the Branch Toll Free number for instructions or your local Evoqua Water Technologies representative if a number has been provided.

IF YOU ARE UNABLE TO REACH A LOCAL CONTACT CALL EVOQUA WATER TECHNOLOGIES CENTRAL EMERGENCY REPORT LINE AT (877) 873-4732 FOR ASSISTANCE.

If requested a Evoqua Water Technologies responder will proceed to the site. The responder will report to the Incident Commander and offer assistance as necessary.

REGULATORY AUTHORITIES

Spill should be evaluated to see if it meets or exceeds reportable quantities.

DURING AN EMERGENCY INCIDENT

When working in and around the spill area and/or the chemical storage area the following personal protective equipment (PPE) will be worn as a minimum and without exception.

EYE AND FACE PROTECTION

- Safety glasses with side shields or chemical safety goggles (face shield should also be available and worn in addition to safety glasses or goggles where splashing or spraying is a possibility).
- Hard hat should be available and worn if required.

SKIN PROTECTION

- Protective clothing including protective gloves as appropriate to prevent skin contact.
- Steel-toed safety shoes/ boots, rubber soled or with rubber overshoes/ boots.

RESPIRATORY PROTECTION

- None required under normal use conditions. Consult the product MSDS/SDS for additional information.

EMERGENCY PROCEDURE FOR ACCIDENTAL RELEASE:

Upon finding a leak or spill situation, if at all possible, slow or stop the leak and turn off any dosing equipment involved. This should be done only when your personal safety will not be compromised.

1. Isolate the spill area and deny entry to unnecessary or unprotected personnel.
2. Remove all sources of ignition, such as flames, hot glowing surfaces, or electric arcs.
3. If necessary, create a dike or trench to contain all liquid material. Every effort should be made to prevent spilled material from entering sewer systems, streams, culverts, or other bodies of water.
4. Contain the spill to as small an area as can be controlled, then make the emergency call as detailed above.
5. If any vapors or gas can be seen or smelled, leave the area immediately and wait for assistance. Stand up wind and keep all unnecessary personnel away from the spill area until the emergency response team arrives.
6. Upon arrival of the Police or Fire department give them a copy of the MSDS/SDS for the product involved.
7. The spill area should be blocked off from pedestrian and vehicle traffic. The Police or Fire department should assume responsibility for this.
8. Once Emergency response teams are on the scene offer your help until a trained Evoqua Water Technologies representative arrives, take notes as much as possible, and do not try to commit all of the details to memory. With Customer's permission take pictures of the affected area.
9. If news media are present be courteous, however, do not elaborate on the spill or incident. You are not trained to handle the media and should decline any attempts by the media to interview you on camera or quote you for publication.

10. At some point a trained person from Evoqua Water Technologies or the environmental contractor's emergency personnel will communicate with the media if required.

CLEAN UP:

Cleanup personnel must wear proper protective equipment.

Each spill must be handled depending upon the circumstances surrounding the site, i.e. quantity involved, ground condition, and proximity to a water course, sewer, or other outlet.

1. For contained spill material follow the guidelines listed below for "Liquid Spill Residue".

   Note: Spill material should not be returned to EWT-Municipal Services without prior consultation with EWT-Municipal Services management.

2. If the solution has filtered into the ground, and there is no surrounding water course, the area can be washed down with water to dilute and reduce the activity of the material. If large quantities of material are spilled onto the ground please consult with Evoqua Water Technologies EHS department to determine whether a HAZMAT response team should be dispatched to the site to evaluate remediation options.

3. If the solution has filtered into the ground, and the spill site is in close proximity to a water course contact your EHS Manager immediately as regulatory notifications may be required.

LIQUID SPILL RESIDUE:

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 Systems (NPDES) permit and the permitting authority has been notified in writing prior to the discharge.

Spilled materials may be absorbed with inert materials such as dry sand, soil, or non-flammable commercial absorbents.

1. Small spills; defined as less than 5 gallons of material may be diluted with large amounts of water and washed down the sanitary sewer, ONLY with prior approval from the Customer and/or the Waste Water Treatment Plant for that area.

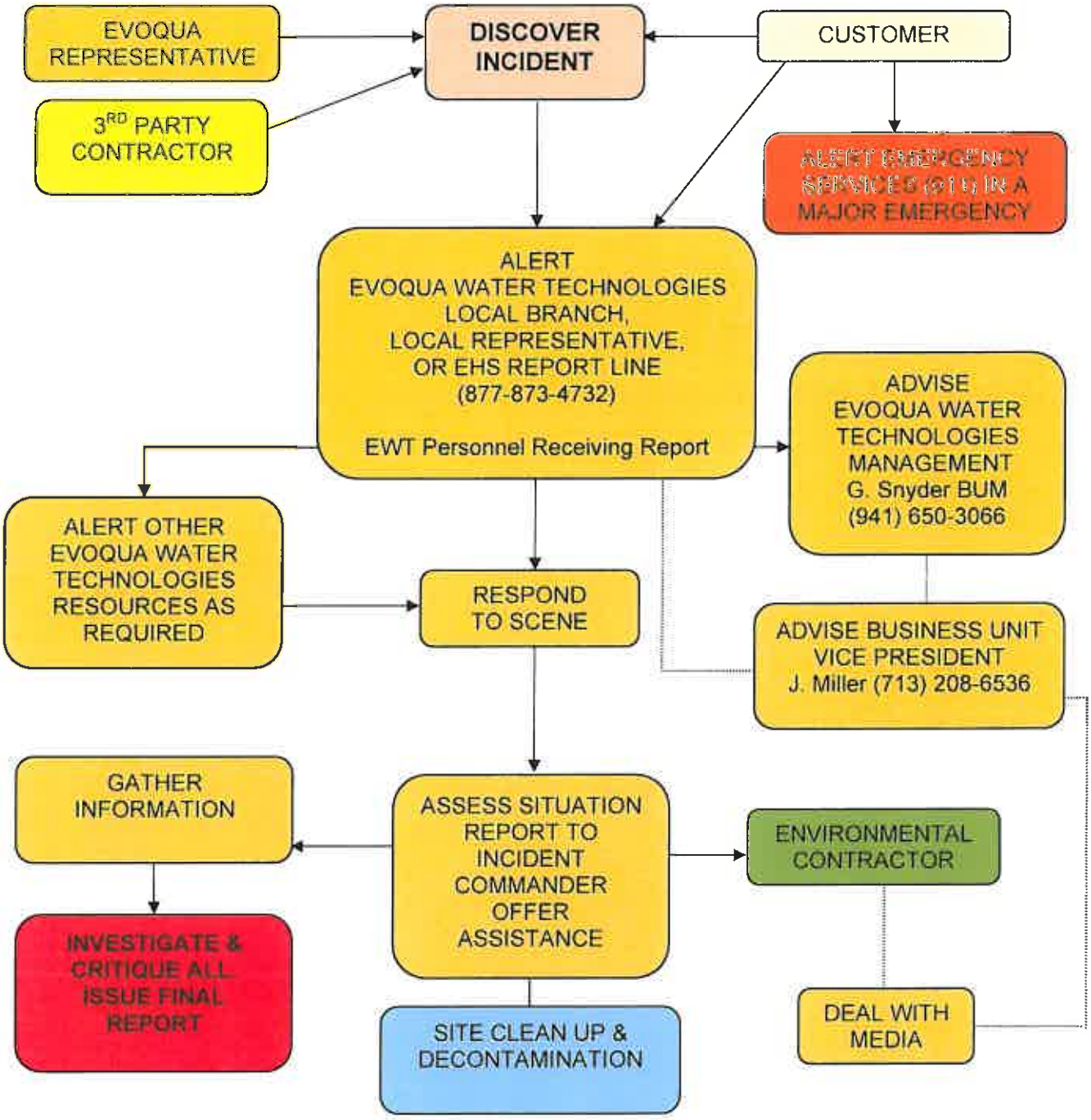
2. Medium spills: defined as more than 5 gallons and less than 50 gallons of material may be diluted with large amounts of water and washed down the sanitary sewer, ONLY with prior approval from the Customer and/or Waste Water Plant for that area.

3. Large spills: defined as more than 50 gallons of material that can be contained as liquid should be diluted with a large volume of water and discharged into a suitable treatment system in accordance with all regulatory agencies.

DISPOSAL OF SPILL RESIDUES:

All disposal of spill material must be done in accordance with local, state and federal regulations. Waste characterization and compliance with disposal regulations are responsibilities of the waste generator.

REPORTING REQUIREMENT DURING AN INCIDENT/ ACCIDENT/ OR CHEMICAL RELEASE AT A CUSTOMER SITE



EVOQUA
WATER TECHNOLOGIES

ENGINEERING LETTER A-214
APPLICATION OF BIOXIDE®
SULFIDE PREVENTION VS. SULFIDE REMOVAL (BIOXIDE PROCESS®)

Introduction

It is known that bacteria commonly present in wastewater collection systems will use dissolved oxygen, nitrate, and sulfate as oxygen sources for respiration, in that order of preference. Dissolved oxygen is usually present in "fresh" wastewater, but is rapidly depleted by biological activity. There is typically very little nitrate present in the wastewater, while sulfate is typically abundant. Since little or no nitrate is available, the bacteria begin utilizing sulfate when the dissolved oxygen is depleted. The byproduct of the sulfate uptake process is dissolved sulfide. The dissolved sulfide combines with hydrogen ions to form hydrogen sulfide, causing odor and corrosion problems.

Nitrate can be added to wastewater to control dissolved sulfide. There are two mechanisms by which nitrate can be used to provide this control. It can be used as a substitute oxygen source to prevent sulfate uptake and thus the formation of sulfide. This mechanism is known as "sulfide prevention". Nitrate can also be used to remove existing sulfide via the "removal" mechanism, which is also known as the Bioxide® Process.

It has been well established that the Bioxide® Process is effective for continuous removal of existing dissolved sulfide in wastewater systems. The stoichiometric nitrate requirement for the Bioxide® Process is 2.4 pounds NO_3-O per pound of sulfide removed (Hunniford, 1990). There is no direct relationship between the amount of sulfide treated and the amount of nitrate applied for the prevention mechanism, however empirical data indicate a nitrate to sulfide mass ratio of ten-to-one (Bowker, et al, 1985). The following information is presented as a comparison of the processes and an explanation for the differences in application rates.

Process Description and Comparison

Prevention: The prevention mechanism uses oxygen-source substitution to prevent the formation of dissolved sulfide. Under "untreated" conditions a carbon source (BOD) is consumed by bacteria in the wastewater in the presence of sulfate-oxygen, producing sulfide. If a single carbon source (methanol) is assumed for simplicity, the resulting reaction is as follows:

$$SO_4^{=} + 4CH_3OH \rightarrow S^{=} + 4H_2O + 2CH_4 + 2CO_2$$

In this process 0.25 moles sulfate are used and 0.25 moles of dissolved sulfide are produced for every mole of carbon consumed.

This process is prevented when nitrate is added to the wastewater. In the presence of nitrate the carbon source is consumed via an anoxic denitrification reaction, producing no sulfide. Again assuming a single carbon source (methanol) for simplicity, the reaction is as follows:

$$6NO_3^{-} + 5CH_3OH \rightarrow 5CO_2 + 3N_2 + 7H_2O + 6OH^{-}$$

In this process 1.2 moles of nitrate are used and zero moles of sulfide are produced for every mole of carbon consumed.

Expressing the nitrate requirement on an amount of sulfide prevented basis for these assumed reactions: (1.2 moles nitrate/mole carbon)/ (0.25 moles sulfide/mole carbon) = 4.8 moles nitrate required per mole sulfide prevented. On a mass basis, 9.3 pounds NO_3, or 7.2 pounds NO_3-O, are required per pound of sulfide.

The above analysis shows a "best-case" scenario for the prevention mechanism. In actual field applications higher carbon consumption (BOD reduction) rates are typically observed under anoxic conditions then under anaerobic conditions, therefore the nitrate-oxygen used is typically somewhat higher than the amount predicted here.

Removal: The removal mechanism (Bioxide® Process) uses naturally occurring bacteria to biochemically oxidize dissolved sulfide in the presence of nitrate. This mechanism takes place when Bioxide® is applied in wastewater that contains dissolved sulfide. The sulfide is typically either 1) generated upstream of the Bioxide® injection point, where no nitrate exists in the wastewater, or 2) is contributed downstream via a septic lateral flow. Then nitrate is injected in sufficient quantities to biochemically oxidize the sulfide via the following reaction (Hunniford, 1990):

$$8NO_3^- + 5H_2S \rightarrow 5SO_4^{=} + 4N_2 + 4H_2O + 2H^+$$

This reaction takes place in the bulk flow and in the upper zones of the slime layer. Nitrate is not added in sufficient quantities to fully saturate the slime layer; therefore sulfide production continues to occur in the lower zones of the slime and is removed in the upper zones or in the bulk flow.

In this process 1.6 moles of nitrate are used for every mole of sulfide removed. On a mass basis, 2.4 pounds NO_3-O is required per pound of sulfide.

Summary

In this comparison it is readily observed that the amount of nitrate required to achieve a sulfide-free condition is *at least three times greater* for the prevention mechanism than for the Bioxide® Process. An application rate of 2.4 pounds NO_3-O per pound of sulfide (0.7 gal. Bioxide® per lb. sulfide) is necessary for the Bioxide® Process while at least 7.2 pounds NO_3.O per pound of sulfide (2.1 gal. Bioxide® per lb. sulfide) are required for the prevention mechanism

This analysis and comparison shows the advantages of maximizing the use of the removal mechanism when applying Bioxide®. Maximizing this mechanism can usually be achieved through careful selection of the application point for the Bioxide® solution. Each wastewater collection system is unique and presents its own set of environmental conditions which affect the injection point selection.

For a free analysis and review of your collection system followed by a Bioxide® application point recommendation, consumption rate prediction, and no-risk product demonstration, please contact the Siemens's Representative in your area by calling 1-800-345-3982.

References:

Hunniford, David J., (1990), Control of Odors and Hydrogen Sulfide Related Corrosion in Municipal Sewage Collection Systems Using a Biochemical Process: Bioxide®, WPCF 63rd Annual Conference, Washington D.C.

Bowker, Robert P. G., and John M. Smith, (1985), Design Manual, Odors and Corrosion Control in Sanitary Sewerage Systems and Treatment Plants, U.S. Environmental Protection Agency, Cincinnati, OH.

Technical Paper

"CONTROL OF ODORS & HYDROGEN SULFIDE RELATED CORROSION IN MUNICIPAL SEWAGE COLLECTION SYSTEMS USING A BIOCHEMICAL PROCESS: BIOXIDE®"

Presented at the 63rd Annual WPCF Conference
October 9, 1990

By
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Director Technical Services
Davis Water & Waste Ind.,
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DAVIS WATER & WASTE INDUSTRIES, INC.®

CONTROL OF ODORS & HYDROGEN SULFIDE RELATED CORROSION IN MUNICIPAL SEWAGE COLLECTION SYSTEMS USING A BIOCHEMICAL PROCESS:

BIOXIDE®

continued

INTRODUCTION

A novel approach to cost effective treatment of severe odor and corrosion problems arising from anaerobic conditions in municipal wastewater collection systems has been developed and perfected by Davis Process. This recently patented treatment, called BIOXIDE®, utilizes the metobolic activity of naturally occuring bacterial organisms in wastewater to eliminate and prevent production of many odor causing compounds; including hydrogen sulfide, mercaptans, and related reduced sulfur containing products of septic sewage conditions.

When applied properly this biochemical treatment process can reduce dissolved hydrogen sulfide to < 0.1 mg/L in sewage streams containing as much as 50 mg/L or more prior to treatment. Dissolved hydrogen sulfide reduction to this degree can in turn provide effective control of related odor and corrosion problems.

Numerous field evaluations have demonstrated that BIOXIDE® is a cost competitive alternative to other established treatments; including hydrogen peroxide, air injection, and metal salts.

This technical paper reviews the requirements for successful application of this process and results of numerous case histories which prove it a cost effective means for system wide odor/corrosion control.

BACKGROUND

The BIOXIDE® process utilizes "liquid phase" treatment to effectively eliminate the presence of dissolved hydrogen sulfide and related odor causing compounds. By attacking the source of odor, corrosion, and safety problems caused by these compounds when released to the "gas phase" or atmosphere within the sewer BIOXIDE® efficiently treats these major collection system problems.

Figure I illustrates how under anaerobic conditions (DO <1) sulfate, SO_4^{2-}, is used as an oxygen source by sulfate reducing bacteria contained within the slime layer and converted to hydrogen sulfide.

Due to its low molecular weight hydrogen sulfide readily leaves the sewage as a gas. Figure II shows the vapor/liquid equilibrium favors gas evolution to an extreme degree; 1 ppm dissolved H_2S will not achieve equilibrium with the vapor phase until it reaches over 100 ppm. As Figure II shows severe toxic conditions can occur with relatively low sewage concentrations. BIOXIDE® reduces such safety problems by eliminating the cause, dissolved hydrogen sulfide.

Similarly, the severe corrosion of concrete and metal sewer structures caused by the biological formation of sulfuric acid from the gaseous hydrogen sulfide can be significantly inhibited by BIOXIDE® treatment of the sewage. It is not uncommon for major portions of wastewater collection systems to fail within 5% of their designed lifetime due to sulfide induced corrosion. Recently the EPA estimated that nationally over one billion dollars of sewer infrastructure repairs are needed. It is likely hydrogen sulfide has been a prime cause of such deterioration.*

Therefore by treating the source of hydrogen sulfide and other "septic" wastewater odor compounds BIOXIDE® effectively minimizes related corrosion and safety problems while preventing odor problems.

DAVIS WATER & WASTE INDUSTRIES, INC.®

*1989 EPA Needs Survey, EPA Publication 430/9-84-011.

BIOXIDE® TREATMENT MECHANISM:

BIOXIDE® removes dissolved hydrogen sulfide from wastewater via a biochemical process which converts the sulfide to sulfate. The process utilizes the inherent ability of a type of facultative bacteria normally present in wastewater to "metabolize" hydrogen sulfide and other reduced sulfur containing compounds. Typically the proper sewage "conditions" required for this biological activity do not exist to any significant degree within a wastewater collection system.

This deficient sewage condition or more specifically a lack of required "nutrients", primarily a stable oxygen source via nitrate ion, can be altered by the proper addition of the BIOXIDE® treatment solution to the wastewater. The primary constituent of this aqueous solution is nitrate-oxygen, NO_3-O, which provides the normally lacking oxygen source necessary for the subject biochemical mechanism.

Figure III illustrates how this process can be applied to remove dissolved hydrogen sulfide and prevent its further production. As this is a biochemical rather than strictly a chemical process reaction time is not "instantaneous"; typically two hours is required for completion. Note the reaction mechanism shows that the bacteria, likely Thiobacillus denitrificans, utilize the nitrate oxygen and as part of their metabolism oxidize the hydrogen sulfide to sulfate and produce nitrogen gas. Based upon the stoichiometry of this reaction 2.4 lbs NO_3-O are required to oxidize 1 lb of hydrogen sulfide.

Figure IV summarizes a series of laboratory experiments conducted in the development of this process which established this as a predictable mechansim. Note the initial "incubation" period, typically 12-48 hours, is significantly greater than the minimum "ongoing" reaction time of two hours. These lab results have been confirmed in numerous full scale collection system applications.

Since the species added to the wastewater via BIOXIDE® are chemically stable, "altering the environment" of a large collection system to establish widespread treatment can be accomplished with minimal application points. The resulting anoxic conditions of the treated collection lines provide for continuous removal of dissolved sulfide contributed by untreated side streams and preventation of further downstream sulfide formation. Because this is a biological action the treated wastewater BOD is lowered, the magnitude or significance of which is dependent on the amount of sulfide treatment.

APPLICATION OVERVIEW:

Based on the established mechanism and field experience the following collection system characteristics are necessary for successful odor control application of this process:

1. Normal Biological Activity: the vast majority of domestic wastewaters will meet this criteria. Potentially some industrial wastewaters with pH outside the 6-8 range or containing some biologically toxic substances could not be treated.

2. Detention Time over 2 hours: BIOXIDE® application must occur such that a reaction period of 2 hours or more is provided. This makes BIOXIDE® a particularly effective treatment technique for long detention time force mains/ interceptors since one application point can control days of detention time problems.

