**Lee County Board Of County Commissioners**
**Agenda Item Summary** **Blue Sheet No. 20020672**

**1. REQUESTED MOTION:**

**ACTION REQUESTED:** Request authorization from the Board for Lee County Utilities to negotiate on the best terms with the sole bidder, U.S. Filter/Davis Process who responded to Formal Quotation No.: Q-020388, Nitrate Solution for the Prevention of Sulfides in Wastewater for a not to exceed unit price of $1.75 per gallon or $0.486 per lb. as outlined within the specifications. Term of the quotation is for five years.

**WHY ACTION IS NECESSARY:**
According to Section 9.4.1 of the Lee County Purchasing & Payment Procedures Manual, approved by the Board on 3/21/00, purchases over $50,000.00 must be approved by the Board.

**WHAT ACTION ACCOMPLISHES:**
To establish a contract with the vendor to provide a nitrate solution for the purpose of preventing the formation of wastewater sulfide concentrations in the sewer collection system as part of Lee County's odor and corrosion control program inclusive of all necessary feed equipment, monitoring and reporting services.

| 2. DEPARTMENTAL CATEGORY: 10<br>COMMISSION DISTRICT # C1OD | 3. MEETING DATE: 08-06-2002 |
|---|---|

| 4. AGENDA: | 5. REQUIREMENT/PURPOSE: (Specify) | 6. REQUESTOR OF INFORMATION: |
|---|---|---|
| X CONSENT | STATUTE | A. COMMISSIONER |
| ADMINISTRATIVE | ORDINANCE | B. DEPARTMENT |
| APPEALS | X ADMIN. CODE AC-4-1 | C. DIVISION Utilities |
| PUBLIC | OTHER | BY: Rick Diaz, Director 6/27/02 |
| WALK ON | | |
| TIME REQUIRED: | | |

**7. BACKGROUND:**
On May 14, 2002, the Division of Purchasing received sealed quotations for Formal Quotation No.: Q-020388, Nitrate Solution for the Prevention of Sulfides in Wastewater. On that date, one response was received and two "No Bids" despite direct mailing and contacting 47 vendors. As outlined in the Florida State Statute 287.057(4) " If less than two responsive bids or proposals for commodity or contractual services purchases are received, the department or agency may negotiate on the best terms and conditions....in lieu of resoliciting competitive sealed bids or proposals." As outlined within the specifications, the awarded vendor will provide the nitrate solution product including the installation and use of all necessary feed equipment inclusive of equipment operation and maintenance, sampling, monitoring and reporting services.
Anticipated expenditures are $300,000.00 annually. Funding will come from the individual department or division's budget whom will be responsible for monitoring their individual expenditures. Authorize Utilities staff to negotiate with the sole vendor for better terms.

**8. MANAGEMENT RECOMMENDATIONS:**

**9. RECOMMENDED APPROVAL:**

| A Department Director | B Purchasing or Contracts | C Human Resources | D Other | E County Attorney | F Budget Services | | | | G County Manager |
|---|---|---|---|---|---|---|---|---|---|
| 6/27/02 | Janet Sheehan 6.27.02 | N/A | | 6/28/02 | OA 6/28/02 | OM 6/30/02 | Risk 7/15 | GC 7-3-02 | |

**10. COMMISSION ACTION:**

_____ APPROVED
_____ DENIED
_____ DEFERRED
_____ OTHER

RECVD. by CO. ATTY 6/28/02 3:00PM CO. ATTY FORWARDED TO: Budget 6/28/02 3:15 PM

RECEIVED BY COUNTY ADMIN. DD 6/28 4:30 COUNTY ADMIN. FORWARDED TO: BL 7/16 12:00

ATTACHMENTS:

(1) Tabulation Sheet
(2) Specifications
(3) Addendum #1
(4) Awarded Vendor's Submitted Quotation

| FORMAL QUOTATION #Q-020388<br>OPENING DATE: MAY 14, 2002<br>BUYER: CHERI ALEXANDER | LEE COUNTY, FLORIDA TABULATION SHEET<br>FOR<br>NITRATE SOLUTION FOR THE PREVENTION OF SULFIDES IN WASTEWATER | | | | | | |
|---|---|---|---|---|---|---|---|
| **VENDORS** | US FILTER DAVIS PROCESS | | | | | | |
| **COMMODITY CODE 19036** | | | | | | | |
| Acknowledged addendum #1 | YES | | | | | | |
| 1. Delivered Nitrate Solution Product including the installation and use of all necessary feed equipment; Specify Product Name | BIOXIDE | | | | | | |
| Unit price/gal | $1.75 | | | | | | |
| Unit price/lb | 0.486 | | | | | | |
| 2. Equipment Operation and Maintenance, Sampling, Monitoring and Reporting Services | 0.00 - EQUIPMENT ON SITE | | | | | | |
| Unit price/gal | $1.75 | | | | | | |
| Unit price/lb | 0.486 | | | | | | |
| **Total Cost** | $1.75 | | | | | | |
| DELIVER WITHIN ____ CALENDAR DAYS | 3 | | | | | | |
| LOCAL VENDOR PREFERENCE | YES | | | | | | |
| MODIFICATIONS | NO | | | | | | |
| QUOTE SIGNED | YES | | | | | | |
| **NO BIDS** | | | | | | | |
| BRENNTAG MID SOUTH | | | | | | | |
| NALCO | | | | | | | |
| POSTING TIME/DATE | | | | | | | |
| FROM: ____/____ | | | | | | | |
| UNTIL: ____/____ | | | | | | | |
| BY: | | | | | | | |

ATTACHMENT 1

ATTACHMENT 2

LEE COUNTY
SOUTHWEST FLORIDA

PROJECT NO.: Q-020388

OPEN DATE: MAY 14, 2002

AND TIME: 2:30 P.M.

PRE-BID DATE: MAY 2, 2002

AND TIME: 2:00 P.M.

LOCATION: PURCHASING

# REQUEST FOR QUOTATIONS

## TITLE:

## NITRATE SOLUTION FOR THE PREVENTION OF SULFIDES IN WASTEWATER

REQUESTER: LEE COUNTY BOARD OF COUNTY COMMISSIONERS
DIVISION OF PURCHASING
3434 HANCOCK BRIDGE PKWY, 3RD FLOOR
P.O. BOX 398
FORT MYERS, FL 33902-0398

BUYER: CHERI ALEXANDER, C.P.M., CPPB
PURCHASING AGENT
PHONE NO.: (239) 689-7385

## GENERAL CONDITIONS

Sealed Quotations will be received by the DIVISION OF PURCHASING, until 2:30pm on the date specified on the cover sheet of this "Request for Quotations", and opened immediately thereafter by the Purchasing Director or designee.

Any question regarding this solicitation should be directed to the Buyer listed on the cover page of this solicitation, or by calling the Division of Purchasing at (239) 689-7385.

1. **SUBMISSION OF QUOTE:**

a. Quotations shall be sealed in an envelope, and the outside of the envelope should be marked with the following information:

1. Marked with the words "Sealed Quote"
2. Name of the firm submitting the quotation
3. Title of the quotation
4. Quotation number

b. The Quotation shall be submitted in triplicate as follows:

1. The original consisting of the Lee County quotes forms completed and signed.
2. A copy of the original quote forms for the Purchasing Director.
3. A second copy of the original quote forms for use by the requesting department.

c. The following should be submitted along with the quotation in a separate envelope. This envelope should be marked as described above, but instead of marking the envelope as "Sealed Quote", please indicate the contents; i.e., literature, drawings, submittals, etc. This information should be submitted in duplicate.

1. Any information (either required or in addition to that asked for by the specifications) necessary to analyze your quotation; i.e., required submittals, literature, technical data, financial statements.

2. Warranties and guarantees against defective materials and workmanship.

d. **ALTERNATE QUOTE:** If the vendor elects to submit more than one quote, then the quotes should be submitted in separate envelopes and marked as indicated above. The second, or alternate quote should be marked as "Alternate".

e. **QUOTES RECEIVED LATE:** It is the quoter's responsibility to ensure that his quote is received by the Division of Purchasing Services prior to the opening date and time specified. Any quote received after the opening date and time will be promptly returned to the quoter unopened. Lee County will not be responsible for quotes received late because of delays by a third party delivery service; i.e., U.S. Mail, UPS, Federal Express, etc.

f. **QUOTE CALCULATION ERRORS:** In the event there is a discrepancy between the total quoted amount or the extended amounts and the unit prices quoted, the unit prices will prevail and the corrected sum will be considered the quoted price.

g. **PAST PERFORMANCE:** All vendors will be evaluated on their past performance and prior dealings with Lee County (i.e., failure to meet specifications, poor workmanship, late delivery, etc.).

h. **WITHDRAWAL OF QUOTE:** No quote may be withdrawn for a period of 90 days after the scheduled time for receiving quotes. A quote may be withdrawn prior to the quote-opening date and time. Such a request to withdraw should be made in writing to the Purchasing Director, who will approve or disapprove of the request.

i. **COUNTY RESERVES THE RIGHT:** The County reserves the right to waive minor informalities in any quote; to reject any or all quotes with or without cause; and/or to accept the quote that in its judgment will be in the best interest of the County of Lee.

j. **EXECUTION OF QUOTE:** All quotes shall contain the signature of an authorized representative of the quoter in the space provided on the quote proposal form. All quotes shall be typed or printed in ink. The bidder may not use erasable ink. All corrections made to the quote shall be initialed.

2. **ACCEPTANCE**

The materials and/or services delivered under the quote **shall** remain the property of the seller until a physical inspection and actual usage of these materials and/or services is accepted to the County and is to be in compliance with the terms herein, fully in accord with the specifications and of the highest quality. In the event the materials and/or services supplied to the County are found to be defective or do not conform to specifications, the County reserves the right to cancel the order upon written notice to the seller and return such product to the seller at the seller's expense.

3. **SUBSTITUTIONS**

Whenever in these specifications a brand name or make is mentioned, it is the intention of the County only to establish a grade or quality of materials and not to rule out other brands or makes of equality. However, if a product other than that specified is quote, it is the vendor's responsibility to name such product with his quote and to prove to the County that said product is equal to the product specified. Lee County **shall** be the sole judge as to whether a product being offered by the quoter is actually equivalent to the one being specified by the detailed specifications. (Note: This paragraph does not apply when it is determined that the technical requirements of this solicitation require only a specific product as stated in the detailed specifications.

4. **RULES, REGULATIONS, LAWS, ORDINANCES & LICENSES**

The awarded vendor shall observe and obey all laws, ordinances, rules, and regulations, of the federal, state, and local government, which may be applicable to the supply of this product or service.

a. Occupational License – Vendor shall submit within 10 calendar days after request.
b. Specialty License(s) – Vendor shall possess at the time of the opening of the quote all necessary permits and/or license required for the sale of this product and/or service and upon the request of the County provide copies of licenses and/or permits within 10 calendar days after request.

5. **RECYCLED PRODUCTS**

It is the Lee County Board of County Commissioners' stated policy objective to "Ensure all departments are aware of the availability of recycled products..." (Administrative Code #AC-10-4). In an effort to provide the utmost opportunity for the use of recycled products by Lee County, vendors should list on their letterhead, all necessary information regarding any applicable recycled products they have available. Recycled products should meet all other specifications listed and have a minimum of 50%-recycled content. Whenever fiscally feasible, available recycled products will be purchased.

6. **WARRANTY/GUARANTY** (unless otherwise specified)

All materials and/or services furnished under this quote shall be warranted by the vendor to be free from defects and fit for the intended use.

7. **PRE-BID CONFERENCE**

A pre-bid conference will be held at the location, date, and time specified on the cover of this solicitation. Pre-bid conferences are generally non-mandatory, but it is highly recommended that everyone planning to submit a quote attend.

In the event a pre-bid conference is classified as mandatory, it will be so specified on the cover of this solicitation and it will be the responsibility of the quoter to ensure that they are represented at the pre-bid. Only those quoters who attend the pre-bid conference will be allowed to quote on this project.

8. **BIDDERS LIST MAINTENANCE**

A bidder should respond to "Request for Quotations" in order to be kept on the Bidder's List. Failure to respond to three different "request for quotations" may result in the vendor being removed from the Bidder's List. A bidder may do one of the following, in order to respond properly to the request:

a. Submission of a quotation prior to the quote receipt deadline.
b. Submission of a "no bid" notice prior to the quote receipt deadline.

9. **LEE COUNTY PAYMENT PROCEDURES**

All vendors are requested to mail one original invoice and one invoice copy to:

Lee County Finance Department
Post Office Box 2238
Fort Myers, FL 33902-2238

All invoices will be paid as directed by the Lee County payment procedure unless otherwise differently stated in the detailed specification portion of this quote.

Lee county will not be liable for request of payment deriving from aid, assistance, or help by any individual, vendor, quoter, or bidder for the preparation of these specifications.

Lee County is generally a tax-exempt entity subject to the provisions of the 1987 legislation regarding sales tax on services. Lee County will pay those taxes for which it is obligated, or it will provide a Certificate of Exemption furnished by the Department of Revenue. All contractors or quoters should include in their quote all sales or use taxes, which they will pay when making purchases of material or subcontractor's services.

10. **LEE COUNTY BID PROTEST PROCEDURE**

Any contractor/vendor/firm that has submitted a formal bid/quote/proposal to Lee County, and who is adversely affected by an intended decision with respect to the award of the formal bid/quote/proposal, shall file with the County's Purchasing Director or Public Works Director a written "Notice of Intent to File a Protest" not later than seventy-two (72) hours (excluding Saturdays, Sundays and Legal Holidays) after receipt of a "Notice of Intended Decision" from the County with respect to the proposed award of the formal bid/quote/proposal.

The "Notice of Intent to File a Protest" is one of two documents necessary to perfect Protest. The second document is the "Formal Written Protest", both documents are described below.

The "Notice of Intent to File a Protest" document shall state all grounds claimed for the Protest, and clearly indicate it as the "Notice of Intent to File a Protest". Failure to clearly indicate the Intent to file the Protest shall constitute a waiver of all rights to seek any further remedies provided for under this Protest Procedure.

The "Notice of Intent to File a Protest" shall be received ("stamped in") by the Purchasing Director or Public Works Director not later than Four o'clock (4:00) PM on the third working day following the day of receipt of the County's Notice of Intended Decision.

The affected party shall then file its Formal Written Protest within ten (10) calendar days after the time for the filing of the Notice of Intent to File a Protest has expired. Except as provided for in the paragraph below, upon filing of the Formal Written Protest, the contractor/vendor/firm shall post a bond, payable to the Lee County Board of County Commissioners in an amount equal to five percent (5%) of the total bid/quote/proposal, or Ten Thousand Dollars ($10,000.00), whichever is

less. Said bond shall be designated and held for payment of any costs that may be levied against the protesting contractor/vendor/firm by the Board of County Commissioners, as the result of a frivolous Protest.

A clean, Irrevocable Letter of Credit or other form of approved security, payable to the County, may be accepted. Failure to submit a bond, letter of credit, or other approved security simultaneously with the Formal Written Protest shall invalidate the protest, at which time the County may continue its procurement process as if the original "Notice of Intent to File a Protest" had never been filed.
Any contractor/vendor/firm submitting the County's standard bond form (CSD: 514), along with the bid/quote/proposal, shall not be required to submit an additional bond with the filing of the Formal Written Protest.

The Formal Written Protest shall contain the following:

- County bid/quote/proposal identification number and title.
- Name and address of the affected party, and the title or position of the person submitting the Protest.
- A statement of disputed issues of material fact. If there are no disputed material facts, the Formal Protest must so indicate.
- A concise statement of the facts alleged, and of the rules, regulations, statues, or constitutional provisions, which entitle the affected party to relief.
- All information, documents, other materials, calculations, and any statutory or case law authority in support of the grounds for the Protest.
- A statement indicating the relief sought by the affected (protesting) party.
- Any other relevant information that the affected party deems to be material to Protest.

Upon receipt of a timely filed "Notice of Intent to File a Protest", the Purchasing Director or Public Works Director (as appropriate) may abate the award of the formal bid/quote/proposal as appropriate, until the Protest is heard pursuant to the informal hearing process as further outlined below, except and unless the County Manager shall find and set forth in writing, particular facts and circumstances that would require an immediate award of the formal bid/quote/proposal for the purpose of avoiding a danger to the public health, safety, or welfare. Upon such written finding by the County Manager, the County Manager may authorize an expedited Protest hearing procedure. The expedited Protest hearing shall be held within ninety-six (96) hours of the action giving rise to the contractor/vendor/firm's Protest, or as soon as may be practicable for all parties. The "Notice of Intent to File a Protest" shall serve as the grounds for the affected party's presentation and the requirements for the submittal of a formal, written Protest under these procedures, to include the requirement for a bond, shall not apply.

The Dispute Committee shall conduct an informal hearing with the protesting contractor/vendor/firm to attempt to resolve the Protest, within seven working days (excluding Saturdays, Sundays and legal holidays) from receipt of the Formal Written Protest. The Chairman of the Dispute Committee shall ensure that all affected parties may make presentations and rebuttals, subject to reasonable time limitations, as appropriate. The purpose of the informal hearing by the Dispute Committee, the protestor and other affected parties is to provide and opportunity: (1) to review the basis of the Protest; (2) to evaluate the facts and merits of the Protest: and (3) to make a determination whether to accept or reject the Protest.

Once a determination is made by the Dispute Committee with respect to the merits of the Protest, the Dispute Committee shall forward to the Board of County Commissioners its recommendations, which shall include relevant background information related to the procurement.

Upon receiving the recommendation from the Dispute Committee, the Board of County Commissioners shall conduct a hearing on the matter at a regularly scheduled meeting. Following presentations by the affected parties, the Board shall render its decision on the merits of the Protest.

If the Board's decision upholds the recommendation by the Dispute Committee regarding the award, and further finds that the Protest was either frivolous and/or lacked merit, the Board, at its discretion, may assess costs, charges, or damages associated with any delay of the award, or any costs incurred with regard to the protest. These costs, charges or damages may be deducted from the security (bond or letter of credit) provided by the contractor/vendor/firm. Any costs, charges or damages assessed by the Board in excess of the security shall be paid by the protesting contractor/vendor/firm within thirty (30) calendar days of the Board's final determination concerning the award.

All formal bid/quote/proposal solicitations shall set forth the following statement:

"FAILURE TO FOLLOW THE BID PROTEST PROCEDURE REQUIREMENTS WITHIN THE TIMEFRAMES AS PRESCRIBED HEREIN AND ESTABLISHED BY LEE COUNTY BOARD OF COUNTY COMMISSIONERS, FLORIDA, SHALL CONSTITUTE A WAIVER OF YOUR PROTEST AND ANY RESULTING CLAIMS."

11. **PUBLIC ENTITY CRIME**

Any person or affiliate as defined by statute who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid or a contract to provide any goods or services to the County; may not submit a bid on a contract with the County for the construction or repair of a public building or a public work; may not submit bids or leases of real property to the County; may not be awarded or perform works as a contractor, supplier, subcontractor, or consultant under a contract with the County, and may not transact business with the County in excess of $15,000.00 for a period of 36 months from the date of being placed on the convicted vendor list.

12. **QUALIFICATION OF QUOTERS** (unless otherwise noted)

Quotes will be considered only from firms normally engaged in the sale and distribution or provision of the services as specified herein. Quoters shall have adequate organization, facilities, equipment, and personnel to ensure prompt and efficient service to Lee County. The County reserves the right before recommending any award to inspect the facilities and organization; or to take any other action necessary to determine ability to perform is satisfactory, and reserves the right to reject quotes where evidence submitted or investigation and evaluation indicates an inability of the quoter to perform.

13. **MATERIAL SAFETY DATA SHEETS**

In accordance with Chapter 443 of the Florida Statues, it is the vendor's responsibility to provide Lee County with Materials Safety Data Sheets on quoted materials, as may apply to this procurement.

14. **MISCELLANEOUS**

If a conflict exists between the General Conditions and the detailed specifications, then the detailed specifications shall prevail.