To provide cost effective odor control and avoid effecting the wastewater treatment plant in any adverse manner successful application of BIOXIDE® requires a detailed knowledge of the collection system to match application rates to sulfide demand.

Figure V shows a typical feed/storage system used by Davis. The BIOXIDE® solution is metered into the wastewater stream via variable stroke, positive displacement bellows pumps. Typically the run time of these pumps is controlled by a timer to match feed to

established flow rates, detention times, and sulfide concentrations of wastewater streams to be treated. BIOXIDE® is supplied in drum or bulk depending upon site and feed requirements.

In order to sufficiently alter the collection system "environment" with the minimum quantity of BIOXIDE® solution an extensive survey of the system must be conducted to establish the "demand" criteria. Once some basic system information (see Figure VI) has been expanded into a true characterization of the odor problem (see Figure VII) then a cost effective application design is established. Thereby a signficant nitrate "residual" in the WWTP influent is avoided and odor control results per treatment dollar are maximized.

A secondary application criteria is that nitrogen gas release predominately occur prior to processing of treated sewage under quiesscent conditions (grit removal/clarifiers). This will avoid solids rising to the water surface with the nitrogen gas bubbles.

By properly designing a BIOXIDE® odor control system the natural biological process is capable of treating and preventing the source of most problem sewage odors throughout a severly affected collection system without any adverse effects. The following case history information provides examples of such.

BIOXIDE® VS OTHER TREATMENTS

Chemical treatment is the most prevalent form of sewage treatment for odor and sulfide corrosion problems because of its ability to effectively treat the liquid phase. But certain aspects of each chemical treatment give BIOXIDE® a basis for being considered as an alternative, especially when wide spread or severe collection system problems exist.

Oxidizers such as hydrogen peroxide, chlorine, or permanganate can rapidly convert hydrogen sulfide to sulfate, but their inherent strong reactivity is not sulfide specific which prevents cost effective treatment of sewage lines with hours of detention time. Additionally their reactive and/or toxic nature cause them to hazardous to handle/ store in residential areas.

Precipitants such as iron or zinc salts rapidly convert hydrogen sulfide to insoluble metal sulfides. While more stable in the sewage matrix than the oxidizers and less hazardous, feed rates may be limited by treatment plant constraints. Additionally, no odor control benefits beyond hydrogen sulfide are provided.

Caustic treatment to elevate pH is not a practical solution for large scale problems due to the hazards of harming the downstream biological process.

BIOXIDE®, due to it's biochemical mechanism can treat sulfide problems at their source without being costly and prevent septic conditions which produce the odors. Because it enhances biological activity downstream problems are less likely. And the solution is relatively safe to handle and store; it is not classified as an oxidizer or corrosive (nor is it classified as a hazardous substance by the CERCLA List).

Effective biological treatment via oxygen injection or bacteria addition for any sizeable problem is normally not practical because of "instability" under septic sewage conditions and dosage problems. Since BIOXIDE® provides for a stable, easily dosed means of changing the biological environment of the sewer it can cost effectively treat septic conditions.

Air Treatment via scrubbing or spraying is attractive from an operating cost standpoint when comparing the cost of treating a few isolated points in a collection system. but when system wide odor control is needed or corrosion is a problem air treatment can not solve the problem. BIOXIDE® is a practical solution because it treats and prevents such problems at their source.

CASE HISTORY REVIEW

The BIOXIDE® process has been proven capable of solving wastewater odor problems in a variety of systems around the country; from single force mains with only 0.02 MGD to entire collection systems with 7 MGD. In most cases the objective was to reduce and maintain dissolved hydrogen sulfide to <1.0 ppm, and in some instances <0.1 ppm. The following project reviews document that BIOXIDE® has achieved these treatment goals with pre-treatment concentrations in excess of 50 ppm and detention times exceeding 7 days.

WEATHERBY LAKE, MO

This lake front community collects approximately 0.25 MGD of wastewater via a small diameter, low pressure collection system. The entire flow is eventually conveyed to one large pump station before being pumped into a larger regional wastewater system. To prevent odor complaints from the community concerning the U Cove Pump Station hydrogen peroxide was fed at four points upstream. During July 1990 a test of BIOXIDE® was initiated to determine if more cost effective treatment could be achieved.

Addition of BIOXIDE® at three upstream points (total feed = 21 gpd) reduced dissolved hydrogen sulfide from 15 ppm to < 0.1 ppm.

The feed rate required matched the predicted amount (0.25 MGD x 15 ppm x 8.34 x 2.4 x 1/3.5 = 21 gpd BIOXIDE®). The nearly "closed" system prevented significant loss of hydrogen sulfide prior to the pump station so predicted amount matched actual.

The cost of BIOXIDE® treatment relative to hydrogen peroxide was 60% less. Based upon this BIOXIDE® replaced peroxide as the permanent treatment.

NASHVILLE, TN

A long force main, detention time = 20 hrs., which discharged at the Dry Creek WWTP was being treated with hydrogen peroxide eight hours upstream in order to maintain dissolved hydrogen sulfide < 1 ppm at its discharge. During July 1990 BIOXIDE® was tested as a possible alternative treatment.

Following a two week trial it was established that 245 gpd of BIOXIDE® treatment was required to maintain < 0.1 ppm dissolved hydrogen sulfide at the WWTP (based upon 2.5 MGD sewage flow and 18 ppm H_2S predicted feed was 257 gpd). The daily BIOXIDE® cost at this rate was 30% less than peroxide requirements to achieve equivalent treatment. Subsequently BIOXIDE® is being used on a regular basis.

AUSTIN, TX

A force main with nearly a 7 day detention time discharged wastewater containing over 50 ppm dissolved hydrogen sulfide at times. Addition of 7.5 gpd of BIOXIDE® at the pump station reduced downstream H_2S to < 1 ppm. Additionally the BOD of the 0.017 MGD flow was reduced 60%.

Additional references and case history information is available upon request.

SUMMARY

BIOXIDE® should be considered for treatment of severe/widespread municipal wastewater collection odor and/or corrosion problems because:

1. Problems are prevented by biological processes early on in the system.
2. Extensive field use has established it economically attractive.
3. Process characteristics are inherently safe relative to many alternatives.

Figure I

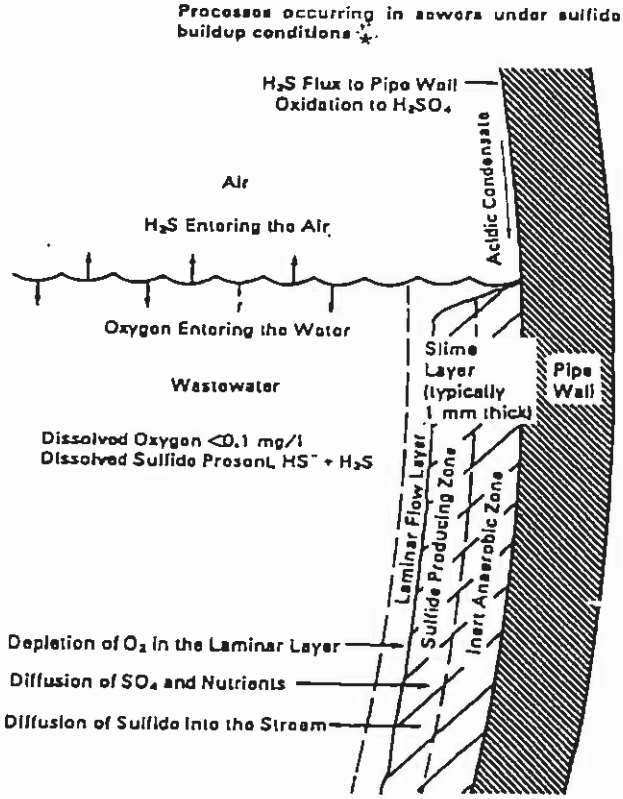
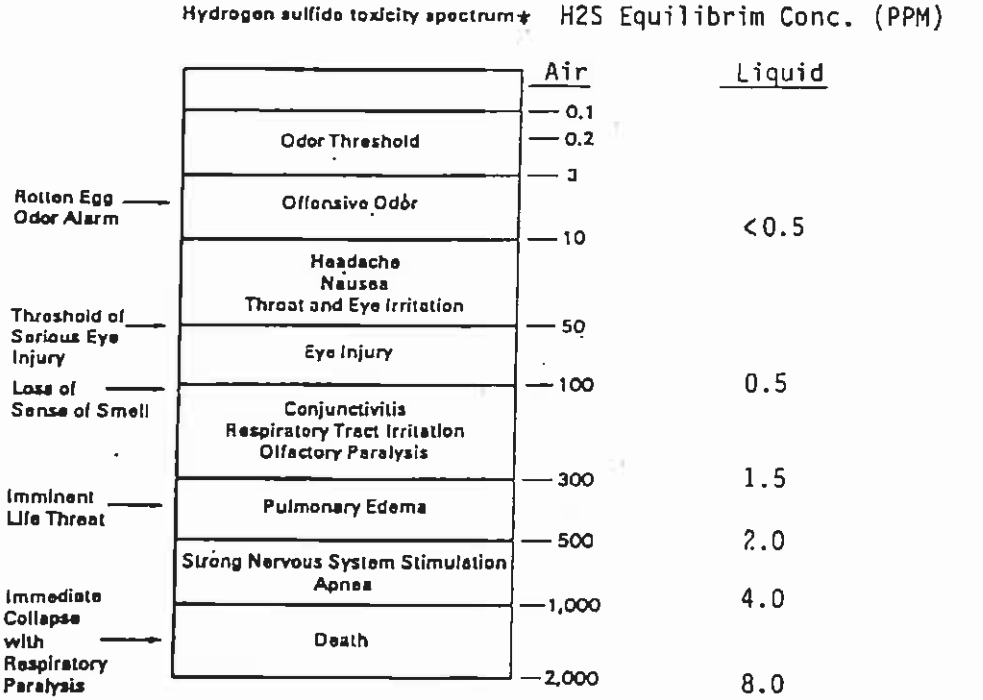
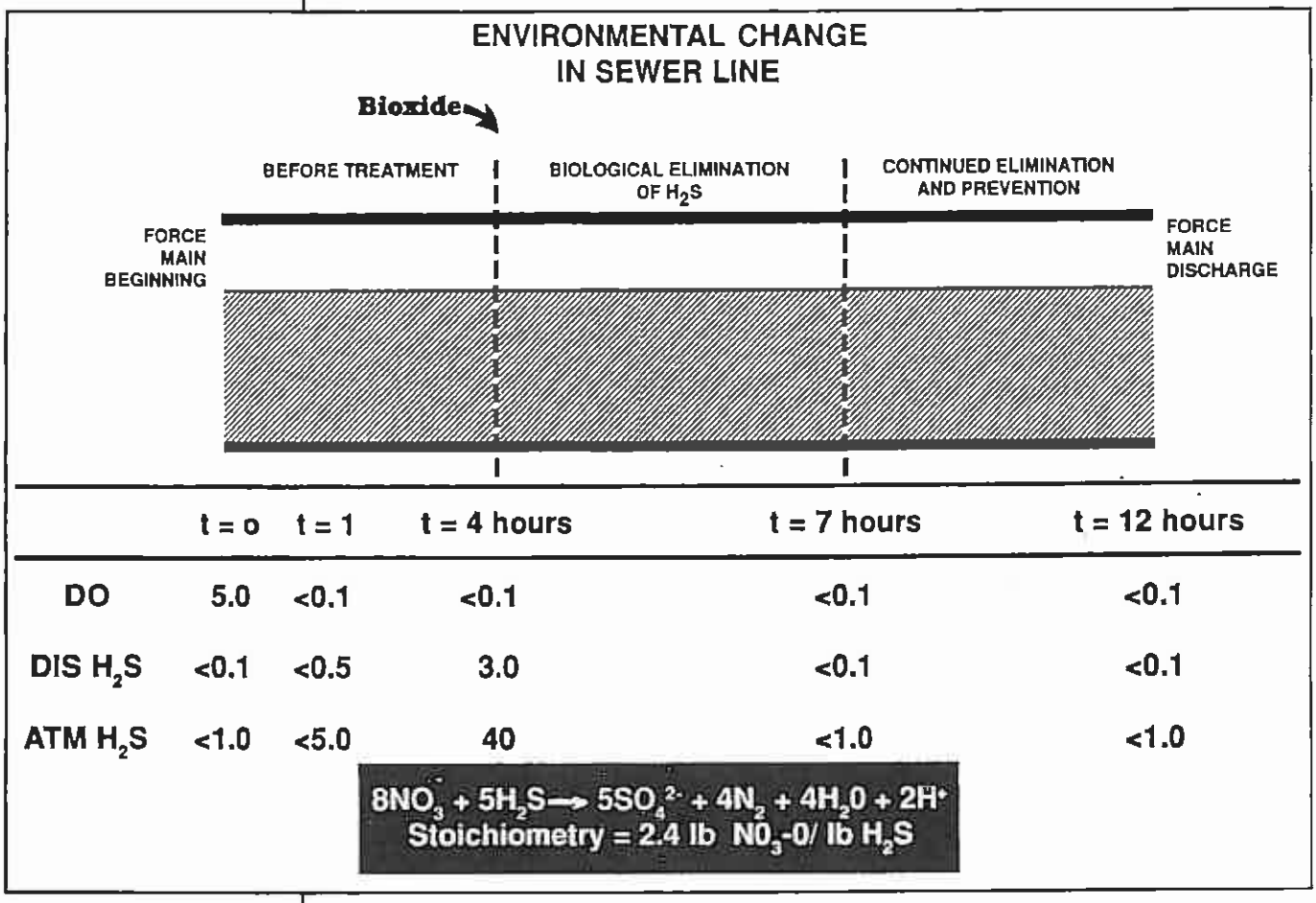


Figure II



*Reproduced in part from EPA Design Manual 625/1-85/018



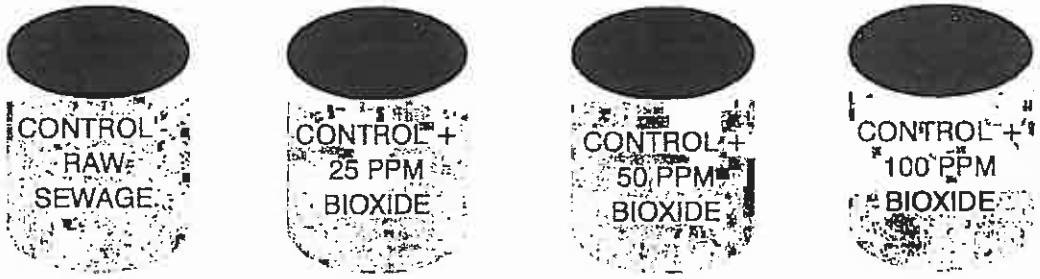
	t = o	t = 1	t = 4 hours	t = 7 hours	t = 12 hours
DO	5.0	<0.1	<0.1	<0.1	<0.1
DIS H_2S	<0.1	<0.5	3.0	<0.1	<0.1
ATM H_2S	<1.0	<5.0	40	<1.0	<1.0

$$8NO_3^- + 5H_2S \rightarrow 5SO_4^{2-} + 4N_2 + 4H_2O + 2H^+$$

Stoichiometry = 2.4 lb NO_3-0/ lb H_2S

Figure III

Lab Experiment Results



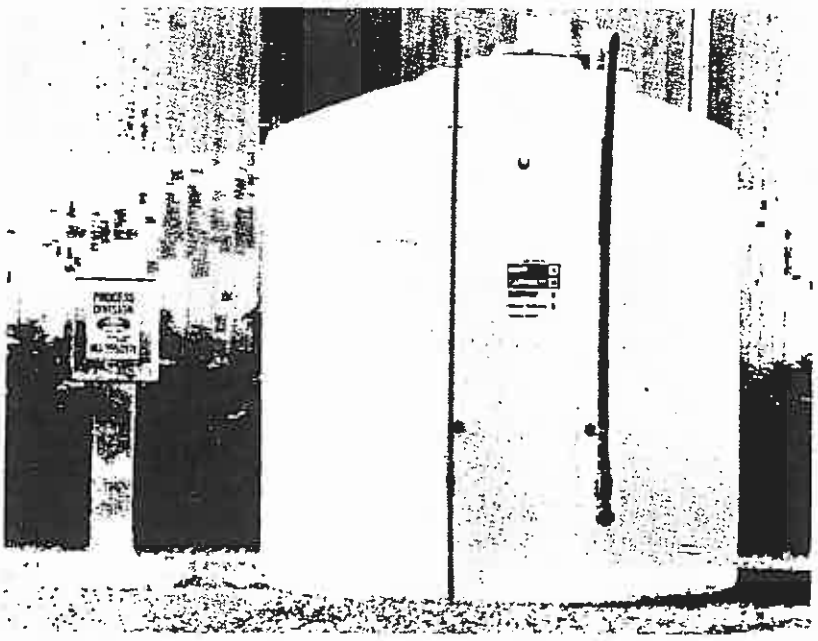
Dissolved H_2S (ppm)

t=0 - Add 20 ppm H_2S to each				
t=4 hrs.	20	20	20	20
t=20 hrs.	18	9	0	0
t=24 hrs. - Add 20 ppm H_2S to each				
t=27	37	28	19	0

Figure IV

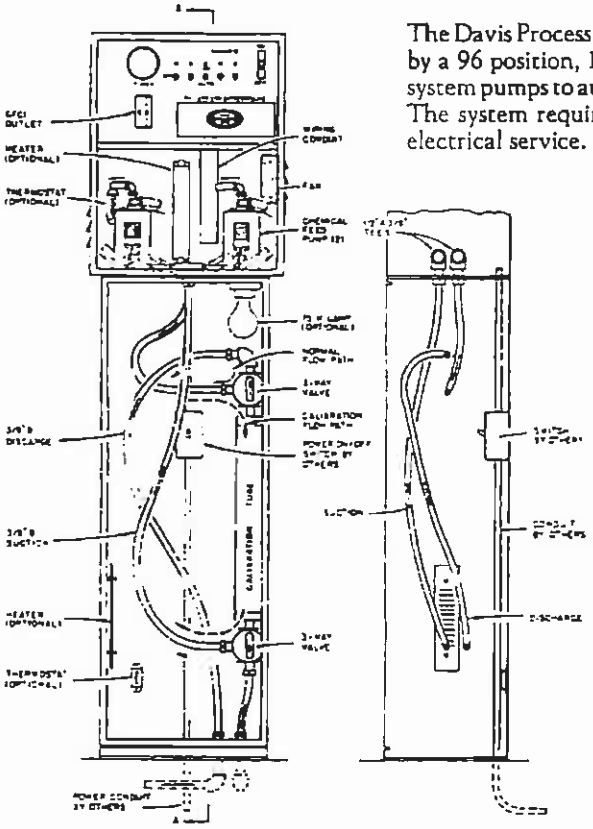
Figure V

ABOVE GROUND BIOXIDE® STORAGE



CONTROL UNIT

The Davis Process Control Unit is activated and programmed by a 96 position, 15 minute increment timer which enables system pumps to automatically turn on and off by timed cycle. The system requires 115 volt, 60 Hz, 15 amp, single phase electrical service.