15. **WAIVER OF CLAIMS**

Once this contract expires, or final payment has been requested and made, the awarded contractor shall have no more than 30 days to present or file any claims against the County concerning this contract. After that period, the County will consider the Contractor to have waived any right to claims against the County concerning this agreement.

16. **AUTHORITY TO PIGGYBACK**

It is hereby made a precondition of any quote and a part of these specifications that the submission of any quote in response to this request constitutes a quote made under the same conditions, for the same price, and for the same effective period as this quote, to any other governmental entity.

17. **COUNTY RESERVES THE RIGHT**

**a) State Contract**

If applicable, the County reserves the right to purchase any of the items in this quote from State Contract Vendors if the prices are deemed lower on State Contract than the prices we receive in this quotation.

**b) Any Single Large Project**

The County, in its sole discretion, reserves the right to separately quote any project that is outside the scope of this quote, whether through size, complexity, or dollar value.

**c) Disadvantaged Business Enterprises**

The County, in its sole discretion, reserves the right to purchase any of the items in this quote from Disadvantage Business Enterprise vendor if the prices are determined to be in the best interest of the County, to assist the County in the fulfillment of any of the County's grant commitments to federal or state agencies.

The County further reserves the right to purchase any of the items in this quote from DBE's to fulfill the County's state policy toward DBE's as outlined in County Ordinance 88-45 and 90-04, as amended.

**d) Anti-Discrimination**

The vendor for itself, its successors in interest, and assignees, as part of the consideration there of covenant and agree that:

In the furnishing of services to the County hereunder, no person on the grounds of race, religion, color, age, sex, national origin, handicap or marital status shall be excluded from participation in, denied the benefits of, or otherwise be subjected to discrimination.

The vendor will not discriminate against any employee or applicant for employment because of race, religion, color, age, sex, national origin, handicap or marital status. The vendor will make affirmative efforts to insure that applicants are employed and that employees are treated during employment without regard to their race, religion, color, age, sex, national origin, handicap or marital status. Such action shall include, but not be limited to, acts of employment, upgrading, demotion or transfer; recruitment advertising; layoff or termination, rates of pay or other forms of compensation and selection for training, including apprenticeship.

Vendor agrees to post in a conspicuous place, available to employees and applicants for employment, notices setting forth the provisions of this anti-discrimination clause.

Vendor will provide all information and reports required by relevant regulations and/or applicable directives. In addition, the vendor shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the County to be pertinent to ascertain compliance. The vendor shall maintain and make available relevant data showing the extent to which members of minority groups are beneficiaries under these contracts.

Where any information required of the vendor is in the exclusive possession of another who fails ore refuses to furnish this information, the vendor shall so certify to the County its effort made toward obtaining said information. The vendor shall remain obligated under this paragraph until the expiration of three (3) years after the termination of this contract.

In the event of breach of any of the above anti-discrimination covenants, the County shall have the right to impose sanctions as it may determine to be appropriate, including withholding payment to the vendor or canceling, terminating, or suspending this contract, in whole or in part.

Additionally, the vendor may be declared ineligible for further County contracts by rule, regulation or order of the

Board of County Commissioners of Lee County, or as otherwise provided by law.

The vendor will send to each union, or representative of workers with which the vendor has a collective bargaining agreement or other contract of understanding, a notice informing the labor union of worker's representative of the vendor's commitments under this assurance, and shall post copies of the notice in conspicuous places available to the employees and the applicants for employment.

The vendor will include the provisions of this section in every subcontract under this contract to insure its provisions will be binding upon each subcontractor. The vendor will take such actions with respect to any subcontractor, as the contracting agency may direct, as a means of enforcing such provisions, including sanctions for non-compliance.

18. **AUDITABLE RECORDS**

The awarded vendor shall maintain auditable records concerning the procurement adequate to account for all receipts and expenditures, and to document compliance with the specifications. These records shall be kept in accordance with generally accepted accounting methods, and Lee County reserves the right to determine the record-keeping method required in the event of non-conformity. These records shall be maintained for two years after completion of the project and shall be readily available to County personnel with reasonable notice, and to other persons in accordance with the Florida Public Disclosure Statues.

19. **DRUG FREE WORKPLACE**

Whenever two or more quotes/proposals, which are equal with respect to price, quality and service, are received for the procurement of commodities or contractual services, a quote/proposal received from a business that certifies that it has implemented a drug-free workplace program shall be given preference in

the award process. In order to have a drug-free workplace program, a business shall comply with the requirements of Florida Statutes 287.087.

20. **REQUIRED SUBMITTALS**

Any submittals requested should be returned with the quote response. This information may be accepted after opening, but no later than 10 calendar days after request.

21. **TERMINATION**

Any agreement as a result of this quote may be terminated by either party giving thirty (30) calendar days advance written notice. The County reserves the right to accept or not accept a termination notice submitted by the vendor, and no such termination notice submitted by the vendor shall become effective unless and until the vendor is notified in writing by the County of its acceptance.

The Purchasing Director may immediately terminate any agreement as a result of this quote for emergency purposes, as defined by the Lee County Purchasing and Payment Procedure Manual.

Any vendor who has voluntarily withdrawn from a formal quote/proposal without the County's mutual consent during the contract period shall be barred from further County procurement for a period of 180 days. The vendor may apply to the Board of Lee County Commissioners for waiver of this debarment. Such application for waiver of debarment must be coordinated with and processed by Purchasing.

22. **CONFIDENTIALITY**

Vendors should be aware that all submittals (including financial statements) provided with a quote/proposal are subject to public disclosure and will **not** be afforded confidentiality.

23. **ANTI-LOBBYING CLAUSE**

All firms are hereby placed on formal notice that neither the County Commissioners nor candidates for County Commission, nor any employees from the Lee County Government, Lee County staff members, nor any members of the Qualification/Evaluation Review Committee are to be lobbied, either individually or collectively, concerning this project. Firms and their agents who intend to submit qualifications, or have submitted qualifications, for this project are hereby placed on *formal notice* that they are ***not*** to contact County personnel for such purposes as holding meetings of introduction, meals, or meetings relating to the selection process outside of those specifically scheduled by the County for negotiations. Any such lobbying activities may cause immediate disqualification for this project.

24. **INSURANCE (AS APPLICABLE)**

Insurance shall be provided, per the attached insurance guide. Upon request, an insurance certificate complying with the attached guide may be required prior to award.

**LEE COUNTY, FLORIDA**
**PROPOSAL QUOTE FORM**
**FOR**
**NITRATE SOLUTION FOR THE PREVENTION**
**OF SULFIDES IN WASTEWATER**

DATE SUBMITTED: _____

VENDOR NAME: _____

TO: The Board of County Commissioners
Lee County
Fort Myers, Florida

Having carefully examined the "General Conditions", and the "Detailed Specifications", all of which are contained herein, the Undersigned proposes to furnish the following, which meet these specifications:

The undersigned acknowledges receipt of Addenda numbers: _____

Lee County Commodity Code 19036

Pounds of nitrate-oxygen per gallon of solution = _____ $NO_3$-O/ gal

| Description | Unit Price per Gallon<br>$ / Gal | Unit Price per Pound of Nitrate-Oxygen<br>$ / lb. of $NO_3$-O |
|---|---|---|
| 1. Delivered Nitrate Solution Product Including The Installation And Use Of All Necessary Feed Equipment; Specify Product Name: _____ | | |
| 2. Equipment Operation and Maintenance, Sampling, Monitoring and Reporting Services | | |
| **Total Cost** | | |

NOTE: LEE COUNTY WILL AWARD THE BID FOR THE SUPPLIER OF THE NITRATE SOLUTION AND ASSOCIATED SERVICES ONLY AFTER ALL PATENT ISSUES ARE RESOLVED TO THE SATISFACTION OF THE COUNTY.

TO BE (DELIVERED/STARTED) WITHIN _____CALENDAR DAYS AFTER RECEIPT OF AWARD AND PURCHASE ORDER.

Is your firm interested in being considered for the Local Vendor Preference?
Yes _____ No _____

If yes, then read the paragraph entitled "Local Vendor Preference" included in these specifications. Also complete the Local Vendor Preference Questionnaire and return with your quotation.

Quoters should carefully read all the terms and conditions of the specifications. Any representation of deviation or modification to the quote may be grounds to reject the quote.

Are there any modifications to the quote or specifications:
Yes _____ No _____

Failure to clearly identify any modifications in the space below or on a separate page may be grounds for the quoter being declared nonresponsive or to have the award of the quote rescinded by the County.

MODIFICATIONS:

Quoter shall submit his/her quote on the County's Proposal Quote Form, including the firm name and authorized signature. Any blank spaces on the Proposal Quote Form, qualifying notes or exceptions, counter offers, lack of required submittals, or signatures, on County's Form may result in the Quoter/Quote being declared non-responsive by the County.

ANTI-COLLUSION STATEMENT

**THE BELOW SIGNED QUOTER HAS NOT DIVULGED TO, DISCUSSED OR COMPARED HIS QUOTE WITH OTHER QUOTERS AND HAS NOT COLLUDED WITH ANY OTHER QUOTER OR PARTIES TO A QUOTE WHATSOEVER. NOTE: NO PREMIUMS, REBATES OR GRATUITIES TO ANY EMPLOYEE OR AGENT ARE PERMITTED EITHER WITH, PRIOR TO, OR AFTER ANY DELIVERY OF MATERIALS. ANY SUCH VIOLATION WILL RESULT IN THE CANCELLATION AND/OR RETURN OF MATERIAL (AS APPLICABLE) AND THE REMOVAL FROM THE MASTER BIDDERS LIST.**

FIRM NAME _____

BY (Printed): _____

BY (Signature): _____

TITLE: _____

FEDERAL ID # OR S.S.# _____

ADDRESS: _____

_____

PHONE NO.: _____

FAX NO.: _____

CELLULAR PHONE/PAGER NO.: _____

LEE COUNTY OCCUPATIONAL LICENSE NUMBER: _____

E-MAIL ADDRESS: _____

REVISED: 7/28/00

# LEE COUNTY, FLORIDA
# DETAILED SPECIFICATIONS
# FOR
# NITRATE SOLUTION FOR THE PREVENTION
# OF SULFIDES IN WASTEWATER

## PART 1 - GENERAL

### 1.1 SCOPE

#### 1.1.1 General

The specification is to contract with the SUPPLIER to provide a nitrate solution for the purpose of preventing the formation of wastewater sulfide concentrations in the sewer collection system as part of the COUNTY's odor and corrosion control program. The SUPPLIER shall also provide all necessary feed equipment, monitoring and reporting services.

The scope of work shall include:

- Supply and deliver the nitrate solution to the feed sites.
- Provide, install and maintain all necessary feed equipment to include but not limited to dual feed pumps, solution storage tanks, piping and valves, solution flow measuring devices, safety equipment and other appurtenances. The equipment shall remain the property of the SUPPLIER and shall be furnished for use at the feed site as long as the COUNTY purchases nitrate solution from the SUPPLIER.
- Operate and maintain in proper working order all components of the feed system.
- SUPPLIER shall monitor and recommend feed rate adjustments to the COUNTY of the nitrate solution product at these feed points to effectively prevent the formation of odor and corrosion causing wastewater sulfides at the downstream control point to 1 mg/L or less. The COUNTY shall first approve all feed rate adjustments.
- Provide sampling, monitoring and reporting services for cost-effective use of the nitrate solution.

#### 1.1.2 Feed Sites

The COUNTY currently has eight (8) feed sites, which are shown on the attachment. These feed sites have existing potable water and electrical service. SUPPLIER and the COUNTY shall monitor and adjust the feed rate of the nitrate solution at these feed points to effectively prevent the formation of odor and corrosion causing sulfides at the downstream control point. The COUNTY is not obligated to contract for any minimum quantity of nitrate solution or minimum number of feed sites during the period of this contract. The COUNTY also reserves the right to increase the number of feed sites and provide 30 days notice to the SUPPLIER.

### 1.2 SUPPLIER

1.2.1 The SUPPLIER of the nitrate solution shall be one recognized and established in the field of wastewater sulfide control.

1.2.2 The SUPPLIER shall be capable of providing on-site technical assistance within 24 hours of notification.

1.2.3 The SUPPLIER shall provide delivery of the nitrate solution within 48 hours of order placement.

1.2.4 To the fullest extent permitted by applicable Florida law, the SUPPLIER shall indemnify and hold harmless the COUNTY, its employees and agents, from and against all claims, damages, losses and expenses, including

reasonable attorney's fees, arising out of or resulting from the performance of the SUPPLIER's operations under this contract, to include any claim arising out of any patent infringement issues raised by third parties.

## 1.3 SUBMITTALS:

### 1.3.1 Product Information

SUPPLIER shall submit the following product information:

a. Technical specification of the composition of the nitrate solution.
b. Material Safety Data Sheet of the nitrate solution.
c. Test results of a Florida State certified laboratory showing the corresponding pounds of nitrate-oxygen per gallon of solution, specific gravity and density.

### 1.3.2 Supplier's Experience

The SUPPLIER must provide a list of references currently using the nitrate solution for the prevention of wastewater dissolved sulfides and hydrogen sulfide gas in sewer systems. The list shall contain telephone numbers and contact names.

a. Reference Utility/Company, contact name, title, address and telephone number.
b. Quantities of solution used in gallons per day.
c. Description of the solution feed equipment installed.
d. Number of years nitrate solution was used.

### 1.3.3 Patent Issues

U.S. Filter Distribution Group, Inc., Tallevast, Florida, holds the rights to patent number Re. 36,651 dated April 11, 2000 entitled "*Process for Removal of Dissolved Hydrogen Sulfide and Reduction of Sewage BOD in Sewer or Other Waste Systems*". *This patent claims a "...process for removing existing dissolved hydrogen sulfide from waste systems wherein removal is achieved by a mechanism consisting essentially of: (a) adding nitrate ions to the waste in accordance with a ratio of 2.4 part nitrate oxygen for each 1 part existing dissolved hydrogen sulfide in order to provide a source of oxygen for naturally occurring bacteria present in the waste which utilize dissolved hydrogen sulfide in their metabolism...*" U.S. Filter has been granted a second-filed continuation of reissue of this patent and is awaiting publication of this second reissue.

Submit information to assure and ensure Lee County that the County's use of the Supplier's process for sulfide prevention with the Supplier's nitrate product will not be in violation of the U.S. Filter patent number Re. 36,651 and the continuation of reissue of this patent. Alternatively, submit information to show to the County how the Supplier will indemnify and hold harmless Lee County from any liability as the result of the use of the Supplier's product in potential violation of the U.S. Filter Patent Rights. Lee County will award the bid for the supplier of the nitrate solution and associated services only after all patent issues are resolved to the County's satisfaction.

## 1.4 SUBSTITUTIONS

The nitrate solution shall be provided in strict compliance with these specifications. Any bid for nitrate solution with deviations from these specifications shall be considered non-responsive and shall not be considered.

## 1.5 CHANGING OF SUPPLIERS

The COUNTY shall coordinate the current SUPPLIER with the successful bidder for the equipment changeout activities to minimize lack of nitrate solution feed to 3 hours or less at the feed sites. This change out shall be performed during the low wastewater flow time of the day (2pm to 5pm).

## PART 2 – PRODUCT, EQUIPMENT AND SERVICE REQUIREMENTS

### 2.1 PRODUCT REQUIREMENTS

#### 2.1.1 Technical Requirements

The material shall be a stabilized liquid phase nitrate solution. It shall be delivered, stored, and fed into the wastewater via standard liquid-phase chemical handling procedures when delivered to the feed site. Nitrate solution is typically supplied in the calcium nitrate or sodium nitrate form. Since the nitrate solution is available in different concentrations and as either calcium nitrate or sodium nitrate, for comparison of bid prices, the supplier must specify the following:

Pounds of nitrate-oxygen per gallon of solution _____
Specific Gravity _____
Density _____

A. The COUNTY will required the successful bidder to provide an analytical report of the pounds of nitrate-oxygen per gallon of solution, specific gravity and density analyzed on a sample of the nitrate solution at the start-up of the project. The SUPPLIER in the presence of COUNTY staff will take this sample. A Florida State Certified Laboratory shall perform these analyses, and the SUPPLIER shall pay for the shipping and analytical cost of these analyses.

#### 2.1.2 Safety Requirements

A. Transportation, storage and handling of the nitrate solution must comply with all Federal, State and Local Department of Transportation, OSHA requirements, and any other applicable regulatory agencies requirements.

B. The SUPPLIER and of all personnel handling the nitrate solution shall adhere to all OSHA recommended safety procedures for the nitrate solution.

### 2.2 EQUIPMENT REQUIREMENTS

#### 2.2.1 Liquid Feed System

The storage and feed equipment material of construction shall be fully compatible with the nitrate solution.

A. The feed system panel shall be a NEMA 4 totally enclosed system, HOA, wired for 110-volt. System shall contain 2 pumps, with at least one pump controllable by a 24 hr timer, calibration cylinder, exhaust fan if needed and related piping, valves and appurtenances. System shall also contain an anti-siphon/back pressure regulator, and shall be designed with leak containment.

B. Pumps - Pumps shall be skid-mounted, portable, and capable of easy removal and transport. All parts of the pump in contact with the nitrate solution must be compatible with the product. Piping shall include antiphon valve, backflow presenter, and pressure gauge. Each pump shall be wired for 110V AC/5 AMP and provided with a separate operational control system. All wiring and electrical work shall be performed in accordance with the National Electrical Code. All motors and control shall be rated for outdoor use and enclosed in adequately rated NEMA enclosures. One of the 2 chemical pumps shall also be wired for timer operation.

C. Storage Tanks – All storage tanks shall be properly labeled prior to initial chemical fill. Tanks shall be constructed of a material fully compatible with the nitrate solution. Provide solution storage tank for preferably 30 days storage, and at a least 2 weeks storage.

D. Piping, Valves, and Fittings - All materials shall be constructed of a material fully compatible with the nitrate solution.

E. Calibration Cylinder - Chemical feed system shall include a calibration tube used for measuring pump output.

## 2.3 SERVICE REQUIREMENTS

### 2.3.1 Feed Sites and Control Points

Attachment B shows the nitrate solution feed sites and the downstream sulfide control points and the control levels required. Attachment C provides the historic usage rate of the nitrate solution.

### 2.3.2 Sulfide Control Levels

The SUPPLIER must adjust the solution feed rate to achieve 1 mg/L or less of sulfides in the downstream control points as shown in the attachment. The goal of 1 mg/L or less of sulfides in the wastewater is the result of an agreement between the City and COUNTY staff, to prevent odors in the COUNTY's portion of the flow entering the City of Fort Myers WWTP.

The only exception is the sample point at PS256 – Pine Ridge Rd. The County has plans to install a biofilter odor control system at this site. When the biofilter is installed, the PS 175 Iona Road feed will be reduced for a downstream treatment goal of 50-ppm average $H_2S$ in the PS256 wetwell air. The wastewater concentration will be allowed to be greater than 1 mg/L when the biofilter is installed. Flow from PS256 discharges as the County's Ft. Myers Beach WWTP. This method will allow savings in nitrate solution while controlling odors at PS256.

### 2.3.3 Residual Nitrate Monitoring

SUPPLIER must optimize feed rates such that residual nitrate concentrations in the wastewater flow at the control points must not exceed 1 mg/L. This is especially important from the economics point of view and also to avoid excess nitrate an oxidant, from entering the City's Bardenpho process, which has an anoxic zone as the first zone of treatment.

### 2.3.4 Monitoring and Reporting Frequency

Nitrate feed equipment must be checked for proper operation at a frequency of at least once every two weeks. Sampling for downstream dissolved sulfides, temperature and residual nitrate in the wastewater and hydrogen sulfide gas at the control points shall be performed at a frequency at least of once every two weeks. Monthly reports shall be submitted to the COUNTY within the first week of the month for the previous month's data. An annual report shall also be submitted.