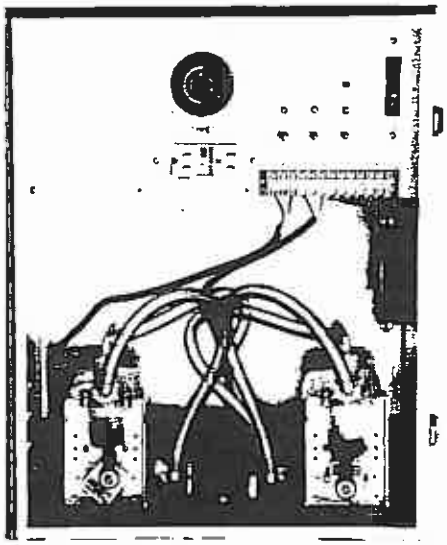


Figure VI

COLLECTION SYSTEMS FLOW DIAGRAM

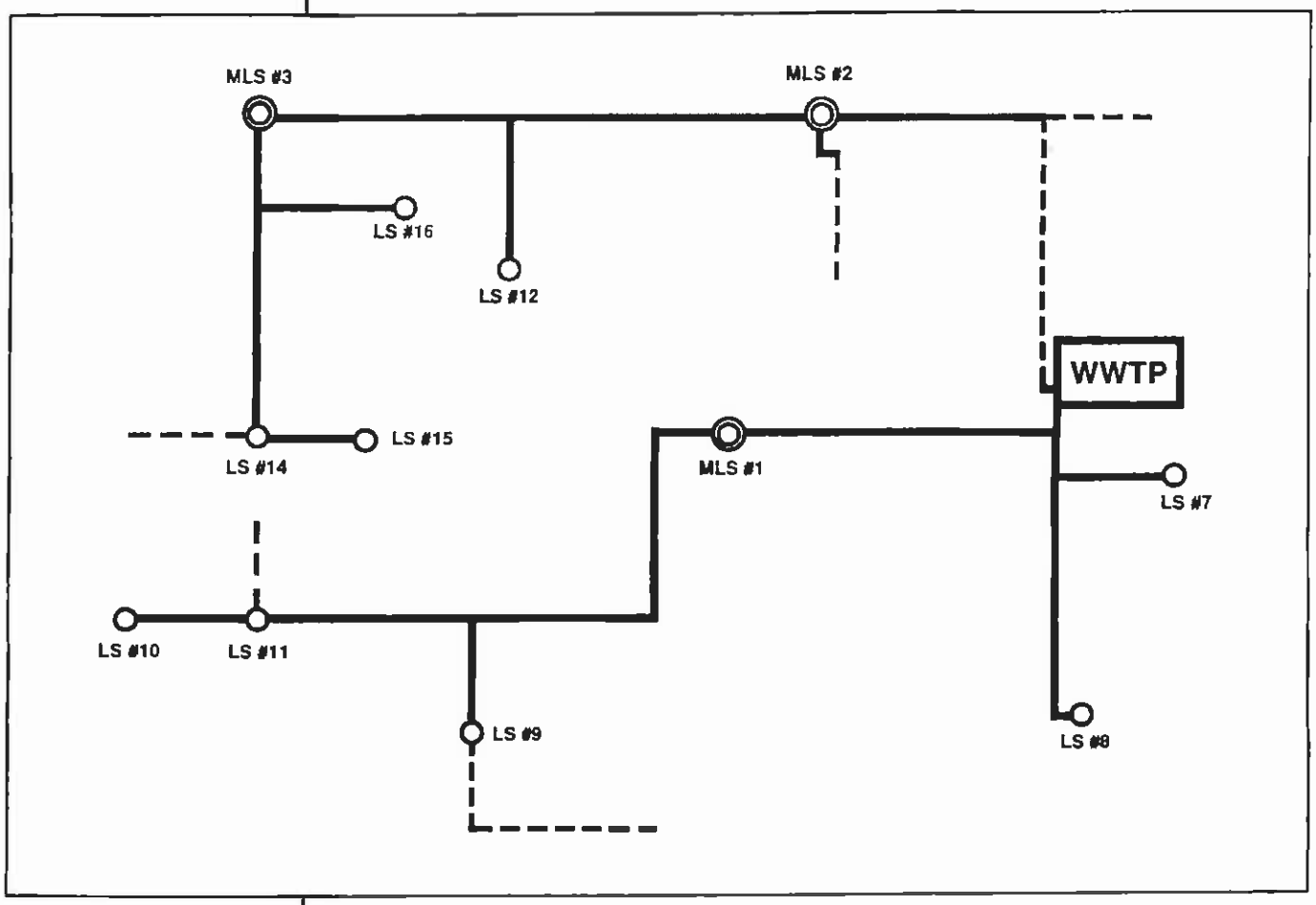
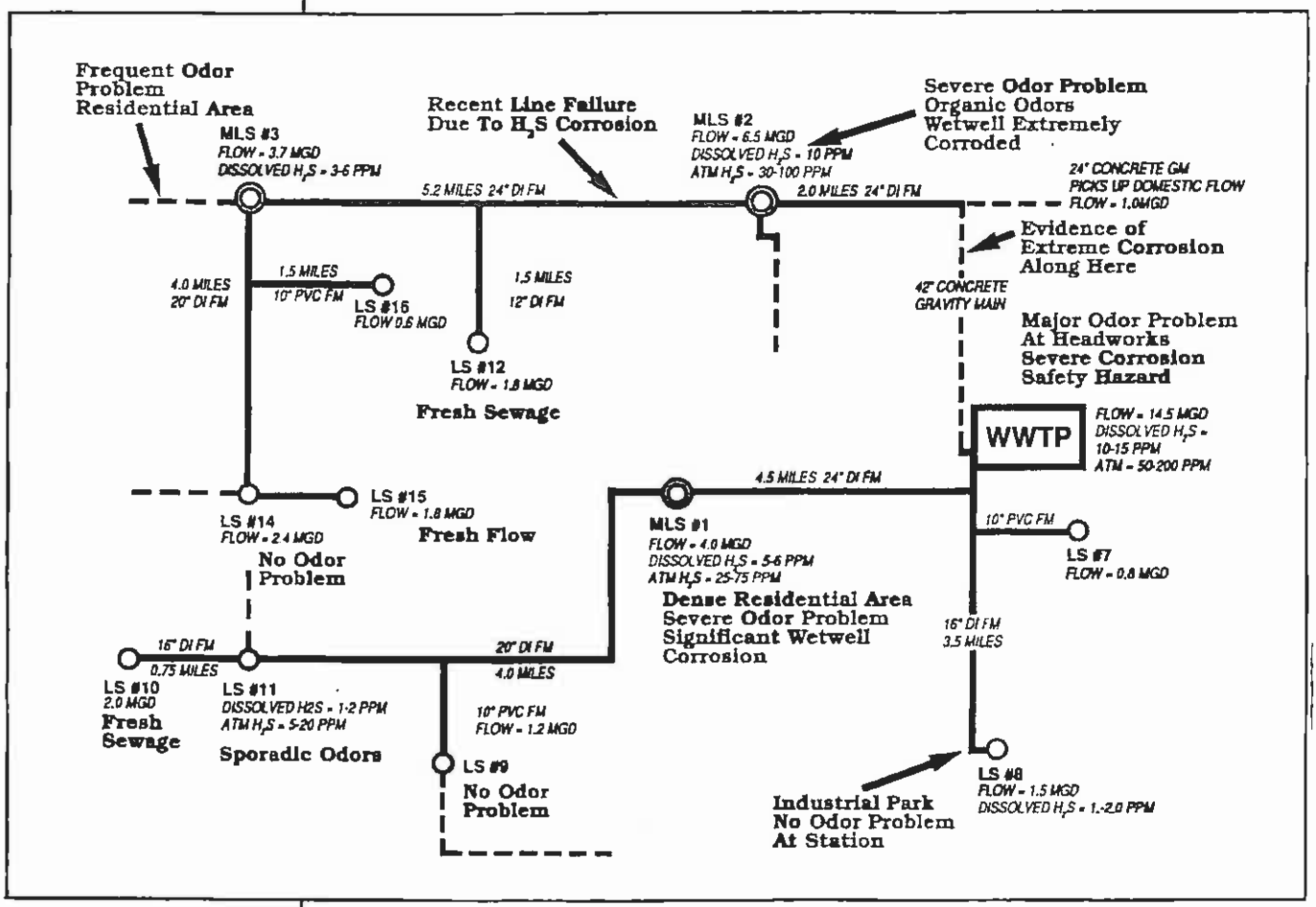


Figure VII

COLLECTION SYSTEMS FLOW DIAGRAM



A REVIEW OF INTERNET MONITORING AND CONTROL TECHNOLOGY UTILIZED BY EVOQUA WATER TECHNOLOGIES IN LIQUID PHASE ODOR CONTROL APPLICATIONS

By Samer El Ajouz, Mike Murphy, Tim Matheis, Jim Harshman and David Morano

ABSTRACT

This paper presents various means being utilized by Evoqua Water Technologies using wireless cellular and internet technology to achieve better and more efficient odor control, enhance return-on-investment (ROI) and offer customers transparency and freedom of changing feed rates.

Control of odor and corrosion due to hydrogen sulfide (H_2S) in sewage collection systems is not a new requirement, but new technology is continually being developed that allows more effective and economical control. The typical sewage flow patterns present in municipal collection systems are not conducive to the traditional methods of dosing liquid phase odor control (LPOC) products, namely feeding at a fixed rate and simple flow pacing.

Advanced process control systems have been developed to specifically account for the dynamic nature of H_2S generation in sewage force mains and gravity interceptors. As a result, this "dose to demand" technology generates a unique LPOC product dose profile that tracks the daily, weekly and monthly fluctuations in key sewage parameters that dictate degree of septicity in the portion of the sewer requiring odor control. An effective dose to demand system is tailored to the specific project requirements and is composed of various information technology components including cellular enabled internet controlled:

- Remote storage tank monitors
- Advanced dosing controllers
- Hydrogen Sulfide in-sewer monitors

This paper will summarize the above proven and emerging examples/capabilities of these various process control components and their integration to create real time internet dose to demand systems. As well as the benefits of this technology such as improved shipping, logistics, inventory management, customer access to data and remote process control.

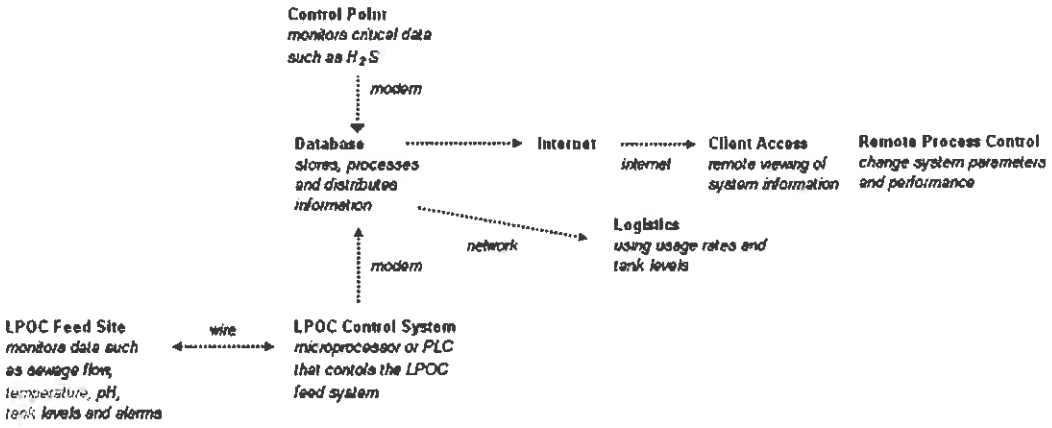
KEYWORDS

VersaDose®, VersaDose® LT, VaporLink® Hydrogen Sulfide Monitor, Tank Monitor, Internet Monitor and Control, Web Enabled Odor Control, Corrosion Control, Liquid Phase Odor Control

BACKGROUND

Each of the six Evoqua Water Technologies service centers is responsible for a defined territory in the United States. The service centers coordinate chemical deliveries with the regional storage locations to keep all of the LPOC pumping systems running and to prevent any of the storage tanks from becoming empty. The method typically used in the past was to keep track of deliveries on an Excel spreadsheet. The spreadsheet was based on the assumed chemical usage rate and was corrected as needed when actual tank levels were called in from the field. As the tank population has grown, the spreadsheet has also grown and has become more difficult to manage. As a result of this and the need to better organize, the Service and Maintenance (SAM) database project was launched in late 2003. At the same time, remote cellular tank monitors were utilized to sense the tank levels and then send to a third party website where customers were given access to monitor tank levels and chemical deliveries and at the same time the tank levels were fed into SAM through the internet (web service feed) where Evoqua Water Technologies operations used this data to schedule tank deliveries.

Flow of information in a typical advanced dose to demand LPOC system



In 2005 Evoqua Water Technologies launched a new chemical feed system, the VersaDose®. The VersaDose® controller is a PLC based, advanced chemical dosing system designed to be used in liquid phase odor control dosing. The VersaDose® controller is able to dose odor control products on a curve using 2 independently controlled chemical pumps (VFD controlled, analog signal or constant speed pumps) rather than operating at fixed speed. The VersaDose® accepts 2 independent tank signals, logs sewage flow and operational data, adjusts the chemical feed on rain events and is able to flow pace the sewage flow with chemical dosage.

Unfortunately, in order to track the chemical tank levels, an additional cellular remote tank monitor had to be installed onsite and the only available way to change chemical feed rates was through the installation of a landline analog modem which was sometimes prohibitive due to remote installations.

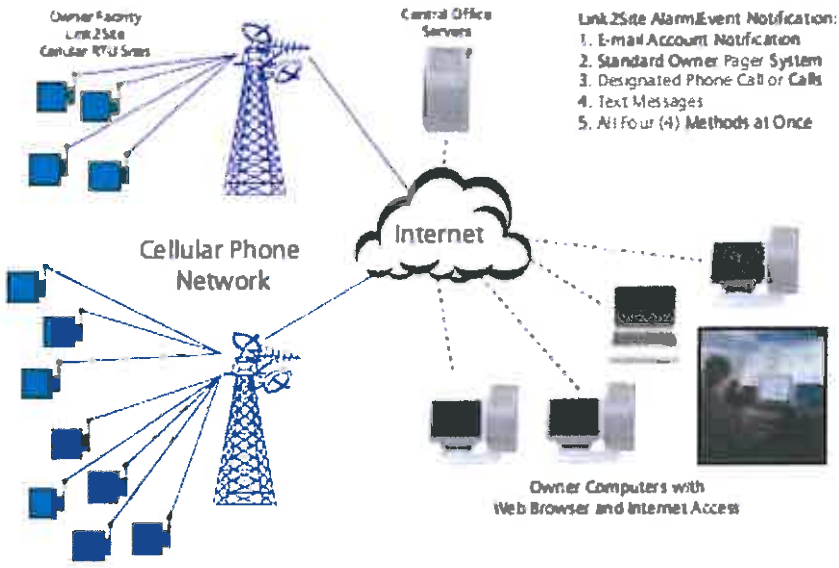
Furthermore, as the sewage flow varied due to seasonal population changes or new construction, the chemical feed rates needed to be modified. But the only way available to do that was to send a technician to the site and manually download the sewage flow data from the VersaDose® system and deploy a hydrogen sulfide data logger (OdaLog) at the control point for that VersaDose system for a whole week. Then by looking at the sewage flow from the VersaDose, the retention time was evaluated and the chemical dose was adjusted at times where the H_2S concentration exceeded a predetermined threshold. As a result, a technician had to go again to the chemical feed system and manually enter the new dose curve.

This process poised to be very uneconomical, inefficient and very time consuming and as a result new technology had to be utilized. The cost effectiveness and availability of industrial cellular communications made cellular/internet/remote control and monitoring a natural evolution and a giant leap forward in odor control where tank monitors, chemical feed controllers and hydrogen sulfide gas data loggers are all integrated into one control system viewed and controlled via the internet.

As a result in 2006, Evoqua Water Technologies planned and executed the advancement in tank monitors, chemical feed equipment, hydrogen sulfide monitors and the integration to the World Wide Web at www.link2site.com and the technology was rolled out to customers, engineers and operations in phases starting in 2007. As a result, customers, engineers and operations personal now have access to the site that was designed to fit the Odor Control Business.

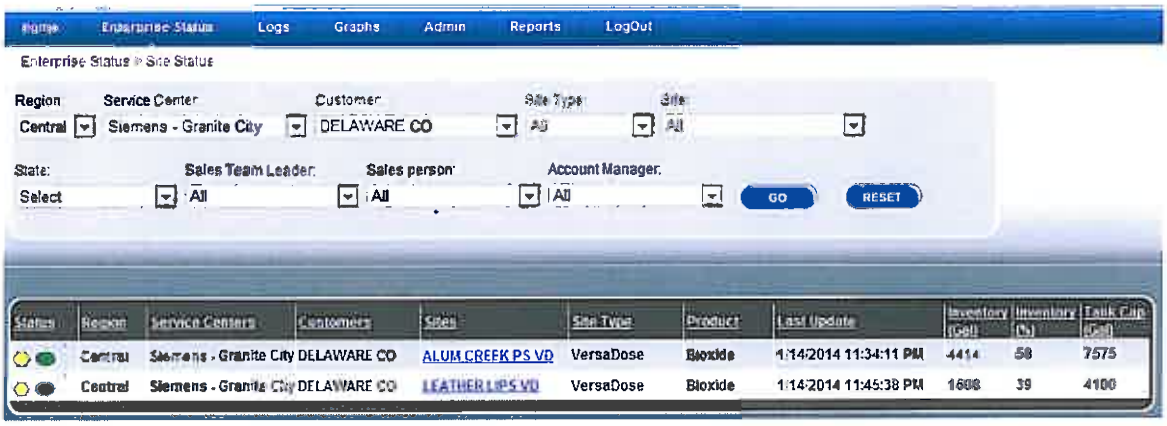
LINK2SITE®

What is Link2Site®? Link2Site is a cellular-internet based monitoring and control solution that is designed to accommodate all Evoqua Full Service Odor Control service centers, customers and sites. It utilizes the cellular networks' strength and national coverage to provide a reliable, secure, low-cost monitoring and control system.