# PART 3 - EXECUTION

## 3.1 SULFIDE CONTROL PRODUCT DELIVERY

3.1.1 Tanker trucks equipped with state certified printing meters shall deliver the nitrate solution. Printed meter tickets reflecting the amount of solution delivered shall be submitted to the COUNTY staff. COUNTY staff shall be given at least 48 hours notice of the exact delivery time.

3.1.2 The SUPPLIER shall be responsible for the safe, clean delivery of the nitrate solution into the storage tanks. The SUPPLIER shall provide prompt and complete clean-up of any spills made during delivery.

3.1.3 The SUPPLIER shall be responsible for the proper labeling of storage tanks in compliance with all local, state and federal requirements. The SUPPLIER shall not deliver the nitrate solution into any tank or vessel which is not properly labeled.

## 3.2 EQUIPMENT INSTALLATION, START-UP, AND OPTIMIZATION

Equipment installation and start-up is the responsibility of the SUPPLIER. The SUPPLIER shall optimize the feed rate with approval from the COUNTY.

### 3.2.1 Routine Monitoring, Optimization, and Data Analysis

Routine monitoring is needed due to the changing conditions caused by seasonal variations or process changes within the system. This monitoring will provide the data necessary to adjust dosing levels to assure optimum sulfide control at minimum product costs. The SUPPLIER shall monitor the COUNTY's system bi-weekly by collecting data to determine $H_2S$ gas levels, wastewater dissolved sulfides, temperature, and residual nitrate. This data shall be evaluated and monthly reports charting trends and showing control levels, shall be prepared and submitted to the COUNTY. Recommended changes in dosing rates to control changing conditions shall also be provided to the COUNTY.

After reviewing the monthly monitoring data, the SUPPLIER shall determine the required feed rate changes to insure that the system optimization is being achieved. The COUNTY needs to first approve any increase in feed rates over the historic solution monthly use rates (see attachment).

Provide an annual report summarizing by month, the amount of nitrate delivered, the amount used, the feed rate of each pump, and the weekly $H_2S$ gas levels, wastewater dissolved sulfides, temperature, and residual nitrate at the control points for each feed site.

The COUNTY reserves the right to perform occasional independent checks on the SUPPLIER's sampling activities and feed rates adjustments.

### 3.2.2 Sampling Methods

All samples collected for analysis will be grab samples. Acceptable methods of analysis are listed below:

| PARAMETER | METHOD |
|---|---|
| Hydrogen sulfide, mg/l | Method 4500-8'D as described in Standard Methods for the Analysis of Water and Wastewater, 17th Ed. |
| Residual Nitrate | Hach Nitrate Portable Test Kit |
| Hydrogen sulfide in air, ppm | Draeger Model 1901, or equal |
| Wastewater Temperature | NBS calibrated thermometer |

### 3.2.3 Equipment Maintenance

The SUPPLIER shall maintain all the storage and feeding equipment. Major and minor preventative maintenance shall be carried out on a continuing basis.

### 3.2.4 Emergency Response

Should the COUNTY staff notice a leak developed with the SUPPLIER's feed equipment, the COUNTY shall notify the SUPPLIER immediately. In such an instance, the SUPPLIER shall immediately take all necessary actions and assume all costs to stop the leak, clean up the spill and repair any damaged caused.

In the event the SUPPLIER finds a leak or spill of the feed equipment, the SUPPLIER shall immediately notify the COUNTY staff and the SUPPLIER shall be responsible for verbal and written notification of all applicable regulatory agencies within

the required time frame. The SUPPLIER shall also be responsible for any regulatory fines incurred and assume all costs to stop the leak, clean up the spill and repair any damaged caused.

### 3.2.5 Safety Training

After the feeding equipment is in place, the SUPPLIER shall hold a safety training session for the COUNTY staff prior to start-up of the feed system. The COUNTY shall coordinate with the SUPPLIER to conduct safety training of all new personnel introduced into the work area on an as-needed basis. Safety equipment and training services shall meet all State and Federal government requirements.

## 4.0 TERM OF QUOTE

This quote shall be in effect for five years, or until new quotes are taken and awarded. This quote (or any portion therof) has the option of being renewed for one additional five-year period, upon mutual agreement of both parties, under the same terms and conditions.

During this time period, the COUNTY may order services as the requirements generate and the SUPPLIER will deliver the services. It is understood that the COUNTY is not obligated to purchase any specific quantity of nitrate solution and services under this contract. If the COUNTY is unsatisfied with the performance of the SUPPLIER's product or services, the COUNTY may cancel this contract, in whole or in part, by giving 30 days prior written notice to the SUPPLIER.

## 5.0 BID PRICE

Award of this bid will be contingent on the resolution of all patent issues to the County's satisfaction as discussed in previous sections. The bid prices shall remain firm during the period of the contract. Quotes are to be based on firm prices delivered F.O.B., as directed to the location specified herein, Lee County, Florida.
Any water or wastewater system that Lee County Utilities acquires through contract operations or direct purchase shall receive the same price structure.

Prices shall be provided on Proposal Quote Form, page 10 on a per gallon cost basis for:

- Delivered nitrate solution product including the installation and use of all necessary feed equipment.

- Equipment operation and maintenance, sampling, monitoring and reporting services.

Since the nitrate solution is available in different concentrations and as either calcium nitrate or sodium nitrate, for comparison of bid prices, the supplier must specify the following:

- Pounds of nitrate-oxygen per gallon of solution
- Cost per gallon of the solution
- Cost per pound of nitrate-oxygen

## 6.0 BASIS OF AWARD

Lee County reserves the right, at the Purchasing Director's discretion, not to award certain items on the Proposal Quote Form.

The basis of award for this quote will be low quoter meeting specifications at Lee County's sole discretion.

Lee County reserves the right to reject unbalanced quotes (a quote where a normally low cost item is priced well out of the normal range).

## 7.0 CONTRACT

A purchase order will serve as the contract.

## 8.0 SUMMARY REPORTS

Upon completion of each six-month period of the quote, the awarded vendor shall be responsible for furnishing a summary report to Purchasing. This report shall include the previous six months history, showing at a minimum, the following information:

1) Total dollars expended per item,

2) Total quantity of each item purchased.

## 9.0 MAJOR BREAKDOWNS/NATURAL DISASTERS

Lee County requires that the awarded vendor provide the name of a contact person and phone number which will afford Lee County access twenty-four hours per day, 365 days per year, of this product or service in the event of major breakdowns or natural disasters.

Lee County reserves the right to purchase the product or service listed in this quotation elsewhere in an emergency situation.

## 10.0 LOCAL BIDDER'S PREFERENCE

Note: In order for your firm to be considered for the local vendor preference, you must complete and return the attached "Local Vendor Preference Questionnaire" with your quotation.

The Lee County Local Bidder's Preference Ordinance No. 00-10 is being included as part of the award process for this project. As such, Lee County at its sole discretion, may choose to award a preference to any qualified "Local Contractor/Vendor" in an amount not to exceed 3 % of the total amount quoted by that firm.

"Local Contractor / Vendor" shall mean: a) any person, firm, partnership, company or corporation whose principal place of business in the sole opinion of the County, is located within the boundaries of Lee County, Florida; or b) any person, firm, partnership, company or corporation that has provided goods or services to Lee County on a regular basis for the preceding consecutive five (5) years, and that has the personnel, equipment and materials located within the boundaries of Lee County sufficient to constitute a present ability to perform the service or provide the goods.

The County reserves the exclusive right to compare, contrast and otherwise evaluate the qualifications, character, responsibility and fitness of all persons, firms, partnerships, companies or corporations submitting formal bids or formal quotes in any procurement for goods or services when making an award in the best interests of the County.

**GUIDE "A"**

**INSURANCE REQUIREMENTS FOR PRODUCTS**

**YOUR CERTIFICATE OF INSURANCE MUST MEET THE FOLLOWING REQUIREMENTS**

**Requirement #1: The Lee County Board of County Commissioners shall be added as an additional insured on the comprehensive general liability policy.**

**Requirement #2: Certificate holder shall be listed as follows:**

**Lee County Board of County Commissioners**
**C/O Lee County Purchasing**
**P.O. Box 398**
**Fort Myers, FL 33902**

**Requirement #3: Each policy shall provide a 30 day notification clause in the event of cancellation, non-renewal or adverse change.**

This Standard Insurance Language is to be utilized for Contracts, or Agreements meeting these circumstances. Certain conditions and/or exposures may not relieve or limit the liability of the vendor. These requirements may not be sufficient or adequate to protect the vendor's interests or liabilities, but are merely minimums.

Circumstances

Project is for vendors providing a tangible product, and not labor, such as, but not limited to , hardware, supplies, and other merchandise.

Worker's Compensation

Statutory benefits as defined by FS 440 encompassing all operations contemplated by this contract or agreement to apply to all owners, officers, and employees regardless of the number of employees. Individual employees may be exempted per State Law. Employees liability will have minimum limits of:

$100,000 per accident
$500,000 disease limit
$100,000 disease limit per employee

Commercial General Liability

Coverage shall apply to premised and/or operations, products and/or completed operations, independent contractors, contractual liability, and broad form property damage exposures with minimum limits of:

$100,000 bodily injury per person (BI)
$300,000 bodily injury per occurrence (BI)
$100,000 property damage (PD) or
$300,000 combined single limit (CSL) of BI and PD

Business Automobile Liability

If the vendor indicates on the price page that vehicles other than their own (common carrier) will be used for delivery, then the following Automobile Liability will not be required.

Coverage shall apply to owned vehicles and/or hired and non-owned vehicles and employee non-ownership use with minimum limits of:

$100,000 bodily injury per person (BI)
$300,000 bodily injury per occurrence (BI)
$100,000 property damage (PD) or
$300,000 combined single limit (CSL) of BI and PD

Certificate of Insurance

An original hand signed certificate shall be on file with and approved by the Lee County Risk Management Office prior to the commencement of any work activities.

In the event the insurance coverage expires prior to the completion of the project, a renewal certificate shall be on file with Risk Management at least 15 days prior to the expiration date.

Revised 10/18/00

# ATTACHMENT A

LOCAL VENDOR PREFERENCE QUESTIONNAIRE
(LEE COUNTY ORDINANCE NO. 00-10)

Instructions: Please complete either Part A or B whichever is applicable to your firm

**PART A: VENDOR'S PRINCIPAL PLACE OF BUSINESS IS LOCATED WITHIN LEE COUNTY (Only complete Part A if your principal place of business is located within the boundaries of Lee County)**

1. What is the physical location of your principal place of business that is located within the boundaries of Lee County, Florida?

_____

_____

2. What is the size of this facility (i.e. sales area size, warehouse, storage yard, etc.)

_____

_____

_____

**PART B: VENDOR'S PRINCIPAL PLACE OF BUSINESS IS NOT LOCATED WITHIN LEE COUNTY OR DOES NOT HAVE A PHYSICAL LOCATION WITHIN LEE COUNTY (Please complete this section.)**

1. How many employees are available to service this contract? _____

2. Describe the types and amount of equipment you have available to service this contract.

_____

_____

3. Describe the types and amount of material stock that you have available to service this contract.

_____

_____

4. Have you provided goods or services to Lee County on a regular basis for the preceding, consecutive five years?

Yes _____ No _____

If yes, please provide your contractual history with Lee County for the past five, consecutive years. Attach additional pages if necessary.

_____

_____

_____

LEE COUNTY PURCHASING SERVICES - BIDDERS CHECK LIST

**IMPORTANT:** Please read carefully and return with your bid proposal.
Please check off each of the following items as the necessary action is completed:

____ 1. The Quote has been signed.

____ 2. The Quote prices offered have been reviewed.

____ 3. The price extensions and totals have been checked.

____ 4. The original (must be manually signed) and 2 copies of the quote have been submitted.

____ 5. Three (3) identical sets of descriptive literature, brochures and/or data (if required) have been submitted under separate cover.

____ 6. All modifications have been acknowledged in the space provided.

____ 7. All addendums issued, if any, have been acknowledged in the space provided.

____ 8. Erasures or other changes made to the quote document have been initialed by the person signing the quote.

____ 9. Bid Bond and/or certified Check, (if required) have been submitted with the quote in amounts indicated.

____ 10. Any Delivery information required is included.

____ 11. The mailing envelope has been addressed to:

| | | |
|---|---|---|
| Lee County Purchasing Services | | Lee County Purchasing |
| P.O. Box 398 | or | 3434 Hancock Bridge Pkwy 3rd FL |
| Ft. Myers, FL 33902-0398 | | N. Ft. Myers, FL 33903 |

____ 12. The mailing envelope **MUST** be sealed and marked with:
Quote Number
Opening Date and/or Receiving Date

____ 13. The quote will be mailed or delivered in time to be received no later than the specified opening date and time. (Otherwise quote cannot be considered or accepted.)

____ 14. If submitting a "NO BID" please write quote number here _____
and check one of the following:
_____ Do not offer this product _____ Insufficient time to respond.
_____ Unable to meet specifications (why)
_____ Unable to meet bond or insurance requirement.
Other: _____

Company Name and Address:

_____

_____

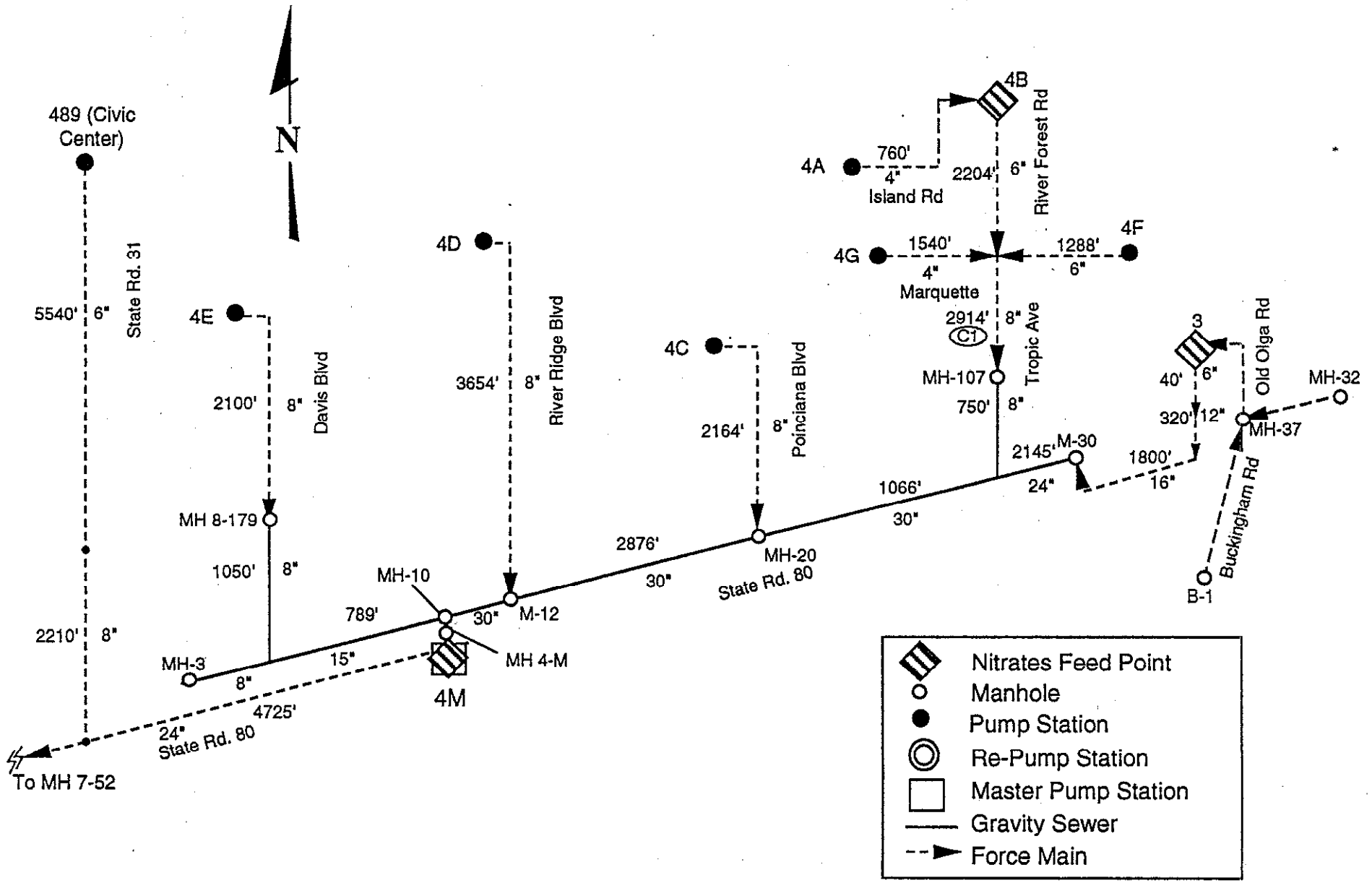



FIGURE 2-1A EAST LEE COUNTY SEWER SYSTEM
NORTH SECTION

ATTACHMENT 'B'

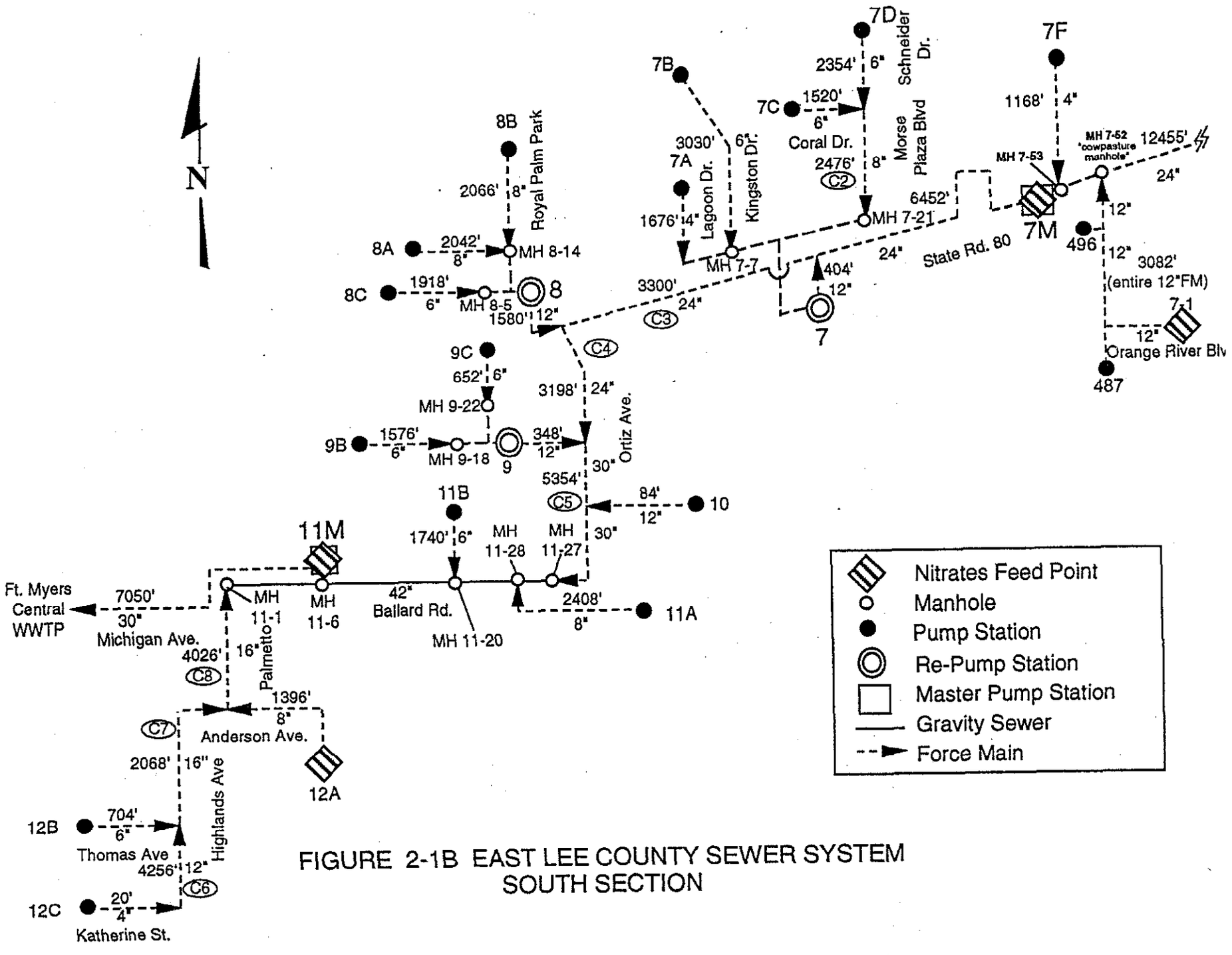
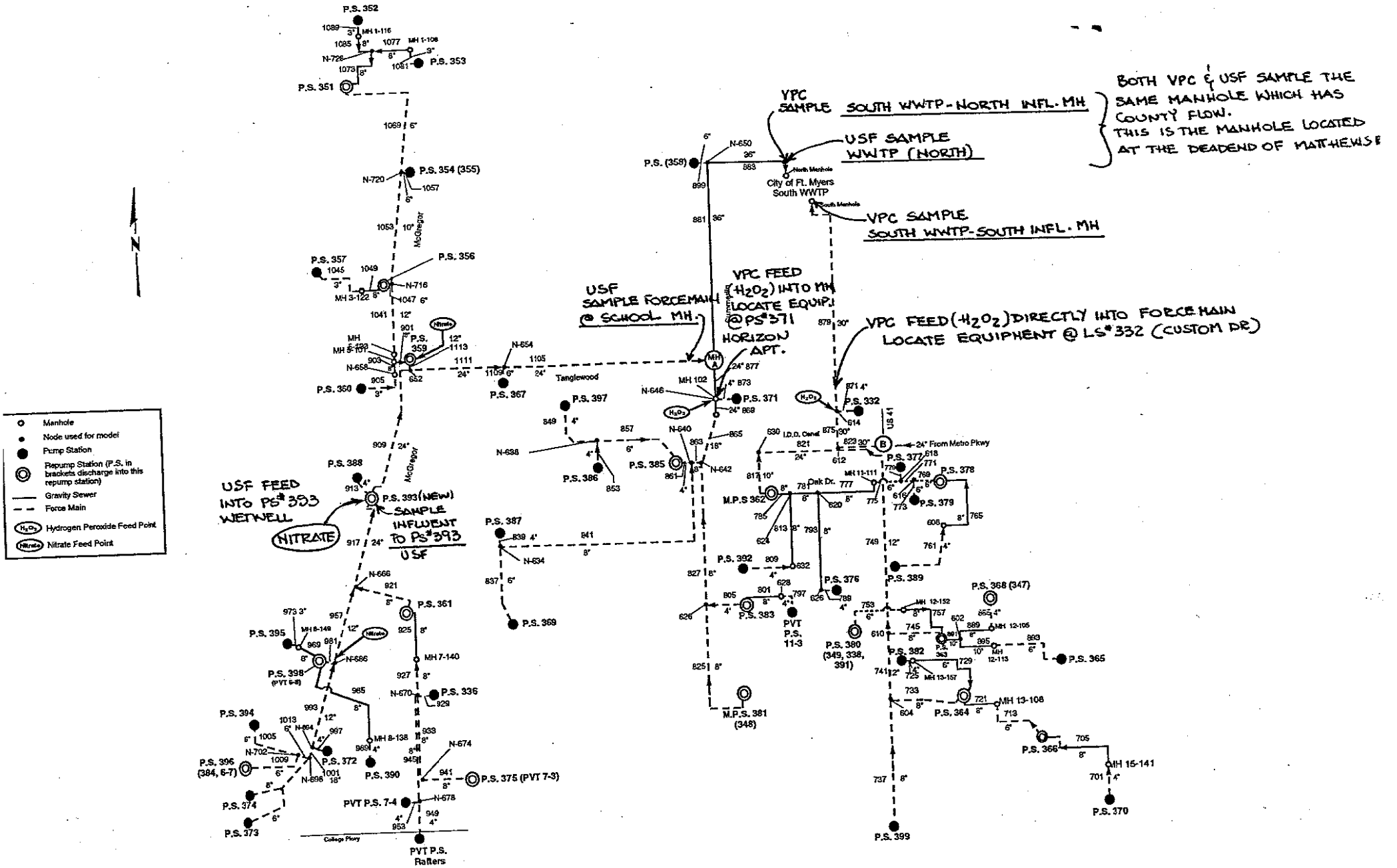



FIGURE 2-1B EAST LEE COUNTY SEWER SYSTEM
SOUTH SECTION

ATTACHMENT "B"




SCHEMATIC OF SOUTH FORT MYERS SEWER SYSTEM

FIGURE 2-1

MONTGOMERY WATSON

ATTACHMENT "B"

**Attachment C**

**LEE COUNTY UTILITIES**

**BIOXIDE ™ NITRATE SOLUTION USAGE**

| Month/Year | PS 398 Travers (Discontinued) | | PS 393 McGregor | | PS 462 Dupree (Discontinued) | | PS 480 11M | | PS 479 Old Olga | | P482 4M | | PS 481 7M | | PS 175 Iona (Discontinued) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Qty Delivered (gals) | Qty Used (gals) | Qty Delivered (gals) | Qty Used (gals) | Qty Delivered (gals) | Qty Used (gals) | Qty Delivered (gals) | Qty Used (gals) | Qty Delivered (gals) | Qty Used (gals) | Qty Delivered (gals) | Qty Used (gals) | Qty Delivered (gals) | Qty Used (gals) | Qty Delivered (gals) | Qty Used (gals) |
| Jan-99 | 1800 | 2250 | 1200 | 600 | 1000 | 450 | 1050 | 1600 | 2050 | 1995 | 5600 | 4250 | 1800 | 2725 | 850 | 750 |
| Feb-99 | 2100 | 2200 | 600 | 650 | 375 | 400 | 1400 | 1750 | 2900 | 1875 | 4800 | 3850 | 3100 | 3000 | 0 | Off* |
| Mar-99 | 2250 | 2425 | 700 | 700 | 650 | 425 | 2975 | 2125 | 2700 | 2700 | 5050 | 4875 | 4976 | 3875 | 0 | Off* |
| Apr-99 | 3200 | 1825 | 1200 | 900 | | 450 | 2000 | 1675 | 1250 | 1850 | 2000 | 2975 | 2900 | 2750 | 0 | Off* |
| May-99 | 0 | 1350 | 0 | 950 | 675 | 275 | 600 | 925 | 2100 | 1875 | 1700 | 3850 | 2175 | 2525 | 0 | Off* |
| Jun-99 | 1700 | 450 | 1200 | 1050 | 0 | 0 | 900 | 600 | 3000 | 2525 | 7875 | 5275 | 4475 | 5075 | 0 | Off* |
| Jul-99 | 0 | 450 | 1175 | 525 | 0 | 200 | 1450 | 1200 | 1800 | 2300 | 3725 | 5025 | 6125 | 4625 | 0 | Off* |
| Aug-99 | 1800 | 1475 | 0 | 450 | 700 | 400 | 1050 | 1375 | 2500 | 2400 | 4950 | 4550 | 4325 | 4450 | 0 | Off* |
| Sep-99 | 1900 | 1975 | 750 | 275 | 450 | 450 | 1400 | 1400 | 2350 | 2325 | 5500 | 5325 | 3275 | 4125 | 0 | 700 |
| Oct-99 | 975 | 1575 | 0 | 825 | 0 | 475 | 1250 | 1025 | 1825 | 1750 | 5175 | 4650 | 4825 | 4525 | 1325 | 1325 |
| Nov-99 | 1200 | 925 | 1050 | 1175 | 475 | 325 | 0 | 1050 | 1000 | 2325 | 6150 | 6075 | 4350 | 5475 | 1225 | 1425 |
| Dec-99 | 1900 | 1425 | 0 | 1025 | 0 | 400 | 2100 | 1425 | 3100 | 1475 | 4600 | 3875 | 4750 | 3400 | 3750 | 1950 |
| **Total of 1999** | **18825** | **18325** | **7875** | **9125** | **4325** | **4250** | **16175** | **16150** | **26575** | **25395** | **57125** | **54575** | **47076** | **46550** | **7150** | **6150** |
| | | | | | | | | | | | | | | | | |
| Jan-00 | 1350 | 1525 | 0 | 500 | 750 | 225 | 1800 | 1675 | 2150 | 3050 | 4800 | 6800 | 5925 | 6575 | 1700 | 2100 |
| Feb-00 | 0 | Off* | 2650 | 550 | 475 | 525 | 700 | 1200 | 2250 | 2050 | 5000 | 4625 | 2250 | 3450 | 450 | 1300 |
| Mar-00 | 0 | Off* | 1000 | 725 | 625 | 475 | 1575 | 725 | 2550 | 2150 | 4900 | 4400 | 6000 | 4200 | 1000 | 850 |
| Apr-00 | 0 | Off* | 825 | 475 | 0 | 300 | 0 | 900 | 1800 | 2200 | 4500 | 5175 | 4600 | 4350 | 2975 | 1725 |
| May-00 | 0 | Off* | 0 | 425 | 0 | 275 | 1400 | 1400 | 1900 | 2150 | 5825 | 6075 | 3950 | 5625 | 2500 | 2500 |
| Jun-00 | 0 | Off* | 0 | 300 | 1000 | 525 | 1850 | 1000 | 1600 | 1000 | 5300 | 4950 | 6025 | 4250 | 3125 | 3325 |
| Jul-00 | 775 | 625 | 850 | 650 | 650 | 450 | 800 | 1025 | 2750 | 2400 | 7800 | 6100 | 4925 | 5323 | 4350 | 4150 |
| Aug-00 | 1625 | 1675 | 825 | 825 | 0 | 450 | 1075 | 2275 | 2350 | 2225 | 4975 | 5050 | 5250 | 4450 | 3300 | 3500 |
| Sep-00 | 750 | 700 | 925 | 325 | 675 | 325 | 2100 | 1275 | 1250 | 1650 | 2700 | 3525 | 5050 | 5025 | 2925 | 2200 |
| Oct-00 | 1975 | 2725 | 400 | 1200 | 0 | 575 | 3675 | 3025 | 2800 | 3200 | 5750 | 5850 | 3275 | 4425 | 3675 | 4200 |
| Nov-00 | 1950 | 1200 | 0 | 450 | 1075 | 460 | 2025 | 2025 | 2525 | 1725 | 4200 | 3300 | 6200 | 5350 | 3575 | 3525 |
| Dec-00 | 1700 | 2150 | 1850 | 975 | 0 | 425 | 2075 | 2725 | 2900 | 2600 | 5350 | 6300 | 3575 | 5075 | 2350 | 3250 |
| **Total of 2000** | **10125** | **10600** | **9325** | **7400** | **5250** | **5010** | **19075** | **19250** | **26825** | **26400** | **61100** | **62150** | **57025** | **58098** | **31925** | **32625** |

* Pump Stations 398 and 175 feed were turned off for several months in order to allow higher sulfide concentrations at the downstream pump stations to test new biofilters.

## BIOXIDE MONITORING DATA- 1998/1999

| | Jan-99 | Feb-99 | Mar-99 | Apr-99 | May-99 | Jun-99 | Jul-99 | Aug-99 | Sep-99 | Oct-99 | Nov-99 | Dec-99 | Jan-00 | Feb-00 | Mar-00 | Apr-00 | May-00 | Jun-00 | Jul-00 | Aug-00 | Sep-00 | Oct-00 | Nov-00 | Dec-00 | YEAR END TOTAL GL | $1.75/gal | TOTAL AMOUNT FOR DELIVERY | TOTAL AMOUNT USED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **LS#398** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 2250 | 2200 | 2425 | 1825 | 1350 | 450 | 450 | 1475 | 1975 | 1575 | 925 | 1425 | 1525 | 0 | 0 | 0 | 0 | 0 | 625 | 1675 | 700 | 2725 | 1200 | 2150 | 44675 | $ 1.75 | | $ 77,656.25 |
| QTY.DELIV. GL. | 1800 | 2100 | 2250 | 3200 | 0 | 1700 | 0 | 1800 | 1900 | 975 | 1200 | 1900 | 1350 | 0 | 0 | 0 | 0 | 0 | 775 | 1625 | 750 | 1975 | 1950 | 1700 | 43650 | $ 1.75 | $ 76,387.50 | |
| TANK LEVEL GL. | 1000 | 900 | 725 | 2100 | 750 | 2000 | 1550 | 1875 | 1850 | 1250 | 1525 | 2000 | 1825 | 1825 | 2200 | 2200 | 2200 | 2200 | 2350 | 2300 | 2350 | 1600 | 2350 | 1900 | | | | |
| *7/28 LEVEL* | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **LS#388-393** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 600 | 650 | 700 | 900 | 950 | 1050 | 525 | 450 | 275 | 825 | 1175 | 1025 | 500 | 550 | 725 | 475 | 425 | 300 | 650 | 825 | 325 | 1200 | 450 | 975 | 24775 | $ 1.75 | | $ 43,356.25 |
| QTY.DELIV. GL. | 1200 | 600 | 700 | 1200 | 0 | 1200 | 1175 | 0 | 750 | 0 | 1050 | 0 | 0 | 2650 | 1000 | 825 | 0 | 0 | 850 | 825 | 925 | 400 | 0 | 1850 | 25225 | $ 1.75 | $ 44,143.75 | |
| TANK LEVEL GL. | 2650 | 2600 | 2600 | 2900 | 1950 | 2100 | 2750 | 2300 | 2775 | 1950 | 1825 | 800 | 300 | 2100 | 2375 | 2725 | 2300 | 2000 | 2200 | 2200 | 2800 | 2000 | 1550 | 2425 | | | | |
| **LS#462** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 450 | 400 | 425 | 450 | 275 | 0 | 200 | 400 | 450 | 475 | 325 | 400 | 225 | 525 | 475 | 300 | 275 | 525 | 450 | 450 | 325 | 575 | 460 | 425 | 11910 | $ 1.75 | | $ 20,842.50 |
| QTY.DELIV. GL. | 1000 | 375 | 650 | | 675 | 0 | 0 | 700 | 450 | 0 | 475 | 0 | 750 | 475 | 625 | 0 | 0 | 1000 | 650 | 0 | 675 | 0 | 1075 | 0 | 11600 | $ 1.75 | $ 20,300.00 | |
| TANK LEVEL GL. | 850 | 825 | 1050 | 600 | 1000 | 1000 | 800 | 1100 | 1100 | 625 | 775 | 375 | 900 | 850 | 1000 | 700 | 425 | 900 | 1100 | 650 | 1000 | 425 | 1100 | 675 | | | | |
| **LS#480** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 1600 | 1750 | 2125 | 1675 | 925 | 600 | 1200 | 1375 | 1400 | 1025 | 1050 | 1425 | 1675 | 1200 | 725 | 900 | 1400 | 1000 | 1025 | 2275 | 1275 | 3025 | 2025 | 2725 | 46625 | $ 1.75 | | $ 81,943.75 |
| QTY.DELIV. GL. | 1050 | 1400 | 2975 | 2000 | 600 | 900 | 1450 | 1050 | 1400 | 1250 | 0 | 2100 | 1800 | 700 | 1575 | 0 | 1400 | 1350 | 800 | 1075 | 2100 | 3675 | 2025 | 2075 | 46625 | $ 1.75 | $ 81,593.75 | |
| TANK LEVEL GL. | 1150 | 700 | 1550 | 1825 | 1550 | 1850 | 2100 | 1775 | 1775 | 2000 | 950 | 1625 | 1750 | 1250 | 2100 | 1200 | 1200 | 2050 | 1825 | 625 | 1450 | 2100 | 2100 | 1450 | | | | |
| **LS#479** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 1995 | 1875 | 2700 | 1850 | 1875 | 2525 | 2300 | 2400 | 2325 | 1750 | 2325 | 1475 | 3050 | 2050 | 2150 | 2200 | 2150 | 1000 | 2400 | 2225 | 1650 | 3200 | 1725 | 2600 | 64470 | $ 1.75 | | $112,822.50 |
| QTY.DELIV. GL. | 2050 | 2900 | 2700 | 1250 | 2100 | 3000 | 1800 | 2500 | 2350 | 1825 | 1000 | 3100 | 2150 | 2250 | 2550 | 1800 | 1900 | 1800 | 2750 | 2350 | 1250 | 2800 | 2525 | 2900 | 65125 | $ 1.75 | $ 113,968.75 | |
| TANK LEVEL GL. | 975 | 2000 | 2000 | 1400 | 1625 | 2100 | 1600 | 1700 | 1725 | 1800 | 475 | 2100 | 1200 | 1400 | 1800 | 1400 | 1150 | 1750 | 2100 | 2100 | 1700 | 1300 | 2100 | 1900 | | | | |
| ***LS#482*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 4250 | 3850 | 4875 | 2975 | 3850 | 5275 | 5025 | 4550 | 5325 | 4650 | 6075 | 3875 | 6800 | 4625 | 4400 | 5175 | 6075 | 4950 | 6100 | 5050 | 3525 | 5850 | 3300 | 5300 | 143100 | $ 1.75 | | $250,425.00 |
| QTY.DELIV. GL. | 5600 | 4900 | 5050 | 2000 | 1700 | 7875 | 3725 | 4950 | 5500 | 5175 | 6150 | 4600 | 4800 | 5000 | 4900 | 4500 | 5825 | 5300 | 7800 | 4975 | 2700 | 5750 | 4200 | 5350 | 143150 | $ 1.75 | $250,512.50 | |
| TANK LEVEL GL. | 2000 | 2950 | 3125 | 2150 | 0 | 2600 | 1300 | 1700 | 1875 | 2400 | 2475 | 3200 | 1200 | 1575 | 2075 | 1400 | 1150 | 1500 | 3200 | 3125 | 2300 | 2200 | 3100 | 2150 | | | | |
| **LS#481** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 2725 | 3000 | 3875 | 2750 | 2525 | 5075 | 4625 | 4450 | 4125 | 4525 | 5475 | 3400 | 6575 | 3450 | 4200 | 4350 | 5625 | 4250 | 5323 | 4450 | 5025 | 4425 | 5350 | 5075 | 124308 | $ 1.75 | | $217,696.50 |
| QTY.DELIV. GL. | 1800 | 3100 | 4976 | 2900 | 2175 | 4475 | 6125 | 4325 | 3275 | 4825 | 4350 | 4750 | 5925 | 2250 | 6000 | 4600 | 3950 | 6025 | 4925 | 5250 | 5050 | 3275 | 6200 | 3575 | 122826 | $ 1.75 | $214,945.50 | |
| TANK LEVEL GL. | 1200 | 1300 | 2400 | 2550 | 2200 | 1600 | 3100 | 2975 | 2125 | 2425 | 1300 | 2650 | 2000 | 800 | 2600 | 2850 | 1175 | 2950 | 2550 | 3125 | 3100 | 1950 | 2800 | 1300 | | | | |
| **LS#175** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 750 | 0 | 0 | 0 | 0 | | 0 | 0 | 700 | 1325 | 1425 | 1950 | 2100 | 1300 | 850 | 1725 | 2500 | 3325 | 4150 | 3500 | 2200 | 4200 | 3525 | 3250 | 43850 | $ 1.75 | | $ 76,387.50 |
| QTY.DELIV. GL. | 850 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 1325 | 1225 | 3750 | 1700 | 450 | 1000 | 2975 | 2500 | 3125 | 4350 | 3300 | 2925 | 3675 | 3575 | 2350 | 52525 | $ 1.75 | $ 91,918.75 | |
| TANK LEVEL GL. | 1300 | 1300 | 1300 | 1300 | 1300 | | 1300 | 1300 | 600 | 600 | 400 | 1700 | 1300 | 450 | 1100 | 1700 | 1700 | 1500 | 1700 | 1500 | 2225 | 1700 | 1700 | 800 | | | | |
| *7/28 LEVEL* | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **LS#371** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 325 | 275 | 370 | 255 | 400 | 375 | 350 | 325 | 325 | 325 | 375 | 300 | 425 | 275 | 275 | 350 | 500 | 250 | 615 | 400 | 275 | 475 | 260 | 365 | 10165 | $ 1.75 | | $ 17,788.75 |
| QTY.DELIV. GL. | 1000 | 0 | 600 | 0 | 800 | 0 | 0 | 1000 | 0 | 0 | 800 | 800 | 0 | 700 | 0 | 800 | 0 | 0 | 1240 | 0 | 800 | 0 | 0 | 700 | 10490 | $ 1.75 | $ 18,357.50 | |
| TANK LEVEL GL. | 1125 | 850 | 1080 | 825 | 1225 | 850 | 500 | 1175 | 850 | 525 | 950 | 1250 | 825 | 1250 | 975 | 1425 | 925 | 675 | 0 | 900 | 1425 | 950 | 690 | 1025 | | | | |
| **LS#332** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 1050 | 875 | 900 | 675 | 575 | 925 | 675 | 950 | 1050 | 1000 | 1100 | 750 | 955 | 1100 | 1205 | 1125 | 1475 | 775 | 1635 | 725 | 425 | 1025 | 675 | 1075 | 29110 | $ 1.75 | | $ 50,942.50 |
| QTY.DELIV. GL. | 1000 | 1300 | 700 | 600 | 800 | 550 | 1500 | 500 | 1100 | 1100 | 1100 | 600 | 1280 | 600 | 1555 | 1525 | 1300 | 1235 | 0 | 1400 | 800 | 600 | 900 | 1700 | 29835 | $ 1.75 | $ 52,211.25 | |
| TANK LEVEL GL. | 475 | 900 | 700 | 625 | 850 | 475 | 1300 | 850 | 900 | 1000 | 1000 | 850 | 1175 | 675 | 1025 | 1425 | 1250 | 1710 | 75 | 700 | 1075 | 650 | 875 | 1500 | | | | |

LEE COUNTY
SOUTHWEST FLORIDA

ATTACHMENT 3

941.689.7385

**BOARD OF COUNTY COMMISSIONERS**

Writer's Direct Dial Number:_____



May 3, 2002

**FORMAL QUOTE NO.: Q-020388**
**LEE COUNTY ADDENDUM NUMBER ONE**
**NITRATE SOLUTION FOR THE PREVENTION OF SULFIDES IN WASTEWATER**

**QUOTERS MUST ACKNOWLEDGE RECEIPT OF THIS ADDENDUM ON THE PROPOSAL QUOTE FORM, PAGE 10.**

Please **delete** page 12 from the Detailed Specifications of the quote package.