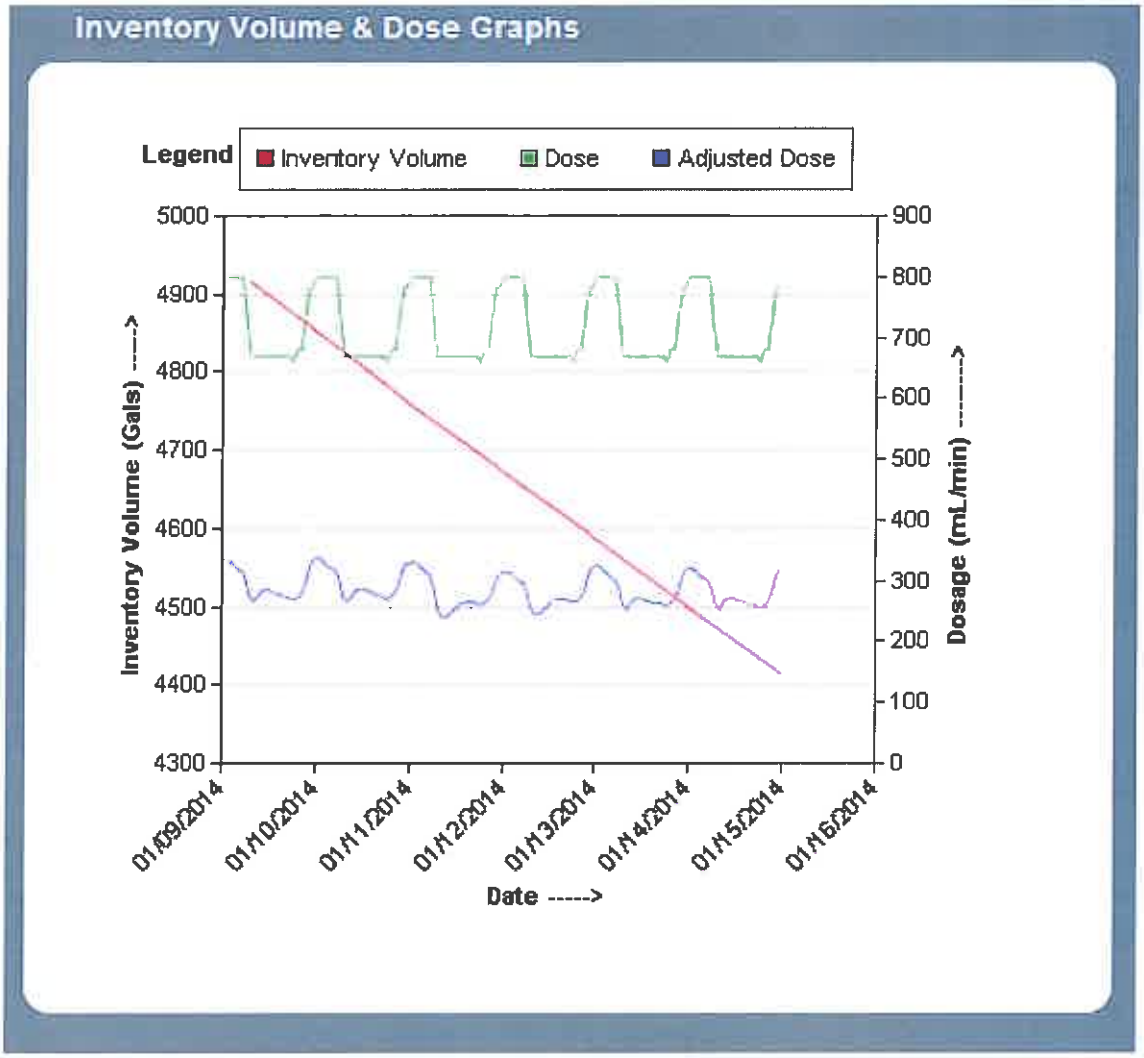


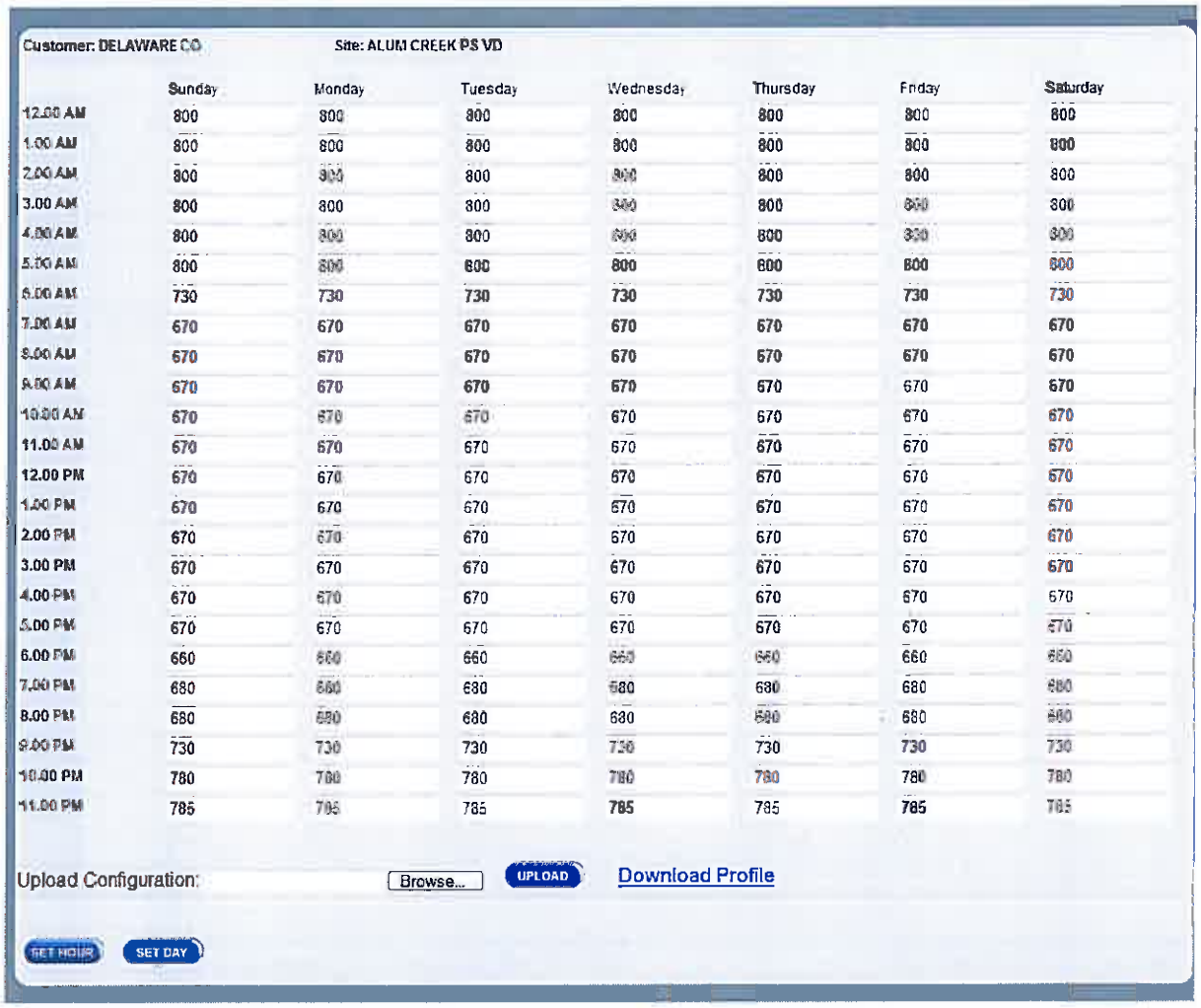
Link2Site® cellular and internet based monitoring and control system.

Link2Site® offers customers as well as Evoqua Link2Site administrators and operators tremendous benefits. As an example, customers now have the ability to track chemical deliveries, tank levels, adjust chemical feed rates on chemical feed systems and view historical trending data (tank levels, chemical dose, sewage flow etc) for the life of the system. In addition, the Link2Site system provides immediate notification of alarms via email, pager, text message, a phone call or all four. Advanced callout scheduling functionality ensures that the appropriate person is called in the event of a system alarm.



Customer Feed Sites


Inventory Volume & Dose Graphs
Legend
Inventory Volume
Dose
Adjusted Dose
5000
4900
4800
4700
4600
4500
4400
4300
Inventory Volume (Gals) ----->
900
800
700
600
500
400
300
200
100
0
Dosage (mL/min) ----->
01/09/2014
01/10/2014
01/11/2014
01/12/2014
01/13/2014
01/14/2014
01/15/2014
01/16/2014
Date ----->
Historical dose and chemical inventory trends



Customer: DELAWARE CO Site: ALUM CREEK PS VD

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
12.00 AM	800	800	800	800	800	800	800
1.00 AM	800	800	800	800	800	800	800
2.00 AM	800	800	800	800	800	800	800
3.00 AM	800	800	800	800	800	800	800
4.00 AM	800	800	800	800	800	800	800
5.00 AM	800	800	800	800	800	800	800
6.00 AM	730	730	730	730	730	730	730
7.00 AM	670	670	670	670	670	670	670
8.00 AM	670	670	670	670	670	670	670
9.00 AM	670	670	670	670	670	670	670
10.00 AM	670	670	670	670	670	670	670
11.00 AM	670	670	670	670	670	670	670
12.00 PM	670	670	670	670	670	670	670
1.00 PM	670	670	670	670	670	670	670
2.00 PM	670	670	670	670	670	670	670
3.00 PM	670	670	670	670	670	670	670
4.00 PM	670	670	670	670	670	670	670
5.00 PM	670	670	670	670	670	670	670
6.00 PM	660	660	660	660	660	660	660
7.00 PM	680	680	680	680	680	680	680
8.00 PM	680	680	680	680	680	680	680
9.00 PM	730	730	730	730	730	730	730
10.00 PM	780	780	780	780	780	780	780
11.00 PM	785	785	785	785	785	785	785

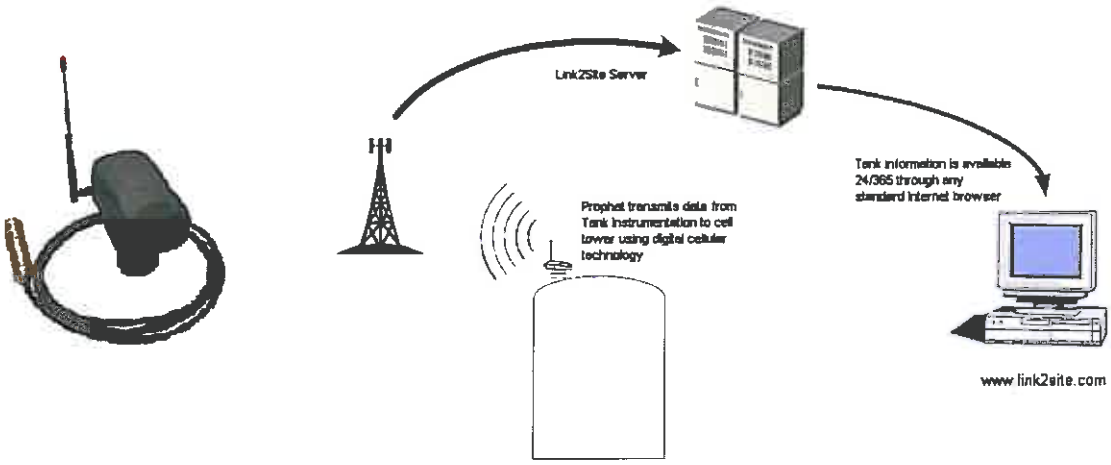
Upload Configuration: Browse... UPLOAD Download Profile

SET HOUR SET DAY

Internet chemical dose curve adjustment

TANK MONITORS

Evoqua has also integrated remote tank monitoring into the Link2Site® system.



Remote tank monitor

Tank monitors represent a very reliable way of tracking inventory by utilizing SMS technology. The integration into Link2Site provides tremendous benefits including the flexibility of selecting different types and ranges of tank level sensors (Pressure ft-H_2O, Pressure PSI, Ultrasonic or external 4-20mA signal) as well as vertical or horizontal tank cylinders.

Link2Site receives the SMS signal form the site, decodes the message and stores the tank level in the site's database. After decoding the message and calculating the tank inventory, the chemical tank volume is checked for any alarm condition and appropriate personnel are notified immediately.

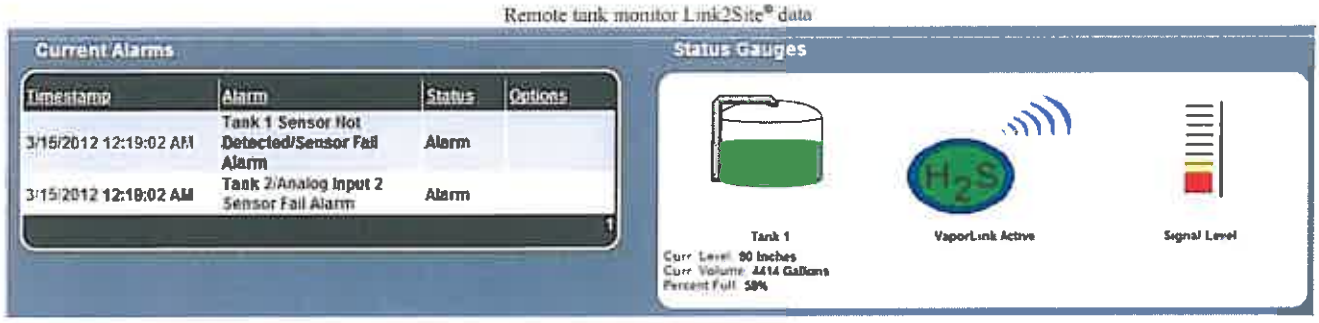
By comparing the daily chemical inventory usage (which is calculated from the daily tank drop) to the target feed rate (which is a target feed set-point entered by the field technician or calculated by the VersaDose®, the website calculates the deviation from the target feed rate and triggers a Dose Delta Alarm which is an indication of over or under pumping.

Possible reasons for a Dose Delta triggered alarm include, but are not limited to, the following:

1. Pumps are calibrated incorrectly
2. Tank parameters entered incorrectly
3. Tank sensor parameters entered incorrectly
4. Tank level indicator providing false readings
5. Pump parameters entered incorrectly
6. Chemical parameters entered incorrectly

7. Problem with chemical feed pumps
8. Problem with back-pressure or pressure relief valves

Remote tank monitor Link2Site® data



Current site alarms and system status gauges

evoqua
WATER TECHNOLOGIES

Site Data

Site Name:	**ALUM CREEK PS VD**
Site Type:	VersaDose
Status:	Active
System Information:	
Customer:	DELAWARE CO
Service Center:	Siemens - Granite City
Product:	Bioxide
Inventory Information:	
Inventory (Gals):	4414
Capacity (Gals):	7575
To Fill (Gals):	3160
Inventory %:	58%
Estimated Usage Information:	
* Delta Dose Calculation is disabled.	
Days worth of storage:	37.1 Days
Control Scheme:	
Control Mode:	Curve Dosing
Delivery Information:	
Last Fill Date:	12/23/2014
Last Fill Amount:	1071 Gallons
BOL Fill Date:	na
BOL Fill Amount:	na
Hydrogen Sulfide (H2S) Monitor:	
Status:	LIVE View Data

Daily Raw Feed Rates (gallons/day):

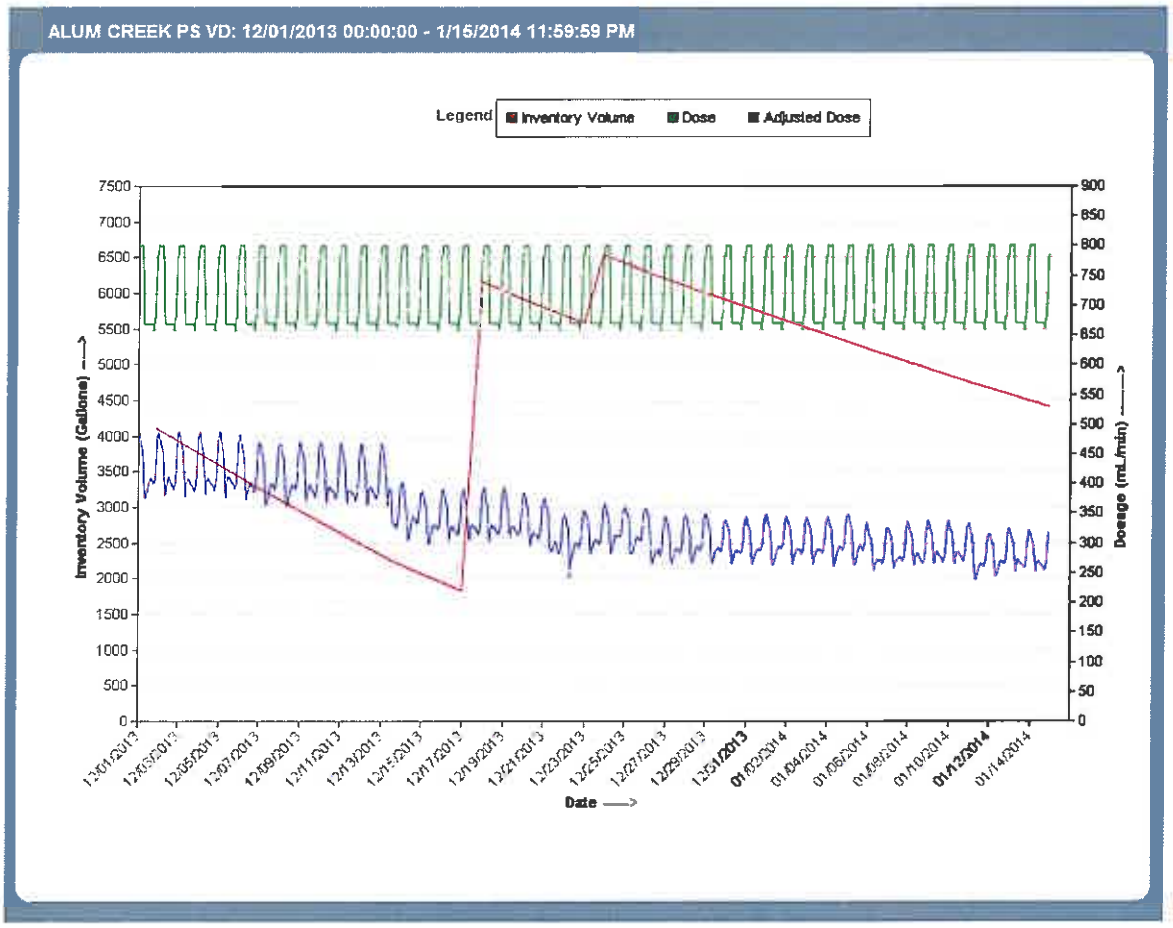
Thursday:	272	Monday:	272
Friday:	272	Tuesday:	272
Saturday:	272	Wednesday:	272
Sunday:	272	Week Total:	1911

Daily Adjusted Feed Rates (gallons/day):

Thursday:	112	Monday:	107
Friday:	112	Tuesday:	106
Saturday:	106	Wednesday:	106
Sunday:	106	Week Total:	757

Sewage Flow:	
Pump # 1 Gallons Pumped (Yesterday)	31261 Gallons
Chemical Pump Status:	
Pump 1 Status:	Off
Pump 2 Status:	Auto

Site data page



Historical inventory and dosing data

ADVANCED DOSING CONTROLLERS: VersaDose® & VersaDose® LT

The VersaDose® and VersaDose® LT automated dosing controllers provide an unmatched combination of power, flexibility, and ease of use for liquid phase odor control chemical dosing. The hardware is rugged and field tested, while the user interface is intuitive and based on proven technology.

The VersaDose is a Siemens S7-200 PLC platform with a touch panel display, while the VersaDose LT is a proprietary microprocessor based controller with an 8X20 character display. The user interface is very intuitive; the min/max limits that are applied to each field allow for the application to effectively correct the user on wrong entries and ensure proper operation. When errors do occur, they are time stamped and displayed in a logs/alarms screen. The interface also uses password protection scheme to prevent unauthorized users from changing system parameters.

Instead of using timers, the VersaDose® and LT systems allows the user to enter a 24 point curve for each day of the week as the dosing profile. These points are interpolated by the machine and the resulting smooth curve is the dose that is delivered to the system via the dosing pumps which can be constant speed pumps, 4-20mA or VFD driven. This dosing curve is determined on a site by site basis by Evoqua personnel and is verified by placing hydrogen sulfide monitoring equipment (VaporLinks®) at the control points. In the case of fixed speed pumps, the dosing curve is achieved by the system calculating the percentage of each minute that the pump should be on and turning it off for the remainder of each minute. Field testing has shown that this method matches the continuous curve delivered by the VFD extremely well in most applications.

Furthermore, temperature has been found to have a profound effect on H_2S generation and consequently, the quantity of product dosed. As a result, the VersaDose and LT systems allow for a temperature device to be incorporated into the system and a temperature adjustment factor, calculated from the temperature using the EPA's standard method, can be applied to the dosing curve. The VersaDose and LT systems also allow the user to alter the entire dose curve with a single factor (Global Factor) rather than having to change all 24 set-points for a given day.

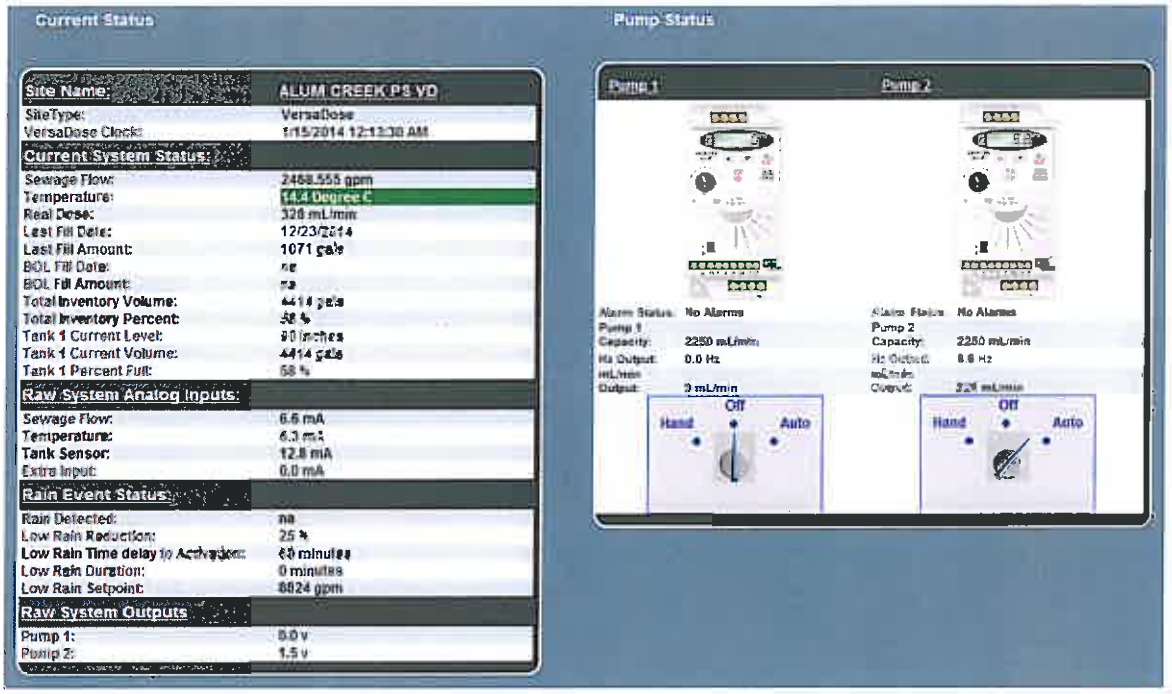
Another important feature is data logging for the past 7 days and sewage flow pacing control algorithm. Both the VersaDose and LT are able to log the chemical dose, tank level(s) (if more than 1 tank is setup) and sewage flow. The sewage flow can be sensed by either lift station digital contacts or an analog signal and the flow trends would then be available at the Link2Site.com website as well as the operator interface. This sewage flow can also be used in a flow pacing algorithm where the chemical dose is fed in proportion to the flow.

The VersaDose is also able to log hydrogen sulfide data every 5 minutes and then transmit to Link2Site®. This feature is very helpful if the VersaDose is feeding chemical into a wet well and the customer would like to monitor the hydrogen sulfide levels at the wet well.

Both the VersaDose and LT are fully configurable through Link2Site® and the user is able to fully monitor the chemical feed equipment, change feed rates, download historical data (tank inventory, sewage flow, chemical dose, H_2S) and request instantaneous system update from the website.

Another benefit of having the VersaDose and LT setup on Link2Site is that now at any time, the user can request a "snapshot" of the VersaDose and LT operation status and display on the Instantaneous System Status

As far as the alarms are concerned, any time the VersaDose or LT experience an alarm condition (VFD or pump fault, high-low-empty tank, sensor failure, delta dose etc.) that alarm is immediately reported to Link2Site where appropriate personnel are notified.



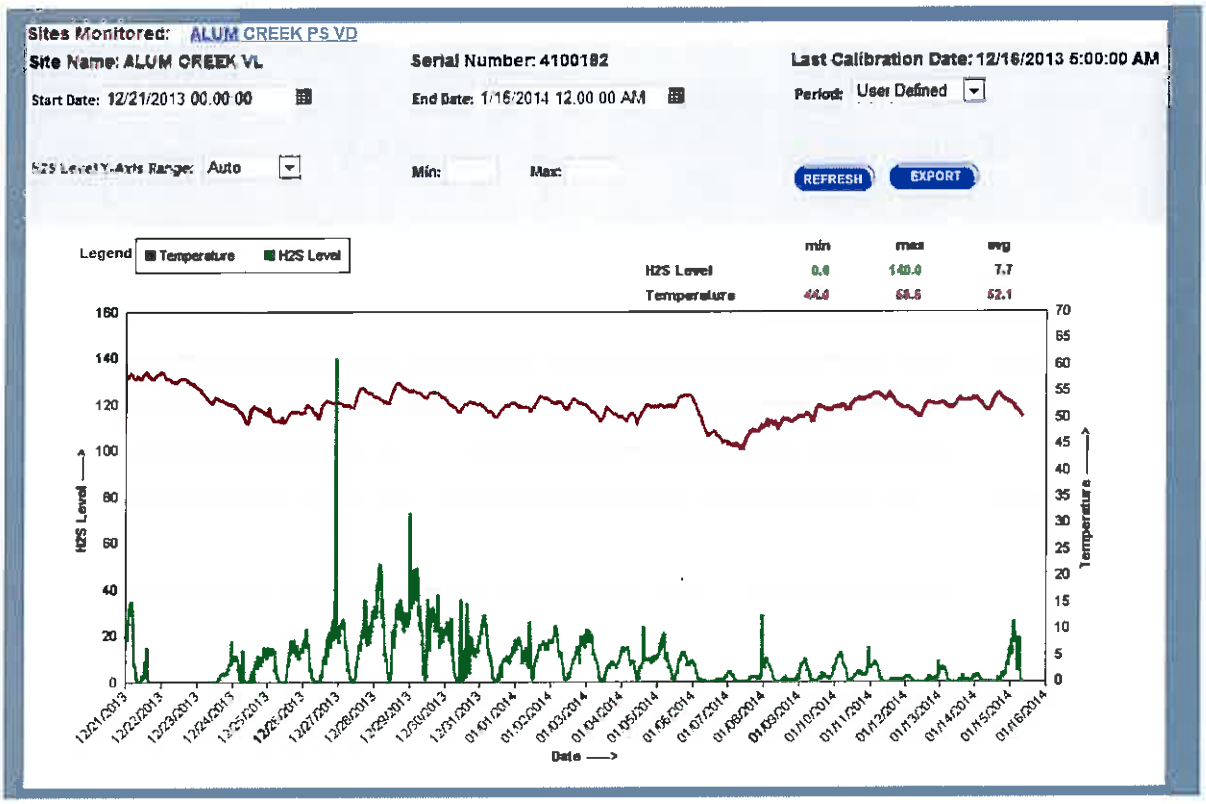
Instantaneous system status

HYDROGEN SULFIDE IN-SEWER MONITORS (VAPORLINK®)

Evoqua has worked with Apptek (manufacturer of the OdaLog) to develop a cell enabled OdaLog called the VaporLink®. The VaporLink system has the ability to communicate directly with Link2Site®. This is critical for Evoqua engineers when making adjustments to dosing curves that have very low control limits, such as those specified by Henrico County. For the County, this is important because it allows you to verify the performance being achieved at any time. Another prominent advantage and value is that the VaporLink monitors and VersaDose systems are all integrated into the same website. Since H_2S data is sent to Link2Site via cell modem, the VaporLink system also greatly reduces the manpower needed to collect the data that is required.

Knowing that in-sewer hydrogen sulfide monitors need to be, most of the times, deployed under thick cast iron manhole covers; getting cellular communication in that environment has been quite a challenge! However, Evoqua has overcome this challenge in the Henrico system through the use of different types on antennas and battery powered cellular booster signal devices. As in the current contract, we will be able to deploy VaporLink units at all control points.

High, low and average H_2S level set-points can be setup in the VaporLink systems and on Link2Site. This way at any point in time where the H_2S level exceeds the High or Average H_2S level set point, the VaporLink would immediately send an alarm to Link2Site where the customer or user can be immediately notified by email or SMS.



Link2Site screenshot showing H2S concentration and temperature

SUMMARY

Extraordinary gains are achieved by implementing the technologies discussed above. By using the cell technology and integrating the tank monitors, chemical feed equipment and hydrogen sulfide into one website, field engineers, application engineers, customers, technical services and operations personnel are all winners.

Engineers can now more efficiently and quickly adjust chemical feed rates by analyzing the H_2S data readily available on Link2Site® without the need to deploy hydrogen sulfide monitors, wait a week to collect data then drive to the site to download the data and adjust the feed rates. The immediate alarm notification enables technical services personnel to respond quicker to sites with problems, hence reducing downtime. Customers now have transparent access to data from their sites. And operations can now more effectively and efficiently track tank levels and schedule chemical fills.

Cellular-internet technology is a natural step in the evolution of Odor Control and Link2Site®, VersaDose®, VersaDose® LT and VaporLink® truly set the new innovative standards in Odor Control.

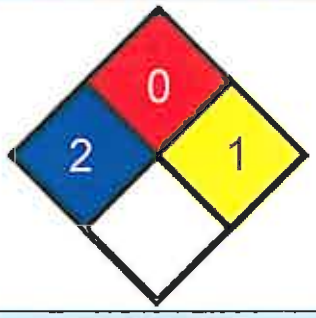
evoQUA
WATER TECHNOLOGIES

SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY INFORMATION

PRODUCT TYPE:	Odor Control Compound		
PRODUCT NAME:	**Bioxide® Plus 71**		
COMPANY ID:	Evoqua Water Technologies LLC 181 Thorne Hill Drive, Warrendale, PA 15086		
TELEPHONE NUMBER:	**INFORMATION:**	**CORPORATE**	866.926.8420
	MEDICAL EMERGENCY:	**CHEMTREC**	800.424.9300
	TRANSPORTATION EMERGENCY:	**CHEMTREC**	800.424.9300
DATE PREPARED:	9 June 2015	**REVISION:** 1	

SECTION 2: HAZARD(S) IDENTIFICATION

HMIS RATINGS		NFPA RATINGS	GUIDE
HEALTH	2		4 – EXTREME/SEVERE 3 – HIGH/SERIOUS 2 – MODERATE 1 - SLIGHT 0 – MINIMUM ~~W~~ – WATER REACTIVE OX - OXIDIZER
FLAMMABILITY	0		
PHYSICAL HAZARD	1		
PERSONAL PROTECTION	D		

PICTOGRAM	SIGNAL WORD	HAZARD STATEMENT
	WARNING	H302: Harmful if swallowed. H315: Causes skin irritation. H320: Causes eye irritation. H335: May cause respiratory irritation.

PRECAUTIONARY STATEMENT(S)

PREVENTION	P264: Wash…..thoroughly after handling. P270: Do not eat, drink or smoke when using this product. P280: Wear protective gloves/protective clothing. P261: Avoid breathing dust/fume/gas/mist/vapors/spray. P271: Use only outdoors or in a well-ventilated area.

RESPONSE	P301+P312: IF SWALLOWED: Call a POISON CENTER/doctor/....if you feel unwell. P330: Rinse Mouth. P302+P352: IF ON SKIN: Wash with plenty of water. P332+P313: If skin irritation occurs: Get medical advice/attention. P362+P364: Take off contaminated clothing and wash it before reuse. P305+P351+P338: IF IN EYES: Rinse cautiously with water for 15 - 20 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P337+P313: If eye irritation persists: Get medical advice/attention. P304+P340: Remove person to fresh air and keep comfortable for breathing. P312: Call a POISON CENTER/doctor/....if you feel unwell.
STORAGE	P402: Store in a dry place. P403+P233: Store in a well-ventilated place. Keep container tightly closed. P404: Store in a closed container. P405: Store locked up.

OTHER HAZARDS

NONE

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

PERCENT BY WEIGHT	COMMON NAME (Ingredient / Component)	CAS NO.	IMPURITIES
30-70	Calcium Nitrate Tetrahydrate	13477-34-4	none
<2.8	Sodium Chlorite	7758-19-2	none
Balance	Water	7732-18-5	none

SECTION 4: FIRST-AID MEASURES

NECESSARY FIRST AID INSTRUCTIONS

INHALATION FIRST AID	Remove affected person from area to fresh air. Give artificial respiration ONLY if breathing has stopped. Obtain medical attention if individual shows symptoms of exposure.
SKIN CONTACT FIRST AID	Immediately remove clothing from affected area and wash skin with flowing water and soap. Clothing must be washed before reuse. Obtain medical attention if irritation occurs.
EYE CONTACT FIRST AID	Immediately irrigate eyes with flowing water 15-20 minutes while holding eyes open. Contacts should be removed before or during flushing. Obtain medical attention if irritation occurs.
INGESTION FIRST AID:	If victim is alert and not convulsing rinse mouth with water and give water to drink. Do not induce vomiting. If spontaneous vomiting occurs, have affected person lean forward with head down to maintain breathing passage. Obtain medical attention immediately.

DESCRIPTION OF MOST IMPORTANT SYMPTOMS

No Additional Information Available

RECOMMENDATIONS FOR IMMEDIATE MEDICAL CARE

Chlorine dioxide vapors are emitted when this product contacts acids or chlorine. If these vapors are inhaled, monitor the patient closely for delayed development of pulmonary edema which may occur up to 48-72 hr. after inhalation.

SECTION 5: FIRE-FIGHTING MEASURES	
SUITABLE EXTINGUISHING MEDIA	Use an extinguishing media suitable for the surrounding fire.
UNSUITABLE EXTINGUISHING MEDIA	None
SPECIFIC HAZARDS	This product becomes a fire or explosion hazard if allowed to dry, so use water spray to keep fire-exposed containers cool.
PERSONAL PROTECTIVE EQUIPMENT	In the event of fire, wear full protective clothing and NIOSH approved self-contained breathing apparatus with full face piece, operated in positive pressure mode.

SECTION 6: ACCIDENTAL RELEASE MEASURES	
PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES	
PERSONAL PRECAUTIONS	Handle in accordance with good industrial hygiene and safety practices. These practices include avoiding unnecessary exposure and removal of material from eyes, skin, and clothing.
ENVIRONMENTAL PRECAUTIONS	DO NOT DUMP ON THE GROUND OR INTO ANY BODY OF WATER.
CONTAINMENT AND CLEAN-UP	Wear appropriate personal protective equipment (See Section 8). Stop leak if safe to do so without risk. Ventilate area. If safe to do so, absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Do not use organic materials, such as wood shavings, wood dust or paper, to absorb spills. Flush area with flooding amounts of water.
OTHER INFORMATION	All disposal methods must be in compliance with all Federal, State, Local and Provincial laws, and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator.

SECTION 7: HANDLING AND STORAGE	
PRECAUTIONS FOR SAFE HANDLING	Wash thoroughly after handling. Use with adequate ventilation. Do not get in eyes, on skin, or on clothing. Do not breathe mists or vapors. Wear all recommended personal protective equipment (See Section 8).
CONDITIONS FOR SAFE STORAGE	Protect from physical damage and freezing. Protect from ultraviolet radiation. Store in a cool well ventilated place away from incompatible materials such as combustible, organic, or other readily oxidizable materials. Avoid storage on wood or other combustible floors. Keep containers tightly closed. Do not store in very warm areas where the liquid may evaporate.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION			
ENGINEERING CONTROLS	Adequate general and mechanical exhaust ventilation.		
RESPIRATORY PROTECTION	None required under normal use conditions. If use conditions generate mists, wear a respirator with acid gas cartridges.		
SKIN PROTECTION	Wear protective gloves and other protective clothing as appropriate to prevent skin contact.		
EYE/FACE PROTECTION	Wear chemical goggles. In addition, wear a face shield when connecting and disconnecting piping or if splashing is likely.		
EXPOSURE LIMITS/GUIDELINES	No occupational exposure limits have been established for this material.		
	RESULT	**OSHA 8 HR** mg/m³	ACGIH TLV 8 HR mg/m³
PARTICULATES NOT OTHERWISE REGULATED (PNOR)		NA	NA
PARTICULATES NOT OTHERWISE CLASSIFIED (PNOC)		NA	NA

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES			
COLOR	Colorless to amber	**MOLECULAR WEIGHT**	NA
ODOR	slight chlorine	**ODOR THRESHOLD**	None
pH VALUE	8-10	**VAPOR PRESSURE**	NA
MELTING POINT	NA	**VAPOR DENSITY**	Liquid
FREEZING POINT	< 25° F (-4° C)	**SPECIFIC GRAVITY**	1.3 – 1.5 @ 68°F
INITIAL BOILING POINT	> 212 °F (>100 °C)	**SOLUBILITY**	Complete
FLASHPOINT	NA	**PARTITION COEFFICIENT**	NA
EVAPORATION RATE	NA	**AUTO IGNITION TEMP.**	None
FLAMMABILITY	NA	**DECOMP. TEMP.**	NA
UEL	NA	**VISCOSITY**	NA
LEL	NA	**Volatile Percentage**	55-65% (water)

SECTION 10: STABILITY AND REACTIVITY	
REACTIVITY	NA
CHEMICAL STABILITY	This product is stable for 90 days or more under normal use conditions. Exposure to ultraviolet radiation may result in decomposition of sodium chlorite.
POSSIBILITY OF HAZARDOUS REACTIONS	Avoid contact with wood and other flammable organics, flammable or combustible materials, cyanides, sodium hypophosphite, or boron phosphide.
CONDITIONS TO AVOID	Do not expose to ultraviolet radiation. Do not allow to evaporate to dryness. Do not heat to 1000PoP F as an explosion may occur in the presence of reducing agents or inorganic materials.
HAZARDOUS DECOMPOSITION PRODUCTS	Gaseous oxides of sodium and nitrogen when heated above the melting point of the solid 306.8° C.

SECTION 11: TOXICOLOGICAL INFORMATION		
INHALATION	ACUTE	Inhalation of vapors or mists may cause irritation to the respiratory tract. Breathing vapor or mists may be harmful.
	CHRONIC	There are no known chronic inhalation effects.
SKIN	ACUTE	Occasional brief contact with the liquid is not expected to result in significant irritation. Prolonged contact may cause irritation.
	CHRONIC	There are no known chronic dermal effects.
EYE	ACUTE	Eye contact will irritate and may burn the eyes.
INGESTION	ACUTE	May be harmful if swallowed. May cause gastrointestinal irritation and nausea.
	CHRONIC	There are no known chronic ingestion effects.
LD50		None established
LC50		None established
Acute Toxicity Estimate		None established
CARCINOGENICITY/MUTAGENICITY		There are no known carcinogenic properties. Sodium chlorite, a minor component of this material, has tested positive in some studies with laboratory animals. The significance of these results for human health is unclear because the oxidizing effects of the chlorite or the salty effects of the sodium may significantly affect the ability of the tests to accurately detect mutagens.
REPRODUCTIVE EFFECTS		There are no known reproductive effects
NEUROTOXICITY		There are no known neurotoxic effects
OTHER EFFECTS		No other effects are known

TARGET ORGANS	Target organs include the skin, eyes, digestive tract, and respiratory system.

SECTION 12: ECOLOGICAL INFORMATION

The ecological effects are not known. Safely store product to prevent release to the environment and water supplies.

SECTION 13: DISPOSAL CONSIDERATIONS

SPILL/LEAK PROCEDURES	Wear appropriate personal protective equipment (See Section 8). Stop leak if safe to do so without risk. Ventilate area.
CLEANUP	If safe to do so, absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Do not use organic materials, such as wood shavings, wood dust or paper, to absorb spills. Flush area with flooding amounts of water. DO NOT DUMP ON THE GROUND OR INTO ANY BODY OF WATER.
REGULATORY REQUIREMENTS	Generators of waste material are required to evaluate all waste for compliance with RCRA and any local disposal procedures and regulations. NOTE: State and local regulations may be more stringent than federal regulations.
DISPOSAL	Material that cannot be used, or reprocessed for use, and empty containers should be disposed of in accordance with all applicable regulations. Product containers should be thoroughly emptied before disposal.

SECTION 14: TRANSPORT INFORMATION

LAND – DOT	**UN/NA IDENTIFICATION NUMBER:**	Not Applicable to unused finished product
	UN-PROPER SHIPPING NAME:	Not Applicable to unused finished product
	TRANSPORT HAZARD CLASS:	Not Applicable to unused finished product
	PACKING GROUP:	Not Applicable to unused finished product
	MARINE POLLUTANT:	Not Applicable to unused finished product
	HAZARD CLASS:	Not Applicable to unused finished product
WATER – IMO/IMDG	**UN/NA IDENTIFICATION NUMBER:**	Not Applicable to unused finished product
	UN-PROPER SHIPPING NAME:	Not Applicable to unused finished product
	TRANSPORT HAZARD CLASS:	Not Applicable to unused finished product
	PACKING GROUP:	Not Applicable to unused finished product
	MARINE POLLUTANT:	Not Applicable to unused finished product
AIR – ICAO/IATA *For product quantities less than 0.5 Kg*	**UN/NA IDENTIFICATION NUMBER:**	Not Applicable to unused finished product
	UN-PROPER SHIPPING NAME:	Not Applicable to unused finished product
	TRANSPORT HAZARD CLASS:	Not Applicable to unused finished product
	PACKING GROUP:	Not Applicable to unused finished product
	MARINE POLLUTANT:	Not Applicable to unused finished product

SECTION 15: REGULATORY INFORMATION

OSHA	Hazard Communication Standard: Not regulated.
OSHA	Process Safety Standard: No
CAA	Section 112r: No
CERCLA	Section 103: No RQ: None
SARA	Section 302: No; SARA Section 304: No; SARA Section 313: No
SARA HAZARD CATEGORIES 311/312	Not listed.

TSCA	The ingredients of this product are on the TSCA Inventory List.

SECTION 16: OTHER INFORMATION	
DISCLAIMER:	The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the user thereof. It is the buyer's responsibility to ensure that its activities comply with federal, state, provincial and local laws.
REVISION INDICATOR:	Revision 0: (This SDS replaces the former MSDS for this product pursuant to OSHA 1910.1200(g) Appendix D. The MSDS for this product should be considered obsolete).