Please **insert** revised page 12A, enclosed.

If you have any questions concerning this addendum, please contact me at the number listed above.

DIVISION OF PURCHASING

Cheri Alexander, C.P.M., CPPB
Purchasing Agent

/cja

Enclosure

**LEE COUNTY, FLORIDA**
**DETAILED SPECIFICATIONS**
**FOR**
**NITRATE SOLUTION FOR THE PREVENTION**
**OF SULFIDES IN WASTEWATER**

## PART 1 - GENERAL

### 1.1 SCOPE

#### 1.1.1 General

The specification is to contract with the SUPPLIER to provide a nitrate solution for the purpose of preventing the formation of wastewater sulfide concentrations in the sewer collection system as part of the COUNTY's odor and corrosion control program. The SUPPLIER shall also provide all necessary feed equipment, monitoring and reporting services.

The scope of work shall include:

- Supply and deliver the nitrate solution to the feed sites.
- Provide, install and maintain all necessary feed equipment to include but not limited to dual feed pumps, solution storage tanks, piping and valves, solution flow measuring devices, safety equipment and other appurtenances. The equipment shall remain the property of the SUPPLIER and shall be furnished for use at the feed site as long as the COUNTY purchases nitrate solution from the SUPPLIER.
- Operate and maintain in proper working order all components of the feed system.
- SUPPLIER shall monitor and recommend feed rate adjustments to the COUNTY of the nitrate solution product at these feed points to effectively prevent the formation of odor and corrosion causing dissolved wastewater sulfides at the downstream control point to 1 mg/L or less. The COUNTY shall first approve all feed rate adjustments.
- Provide sampling, monitoring and reporting services for cost-effective use of the nitrate solution.

#### 1.1.2 Feed Sites

The COUNTY currently has five (5) feed sites: LS 479 - Old Olga Rd, East Ft. Myers, LS 482 – SR 80 @ Parker Ave, East Ft. Myers, LS 481 – SR 80 @ I-75, E. Ft. Myers, LS 480 – Ballard Rd., E. Ft. Myers, and LS 393- McGregor Blvd @ Winkler Ave., which are shown on the attachment. These feed sites have existing potable water and electrical service. SUPPLIER and the COUNTY shall monitor and adjust the feed rate of the nitrate solution at these feed points to effectively prevent the formation of odor and corrosion causing dissolved sulfides at the downstream control point maintaining them at 1 mg/L or less. The COUNTY is not obligated to contract for any minimum quantity of nitrate solution or minimum number of feed sites during the period of this contract. The COUNTY also reserves the right to increase the number of feed sites and provide 30 days notice to the SUPPLIER.

### 1.2 SUPPLIER

1.2.1 The SUPPLIER of the nitrate solution shall be one recognized and established in the field of wastewater sulfide control.

1.2.2 The SUPPLIER shall be capable of providing on-site technical assistance within 24 hours of notification.

1.2.3 The SUPPLIER shall provide delivery of the nitrate solution within 48 hours of order placement.

1.2.4 To the fullest extent permitted by applicable Florida law, the SUPPLIER shall indemnify and hold harmless the COUNTY, its employees and agents, from and against all claims, damages, losses and expenses, including

ATTACHMENT 4
#1.75

# LEE COUNTY
SOUTHWEST FLORIDA

941.689.7385

BOARD OF COUNTY COMMISSIONERS

Writer's Direct Dial Number:

Bob Janes
*District One*

Douglas R. St. Cerny
*District Two*

Ray Judah
*District Three*

Andrew W. Coy
*District Four*

John E. Albion
*District Five*

Donald D. Stilwell
*County Manager*

James G. Yaeger
*County Attorney*

Diana M. Parker
*County Hearing Examiner*

COPY

May 3, 2002

**FORMAL QUOTE NO.: Q-020388**
**LEE COUNTY ADDENDUM NUMBER ONE**
**NITRATE SOLUTION FOR THE PREVENTION OF SULFIDES IN WASTEWATER**

**QUOTERS MUST ACKNOWLEDGE RECEIPT OF THIS ADDENDUM ON THE PROPOSAL QUOTE FORM, PAGE 10.**

Please **delete** page 12 from the Detailed Specifications of the quote package.

Please **insert** revised page 12A, enclosed.

If you have any questions concerning this addendum, please contact me at the number listed above.

| Post-it® Fax Note 7671 | Date | # of pages ▶ |
|---|---|---|
| To Cheri Whalen | From Cheri | |
| Co./Dept. US Filter | Co. Lee County | |
| Phone # | Phone # | |
| Fax # 941/351-4756 | Fax # 239-689-7390 | |

DIVISION OF PURCHASING

Cheri Alexander, C.P.M., CPPB
Purchasing Agent

/cja

Enclosure

LEE COUNTY
SOUTHWEST FLORIDA

PROJECT NO.: Q-020388

OPEN DATE: MAY 14, 2002

AND TIME: 2:30 P.M.

PRE-BID DATE: MAY 2, 2002

AND TIME: 2:00 P.M.

LOCATION: PURCHASING

REC'D APR 24 2002

# REQUEST FOR QUOTATIONS

## TITLE:

## NITRATE SOLUTION FOR THE PREVENTION OF SULFIDES IN WASTEWATER

REQUESTER: LEE COUNTY BOARD OF COUNTY COMMISSIONERS
DIVISION OF PURCHASING
3434 HANCOCK BRIDGE PKWY, 3RD FLOOR
P.O. BOX 398
FORT MYERS, FL 33902-0398

BUYER: CHERI ALEXANDER, C.P.M., CPPB
PURCHASING AGENT
PHONE NO.: (239) 689-7385

**LEE COUNTY, FLORIDA**
**PROPOSAL QUOTE FORM**
**FOR**
**NITRATE SOLUTION FOR THE PREVENTION**
**OF SULFIDES IN WASTEWATER**

DATE SUBMITTED: 5/14/02

VENDOR NAME: USFILTER DAVIS PROCESS

TO: The Board of County Commissioners
Lee County
Fort Myers, Florida

Having carefully examined the "General Conditions", and the "Detailed Specifications", all of which are contained herein, the Undersigned proposes to furnish the following, which meet these specifications:

*The undersigned acknowledges receipt of Addenda numbers:* 1

Lee County Commodity Code 19036

Pounds of nitrate-oxygen per gallon of solution = 3.5 $NO_3$-O/ gal

| Description | Unit Price per Gallon $ / Gal | Unit Price per Pound of Nitrate-Oxygen $ / lb. of $NO_3$-O |
|---|---|---|
| 1. Delivered Nitrate Solution Product Including The Installation And Use Of All Necessary Feed Equipment; Specify Product Name: BIOXIDE® | $1.75 | $0.486 |
| 2. Equipment Operation and Maintenance, Sampling, Monitoring and Reporting Services | $0.00 EQUIPMENT ON SITE | |
| **Total Cost** | $1.75/GALLON | $0.486/LB OF $NO_3$-O |

NOTE: LEE COUNTY WILL AWARD THE BID FOR THE SUPPLIER OF THE NITRATE SOLUTION AND ASSOCIATED SERVICES ONLY AFTER ALL PATENT ISSUES ARE RESOLVED TO THE SATISFACTION OF THE COUNTY.

TO BE (DELIVERED/STARTED) WITHIN 3 CALENDAR DAYS AFTER RECEIPT OF AWARD AND PURCHASE ORDER.

Is your firm interested in being considered for the Local Vendor Preference?
Yes X No _____

If yes, then read the paragraph entitled "Local Vendor Preference" included in these specifications. Also complete the Local Vendor Preference Questionnaire and return with your quotation.

Quoters should carefully read all the terms and conditions of the specifications. Any representation of deviation or modification to the quote may be grounds to reject the quote.

Are there any modifications to the quote or specifications:
Yes _____ No X

Failure to clearly identify any modifications in the space below or on a separate page may be grounds for the quoter being declared nonresponsive or to have the award of the quote rescinded by the County.

MODIFICATIONS:

Quoter shall submit his/her quote on the County's Proposal Quote Form, including the firm name and authorized signature. Any blank spaces on the Proposal Quote Form, qualifying notes or exceptions, counter offers, lack of required submittals, or signatures, on County's Form may result in the Quoter/Quote being declared non-responsive by the County.

ANTI-COLLUSION STATEMENT

**THE BELOW SIGNED QUOTER HAS NOT DIVULGED TO, DISCUSSED OR COMPARED HIS QUOTE WITH OTHER QUOTERS AND HAS NOT COLLUDED WITH ANY OTHER QUOTER OR PARTIES TO A QUOTE WHATSOEVER. NOTE: NO PREMIUMS, REBATES OR GRATUITIES TO ANY EMPLOYEE OR AGENT ARE PERMITTED EITHER WITH, PRIOR TO, OR AFTER ANY DELIVERY OF MATERIALS. ANY SUCH VIOLATION WILL RESULT IN THE CANCELLATION AND/OR RETURN OF MATERIAL (AS APPLICABLE) AND THE REMOVAL FROM THE MASTER BIDDERS LIST.**

FIRM NAME USFILTER DAVIS PROCESS

BY (Printed): DOUG DAVIS

BY (Signature):

TITLE: SALES MANAGER

FEDERAL ID # OR S.S.# 95-4328532

ADDRESS: 2650 TALLEVAST ROAD

SARASOTA, FL 34243

PHONE NO.: 941-355-2971

FAX NO.: 941-351-4756

CELLULAR PHONE/PAGER NO.: 941-720-4144

LEE COUNTY OCCUPATIONAL LICENSE NUMBER: _____

E-MAIL ADDRESS: davisd@usfilter.com

REVISED: 7/28/00

**LEE COUNTY, FLORIDA**
**DETAILED SPECIFICATIONS**
**FOR**
**NITRATE SOLUTION FOR THE PREVENTION**
**OF SULFIDES IN WASTEWATER**

## PART 1 - GENERAL

### 1.1 SCOPE

#### 1.1.1 General

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### 1.2 SUPPLIER

1.2.1 The SUPPLIER of the nitrate solution shall be one recognized and established in the field of wastewater sulfide control.

1.2.2 The SUPPLIER shall be capable of providing on-site technical assistance within 24 hours of notification.

1.2.3 The SUPPLIER shall provide delivery of the nitrate solution within 48 hours of order placement.

1.2.4 To the fullest extent permitted by applicable Florida law, the SUPPLIER shall indemnify and hold harmless the COUNTY, its employees and agents, from and against all claims, damages, losses and expenses, including

reasonable attorney's fees, arising out of or resulting from the performance of the SUPPLIER's operations under this contract, to include any claim arising out of any patent infringement issues raised by third parties.

## 1.3 SUBMITTALS:

### 1.3.1 Product Information

SUPPLIER shall submit the following product information:

a. Technical specification of the composition of the nitrate solution.
b. Material Safety Data Sheet of the nitrate solution.
c. Test results of a Florida State certified laboratory showing the corresponding pounds of nitrate-oxygen per gallon of solution, specific gravity and density.

### 1.3.2 Supplier's Experience

The SUPPLIER must provide a list of references currently using the nitrate solution for the prevention of wastewater dissolved sulfides and hydrogen sulfide gas in sewer systems. The list shall contain telephone numbers and contact names.

a. Reference Utility/Company, contact name, title, address and telephone number.
b. Quantities of solution used in gallons per day.
c. Description of the solution feed equipment installed.
d. Number of years nitrate solution was used.

### 1.3.3 Patent Issues

U.S. Filter Distribution Group, Inc., Tallevast, Florida, holds the rights to patent number Re. 36,651 dated April 11, 2000 entitled *"Process for Removal of Dissolved Hydrogen Sulfide and Reduction of Sewage BOD in Sewer or Other Waste Systems". This patent claims a "...process for removing existing dissolved hydrogen sulfide from waste systems wherein removal is achieved by a mechanism consisting essentially of: (a) adding nitrate ions to the waste in accordance with a ratio of 2.4 part nitrate oxygen for each 1 part existing dissolved hydrogen sulfide in order to provide a source of oxygen for naturally occurring bacteria present in the waste which utilize dissolved hydrogen sulfide in their metabolism..."* U.S. Filter has been granted a second-filed continuation of reissue of this patent and is awaiting publication of this second reissue.

Submit information to assure and ensure Lee County that the County's use of the Supplier's process for sulfide prevention with the Supplier's nitrate product will not be in violation of the U.S. Filter patent number Re. 36,651 and the continuation of reissue of this patent. Alternatively, submit information to show to the County how the Supplier will indemnify and hold harmless Lee County from any liability as the result of the use of the Supplier's product in potential violation of the U.S. Filter Patent Rights. Lee County will award the bid for the supplier of the nitrate solution and associated services only after all patent issues are resolved to the County's satisfaction.

## 1.4 SUBSTITUTIONS

The nitrate solution shall be provided in strict compliance with these specifications. Any bid for nitrate solution with deviations from these specifications shall be considered non-responsive and shall not be considered.

## 1.5 CHANGING OF SUPPLIERS

The COUNTY shall coordinate the current SUPPLIER with the successful bidder for the equipment changeout activities to minimize lack of nitrate solution feed to 3 hours or less at the feed sites. This change out shall be performed during the low wastewater flow time of the day (2pm to 5pm).

## PART 2 – PRODUCT, EQUIPMENT AND SERVICE REQUIREMENTS

### 2.1 PRODUCT REQUIREMENTS

#### 2.1.1 *Technical Requirements*

The material shall be a stabilized liquid phase nitrate solution. It shall be delivered, stored, and fed into the wastewater via standard liquid-phase chemical handling procedures when delivered to the feed site. Nitrate solution is typically supplied in the calcium nitrate or sodium nitrate form. Since the nitrate solution is available in different concentrations and as either calcium nitrate or sodium nitrate, for comparison of bid prices, the supplier must specify the following:

| | |
|---|---|
| Pounds of nitrate-oxygen per gallon of solution | 3.5 LBS. |
| Specific Gravity | 1.45 |
| Density | 0.03 |

A. The COUNTY will required the successful bidder to provide an analytical report of the pounds of nitrate-oxygen per gallon of solution, specific gravity and density analyzed on a sample of the nitrate solution at the start-up of the project. The SUPPLIER in the presence of COUNTY staff will take this sample. A Florida State Certified Laboratory shall perform these analyses, and the SUPPLIER shall pay for the shipping and analytical cost of these analyses.

#### 2.1.2 Safety Requirements

A. Transportation, storage and handling of the nitrate solution must comply with all Federal, State and Local Department of Transportation, OSHA requirements, and any other applicable regulatory agencies requirements.

B. The SUPPLIER and of all personnel handling the nitrate solution shall adhere to all OSHA recommended safety procedures for the nitrate solution.

### 2.2 EQUIPMENT REQUIREMENTS

#### 2.2.1 Liquid Feed System

The storage and feed equipment material of construction shall be fully compatible with the nitrate solution.

A. The feed system panel shall be a NEMA 4 totally enclosed system, HOA, wired for 110-volt. System shall contain 2 pumps, with at least one pump controllable by a 24 hr timer, calibration cylinder, exhaust fan if needed and related piping, valves and appurtenances. System shall also contain an anti-siphon/back pressure regulator, and shall be designed with leak containment.

B. Pumps - Pumps shall be skid-mounted, portable, and capable of easy removal and transport. All parts of the pump in contact with the nitrate solution must be compatible with the product. Piping shall include antiphon valve, backflow presenter, and pressure gauge. Each pump shall be wired for 110V AC/5 AMP and provided with a separate operational control system. All wiring and electrical work shall be performed in accordance with the National Electrical Code. All motors and control shall be rated for outdoor use and enclosed in adequately rated NEMA enclosures. One of the 2 chemical pumps shall also be wired for timer operation.

C. Storage Tanks – All storage tanks shall be properly labeled prior to initial chemical fill. Tanks shall be constructed of a material fully compatible with the nitrate solution. Provide solution storage tank for preferably 30 days storage, and at a least 2 weeks storage.

# ATTACHMENT A

LOCAL VENDOR PREFERENCE QUESTIONNAIRE
(LEE COUNTY ORDINANCE NO. 00-10)

Instructions: Please complete either Part A or B whichever is applicable to your firm

**PART A: VENDOR'S PRINCIPAL PLACE OF BUSINESS IS LOCATED WITHIN LEE COUNTY (Only complete Part A if your principal place of business is located within the boundaries of Lee County)**

1. What is the physical location of your principal place of business that is located within the boundaries of Lee County, Florida?

_____

_____

2. What is the size of this facility (i.e. sales area size, warehouse, storage yard, etc.)

_____

_____

_____

**PART B: VENDOR'S PRINCIPAL PLACE OF BUSINESS IS NOT LOCATED WITHIN LEE COUNTY OR DOES NOT HAVE A PHYSICAL LOCATION WITHIN LEE COUNTY (Please complete this section.)**

1. How many employees are available to service this contract? 12

2. Describe the types and amount of equipment you have available to service this contract.

5 COMPANY OWNED AND OPERATED SERVICE TRUCKS, 10 SERVICE TECHNICIANS/

APPLICATION ENGINEERS

3. Describe the types and amount of material stock that you have available to service this contract.

BIOXIDE® STORAGE COMPLETE WAREHOUSE TO PROVIDE TOTAL SERVICE CAPABILITIES.

_____

4. Have you provided goods or services to Lee County on a regular basis for the preceding, consecutive five years?

Yes X No _____

*If yes, please provide your contractual history with Lee County for the past five, consecutive years. Attach additional pages if necessary.*

COUNTY WIDE BIOXIDE3 SERVICE CONTRACT FOR THE PAST EIGHT (8) YEARS.