Municipal Services Original 06/24/10 Rev 1 - 01/31/14	**Bioxide® Plus 71** **(Calcium Nitrate Tetrahydrate Solution with Sodium Chlorite)** **Spill Response Procedures**

MS-SRP-014

Emergency Response Guide 143

PURPOSE

The purpose of this procedure is to ensure that the correct guidelines and information are available for handling an accidental spill or release of Bioxide® Plus 71 (calcium nitrate tetrahydrate CAS No.13477-34-4; sodium chlorite CAS No. 7758-19-2). It is intended to be available to all Evoqua employees that are involved in the operation of dosing sites where this chemical is stored.

A copy of this document should be made available at each chemical storage location and kept in a weather proof container with ease of access for operators and emergency response organizations.

SCOPE

This procedure will be maintained in accordance with Evoqua Water Technologies - Municipal Services Business Unit procedures.

RESPONSIBILITY

Evoqua Water Technologies - Municipal Services (EWT-Municipal Services)

EMERGENCY OVERVIEW

COLOR: Colorless to amber liquid.

ODOR: Slight chlorine odor

SIGNAL WORD: Caution

MAJOR HEALTH HAZARDS: May be harmful if ingested. May cause irritation to the skin, eyes, or respiratory tract.

PHYSICAL HAZARDS: Product may be slippery when wet. Do not allow spilled material to evaporate to dryness.

PRECAUTIONARY STATEMENTS: Do not breathe vapor or spray mist. Do not taste or swallow. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Wash thoroughly after handling. Use only with adequate ventilation. Do not add acid to the solution as chlorine gas will be liberated.

NFPA: Health = 1 Fire = 0 Reactivity = 1

FIRE FIGHTING MEASURES: Use extinguishing agents appropriate for surrounding area. Consult the product MSDS/SDS for additional Information.

REPORTING REQUIREMENTS:

Evoqua Water Technologies requires that all spills and accidental releases be reported. An internal investigation will be conducted for all reported incidents.

1. **Evoqua Employees**
   Employees are required to report all spills of any magnitude to their supervisor immediately. The EWT-Municipal Services EHS Manager must be notified within six hours of the incident.

   NOTE! At a customer site the customer must be the one to call 911 or the local emergency response organization.

2. **Customers and Contractors**
   During normal working hours (8.00 – 5.00 local time) call the closest EWT-Municipal Services branch listed below or your local Evoqua Water Technologies representative if a number has been provided:

BRANCH LOCATION	CONTACT PHONE NUMBER
Canton, GA	(800) 445-4771
Cedar Park, TX	(800) 224-2450
Granite City, IL	(800) 887-8710
Sarasota, FL	(800) 345-3982
Temecula, CA	(800) 566-1568
Wilmington, DE	(800) 566-4208

AFTER HOURS ASSISTANCE: Call the Branch Toll Free number for instructions or your local Evoqua Water Technologies representative if a number has been provided.

IF YOU ARE UNABLE TO REACH A LOCAL CONTACT CALL EVOQUA WATER TECHNOLOGIES CENTRAL EMERGENCY REPORT LINE AT (877) 873-4732 FOR ASSISTANCE.

If requested a Evoqua Water Technologies' responder will proceed to the site. The responder will report to the Incident Commander and offer assistance as necessary.

REGULATORY AUTHORITIES

Spill should be evaluated to see if it meets or exceeds reportable quantities.

DURING AN EMERGENCY INCIDENT

When working in and around the spill area and/or the chemical storage area the following personal protective equipment (PPE) will be worn as a minimum and without exception.

EYE AND FACE PROTECTION

- Chemical safety goggles (face shield should also be available and worn in addition to safety goggles where splashing or spraying is a possibility).
- Hard hat should be available and worn if required.

SKIN PROTECTION

- Rubber gloves and protective clothing such as coveralls to prevent skin contact. Wear a rubber apron if splashing is likely.
- Steel-toed safety shoes/ boots, rubber soled or with rubber overshoes/ boots.

RESPIRATORY PROTECTION

- None required under normal use conditions. Consult the product MSDS/SDS for additional information.

EMERGENCY PROCEDURE FOR ACCIDENTAL RELEASE:

Upon finding a leak or spill situation, if at all possible, slow or stop the leak and turn off any dosing equipment involved. This should be done only when your personal safety will not be compromised.

1. Isolate the spill area and deny entry to unnecessary or unprotected personnel.
2. Remove all sources of ignition, such as flames, hot glowing surfaces, or electric arcs.
3. If necessary, create a dike or trench to contain all liquid material. Every effort should be made to prevent spilled material from entering sewer systems, streams, culverts, or other bodies of water.
4. Contain the spill to as small an area as can be controlled, then make the emergency call as detailed above.
5. If any vapors or gas can be seen or smelled, leave the area immediately and wait for assistance. Stand up wind and keep all unnecessary personnel away from the spill area until the emergency response team arrives.
6. Continue to keep damp. If allowed to dry, dried material can ignite in contact with combustible materials.
7. Upon arrival of the Police or Fire department give them a copy of the MSDS/SDS for the product involved.
8. The spill area should be blocked off from pedestrian and vehicle traffic. The Police or Fire department should assume responsibility for this.
9. Once Emergency response teams are on the scene offer your help until a trained Evoqua Water Technologies representative arrives, take notes as much as possible, and do not try to commit all of the details to memory. With Customer's permission take pictures of the affected area.

10. If news media are present be courteous, however, do not elaborate on the spill or incident. You are not trained to handle the media and should decline any attempts by the media to interview you on camera or quote you for publication.

11. At some point a trained person from Evoqua Water Technologies or the environmental contractor's emergency personnel will communicate with the media if required.

CLEAN UP:

Cleanup personnel must wear proper protective equipment.

Each spill must be handled depending upon the circumstances surrounding the site, i.e. quantity involved, ground condition, and proximity to a water course, sewer, or other outlet.

1. For contained spill material follow the guidelines listed below for "Liquid Spill Residue". Note: Spill material should not be returned to Evoqua Water Technologies without prior consultation with Evoqua Water Technologies management.

2. If the solution has filtered into the ground, and there is no surrounding water course, the area can be washed down with water to dilute the activity of the material. If large quantities of material are spilled onto the ground please consult with Evoqua Water Technologies EHS department to determine whether a HAZMAT response team should be dispatched to the site to evaluate remediation options.

3. If the solution has filtered into the ground, and the spill site is in close proximity to a water course contact your EHS Manager immediately as regulatory notifications may be required.

NOTE: Do not allow the product to evaporate to dryness as the dry residue can ignite upon contact with combustible materials.

LIQUID SPILL RESIDUE:

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 Systems (NPDES) permit and the permitting authority has been notified in writing prior to the discharge.

Spilled materials may be absorbed with inert materials such as dry sand, soil, or non-flammable commercial absorbents.

1. Small spills; defined as less than 5 gallons of material may be diluted with large amounts of water and washed down the sanitary sewer, ONLY with prior approval from the Customer and/or the Waste Water Treatment Plant for that area.

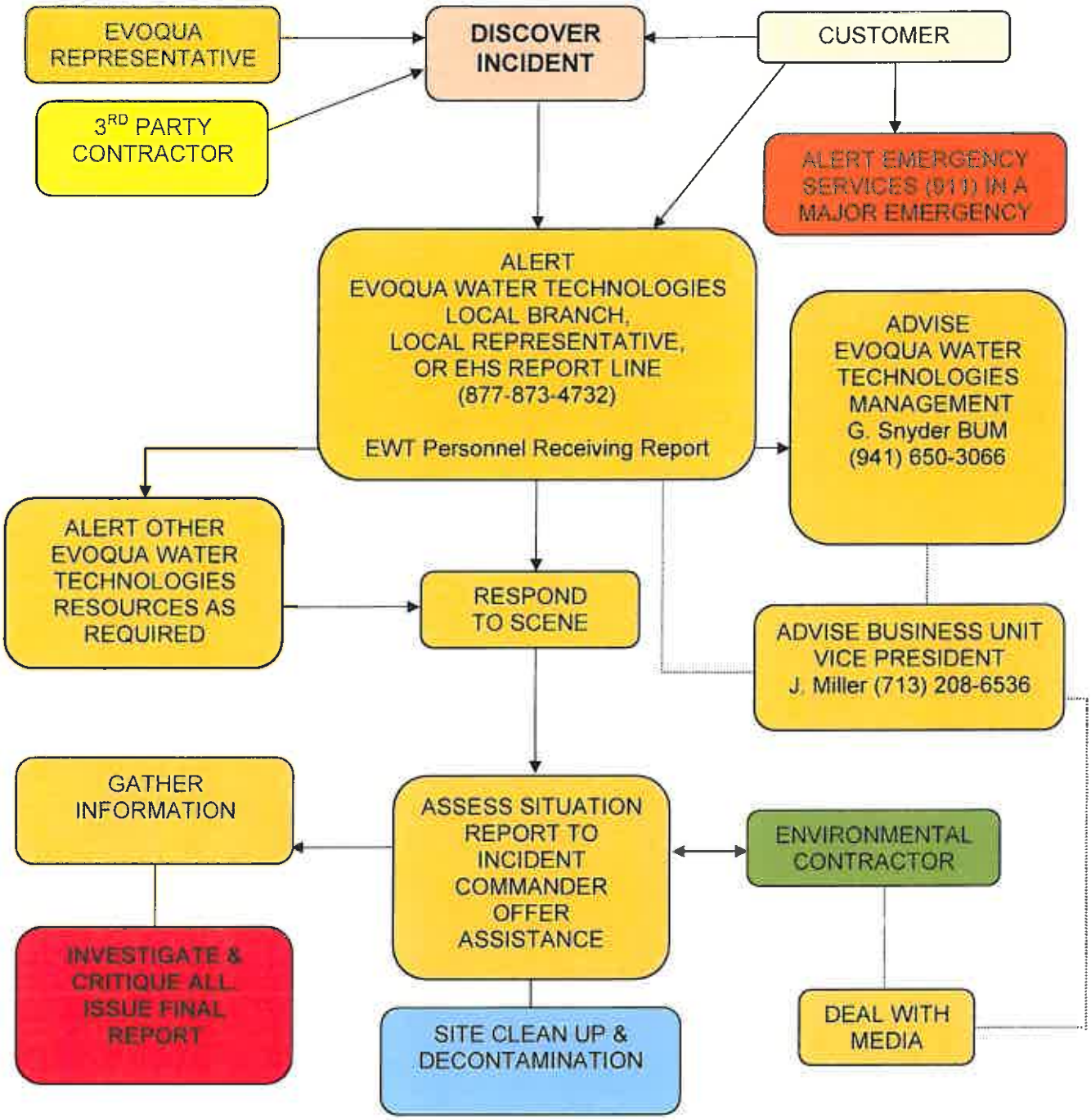
2. Medium spills: defined as more than 5 gallons and less than 50 gallons of material may be diluted with large amounts of water and washed down the sanitary sewer, ONLY with prior approval from the Customer and/or the Waste Water Treatment Plant for that area.

3. Large spills: defined as more than 50 gallons of material that can be contained as liquid should be diluted with a large volume of water and discharged into a suitable treatment system in accordance with all regulatory agencies.

DISPOSAL OF SPILL RESIDUES:

All disposal of spill material must be done in accordance with local, state and federal regulations. Waste characterization and compliance with disposal regulations are responsibilities of the waste generator.

REPORTING REQUIREMENT DURING AN INCIDENT/ ACCIDENT/ OR CHEMICAL RELEASE AT A CUSTOMER SITE



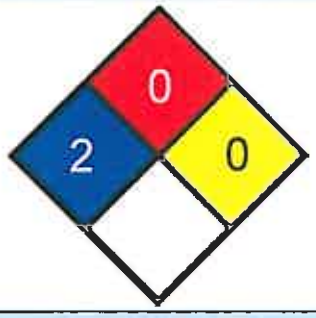
evoqua
WATER TECHNOLOGIES

SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY INFORMATION

PRODUCT TYPE:	Preserved Inorganic Salt Solution		
PRODUCT NAME:	**Bioxide®** AQ		
COMPANY ID:	Evoqua Water Technologies LLC 181 Thorne Hill Drive, Warrendale, PA 15086		
TELEPHONE NUMBER:	**INFORMATION:**	**CORPORATE**	866.926.8420
	MEDICAL EMERGENCY:	**CHEMTREC**	800.424.9300
	TRANSPORTATION EMERGENCY:	**CHEMTREC**	800.424.9300
DATE PREPARED:	9 June 2015	**REVISION: 1**	

SECTION 2: HAZARD(S) IDENTIFICATION

HMIS RATINGS		NFPA RATINGS	GUIDE
HEALTH	2		4 – EXTREME/SEVERE 3 – HIGH/SERIOUS 2 – MODERATE 1 - SLIGHT 0 – MINIMUM ~~W~~ – WATER REACTIVE OX - OXIDIZER
FLAMMABILITY	0		
PHYSICAL HAZARD	0		
PERSONAL PROTECTION	D		

PICTOGRAM	SIGNAL WORD	HAZARD STATEMENT
	WARNING	H302: Harmful if swallowed. H315: Causes skin irritation. H320: Causes eye irritation. H335: May cause respiratory irritation.

PRECAUTIONARY STATEMENT(S)

PREVENTION	P264: Wash…..thoroughly after handling. P270: Do not eat, drink or smoke when using this product. P280: Wear protective gloves/protective clothing. P261: Avoid breathing dust/fume/gas/mist/vapors/spray. P271: Use only outdoors or in a well-ventilated area.
RESPONSE	P301+P312: IF SWALLOWED: Call a POISON CENTER/doctor/….if you feel unwell.

	P330: Rinse Mouth. P302+P352: IF ON SKIN: Wash with plenty of water. P332+P313: If skin irritation occurs: Get medical advice/attention. P362+P364: Take off contaminated clothing and wash it before reuse. P305+P351+P338: IF IN EYES: Rinse cautiously with water for 15 - 20 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P337+P313: If eye irritation persists: Get medical advice/attention. P304+P340: Remove person to fresh air and keep comfortable for breathing. P312: Call a POISON CENTER/doctor/....if you feel unwell.
STORAGE	P402: Store in a dry place. P403+P233: Store in a well-ventilated place. Keep container tightly closed. P404: Store in a closed container. P405: Store locked up.
OTHER HAZARDS	
NONE	

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

PERCENT BY WEIGHT	COMMON NAME (Ingredient / Component)	CAS NO.	IMPURITIES
50-60	Ammonium Calcium Nitrate Double Salt	15245-12-2	none
> 1	Anthraquinone	84-65-1	none
40-50	Water	7732-18-5	none

SECTION 4: FIRST-AID MEASURES

NECESSARY FIRST AID INSTRUCTIONS	
INHALATION FIRST AID	Remove affected person from area to fresh air. Give artificial respiration ONLY if breathing has stopped. Obtain medical attention if individual shows symptoms of exposure.
SKIN CONTACT FIRST AID	Immediately remove clothing from affected area and wash skin with flowing water and soap. Clothing must be washed before reuse. DO NOT instruct person to neutralize affected skin area. Obtain medical attention if irritation occurs.
EYE CONTACT FIRST AID	Immediately irrigate eyes with flowing water 15-20 minutes while holding eyes open. Contacts should be removed before or during flushing. DO NOT instruct person to neutralize. Obtain medical attention if irritation occurs.
INGESTION FIRST AID:	If victim is alert and not convulsing rinse mouth with water and give water to drink. Do not induce vomiting. If spontaneous vomiting occurs, have affected person lean forward with head down to maintain breathing passage. Obtain medical attention.
DESCRIPTION OF MOST IMPORTANT SYMPTOMS	
No Additional Information Available	
RECOMMENDATIONS FOR IMMEDIATE MEDICAL CARE	
Treat Symptomatically.	

SECTION 5: FIRE-FIGHTING MEASURES

SUITABLE EXTINGUISHING MEDIA	**Use an extinguishing media suitable for the surrounding fire.**
UNSUITABLE EXTINGUISHING MEDIA	None

SPECIFIC HAZARDS	May support combustion at high temperature.
PERSONAL PROTECTIVE EQUIPMENT	In the event of fire, wear full protective clothing and NIOSH approved self-contained breathing apparatus with full face piece, operated in positive pressure mode.

SECTION 6: ACCIDENTAL RELEASE MEASURES	
PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES	
PERSONAL PRECAUTIONS	Handle in accordance with good industrial hygiene and safety practices. These practices include avoiding unnecessary exposure and removal of material from eyes, skin, and clothing.
ENVIRONMENTAL PRECAUTIONS	DO NOT DUMP ON THE GROUND OR INTO ANY BODY OF WATER.
CONTAINMENT AND CLEAN-UP	Mop up and containerize for subsequent recycling or disposal. Triple rinse empty containers with water prior to reconditioning.
OTHER INFORMATION	All disposal methods must be in compliance with all Federal, State, Local and Provincial laws, and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator.

SECTION 7: HANDLING AND STORAGE	
PRECAUTIONS FOR SAFE HANDLING	Wash thoroughly after handling, immediately remove and dispose of any spillage. Immediately rinse contaminated clothing thoroughly with water. Rinse containers with water only.
CONDITIONS FOR SAFE STORAGE	Store in dry place at ambient temperatures apart from combustible and other readily oxidizable materials, food, beverage, and excessive heat. Rinse empty containers with water only.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION			
ENGINEERING CONTROLS	Adequate general and mechanical exhaust ventilation.		
RESPIRATORY PROTECTION	None required under normal use conditions. If use conditions generate mists, wear a respirator with acid gas cartridges.		
SKIN PROTECTION	Wear protective gloves and other protective clothing as appropriate to prevent skin contact.		
EYE/FACE PROTECTION	Wear safety glasses with side shields. Wear chemical goggles if splashing is likely.		
EXPOSURE LIMITS/GUIDELINES	No occupational exposure limits have been established for this material.		
	RESULT	**OSHA 8 HR** mg/m³	**ACGIH TLV 8 HR** mg/m³
PARTICULATES NOT OTHERWISE REGULATED (PNOR)		NA	NA
PARTICULATES NOT OTHERWISE CLASSIFIED (PNOC)		NA	NA

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES			
COLOR	Cloudy, light brown	**MOLECULAR WEIGHT**	NA
ODOR	None	**ODOR THERSHOLD**	None
pH VALUE	5-8	**VAPOR PRESSURE**	NA
MELTING POINT	NA	Specific Gravity	1.41 – 1.47 @ 20°C
FREEZING POINT	≤ -5 F (-20 C)	**DENSITY**	11.8 – 12.2 @ 68°F
INITIAL BOILING POINT	218 F – 221 F	**SOLUBILITY**	Complete
FLASHPOINT	NA	**PARTITION COEFFICEINT**	NA
EVAPORATION RATE	NA	**AUTO IGNITION TEMP.**	None
FLAMMABILITY	NA	**DECOMP. TEMP.**	NA

UEL	NA	VISCOSITY	NA
LEL	NA	Volatile Percentage (water)	40-50%

SECTION 10: STABILITY AND REACTIVITY	
REACTIVIVITY	NA
CHEMICAL STABILITY	Stable
POSSIBILITY OF HAZARDOUS REACTIONS	This product is incompatible with organic materials, reducing agents, chlorine or hypochlorite products, and caustic products.
CONDITIONS TO AVOID	Avoid evaporation to dryness. If allowed to dry, product residue is incompatible with flammable organic materials, reducing agents, and chlorine or hypochlorite products. This product is incompatible with caustic materials.
HAZAROUS DECOMPOSITION PRODUCTS	Nitrogen oxides, ammonia

SECTION 11: TOXICOLOGICAL INFORMATION		
INHALATION	ACUTE	Spray or mist may irritate respiratory tract.
	CHRONIC	There are no known chronic inhalation effects.
SKIN	ACUTE	May irritate the skin.
	CHRONIC	There are no known chronic dermal effects.
EYE	ACUTE	May irritate the eyes.
INGESTION	ACUTE	Ingestion of large amounts may cause violent gastroenteritis.
	CHRONIC	There are no known chronic ingestion effects.
LD50		>2000 mg/kg, oral (rat)
LC50		Not applicable
Acute Toxicity Estimate		>3900 mg/kg
CARCINOGENICITY/MUTAGENICITY		There are no known carcinogenic or mutagenic properties
REPRODUCTIVE EFFECTS		There are no known reproductive effects
NEUROTOXICITY		There are no known neurotoxic effects
OTHER EFFECTS		No other effects are known
TARGET ORGANS		Target organs include skin and eyes

SECTION 12: ECOLOGICAL INFORMATION

California Title 22 Acute Toxicity Screening Protocol:

Fish bioassay (96 hr): 100mg/l

The products of biodegradation are non-toxic. This product does not show any bioaccumulation phenomena.