_____

_____

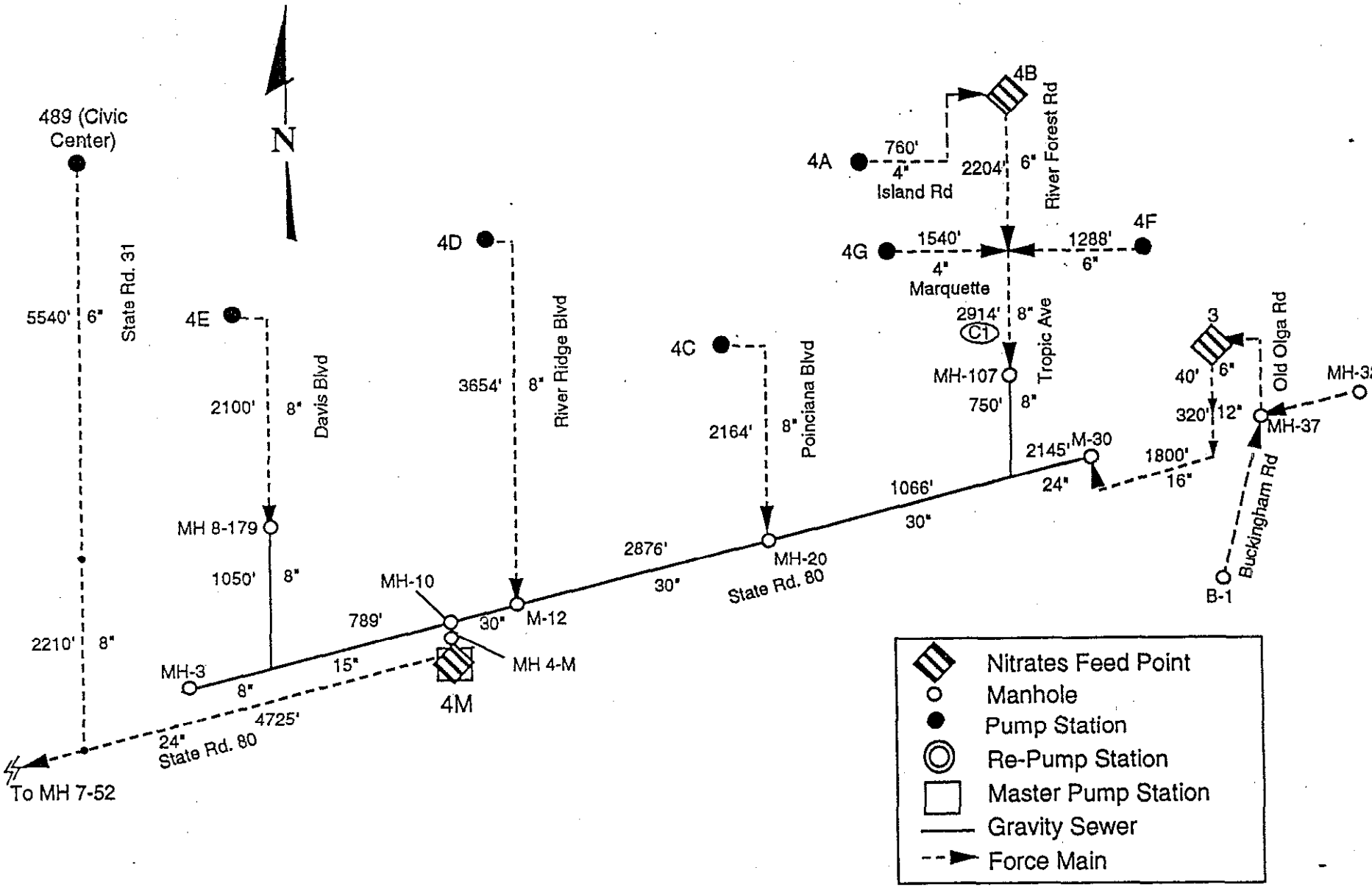



FIGURE 2-1A EAST LEE COUNTY SEWER SYSTEM
NORTH SECTION

ATTACHMENT 'B'

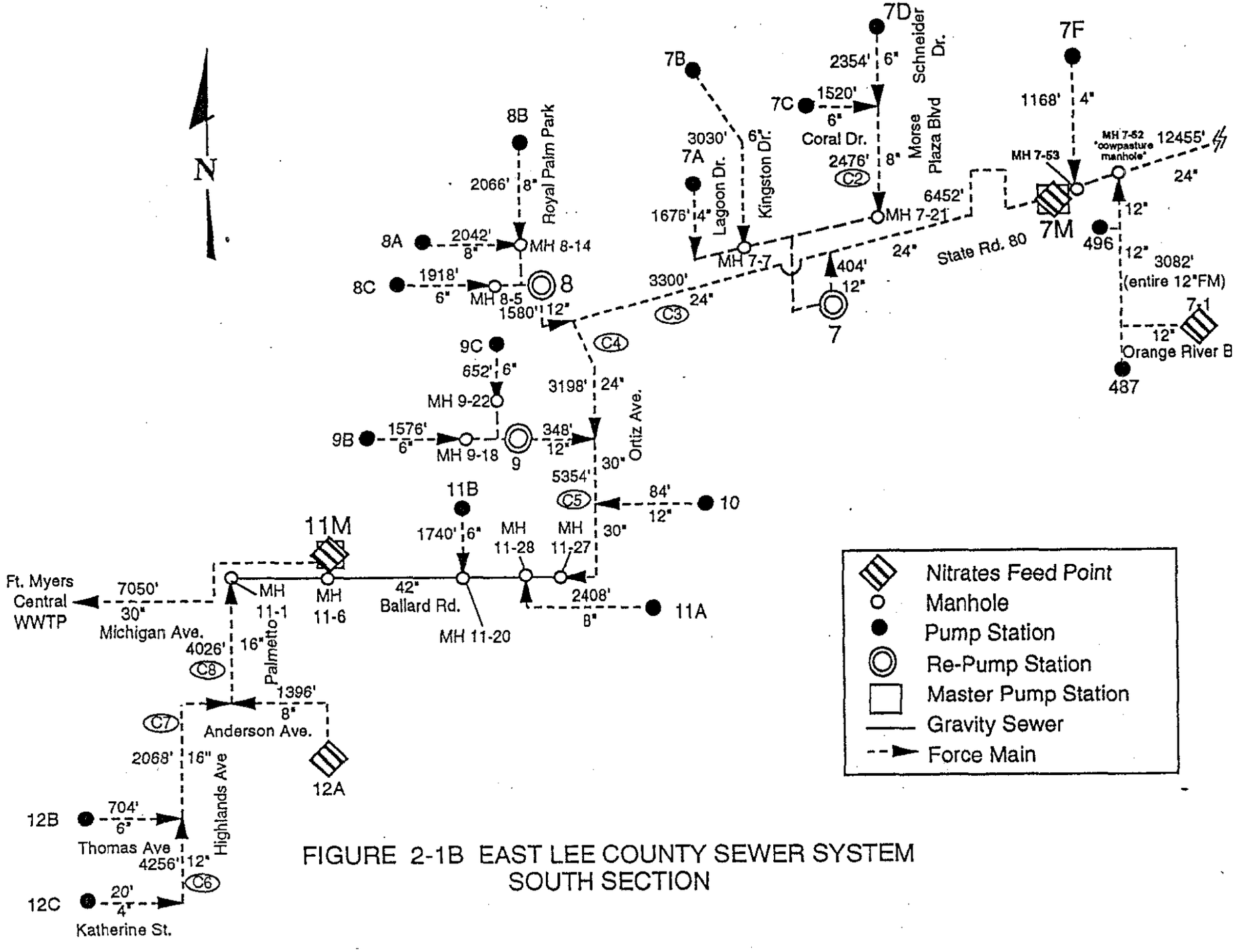
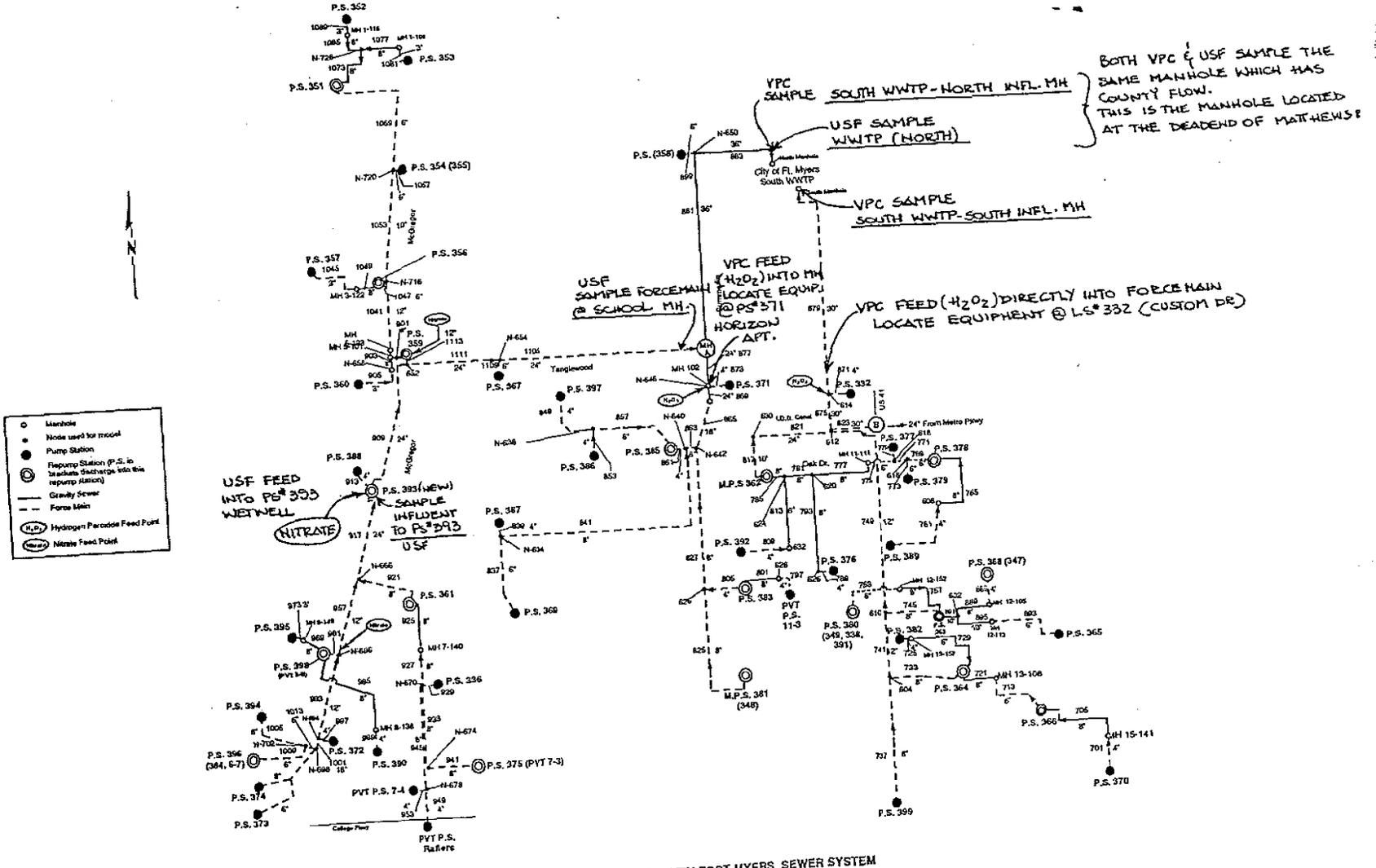



FIGURE 2-1B EAST LEE COUNTY SEWER SYSTEM
SOUTH SECTION

ATTACHMENT "B"




SCHEMATIC OF SOUTH FORT MYERS SEWER SYSTEM

FIGURE 2-1

MONTGOMERY WATSON

ATTACHMENT "B"

**Attachment C**

**LEE COUNTY UTILITIES**

**BIOXIDE ™ NITRATE SOLUTION USAGE**

| Month/Year | PS 398 Travers (Discontinued) | | PS 393 McGregor | | PS 462 Dupree (Discontinued) | | PS 480 11M | | PS 479 Old Olga | | P482 4M | | PS 481 7M | | PS 175 Iona (Discontinued) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Qty Delivered (gals) | Qty Used (gals) | Qty Delivered (gals) | Qty Used (gals) | Qty Delivered (gals) | Qty Used (gals) | Qty Delivered (gals) | Qty Used (gals) | Qty Delivered (gals) | Qty Used (gals) | Qty Delivered (gals) | Qty Used (gals) | Qty Delivered (gals) | Qty Used (gals) | Qty Delivered (gals) | Qty Used (gals) |
| Jan-99 | 1800 | 2250 | 1200 | 600 | 1000 | 450 | 1050 | 1600 | 2050 | 1995 | 5600 | 4250 | 1800 | 2725 | 850 | 750 |
| Feb-99 | 2100 | 2200 | 600 | 650 | 375 | 400 | 1400 | 1750 | 2900 | 1875 | 4800 | 3850 | 3100 | 3000 | 0 | Off* |
| Mar-99 | 2250 | 2425 | 700 | 700 | 650 | 425 | 2975 | 2125 | 2700 | 2700 | 5050 | 4875 | 4976 | 3875 | 0 | Off* |
| Apr-99 | 3200 | 1825 | 1200 | 900 | | 450 | 2000 | 1675 | 1250 | 1850 | 2000 | 2975 | 2900 | 2750 | 0 | Off* |
| May-99 | 0 | 1350 | 0 | 950 | 675 | 275 | 600 | 925 | 2100 | 1875 | 1700 | 3850 | 2175 | 2525 | 0 | Off* |
| Jun-99 | 1700 | 450 | 1200 | 1050 | 0 | 0 | 900 | 600 | 3000 | 2525 | 7875 | 5275 | 4475 | 5075 | 0 | Off* |
| Jul-99 | 0 | 450 | 1175 | 525 | 0 | 200 | 1450 | 1200 | 1800 | 2300 | 3725 | 5025 | 6125 | 4625 | 0 | Off* |
| Aug-99 | 1800 | 1475 | 0 | 450 | 700 | 400 | 1050 | 1375 | 2500 | 2400 | 4950 | 4550 | 4325 | 4450 | 0 | Off* |
| Sep-99 | 1900 | 1975 | 750 | 275 | 450 | 450 | 1400 | 1400 | 2350 | 2325 | 5500 | 5325 | 3275 | 4125 | 0 | 700 |
| Oct-99 | 975 | 1575 | 0 | 825 | 0 | 475 | 1250 | 1025 | 1825 | 1750 | 5175 | 4650 | 4825 | 4525 | 1325 | 1325 |
| Nov-99 | 1200 | 925 | 1050 | 1175 | 475 | 325 | 0 | 1050 | 1000 | 2325 | 6150 | 6075 | 4350 | 5475 | 1225 | 1425 |
| Dec-99 | 1900 | 1425 | 0 | 1025 | 0 | 400 | 2100 | 1425 | 3100 | 1475 | 4600 | 3875 | 4750 | 3400 | 3750 | 1950 |
| **Total of 1999** | **18825** | **18325** | **7875** | **9125** | **4325** | **4250** | **16175** | **16150** | **26575** | **25395** | **57125** | **54575** | **47076** | **46550** | **7150** | **6150** |
| | | | | | | | | | | | | | | | | |
| Jan-00 | 1350 | 1525 | 0 | 500 | 750 | 225 | 1800 | 1675 | 2150 | 3050 | 4800 | 6800 | 5925 | 6575 | 1700 | 2100 |
| Feb-00 | 0 | Off* | 2650 | 550 | 475 | 525 | 700 | 1200 | 2250 | 2050 | 5000 | 4625 | 2250 | 3450 | 450 | 1300 |
| Mar-00 | 0 | Off* | 1000 | 725 | 625 | 475 | 1575 | 725 | 2550 | 2150 | 4900 | 4400 | 6000 | 4200 | 1000 | 850 |
| Apr-00 | 0 | Off* | 825 | 475 | 0 | 300 | 0 | 900 | 1800 | 2200 | 4500 | 5175 | 4600 | 4350 | 2975 | 1725 |
| May-00 | 0 | Off* | 0 | 425 | 0 | 275 | 1400 | 1400 | 1900 | 2150 | 5825 | 6075 | 3950 | 5625 | 2500 | 2500 |
| Jun-00 | 0 | Off* | 0 | 300 | 1000 | 525 | 1850 | 1000 | 1600 | 1000 | 5300 | 4950 | 6025 | 4250 | 3125 | 3325 |
| Jul-00 | 775 | 625 | 850 | 650 | 650 | 450 | 800 | 1025 | 2750 | 2400 | 7800 | 6100 | 4925 | 5323 | 4350 | 4150 |
| Aug-00 | 1625 | 1675 | 825 | 825 | 0 | 450 | 1075 | 2275 | 2350 | 2225 | 4975 | 5050 | 5250 | 4450 | 3300 | 3500 |
| Sep-00 | 750 | 700 | 925 | 325 | 675 | 325 | 2100 | 1275 | 1250 | 1650 | 2700 | 3525 | 5050 | 5025 | 2925 | 2200 |
| Oct-00 | 1975 | 2725 | 400 | 1200 | 0 | 575 | 3675 | 3025 | 2800 | 3200 | 5750 | 5850 | 3275 | 4425 | 3675 | 4200 |
| Nov-00 | 1950 | 1200 | 0 | 450 | 1075 | 460 | 2025 | 2025 | 2525 | 1725 | 4200 | 3300 | 6200 | 5350 | 3575 | 3525 |
| Dec-00 | 1700 | 2150 | 1850 | 975 | 0 | 425 | 2075 | 2725 | 2900 | 2600 | 5350 | 6300 | 3575 | 5075 | 2350 | 3250 |
| **Total of 2000** | **10125** | **10600** | **9325** | **7400** | **5250** | **5010** | **19075** | **19250** | **26825** | **26400** | **61100** | **62150** | **57025** | **58098** | **31925** | **32625** |

* Pump Stations 398 and 175 feed were turned off for several months in order to allow higher sulfide concentrations at the downstream pump stations to test new biofilters.