SECTION 13: DISPOSAL CONSIDERATIONS	
SPILL/LEAK **PROCEDURES**	Only properly protected personnel should remain in the spill area; dike and contain spill; absorb or scrape up excess into suitable container for disposal; wash area with water. Stop or reduce discharge if it can be done safely.
CLEANUP	Mop up and containerize for subsequent recycling or disposal. Triple rinse empty containers with water prior to reconditioning.
REGULATORY **REQUIREMENTS**	Generators of waste material are required to evaluate all waste for compliance with RCRA and any local disposal procedures and regulations. NOTE: State and local regulations may be more stringent than federal regulations.

DISPOSAL	Material that cannot be used, or reprocessed for use, and empty containers should be disposed of in accordance with all applicable regulations. Product containers should be thoroughly emptied before disposal.

SECTION 14: TRANSPORT INFORMATION		
LAND – DOT	**UN/NA IDENTIFICATION NUMBER:**	Not Applicable to unused finished product
	UN-PROPER SHIPPING NAME:	Not Applicable to unused finished product
	TRANSPORT HAZARD CLASS:	Not Applicable to unused finished product
	PACKING GROUP:	Not Applicable to unused finished product
	MARINE POLLUTANT:	Not Applicable to unused finished product
	HAZARD CLASS:	Not Applicable to unused finished product
WATER – IMO/IMDG	**UN/NA IDENTIFICATION NUMBER:**	Not Applicable to unused finished product
	UN-PROPER SHIPPING NAME:	Not Applicable to unused finished product
	TRANSPORT HAZARD CLASS:	Not Applicable to unused finished product
	PACKING GROUP:	Not Applicable to unused finished product
	MARINE POLLUTANT:	Not Applicable to unused finished product
AIR – ICAO/IATA *For product quantities less than 0.5 Kg*	**UN/NA IDENTIFICATION NUMBER:**	Not Applicable to unused finished product
	UN-PROPER SHIPPING NAME:	Not Applicable to unused finished product
	TRANSPORT HAZARD CLASS:	Not Applicable to unused finished product
	PACKING GROUP:	Not Applicable to unused finished product
	MARINE POLLUTANT:	Not Applicable to unused finished product

SECTION 15: REGULATORY INFORMATION	
OSHA	Hazard Communication Standard: Not regulated.
OSHA	Process Safety Standard: No
CAA	Section 112r: No
CERCLA	Section 103: No RQ: None
SARA	Section 302: No; SARA Section 304: No; SARA Section 313: No
SARA HAZARD CATEGORIES 311/312	Not listed.
TSCA	The ingredients of this product are on the TSCA Inventory List.

SECTION 16: OTHER INFORMATION	
DISCLAIMER:	The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the user thereof. It is the buyer's responsibility to ensure that its activities comply with federal, state, provincial and local laws.
REVISION INDICATOR:	Revision 0: (This SDS replaces the former MSDS for this product pursuant to OSHA 1910.1200(g) Appendix D. The MSDS for this product should be considered obsolete).

Municipal Services Original 07/28/10 Rev 1 - 01/31/14	**Bioxide-AQ® Solution** **(Ammonium Calcium Nitrate and Anthraquinone Solution)** **Spill Response Procedures**

MS-SRP-017 **Emergency Response Guide 140**

PURPOSE

The purpose of this procedure is to ensure that the correct guidelines and information are available for handling an accidental spill or release of Bioxide-AQ® solution (ammonium calcium nitrate double salt CAS No: 15245-12-2 and anthraquinone CAS No: 84-65-1). It is intended to be available to all Evoqua employees that are involved in the operation of dosing sites where this chemical is stored.

A copy of this document should be made available at each chemical storage location and kept in a weather proof container with ease of access for operators and emergency response organizations.

SCOPE

This procedure will be maintained in accordance with Evoqua Water Technologies - Municipal Services Business Unit procedures.

RESPONSIBILITY

Evoqua Water Technologies - Municipal Services (EWT-Municipal Services)

EMERGENCY OVERVIEW

COLOR: Clear, colorless solution.

ODOR: Odorless.

SIGNAL WORD: Caution.

MAJOR HEALTH HAZARDS: May be harmful if ingested. May cause irritation to the skin, eyes, or respiratory tract.

PHYSICAL HAZARDS: Product may be slippery when wet. Do not allow spilled material to evaporate to dryness.

PRECAUTIONARY STATEMENTS: Wash thoroughly after handling, immediately remove, and dispose of any spillage. Immediately rinse contaminated clothing thoroughly with water. Rinse containers with water only.

NFPA: Health = 1 Fire = 0 Reactivity = 0

FIRE FIGHTING MEASURES: Use extinguishing agents appropriate for surrounding area. Consult the product MSDS/SDS for additional Information.

REPORTING REQUIREMENTS:

Evoqua Water Technologies requires that all spills and accidental releases be reported. An internal investigation will be conducted for all reported incidents.

1. **Evoqua Employees**
   Employees are required to report all spills of any magnitude to their supervisor immediately. The EWT-Municipal Services EHS Manager must be notified within six hours of the incident.

   NOTE! At a customer site the customer must be the one to call 911 or the local emergency response organization.

2. **Customers and Contractors**
   During normal working hours (8.00 – 5.00 local time) call the closest EWT-Municipal Services branch listed below or your local Evoqua Water Technologies representative if a number has been provided:

BRANCH LOCATION	CONTACT PHONE NUMBER
Canton, GA	(800) 445-4771
Cedar Park, TX	(800) 224-2450
Granite City, IL	(800) 887-8710
Sarasota, FL	(800) 345-3982
Temecula, CA	(800) 566-1568
Wilmington, DE	(800) 566-4208

AFTER HOURS ASSISTANCE: Call the Branch Toll Free number for instructions or your local Evoqua Water Technologies representative if a number has been provided.

IF YOU ARE UNABLE TO REACH A LOCAL CONTACT CALL EVOQUA WATER TECHNOLOGIES CENTRAL EMERGENCY REPORT LINE AT (877) 873-4732 FOR ASSISTANCE.

If requested a Evoqua Water Technologies' responder will proceed to the site. The responder will report to the Incident Commander and offer assistance as necessary.

REGULATORY AUTHORITIES

Spill should be evaluated to see if it meets or exceeds reportable quantities.

DURING AN EMERGENCY INCIDENT

When working in and around the spill area and/or the chemical storage area the following personal protective equipment (PPE) will be worn as a minimum and without exception.

EYE AND FACE PROTECTION

- Safety glasses with side shields or chemical safety goggles (face shield should also be available and worn in addition to safety glasses or goggles where splashing or spraying is a possibility).
- Hard hat should be available and worn if required.

SKIN PROTECTION

- Protective clothing including protective gloves as appropriate to prevent skin contact.
- Steel-toed safety shoes/ boots, rubber soled or with rubber overshoes/ boots.

RESPIRATORY PROTECTION

- None required under normal use conditions. Consult the product MSDS/SDS for additional information.

EMERGENCY PROCEDURE FOR ACCIDENTAL RELEASE:

Upon finding a leak or spill situation, if at all possible, slow or stop the leak and turn off any dosing equipment involved. This should be done only when your personal safety will not be compromised.

1. Isolate the spill area and deny entry to unnecessary or unprotected personnel.

2. Remove all sources of ignition, such as flames, hot glowing surfaces, or electric arcs.

3. If necessary, create a dike or trench to contain all liquid material. Every effort should be made to prevent spilled material from entering sewer systems, streams, culverts, or other bodies of water.

4. Contain the spill to as small an area as can be controlled, then make the emergency call as detailed above.

5. If any vapors or gas can be seen or smelled, leave the area immediately and wait for assistance. Stand up wind and keep all unnecessary personnel away from the spill area until the emergency response team arrives.

6. Upon arrival of the Police or Fire department give them a copy of the MSDS/SDS for the product involved.

7. The spill area should be blocked off from pedestrian and vehicle traffic. The Police or Fire department should assume responsibility for this.

8. Once Emergency response teams are on the scene offer your help until a trained Evoqua Water Technologies representative arrives, take notes as much as possible, and do not try to commit all of the details to memory. With Customer's permission take pictures of the affected area.

9. If news media are present be courteous, however, do not elaborate on the spill or incident. You are not trained to handle the media and should decline any attempts by the media to interview you on camera or quote you for publication.

10. At some point a trained person from Evoqua Water Technologies or the environmental contractor's emergency personnel will communicate with the media if required.

CLEAN UP:

Cleanup personnel must wear proper protective equipment.

Each spill must be handled depending upon the circumstances surrounding the site, i.e. quantity involved, ground condition, and proximity to a water course, sewer, or other outlet.

1. For contained spill material follow the guidelines listed below for "Liquid Spill Residue".

   Note: Spill material should not be returned to EWT-Municipal Services without prior consultation with EWT-Municipal Services management.

2. If the solution has filtered into the ground, and there is no surrounding water course, the area can be washed down with water to dilute and reduce the activity of the material. If large quantities of material are spilled onto the ground please consult with Evoqua Water Technologies EHS department to determine whether a HAZMAT response team should be dispatched to the site to evaluate remediation options.

3. If the solution has filtered into the ground, and the spill site is in close proximity to a water course contact your EHS Manager immediately as regulatory notifications may be required.

LIQUID SPILL RESIDUE:

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 Systems (NPDES) permit and the permitting authority has been notified in writing prior to the discharge.

Spilled materials may be absorbed with inert materials such as dry sand, soil, or non-flammable commercial absorbents.

1. Small spills; defined as less than 5 gallons of material may be diluted with large amounts of water and washed down the sanitary sewer, ONLY with prior approval from the Customer and/or the Waste Water Treatment Plant for that area.

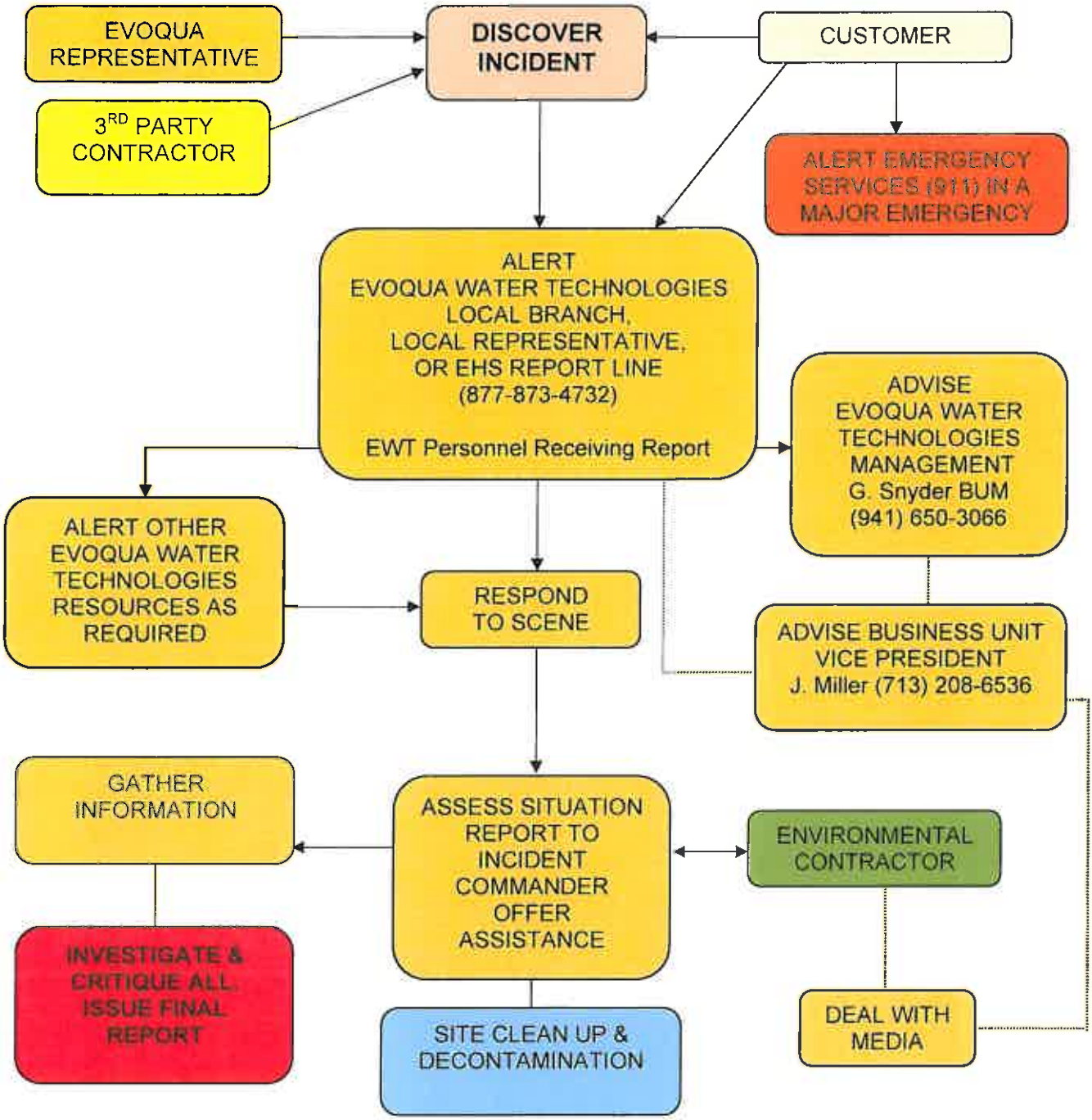
2. Medium spills: defined as more than 5 gallons and less than 50 gallons of material may be diluted with large amounts of water and washed down the sanitary sewer, ONLY with prior approval from the Customer and/or Waste Water Plant for that area.

3. Large spills: defined as more than 50 gallons of material that can be contained as liquid should be diluted with a large volume of water and discharged into a suitable treatment system in accordance with all regulatory agencies.

DISPOSAL OF SPILL RESIDUES:

All disposal of spill material must be done in accordance with local, state and federal regulations. Waste characterization and compliance with disposal regulations are responsibilities of the waste generator.

REPORTING REQUIREMENT DURING AN INCIDENT/ ACCIDENT/ OR CHEMICAL RELEASE AT A CUSTOMER SITE



evoqua
WATER TECHNOLOGIES

SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY INFORMATION			
PRODUCT TYPE:	Inorganic peroxide		
PRODUCT NAME:	Hydrogen Peroxide 50 %		
COMPANY ID:	Evoqua Water Technologies LLC 181 Thorne Hill Drive, Warrendale, PA 15086		
TELEPHONE NUMBER:	**INFORMATION:**	**CORPORATE**	866.926.8420
	MEDICAL EMERGENCY:	**CHEMTREC**	800.424.9300
	TRANSPORTATION EMERGENCY:	**CHEMTREC**	800.424.9300
DATE PREPARED:	June 1, 2015	**REVISION:** 0	

SECTION 2: HAZARD(S) IDENTIFICATION

HMIS RATINGS		NFPA RATINGS	GUIDE
HEALTH	3		4 – EXTREME/SEVERE 3 – HIGH/SERIOUS 2 – MODERATE 1 - SLIGHT 0 – MINIMUM ~~W~~ – WATER REACTIVE OX - OXIDIZER
FLAMMABILITY	0		
PHYSICAL HAZARD	1		
PERSONAL PROTECTION	H		

PICTOGRAM	SIGNAL WORD	HAZARD STATEMENT
	DANGER	H314: Causes severe skin burns and eye damage H302: Harmful if swallowed H332: Harmful if inhaled H335: May cause respiratory irritation H272: May intensify fire; oxidizer

PRECAUTIONARY STATEMENT(S)	
PREVENTION	P271: Use only outdoors or in a well ventilated area P260: Do not breathe mist, vapors or spray P280: Wear protective gloves/ protective clothing/ eye protection/ face protection P210: keep away from heat/sparks/open flames/ hot surfaces. – No Smoking P220: Keep/Store away from clothing/flammable materials/combustibles P221: Take any precaution to avoid mixing with

	combustibles/flammables
RESPONSE	P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing P310: Immediately call a POISON CENTER or doctor P303+P361+P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower P363: Wash contaminated clothing before reuse P304+P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing P312: Call a POISON CENTER or doctor if you feel unwell P301+P330+P331: IF SWALLOWED: rinse mouth. Do NOT induce vomiting P310: Immediately call a POISON CENTER or doctor P370+P378: In case of fire: Use water for extinction
STORAGE	Keep container in a cool place out of direct sunlight. Store only in vented containers. Do not store on wooden pallets. Do not return unused material to its original container. Avoid contamination – Contamination could cause decomposition and generation of oxygen which may result in high pressure and possible container rupture. Empty drums should be triple rinsed with water before discarding.

OTHER HAZARDS
NONE

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS			
PERCENT BY WEIGHT	COMMON NAME (Ingredient / Component)	CAS NO.	IMPURITIES
50%	Hydrogen peroxide	7722-84-1	NONE
Balance	Water	7732-18-5	NONE

SECTION 4: FIRST-AID MEASURES	
NECESSARY FIRST AID INSTRUCTIONS	
INHALATION FIRST AID	Move to fresh air. If person is not breathing, contact emergency medical services, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.
SKIN CONTACT FIRST AID	Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for further treatment advice
EYE CONTACT FIRST AID	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing. Seek immediate medical attention/advice
INGESTION FIRST AID:	Rinse mouth. Do not induce vomiting. If conscious, give 2 glasses of water. Get immediate medical attention. Never give anything by mouth to an unconscious person.
DESCRIPTION OF MOST IMPORTANT SYMPTOMS	
Hydrogen Peroxide irritates respiratory system and, if inhaled, may cause inflammation and pulmonary edema. The effects may not be immediate. Overexposure symptoms are coughing, giddiness and sore throat. In case of accidental ingestion, necrosis may result from mucous membrane burns (mouth, esophagus and stomach). Oxygen rapid release may cause stomach swelling and hemorrhaging, which may product	

major, or even fatal, injury to organs if a large amount has been ingested. In case of skin contact, may cause burns, erythema, blisters or even necrosis.
RECOMMENDATIONS FOR IMMEDIATE MEDICAL CARE
Hydrogen peroxide at these concentrations is a strong oxidant. Direct contact with the eye is likely to cause corneal damage especially if not washed immediately. Careful ophthalmologic evaluation is recommended and the possibility of local corticosteroid therapy should be considered. Because of the likelihood of corrosive effects on the gastrointestinal tract after ingestion, and the unlikelihood of systemic effects, attempts at evacuating the stomach via emesis induction or gastric lavage should be avoided. There is a remote possibility, however, that a nasogastric or orogastric tube may be required for the reduction of severe distension due to gas formation.

SECTION 5: FIRE-FIGHTING MEASURES	
SUITABLE EXTINGUISHING MEDIA	Water. Do not use any other substance
UNSUITABLE EXTINGUISHING MEDIA	Do not use any other substance but water.
SPECIFIC HAZARDS	In closed unventilated containers, risk of rupture due to the increased pressure from decomposition. Contact with combustible material may cause fire
PERSONAL PROTECTIVE EQUIPMENT	Use water spray to cool fire exposed surfaces and protect personnel. Move containers from fire area if you can do it without risk. As in any fire, wear self-contained breathing apparatus and full protective gear.