BIOXIDE MONITORING DATA- 1998/1999

| | Jan-99 | Feb-99 | Mar-99 | Apr-99 | May-99 | Jun-99 | Jul-99 | Aug-99 | Sep-99 | Oct-99 | Nov-99 | Dec-99 | Jan-00 | Feb-00 | Mar-00 | Apr-00 | May-00 | Jun-00 | Jul-00 | Aug-00 | Sep-00 | Oct-00 | Nov-00 | Dec-00 | YEAR END TOTAL GL | $1.75/gal | TOTAL AMOUNT FOR DELIVERY | TOTAL AMOUNT USED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **LS#398** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 2250 | 2200 | 2425 | 1825 | 1350 | 450 | 450 | 1475 | 1975 | 1575 | 925 | 1425 | 1525 | 0 | 0 | 0 | 0 | 0 | 625 | 1675 | 700 | 2725 | 1200 | 2150 | 44375 | $ 1.75 | | $ 77,656.25 |
| QTY.DELIV. GL. | 1800 | 2100 | 2250 | 3200 | 0 | 1700 | 0 | 1800 | 1900 | 975 | 1200 | 1900 | 1350 | 0 | 0 | 0 | 0 | 0 | 775 | 1625 | 750 | 1975 | 1950 | 1700 | 43650 | $ 1.75 | $ 76,387.50 | |
| TANK LEVEL GL. | 1000 | 900 | 725 | 2100 | 750 | 2000 | 1550 | 1875 | 1850 | 1250 | 1525 | 2000 | 1825 | 1825 | 2200 | 2200 | 2200 | 2200 | 2350 | 2300 | 2350 | 1600 | 2350 | 1900 | | | | |
| 7/28 LEVEL | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **LS#386-393** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 600 | 650 | 700 | 900 | 950 | 1050 | 525 | 450 | 275 | 825 | 1175 | 1025 | 500 | 550 | 725 | 475 | 425 | 300 | 650 | 825 | 325 | 1200 | 450 | 975 | 24775 | $ 1.75 | | $ 43,356.25 |
| QTY.DELIV. GL. | 1200 | 600 | 700 | 1200 | 0 | 1200 | 1175 | 0 | 750 | 0 | 1050 | 0 | 0 | 2850 | 1000 | 625 | 0 | 0 | 850 | 825 | 925 | 400 | 0 | 1850 | 25225 | $ 1.75 | $ 44,143.75 | |
| TANK LEVEL GL. | 2650 | 2600 | 2600 | 2900 | 1950 | 2100 | 2750 | 2300 | 2775 | 1950 | 1825 | 800 | 300 | 2100 | 2375 | 2725 | 2300 | 2000 | 2200 | 2200 | 2800 | 2000 | 1550 | 2425 | | | | |
| **LS#462** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 450 | 400 | 425 | 450 | 275 | 0 | 200 | 400 | 450 | 475 | 325 | 400 | 225 | 525 | 475 | 300 | 275 | 525 | 450 | 450 | 325 | 575 | 450 | 425 | 11910 | $ 1.75 | | $ 20,842.50 |
| QTY.DELIV. GL. | 1000 | 375 | 650 | | 675 | 0 | 0 | 700 | 450 | 0 | 475 | 0 | 750 | 475 | 625 | 0 | 0 | 1000 | 650 | 0 | 675 | 0 | 1075 | 0 | 11500 | $ 1.75 | $ 20,300.00 | |
| TANK LEVEL GL. | 850 | 825 | 1050 | 600 | 1000 | 1000 | 800 | 1100 | 1100 | 625 | 775 | 375 | 900 | 850 | 1000 | 700 | 425 | 900 | 1100 | 650 | 1000 | 425 | 1100 | 675 | | | | |
| **LS#460** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 1600 | 1750 | 2125 | 1675 | 925 | 600 | 1200 | 1375 | 1400 | 1025 | 1050 | 1425 | 1675 | 1200 | 725 | 900 | 1400 | 1000 | 1025 | 2275 | 1275 | 3025 | 2025 | 2725 | 46825 | $ 1.75 | | $ 81,943.75 |
| QTY.DELIV. GL. | 1050 | 1400 | 2975 | 2000 | 600 | 900 | 1450 | 1050 | 1400 | 1250 | 0 | 2100 | 1800 | 700 | 1575 | 0 | 1400 | 1850 | 800 | 1075 | 2100 | 3675 | 2025 | 2075 | 46825 | $ 1.75 | $ 81,993.75 | |
| TANK LEVEL GL. | 1150 | 700 | 1550 | 1825 | 1550 | 1850 | 2100 | 1775 | 1775 | 2000 | 950 | 1625 | 1750 | 1250 | 2100 | 1200 | 1200 | 2050 | 1825 | 625 | 1450 | 2100 | 2100 | 1450 | | | | |
| **LS#479** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 1995 | 1875 | 2700 | 1850 | 1875 | 2525 | 2300 | 2400 | 2325 | 1750 | 2325 | 1475 | 3050 | 2050 | 2150 | 2200 | 2150 | 1000 | 2400 | 2225 | 1650 | 3200 | 1725 | 2600 | 64470 | $ 1.75 | | $ 112,822.50 |
| QTY.DELIV. GL. | 2050 | 2900 | 2700 | 1250 | 2100 | 3000 | 1800 | 2500 | 2350 | 1825 | 1000 | 3100 | 2150 | 2250 | 2550 | 1800 | 1900 | 1600 | 2750 | 2350 | 1250 | 2800 | 2525 | 2900 | 65125 | $ 1.75 | $ 113,968.75 | |
| TANK LEVEL GL. | 875 | 2000 | 2000 | 1400 | 1625 | 2100 | 1800 | 1700 | 1725 | 1800 | 475 | 2100 | 1200 | 1400 | 1800 | 1400 | 1150 | 1750 | 2100 | 2100 | 1700 | 1300 | 2100 | 1900 | | | | |
| **LS#482** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 4250 | 3850 | 4875 | 2975 | 3850 | 5275 | 5025 | 4550 | 5325 | 4650 | 6075 | 3875 | 6800 | 4625 | 4400 | 5175 | 6075 | 4950 | 6100 | 5050 | 3525 | 5850 | 3300 | 6300 | 143100 | $ 1.75 | | $250,425.00 |
| QTY.DELIV. GL. | 5800 | 4800 | 5050 | 2000 | 1700 | 7875 | 3725 | 4950 | 5500 | 5175 | 6150 | 4600 | 4800 | 5000 | 4900 | 4500 | 5825 | 5300 | 7800 | 4975 | 2700 | 5750 | 4200 | 5350 | 143150 | $ 1.75 | $ 250,512.50 | |
| TANK LEVEL GL. | 2000 | 2950 | 3125 | 2150 | 0 | 2600 | 1300 | 1700 | 1875 | 2400 | 2475 | 3200 | 1200 | 1575 | 2075 | 1400 | 1150 | 1500 | 3200 | 3125 | 2300 | 2200 | 3100 | 2150 | | | | |
| **LS#481** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 2725 | 3000 | 3875 | 2750 | 2525 | 5075 | 4625 | 4450 | 4125 | 4525 | 5475 | 3400 | 6575 | 3450 | 4200 | 4350 | 5625 | 4250 | 5323 | 4450 | 5025 | 4425 | 5350 | 5075 | 124398 | $ 1.75 | | $217,696.50 |
| QTY.DELIV. GL. | 1800 | 3100 | 4975 | 2900 | 2175 | 4475 | 6125 | 4325 | 3275 | 4825 | 4350 | 4750 | 5925 | 2250 | 6000 | 4600 | 3950 | 6025 | 4925 | 5250 | 5050 | 3275 | 6200 | 3575 | 122826 | $ 1.75 | $214,945.50 | |
| TANK LEVEL GL. | 1200 | 1300 | 2400 | 2550 | 2200 | 1600 | 3100 | 2975 | 2125 | 2425 | 1300 | 2650 | 2000 | 800 | 2600 | 2850 | 1175 | 2950 | 2550 | 3125 | 3100 | 1950 | 2800 | 1300 | | | | |
| **LS#175** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 750 | 0 | 0 | 0 | 0 | | 0 | 0 | 700 | 1325 | 1425 | 1950 | 2100 | 1300 | 850 | 1725 | 2500 | 3325 | 4150 | 3500 | 2200 | 4200 | 3525 | 3250 | 43650 | $ 1.75 | | $ 76,387.50 |
| QTY.DELIV. GL. | 850 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 1325 | 1225 | 3750 | 1700 | 450 | 1000 | 2975 | 2500 | 3125 | 4350 | 3300 | 2925 | 3675 | 3575 | 2350 | 52525 | $ 1.75 | $ 91,918.75 | |
| TANK LEVEL GL. | 1300 | 1300 | 1300 | 1300 | 1300 | | 1300 | 1300 | 600 | 600 | 400 | 1700 | 1300 | 450 | 1100 | 1700 | 1700 | 1500 | 1700 | 1500 | 2225 | 1700 | 1700 | 800 | | | | |
| 7/28 LEVEL | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **LS#371** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 325 | 275 | 370 | 255 | 400 | 375 | 350 | 325 | 325 | 325 | 375 | 300 | 425 | 275 | 275 | 350 | 500 | 250 | 615 | 400 | 275 | 475 | 260 | 365 | 10165 | $ 1.75 | | $ 17,788.75 |
| QTY.DELIV. GL. | 1000 | 0 | 600 | 0 | 800 | 0 | 0 | 1000 | 0 | 0 | 800 | 600 | 0 | 700 | 0 | 800 | 0 | 0 | 1240 | 0 | 800 | 0 | 0 | 700 | 10490 | $ 1.75 | $ 18,357.50 | |
| TANK LEVEL GL. | 1125 | 850 | 1080 | 625 | 1225 | 850 | 500 | 1175 | 850 | 525 | 950 | 1250 | 825 | 1250 | 975 | 1425 | 925 | 675 | 0 | 900 | 1425 | 950 | 690 | 1025 | | | | |
| **LS#332** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QTY USED GL. | 1050 | 875 | 900 | 675 | 575 | 925 | 675 | 950 | 1050 | 1000 | 1100 | 750 | 955 | 1100 | 1205 | 1125 | 1475 | 775 | 1635 | 725 | 425 | 1025 | 675 | 1075 | 29110 | $ 1.75 | | $ 50,942.50 |
| QTY.DELIV. GL. | 1000 | 1300 | 700 | 600 | 800 | 550 | 1500 | 500 | 1100 | 1100 | 1100 | 600 | 1280 | 600 | 1555 | 1525 | 1300 | 1235 | 0 | 1400 | 800 | 600 | 900 | 1700 | 29835 | $ 1.75 | $ 52,211.25 | |
| TANK LEVEL GL. | 475 | 900 | 700 | 625 | 850 | 475 | 1300 | 850 | 900 | 1000 | 1000 | 850 | 1175 | 675 | 1025 | 1425 | 1250 | 1710 | 75 | 700 | 1075 | 650 | 875 | 1500 | | | | |

US00RE36651E

# United States Patent [19]

Hunniford et al.

[11] E Patent Number: Re. 36,651

[45] Reissued Date of Patent: Apr. 11, 2000

[54] **PROCESS FOR REMOVAL OF DISSOLVED HYDROGEN SULFIDE AND REDUCTION OF SEWAGE BOD IN SEWER OR OTHER WASTE SYSTEMS**

[75] Inventors: **David J. Hunniford**, Tallevast; **H. Forbes Davis**, Sarasota, both of Fla.

[73] Assignee: **U.S. Filter Distribution Group, Inc.**, Tallevast, Fla.

[21] Appl. No.: **08/437,874**

[22] Filed: **May 9, 1995**

**Related U.S. Patent Documents**

Reissue of:

[64] Patent No.: **4,911,843**
Issued: **Mar. 27, 1990**
Appl. No.: **07/281,747**
Filed: **Dec. 9, 1988**

[51] **Int. Cl.**[7] ..... **C02F 3/00**

[52] **U.S. Cl.** ..... **210/610**; 210/631; 210/916; 435/264; 435/266

[58] **Field of Search** ..... 210/610, 611, 210/620, 631, 916; 435/264, 266, 282

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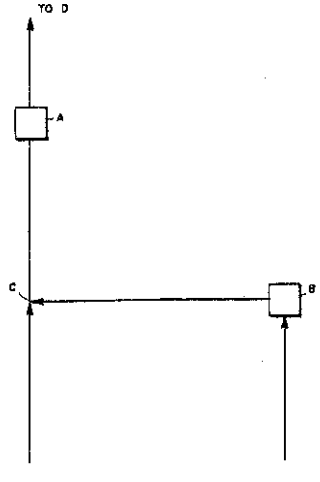
*Primary Examiner*—Christopher Upton
*Attorney, Agent, or Firm*—Nixon & Vanderhye P.C.

[57] **ABSTRACT**

Removal of dissolved hydrogen sulfide and a reduction in BOD is achieved by the addition of nitrate ions to waste systems in an amount sufficient to stimulate growth of bacteria which utilize dissolved hydrogen sulfide in their metabolism. Specifically, about 2.4 lbs. *nitrate* oxygen per lb. of sulfide is required.

**2 Claims, 1 Drawing Sheet**



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# PROCESS FOR REMOVAL OF DISSOLVED HYDROGEN SULFIDE AND REDUCTION OF SEWAGE BOD IN SEWER OR OTHER WASTE SYSTEMS

**Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.**

*Appl. Ser. No. 08/437,874, filed May 9, 1995, and Appl. Ser. No. 08/198,506, filed Nov. 24, 1998, are copending applications and are each reissues of U.S. Pat. No. 4,911, 843, (which issued from Appl. Ser. No. 07/281,747, filed Dec. 9, 1988).*

## BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to a process for the removal or reduction of dissolved hydrogen sulfide, and reduction of BOD in sewer systems, municipal waste treatment plants and in other industrial waste applications.

It is known to add nitrates or nitrites to sewage to effect reduction in BOD and even to suppress the formation of hydrogen sulfide gas via bacterial action. See, for example, U.S. Pat. Nos. 3,300,404; 4,446,031; and 4,681,687.

It is also known to add nitrates to sewage in order to control objectionable odors. See, for example, U.S. Pat. Nos. 3,966,450; 4,108,771.

There have also been attempts to remove hydrogen sulfide directly from waste. For example, in U.S. Pat. No. 4,680, 127, the patentee adds amounts of glyoxal, or glyoxal in combination with formaldehyde or glutaraldehyde, in order to reduce or scavenge the amount of hydrogen sulfide in aqueous or wet gaseous mediums.

In U.S. Pat. No. 4,501,668, the patentee utilizes polycondensation products produced by the condensation of acrolein and formaldehyde to eliminate hydrogen sulfide present in aqueous systems, such as waste water clarification plants. Merk also mentions benefits relating to corrosion prevention and deodorization.

In U.S. Pat No. 3,959,130, the patentee decontaminates sewage systems, waste water treatment plants and other industrial waste applications containing hydrogen sulfide by adjusting the pH of the sewage of a value over 7.0 and bringing the sewage into contact with an ash product.

It has now been discovered that the addition of nitrate, via an aqueous sodium nitrate solution, to sewage systems, waste treatment plants and other industrial waste applications containing dissolved hydrogen sulfide will result in the elimination or substantial reduction of the hydrogen sulfide, as well as the elimination of other "minor" odors associated with other sulphur-containing compounds.

It is believed that the addition of nitrate provides an oxygen source which promotes the growth of naturally occurring bacteria which utilize in their metabolism the sulfur tied up as hydrogen sulfide. It has been demonstrated both in lab jar tests and in an actual sewage collection system test, that dosing sewage containing over 50 mg/L of dissolved hydrogen sulfide with a sodium nitrate solution reduces the dissolved hydrogen sulfide to less than 0.1 mg/L. Along with this phenomena a significant reduction in sewage biological oxygen demand, BOD, of up to about 70%, and overall "sweetening", i.e., removal of other minor odors, of the sewage has been observed. These phenomena are believed to be the results of the biological process promoted by the nitrate addition.



More specifically, it has been found that 2.4 parts of nitrate oxygen ($NO_3$—O) are necessary to remove 1 part dissolved sulfide ($S^{2-}$). The source of nitrate to accomplish removal of the hydrogen sulfide is not specific, and aqueous solutions of both sodium nitrate and calcium nitrate appear to be suitable.

Because the necessary, reaction is biochemical, it will not occur within a sterile solution, i.e., naturally occurring bacteria must be present. Moreover, the removal of hydrogen sulfide is not instantaneous. According to applicant's tests, an "incubation" period of about 8 to about 96 hours and preferably about 24 to about 48 hours, is necessary to culture the bacteria, followed by about 1.5 to about 20 hours, and preferably about 3 to about 12 hours, for ongoing sulfide removal.

It has further been determined that the process in accordance with this invention achieves a significant reduction in sewage BOD due to the utilization of organic matter in the metabolism described.

Other objects and advantages will become apparent from the detailed description which follows.

## BRIEF DESCRIPTION OF THE DRAWING

The FIGURE is a schematic diagram representing a sewage system employed in the Example described herein.

## DETAILED DESCRIPTION OF THE INVENTION

Removal of dissolved hydrogen sulfide and a reduction in BOD in waste systems treated with sodium nitrate or calcium nitrate is believed to occur for the reasons described below.

The presence of dissolved hydrogen sulfide in sewage occurs as a result of a lack of dissolved oxygen. The addition of nitrate ions $NO_3$ provides an oxygen source for certain bacteria already present in the waste or sewage to thrive.

The bacteria that grow as a result of the nitrate oxygen utilize the dissolved hydrogen sulfide as part of their metabolism. The dissolved hydrogen sulfide contains sulfur which the bacteria also require in their metabolism.

It is theorized that the biochemical reaction which occurs has the following half reactions:

$$8\,[NO_3^-]NO_3^- \rightarrow 4N_2 + [120]\,12O_2$$

$$[120]12O_2 + 5H_2S \rightarrow 5SO_4^{2-} + 4H_2O + 2H^+$$

Based upon the above it is calculated that 2.4 parts of nitrate oxygen ($NO_3$—[0]*O*) are necessary to remove 1 part of dissolved sulfide ($S^{2-}$).

$$\frac{8 \text{ moles } NO_3^-}{5 \text{ moles } H_2S} \times \frac{48 \text{ lb Oxygen/mole } NO_3^-}{32 \text{ lb Sulfide/mole } H_2S}$$

yields 2.4 [lb] *lbs nitrate* oxygen/lb sulfide.

This ratio of oxygen to sulfide has been confirmed in both bench and field tests.

The source of nitrate to accomplish the sulfide removal is not critical, and both aqueous solutions of sodium nitrate and calcium nitrate have been used successfully.

This reaction is biochemical and it will not occur within a sterile solution, i.e., naturally occurring bacteria in sewage must be present. Additionally, the sulfide removal is not instantaneous; tests have shown that an "incubation" period

of 24–48 hours is necessary to culture the bacteria and thereafter 3–12 hours for ongoing sulfide removal. It is believed, however, that the incubation period may extend from about 8 to about 96 hours, and the ongoing removal period from about 1.5 to about 20 hours, depending on conditions.

The promotion of biological activity via nitrate addition as described also achieves a reduction in sewage BOD due to the utilization of organic mater in the metabolism described.

## EXAMPLE

With reference to the FIGURE, sodium nitrate was added to a sewer system in Jacksonville, Florida at a master pump station, or feed point B, upstream of a second master pump station comprising a monitoring point A. The feed point B was at a point removed from an intersection C of the feed line and main sewage line, as indicated in the FIGURE.

The treated sewage continued to a downstream waste water treatment plant in Jacksonville, indicated as point D.

Average detention times (based on average daily flows, line sizes and lengths are as follows:

B→C 7 hours

C→A 3.3 hours

B→A 10.3 hours

In terms of the description provided above, the B→C distance and retention time of 7 hours constitutes the incubation period, coupled with the distance C→A and associated retention time of 3.3 hours comprises a total of 10.3 hours from addition of the nitrate station at point B to the monitoring at point A, thereby permitting sufficient time for the bacteria to culture.

The following table shows the change in dissolved hydrogen sulfide at point A, with addition of nitrate occurring at point B.

TABLE I

| DATE | SODIUM NITRATE SOLUTION FEED – GPD | DAILY AVERAGE DISSOLVED $H_2S$ PPM AT POINT A |
|---|---|---|
| 2/22/88 | 0 | 35–40 |
| 2/23/88 | 0 | 30–50 |
| 2/24/88 | 1800 | 30 |
| 2/25/88 | 1800 | 15–20 |
| 2/26/88 | 1800 | 0.1–15 |
| 2/27/88 | 1200 | 0.1–4 |
| 2/28/88 | 1200 | 0.3–4 |
| 2/29/88 | 1200 | 0.1–8 |
| 3/01/88 | 650 | 0.7–1.5 |
| 3/02/88 | 650 | 1.0–1.5 |

During the period of time, the average daily $H_2S$ at point B was 25–30 ppm.

It is readily apparent from the above chart that significant reduction in $H_2S$ was achieved over a nine day period of time, commencing about 24 hours after the addition of the sodium nitrate, with maximum reductions occurring after 48 hours.

Subjective sampling also indicated a significant reduction in sewage odors other than hydrogen sulfide.

It was also found that sewage BOD was also reduced or indicated as in the following table:

TABLE II

| | BOD (mg/L) | | |
|---|---|---|---|
| DATE | POINT B | POINT A | POINT D |
| 03/02/88 | 165 | 112 | 138 |
| 03/03/88 | 145 | 55 | 135 |

It will thus be appreciated that the present invention provides for the removal of significant amounts of *existing* dissolved hydrogen sulfide and a corresponding reduction in sewage BOD. By properly feeding sodium nitrate into the sewage or waste, odor and corrosion problems can also be substantially eliminated.