SECTION 6: ACCIDENTAL RELEASE MEASURES	
PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES	
PERSONAL PRECAUTIONS	Avoid contact with skin, eyes and clothing. Wear personal protective equipment. Isolate and post spill area. Keep people away from and upwind of spill/leak. Eliminate all sources of ignition and remove combustible materials.
ENVIRONMENTAL PRECAUTIONS	See Section 12 for additional Ecological Information.
CONTAINMENT AND CLEAN-UP	Dike to collect large liquid spills. Stop leak and contain spill if this can be done safely. Small spillage: Dilute with large quantities of water. Flush area with flooding quantities of water. Hydrogen peroxide may be decomposed by adding sodium metabisulfite or sodium sulfite after diluting to about 5%.
OTHER INFORMATION	Combustible materials exposed to hydrogen peroxide should be immediately submerged in or rinsed with large amounts of water to ensure that all hydrogen peroxide is removed. Residual hydrogen peroxide that is allowed to dry (upon evaporation hydrogen peroxide can concentrate) on organic materials such as paper, fabrics, cotton, leather, wood or other combustibles can cause the material to ignite and result in fire.

SECTION 7: HANDLING AND STORAGE	
PRECAUTIONS FOR **SAFE HANDLING**	Use only in well-ventilated areas. Keep/Store away from clothing/ combustible materials. Wear personal protective equipment. Never return unused hydrogen peroxide to original container. Contamination may cause decomposition and generation of oxygen gas which could result in high pressures and possible container rupture. Empty drums should be triple rinsed with water before discarding. Utensils used for handling hydrogen peroxide should only be made of glass, stainless steel, aluminum or plastic. Pipes and equipment should be passivated before first use. Hydrogen peroxide should be stored only in vented containers and transferred only in a prescribed manner.
CONDITIONS FOR **SAFE STORAGE**	Keep containers in cool areas out of direct sunlight and away from combustibles. Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work

	environment. Containers must be vented. Keep/store only in original container. Store rooms or warehouses should be made of non-combustible materials with impermeable floors. In case of release, spillage should flow to safe area. Containers should be visually inspected on a regular basis to detect any abnormalities (swollen drums, increases in temperature, etc.).
Incompatible Products	Combustible materials. Copper alloys, galvanized iron. Strong reducing agents. Heavy metals. Iron. Copper alloys. Contact with metals, metallic ions, alkalis, reducing agents and organic matter (such as alcohols or terpenes) may produce self-accelerated thermal decomposition.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS	Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation.
RESPIRATORY PROTECTION	If concentrations in excess of 10 ppm are expected, use NIOSH/DHHS approved self-contained breathing apparatus (SCBA) or other approved air-supplied respirator (ASR) equipment (e.g., a full-face airline respirator (ALR)). DO NOT use any form of air-purifying respirator (APR) or filtering facepiece (dust mask), especially those containing oxidizable sorbents such as activated carbon.
SKIN PROTECTION	For body protection wear impervious clothing such as an approved splash protective suit made of SBR rubber, PVC (PVC Outershell w/Polyester Substrate), Gore-Tex (Polyester trilaminate w/Gore-Tex), or a specialized HAZMAT Splash or Protective Suite (Level A, B, or C). For foot protection, wear approved boots made of NBR, PVC, Polyurethane, or neoprene. Overboots made of Latex or PVC, as well as firefighter boots or specialized HAZMAT boots are also permitted. DO NOT wear any form of boot or overboot made of nylon or nylon blends. DO NOT USE cotton, wool or leather as these materials react rapidly with higher concentrations of hydrogen peroxide. Completely submerge hydrogen peroxide contaminated clothing or other materials in water prior to drying. Residual hydrogen peroxide, if allowed to dry on materials such as paper, fabrics, cotton, leather, wood or other combustibles, can cause the material to ignite and result in a fire.
EYE/FACE PROTECTION	Use chemical splash-type monogoggles and a full-face shield made of polycarbonate, acetate, polycarbonate/acetate, PETG or thermoplastic.
HAND PROTECTION	For hand protection, wear approved gloves made of nitrile, PVC, or neoprene. DO NOT use cotton, wool or leather for these materials react RAPIDLY with higher concentrations of hydrogen peroxide. Thoroughly rinse the outside of gloves with water prior to removal. Inspect regularly for leaks.
EXPOSURE LIMITS/GUIDELINES	

	NIOSH	**OSHA PEL**	**ACGIH TLV**
	IDLH: 75 ppm TWA: 1 ppm	TWA: 1 ppm	TWA: 1 ppm

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

COLOR	Clear	**MOLECULAR WEIGHT**	34
ODOR	slightly pungent odor	**ODOR THRESHOLD**	NA
pH VALUE	<= 3.0	**VAPOR PRESSURE**	18 mm Hg @ 30 °C
MELTING POINT	NA	**VAPOR DENSITY**	NA
FREEZING POINT	-52 ^{0} C	**RELATIVE DENSITY**	1.2 @ 20 °C

INITIAL BOILING POINT	239 ^{0} F	SOLUBILITY	Soluble in water
FLASHPOINT	Not flammable	PARTITION COEFFICIENT	log Kow = -1.5 @ 20 °C
EVAPORATION RATE	> 1 (n-butyl acetate = 1)	AUTO IGNITION TEMP.	Not combustible
FLAMMABILITY	NA	DECOMP. TEMP.	100 °C (adiabatic)
UEL	NA	VISCOSITY	1.17 cP @ 20 °C
LEL	NA	SPECIFIC GRAVITY	1.2

SECTION 10: STABILITY AND REACTIVITY	
REACTIVITY	Reactive and oxidizing agent.
CHEMICAL STABILITY	Stable under normal conditions. Decomposes on heating. Stable under recommended storage conditions.
POSSIBILITY OF HAZARDOUS REACTIONS	Contact with organic substances may cause fire or explosion. Contact with metals, metallic ions, alkalis, reducing agents and organic matter (such as alcohols or terpenes) may produce self-accelerated thermal decomposition.
CONDITIONS TO AVOID	Excessive heat; Contamination; Exposure to UV-rays; pH variations.
HAZARDOUS DECOMPOSITION PRODUCTS	Oxygen which supports combustion. Liable to produce overpressure in container.

SECTION 11: TOXICOLOGICAL INFORMATION		
INHALATION	ACUTE	Irritating to the nose, throat, and respiratory tract.
	CHRONIC	Not known as this time.
SKIN	ACUTE	Corrosive to skin. Causes serious burns.
	CHRONIC	Not known as this time.
EYE	ACUTE	Corrosive. Risk of serious damage to eyes.
INGESTION	ACUTE	Harmful and may be fatal if swallowed. This product will burn the mouth, throat, and stomach. Oxygen gas in the esophagus and stomach causes extreme swelling leading to severe injuries.
	CHRONIC	Not known as this time.
LD50		ORAL: 50% solution: LD50 > 225 mg/kg bw (rat) 35 % solution:LD50 1193 mg/kg bw (rat) 70 % solution: LD50 1026 mg/kg bw (rat) DERMAL: 35% solution: LD50 > 2000 mg/kg bw (rabbit) 70 % solution: LD50 9200 mg/kg bw (rabbit)
LC50		50% solution: LC50 > 170 mg/m3 (rat) (4-hr) Hydrogen Peroxide vapors: LC0 9400 mg/m³ (mouse) (5 - 15 minutes) Hydrogen Peroxide vapors: LC50 > 2160 mg/m³ (mouse)
ACUTE TOXICITY ESTIMATES		NA
CARCINOGENICITY/MUTAGENICITY		This product contains hydrogen peroxide. The International Agency for Research on Cancer (IARC) has concluded that there is inadequate evidence for carcinogenicity of hydrogen peroxide in humans, but limited evidence in experimental animals (Group 3 – not classifiable as to its carcinogenicity to humans). The American Conference of Governmental Industrial Hygienists (ACGIH) has concluded that hydrogen peroxide is a 'Confirmed Animal Carcinogen with Unknown Relevance to Humans' (A3). This product is not recognized as mutagenic by Research Agencies In vivo tests did not show mutagenic effects.
REPRODUCTIVE EFFECTS		This product is not recognized as reprotox by Research

	Agencies. No toxicity to reproduction in animal studies.
NEUROTOXICITY	Not known as this time.
OTHER EFFECTS	Aspiration risk: may cause lung damage if swallowed.
TARGET ORGANS	Eyes, Respiratory System, Skin.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity effects Hydrogen peroxide is naturally produced by sunlight (between 0.1 and 4 ppb in air and 0.001 to 0.1 mg/L in water). Not expected to have significant environmental effects.

Hydrogen peroxide (7722-84-1)				
Active Ingredient(s)	Duration	Species	Value	Units
Hydrogen peroxide	96 h LC50	Fish Pimephales promelas	16.4	mg/L
Hydrogen peroxide	72 h LC50	Fish Leuciscus idus	35	mg/L
Hydrogen peroxide	48 h EC50	Daphnia pulex	2.4	mg/L
Hydrogen peroxide	24 h EC50	Daphnia magna	7.7	mg/L
Hydrogen peroxide	72 h EC50	Algae Skeletonema costatum	1.38	mg/L
Hydrogen peroxide	21 d NOEC	Daphnia magna	0.63	mg/L

Persistence and degradability Hydrogen peroxide in the aquatic environment is subject to various reduction or oxidation processes and decomposes into water and oxygen. Hydrogen peroxide half-life in freshwater ranged from 8 hours to 20 days, in air from 10 - 20 hours, and in soils from minutes to hours depending upon microbiological activity and metal contamination.

Bioaccumulation Material may have some potential to bioaccumulate but will likely degrade in most environments before accumulation can occur.

Mobility Will likely be mobile in the environment due to its water solubility but will likely degrade over time.

Other Adverse Effects Decomposes into oxygen and water. No adverse effects.

SECTION 13: DISPOSAL CONSIDERATIONS

SPILL/LEAK PROCEDURES	• Keep combustibles (wood, paper, oil, etc.) away from spilled material. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Stop leak if you can do it without risk. • Do not get water inside containers.
CLEANUP	Small Dry Spill • With clean shovel place material into clean, dry container and cover loosely; move containers from spill area. Small Liquid Spill • Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. Large Spill • Dike far ahead of liquid spill for later disposal. • Following product recovery, flush area with water.
REGULATORY REQUIREMENTS	US EPA Waste Number D001 D003
DISPOSAL	Dispose of in accordance with local regulations. Can be disposed as waste water, when in compliance with local regulations. Contaminated Packaging Dispose of in accordance with local regulations. Drums - Empty as thoroughly as possible. Triple rinse drums before disposal. Avoid contamination; impurities accelerate decomposition. Never return product to original container.

SECTION 14: TRANSPORT INFORMATION		
LAND – DOT	**UN/NA IDENTIFICATION NUMBER:**	UN 2014
	UN-PROPER SHIPPING NAME:	Hydrogen peroxide, aqueous solutions with more than 40 percent but not more than 60 percent hydrogen peroxide (stabilized as necessary)
	TRANSPORT HAZARD CLASS:	5.1, 8
	PACKING GROUP:	II
	MARINE POLLUTANT:	Not known
	HAZARD CLASS:	5.1, 8
WATER – IMO/IMDG	**UN/NA IDENTIFICATION NUMBER:**	UN 2014
	UN-PROPER SHIPPING NAME:	Hydrogen peroxide, aqueous solutions with more than 40 percent but not more than 60 percent hydrogen peroxide (stabilized as necessary)
	TRANSPORT HAZARD CLASS:	5.1, 8
	PACKING GROUP:	II
	MARINE POLLUTANT:	Not known
AIR – ICAO/IATA *For product quantities less than 0.5 Kg*	**UN/NA IDENTIFICATION NUMBER:**	Forbidden
	UN-PROPER SHIPPING NAME:	Forbidden
	TRANSPORT HAZARD CLASS:	Forbidden
	PACKING GROUP:	Forbidden
	MARINE POLLUTANT:	Forbidden

SECTION 15: REGULATORY INFORMATION	
OSHA	Corrosive, Oxidizer
OSHA	NA
CAA	This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)
CERCLA	Yes RQ: 1000lbs. (only for concentrations of > 52%)
SARA	No
SARA HAZARD CATEGORIES 311/312	Acute: Yes Chronic: No Fire: Yes Pressure Release: No Reactive: No
TSCA	Yes

SECTION 16: OTHER INFORMATION	
DISCLAIMER:	The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the user thereof. It is the buyer's responsibility to ensure that its activities comply with federal, state, provincial and local laws.
REVISION INDICATOR:	Revision 0: (This SDS replaces the former MSDS for this product pursuant to OSHA 1910.1200(g) Appendix D. The MSDS for this product should be considered obsolete).

Municipal Services Original 06/14/10 Rev 1 - 01/31/14	**Hydrogen Peroxide Solutions to 50% Spill Response Procedures**

MS-SRP-002

Emergency Response Guide 140
UN 2014

PURPOSE

The purpose of this procedure is to ensure that the correct guidelines and information are available for handling an accidental spill or release of Hydrogen Peroxide Solutions to 50% (CAS No: 7722-84-1). It is intended to be available to all Evoqua employees that are involved in the operation of dosing sites where this chemical is stored.

A copy of this document should be made available at each chemical storage location and kept in a weather proof container with ease of access for operators and emergency response organizations.

SCOPE

This procedure will be maintained in accordance with Evoqua Water Technologies - Municipal Services Business Unit procedures.

RESPONSIBILITY

Evoqua Water Technologies - Municipal Services (EWT-Municipal Services)

EMERGENCY OVERVIEW

COLOR: Clear, colorless solution.

ODOR: Slightly pungent odor.

SIGNAL WORD: Danger

MAJOR HEALTH HAZARDS: OXIDIZER. MAY BE FATAL IF SWALLOWED. CORROSIVE TO EYES, NOSE, THROAT, LUNGS, AND GASTROINTESTINAL TRACT.

PHYSICAL HAZARDS: Contact with combustibles may cause fire. Decomposes yielding oxygen, and heat that supports combustion of organic matter and can cause overpressure if confined.

PRECAUTIONARY STATEMENTS: Do not breathe vapor or spray mist. Do not taste or swallow. Do not get in eyes, on skin, or on clothing. Keep container ventilated. Wash thoroughly after handling. Use only with adequate ventilation.

NFPA: Health = 3 Fire = 0 Reactivity = 1 Other = OX

FIRE FIGHTING MEASURES: Flood with water. Consult the product MSDS/SDS for additional Information.

REPORTING REQUIREMENTS:

Evoqua Water Technologies requires that all spills and accidental releases be reported. An internal investigation will be conducted for all reported incidents.

1. **Evoqua Employees**
   Employees are required to report all spills of any magnitude to their supervisor immediately. The EWT - Municipal Services EHS Manager must be notified within six hours of the incident.

   NOTE! At a customer site the customer must be the one to call 911 or the local emergency response organization.

2. **Customers and Contractors**
   During normal working hours (8.00 – 5.00 local time) call the closest EWT-Municipal Services branch listed below or your local Evoqua Water Technologies representative if a number has been provided:

BRANCH LOCATION	CONTACT PHONE NUMBER
Canton, GA	(800) 445-4771
Cedar Park, TX	(800) 224-2450
Granite City, IL	(800) 887-8710
Sarasota, FL	(800) 345-3982
Temecula, CA	(800) 566-1568
Wilmington, DE	(800) 566-4208

AFTER HOURS ASSITANCE: Call the Branch Toll Free number for instructions or your local Evoqua Water Technologies representative if a number has been provided.

IF YOU ARE UNABLE TO REACH A LOCAL CONTACT, CALL EVOQUA WATER TECHNOLOGIES CENTRAL EMERGENCY REPORT LINE AT (877) 873-4732 FOR ASSISTANCE.

If requested an Evoqua Water Technologies responder will proceed to the site. The responder will report to the Incident Commander and offer assistance as necessary.

REGULATORY AUTHORITIES

Spill should be evaluated to see if it meets or exceeds reportable quantities.

DURING AN EMERGENCY INCIDENT

When working in and around the spill area and/or the chemical storage area the following personal protective equipment (PPE) will be worn as a minimum and without exception.

EYE AND FACE PROTECTION

- Chemical safety goggles (face shield should also be available and worn in addition to goggles where splashing or spraying is a possibility).
- Hard hat should be available and worn if required.

SKIN PROTECTION

- Impervious clothing such as a Neoprene Apron or Neoprene Slicker suit (avoid cotton, wool, and leather).
- Safety shoes/ boots, steel-toed, rubber soled (not leather or wear rubber overshoes).

RESPIRATORY PROTECTION

- Do not use any form of air purifying respirator or filtering face piece respirator (2-strap dust mask), especially those containing oxidizable substances such as activated carbon.
- Water applied to vapor will eliminate the vapor.

EMERGENCY PROCEDURE FOR ACCIDENTAL RELEASE:

Upon finding a leak or spill situation, if at all possible, slow or stop the leak and turn off any dosing equipment involved. This should be done only when your personal safety will not be compromised.

1. Isolate the spill area and deny entry to unnecessary or unprotected personnel.
2. Remove all sources of ignition, such as flames, hot glowing surfaces, or electric arcs.
3. If necessary, create a dike or trench to contain all liquid material. Every effort should be made to prevent spilled material from entering sewer systems, streams, culverts, or other bodies of water.
4. Contain the spill to as small an area as can be controlled, then make the emergency call as detailed above.
5. If any vapors or gas can be seen or smelled, leave the area immediately and wait for assistance. Stand up wind and keep all unnecessary personnel away from the spill area until the emergency response team arrives.
6. Upon arrival of the Police or Fire department give them a copy of the MSDS/SDS for the product involved.
7. The spill area should be blocked off from pedestrian and vehicle traffic. The Police or Fire department should assume responsibility for this.
8. Once Emergency response teams are on the scene offer your help until a trained Evoqua Water Technologies representative arrives, take notes as much as possible, and do not try to commit all of the details to memory. With Customer's permission take pictures of the affected area.

9. If news media are present be courteous, however, do not elaborate on the spill or incident. You are not trained to handle the media and should decline any attempts by the media to interview you on camera or quote you for publication.

10. At some point a trained person from Evoqua Water Technologies or the environmental contractor's emergency personnel will communicate with the media if required.

CLEAN UP:

Cleanup personnel must wear proper protective equipment.

Each spill must be handled depending upon the circumstances surrounding the site, i.e. quantity involved, ground condition, and proximity to a water course, sewer, or other outlet.

1. For contained spill material follow the guidelines listed below for "Liquid Spill Residue".

   Note: Spill material should not be returned to EWT - Municipal Services without prior consultation with EWT - Municipal Services management.

2. If the solution has filtered into the ground, and there is no surrounding water course, the area can be washed down with water to dilute and reduce the activity of the material. Continue to keep damp. If allowed to dry, dried material can ignite in contact with combustible materials. If large quantities of material are spilled onto the ground in an area covered with dry grass or heavy vegetation please consult with Evoqua Water Technologies EHS department to determine whether a HAZMAT response team should be dispatched to the site to evaluate remediation options.

3. If the solution has filtered into the ground, and the spill site is in close proximity to a water course contact your EHS Manager immediately as regulatory notifications may be required.

LIQUID SPILL RESIDUE:

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 Systems (NPDES) permit and the permitting authority has been notified in writing prior to the discharge.

Combustible materials exposed to hydrogen peroxide should be immediately submerged in or rinsed with large amounts of water to ensure that all hydrogen peroxide is removed. Residual hydrogen peroxide that is allowed to dry can ignite in contact with combustible materials.

Hydrogen peroxide may be neutralized by adding copious amounts of water. No other substance or chemical is to be used. Neutralize as follows:

- Dilute hydrogen peroxide to about 5% and dispose of in accordance with all local, state, and Federal regulations.

1. Small spills; defined as less than 5 gallons of material may be diluted with large amounts of water and washed down the sanitary sewer, ONLY with prior approval from the Customer and/or the Waste Water Treatment Plant for that area.

2. Medium spills: defined as more than 5 gallons and less than 50 gallons of material may be diluted with large amounts of water and washed down the sanitary sewer, ONLY with prior approval from the Customer and/or the Waste Water Treatment Plant for that area.

3. Large spills: defined as more than 50 gallons of material that can be contained as liquid should be diluted with a large volume of water and held until the hydrogen peroxide decomposes, or neutralized as described above. Once the product has decomposed or has been neutralized discharge into a suitable treatment system in accordance with all regulatory agencies.

DISPOSAL OF SPILL RESIDUES:

All disposal of spill material must be done in accordance with local, state, and federal regulations. Waste characterization and compliance with disposal regulations are responsibilities of the waste generator.

REPORTING REQUIREMENT DURING AN INCIDENT/ ACCIDENT/ OR CHEMICAL RELEASE AT A CUSTOMER SITE