While the invention has been described in connection with what is presently known to be the most practical and preferred embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiment, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

What is claimed is:

[1. A process for removing dissolved hydrogen sulfide from waste systems comprising the steps of:

(a) adding nitrate ions to the waste in accordance with a ratio of at least 2.4 parts nitrate oxygen for each 1 part dissolved sulfide in order to provide a source of oxygen for naturally occurring bacteria present in the waste which utilize dissolved hydrogen sulfide in their metabolism;

(b) providing sufficient time to culture said bacteria within said waste systems; and

(c) providing ongoing time sufficient to enable said bacteria to remove the dissolved hydrogen sulfide.]

[2. A process according to claim 1 wherein said nitrate ions are provided by the addition of sodium nitrate to the waste.]

[3. A process according to claim 1 wherein said nitrate ions are provided by the addition of calcium nitrate to the waste.]

[4. A process according to claims 2 or 3 wherein a period of from about 8 to about 96 hours is provided in the practice of step (b).]

[5. A process according to claims 2 or 3 wherein a period of from about 24 to about 48 hours is provided in the practice of step (b).]

[6. A process according to claims 2 or 3 wherein a period of from about 1.5 to about 20 hours is provided in the practice of step (c).]

[7. A process according to claims 2 or 3 wherein a period of from about 3 to about 12 hours is provided in the practice of step (c).]

[8. A process according to claim 1 wherein a period of from 8 to about 96 hours is provided in the practice of step (b).]

[9. A process according to claim 8 wherein a period from about 1.5 to about 20 hours is provided in the practice of step (c).]

[10. A process according to claim 8 wherein a period from about 3 to about 12 hours is provided in the practice of step (c).]

[11. A process according to claim 1 wherein a period of from about 24 to about 48 hours is provided in the practice of step (b).]

[12. A process according to claim 11 wherein a period of from about 1.5 to about 20 hours is provided in the practice of step (c).]

[13. A process according to claim 11 wherein a period of from about 3 to about 12 hours is provided in the practice of step (c).]

[14. A process according to claim 1 wherein a period of from about 1.5 to about 20 hours is provided in the practice of step (c).]

[15. A process according to claim 1 wherein a period of from 3 to about 12 hours is provided in the practice of step (c).]

[16. A process according to claim 1 wherein sewage BOD is also reduced by up to about 70%.]

[17. A process according to claim 1 wherein said process further eliminates minor odors associated with other sulphur-containing compounds.]

[18. A process for removing from waste systems dissolved hydrogen sulfide and other minor odors associated with other sulphur-containing compounds comprising the steps of: providing a source of oxygen in the form of nitrate in the form of nitrate in the waste in sufficient amount to cause naturally occurring bacteria in the waste which utilize dissolved hydrogen sulfide and sulfur in their metabolism to grow, and providing sufficient time for the bacteria to culture in said waste, to thereby initiate a biochemical reaction which has the following half reactions:

$$8\ NO_3^- \rightarrow 4N_2 + 12O_2$$

$$12O_2 + 5H_2S \rightarrow 5SO_4^{2-} + 4H_2O + 2H^+$$

[19. The process according to claim 18 wherein the source of oxygen comprises sodium nitrate.]

[20. The process according to claim 18 wherein the source of oxygen comprises calcium nitrate.]

[21. The process according to claim 18 wherein about 8 to about 96 hours is provided for the bacteria to culture.]

[22. The process according to claim 18 wherein about 24 to about 48 hours is provided for the bacteria to culture.]

[23. A process for removing dissolved $H_2S$ and reducing sewage BOD in sewer systems comprising the steps of:

(a) adding a source of oxygen in the form of nitrate to the sewer system in an amount equal to about 2.4 lb. oxygen per lb. sulfide; and

(b) providing about 8 to about 96 hours to allow naturally occurring bacteria already present in the system to culture as a result of the addition of said source of oxygen; and providing about 1.5 to about 20 hours to effect ongoing $H_2S$ removal and sewage BOD reduction.]

[24. The process according to claim 23 wherein said source of oxygen is sodium nitrate.]

[25. The process according to claim 23 wherein said source of oxygen is a calcium nitrate.]

[26. The process according to claim 23 wherein about 24 to about 48 hours is provided to allow bacteria present in the system to culture.]

[27. The process according to claim 23 wherein about 3 to about 12 hours are provided to effect ongoing $H_2S$ removal and sewage BOD reduction.]

[28. The process according to 23 wherein, during the process, additional minor odors associated with other sulphur-containing compounds are also eliminated.]

*29. A process for removing existing dissolved hydrogen sulfide from waste systems wherein removal is achieved by a mechanism consisting essentially of:*

*(a) adding nitrate ions to the waste in accordance with a ratio of 2.4 parts nitrate oxygen for each 1 part existing dissolved hydrogen sulfide in order to provide a source of oxygen for naturally occurring bacteria present in the waste which utilize dissolved hydrogen sulfide in their metabolism;*

*(b) providing sufficient time to culture said bacteria within said waste systems; and*

*(c) providing ongoing time sufficient to enable said bacteria to remove substantially all said existing dissolved hydrogen sulfide.*

*30. A process for removing from waste systems existing dissolved hydrogen sulfide and other minor odors associated with other sulphur-containing compounds wherein removal is achieved by a mechanism consisting essentially of: providing a source of oxygen in the form of nitrate in the waste in accordance with a ratio of substantially 2.4 parts nitrate oxygen for each 1 part existing dissolved hydrogen sulfide to cause naturally occurring bacteria in the waste which utilize dissolved hydrogen sulfide and sulfur in their metabolism to grow, and providing sufficient time for the bacteria to culture in said waste, to thereby initiate a biochemical reaction which has the following half reactions:*

$$8\ NO_3^- \rightarrow 4N_2 + 12O_2$$

$$12O_2 + 5H_2S \rightarrow 5SO_4^{2-} + 4H_2O + 2H^+$$

*to thereby remove substantially all of said existing dissolved hydrogen sulfide.*

* * * * *

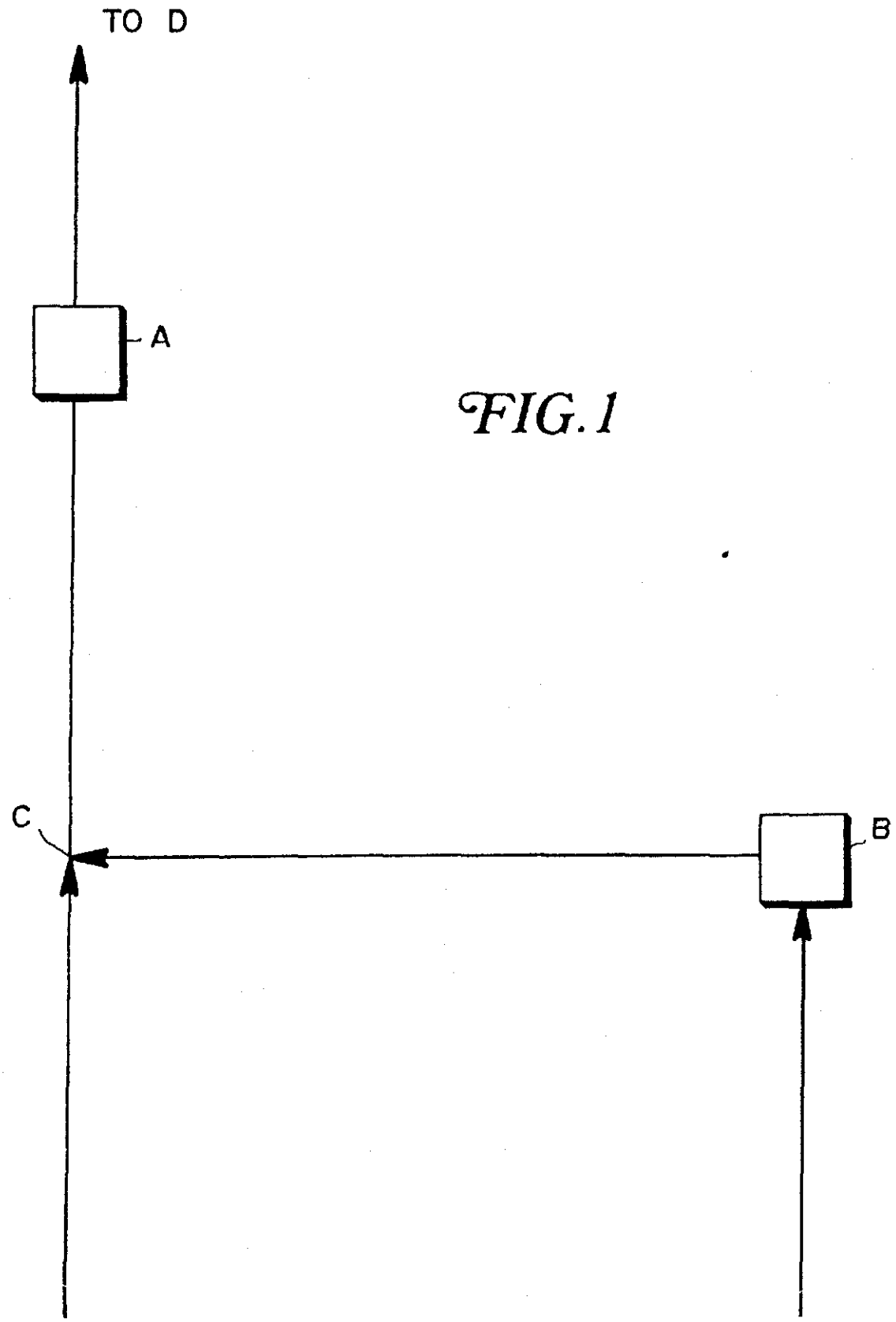


FIG. 1

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(12) **Reissued Patent**

**Hunniford et al.**

(10) **Patent Number: US RE37,181 E**

(45) **Date of Reissued Patent: May 22, 2001**

(54) **PROCESS FOR REMOVAL OF DISSOLVED HYDROGEN SULFIDE AND REDUCTION OF SEWAGE BOD IN SEWER OR OTHER WASTE SYSTEMS**

(75) Inventors: **David J. Hunniford**, Tallevast; **H. Forbes Davis**, Sarasota, both of FL (US)

(73) Assignee: **U.S. Filter Corporation**, Palm Desert, CA (US)

( * ) Notice: This patent is subject to a terminal disclaimer.

(21) Appl. No.: **09/198,506**

(22) Filed: **Nov. 24, 1998**

**Related U.S. Patent Documents**

Reissue of:

(64) Patent No.: **4,911,843**
Issued: **Mar. 27, 1990**
Appl. No.: **07/281,747**
Filed: **Dec. 9, 1988**

U.S. Applications:

(63) Continuation of application No. 08/437,874, filed on May 9, 1995, now Pat. No. Re. 36,651.

(51) **Int. Cl.**[7] ..... **C02F 3/00**

(52) **U.S. Cl.** ..... **210/610**; 210/631; 210/916; 435/264; 435/266

(58) **Field of Search** ..... 210/610, 611, 210/620, 631, 916; 435/264, 266, 282

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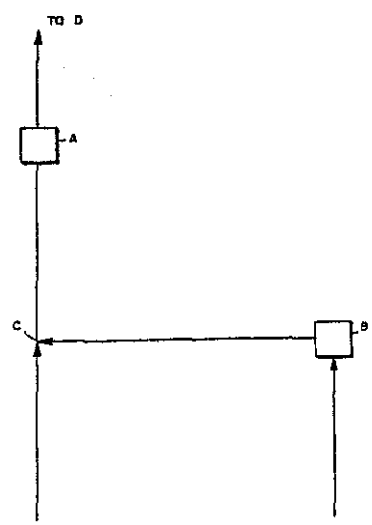
(74) *Attorney, Agent, or Firm*—Nixon & Vanderhye P.C.

(57) **ABSTRACT**

Removal of dissolved hydrogen sulfide and a reduction in BOD is achieved by the addition of nitrate ions to waste systems in an amount sufficient to stimulate growth of bacteria which utilize dissolved hydrogen sulfide in their metabolism. Specifically, about 2.4 lbs. *nitrate* oxygen per lb. of sulfide is required.

**23 Claims, 1 Drawing Sheet**



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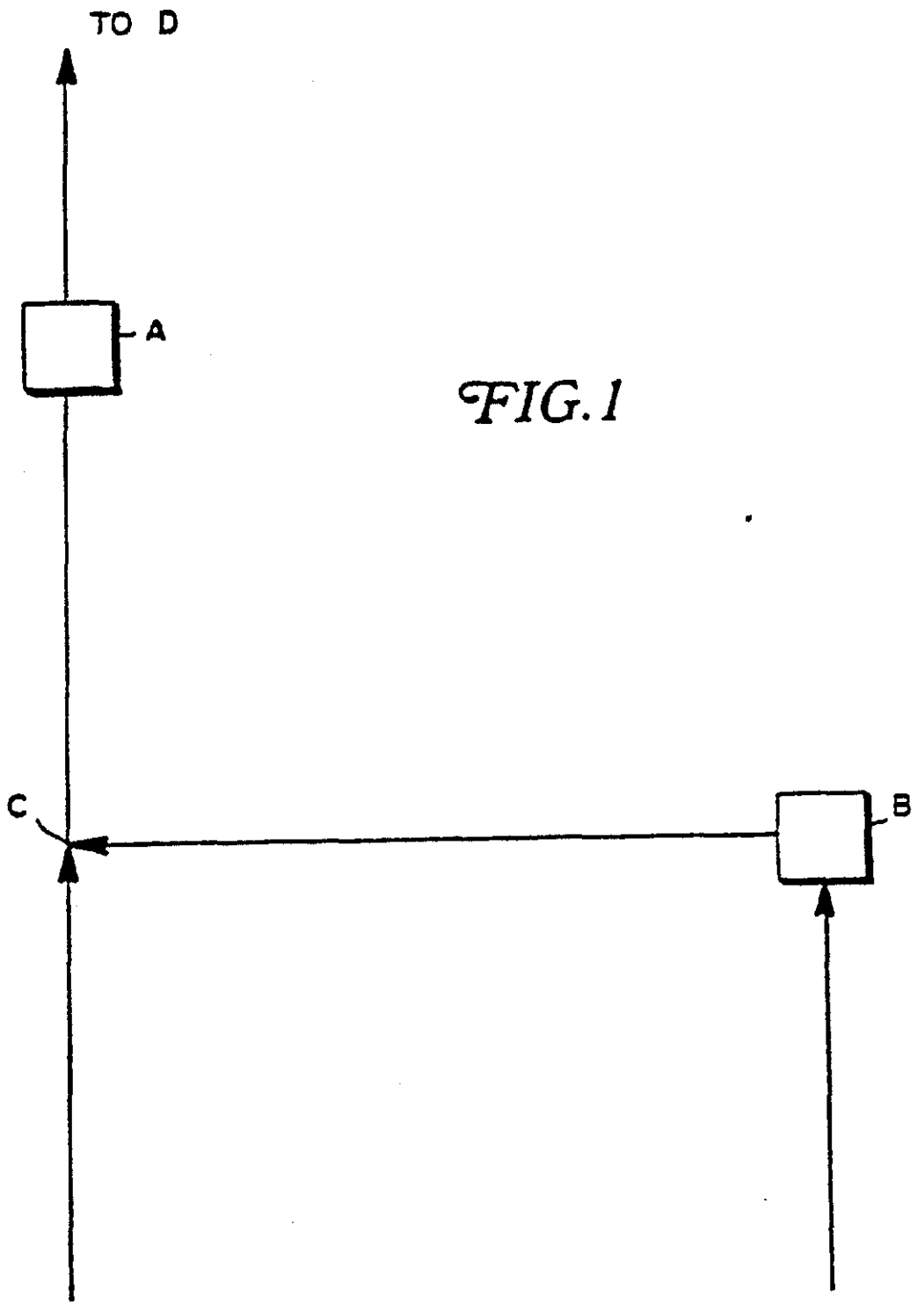


FIG. 1

# PROCESS FOR REMOVAL OF DISSOLVED HYDROGEN SULFIDE AND REDUCTION OF SEWAGE BOD IN SEWER OR OTHER WASTE SYSTEMS

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## BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to a process for the removal or reduction of dissolved hydrogen sulfide, and reduction of BOD in sewer systems, municipal waste treatment plants and in other industrial waste applications.

It is known to add nitrates or nitrites to sewage to effect reduction in BOD and even to suppress the formation of hydrogen sulfide gas via bacterial action. See, for example, U.S. Pat. Nos. 3,300,404; 4,446,031; and 4,681,687.

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It has now been discovered that the addition of nitrate, via an aqueous sodium nitrate solution, to sewage systems, waste treatment plants and other industrial waste applications containing dissolved hydrogen sulfide will result in the elimination or substantial reduction of the hydrogen sulfide, as well as the elimination of other "minor" odors associated with other sulphur-containing compounds.

It is believed that the addition of nitrate provides an oxygen source which promotes the growth of naturally occurring bacteria which utilize in their metabolism the sulfur tied up as hydrogen sulfide. It has been demonstrated both in lab jar tests and in an actual sewage collection system test, that dosing sewage containing over 50 mg/L of dissolved hydrogen sulfide with a sodium nitrate solution reduces the dissolved hydrogen sulfide to less than 0.1 mg/L. Along with this phenomena a significant reduction in sewage biological oxygen demand, BOD, of up to about 70%, and overall "sweetening", i.e., removal of other minor odors, of the sewage has been observed. These phenomena are believed to be the results of the biological process promoted by the nitrate addition.



More specifically, it has been found that 2.4 parts of nitrate oxygen ($NO_3$—O) are necessary to remove 1 part dissolved sulfide ($S^{2-}$). The source of nitrate to accomplish removal of the hydrogen sulfide is not specific, and aqueous solutions of both sodium nitrate and calcium nitrate appear to be suitable.

Because the necessary reaction is biochemical, it will not occur within a sterile solution, i.e., naturally occurring bacteria must be present. Moreover, the removal of hydrogen sulfide is not instantaneous. According to applicant's tests, an "incubation" period of about 8 to about 96 hours, and preferably about 24 to about 48 hours, is necessary to culture the bacteria, followed by about 1.5 to about 20 hours, and preferably about 3 to about 12 hours, for ongoing sulfide removal.

It has further been determined that the process in accordance with this invention achieves a significant reduction in sewage BOD due to the utilization of organic matter in the metabolism described.

Other objects and advantages will become apparent from the detailed description which follows.

## BRIEF DESCRIPTION OF THE DRAWING

The FIGURE is a schematic diagram representing a sewage system employed in the Example described herein.

## DETAILED DESCRIPTION OF THE INVENTION

Removal of dissolved hydrogen sulfide and a reduction in BOD in waste systems treated with sodium nitrate or calcium nitrate is believed to occur for the reasons described below.

The presence of dissolved hydrogen sulfide in sewage occurs as a result of a lack of dissolved oxygen. The addition of nitrate ions $NO_3$ provides an oxygen source for certain bacteria already present in the waste or sewage to thrive.

The bacteria that grow as a result of the nitrate oxygen utilize the dissolved hydrogen sulfide as part of their metabolism. The dissolved hydrogen sulfide contains sulfur which the bacteria also require in their metabolism.

It is theorized that the biochemical reaction which occurs has the following half reactions:

$$8\ N[O_3—]O_3 \rightarrow 4N_2 + 12[O_2]O_2$$

$$12[O_2]O_2 + 5H_2S \rightarrow 5SO_4^{2-} + 4H_2O + 2H^+$$

Based upon the above it is calculated that 2.4 parts of nitrate oxygen [$(NO_3—0)$] ($NO_3—O$) are necessary to remove 1 part of dissolved sulfide ($S^{2-}$):

$$\frac{8 \text{ moles } NO_3^-}{5 \text{ moles } H_2S} \times \frac{48 \text{ lb Oxygen/mole } NO_3^-}{32 \text{ lb Sulfide/mole } H_2S}$$

yields 2.4 [lb] *lbs nitrate* oxygen/lb sulfide.

This ratio of oxygen to sulfide has been confirmed in both bench and field tests.

The source of nitrate to accomplish the sulfide removal is not critical, and both aqueous solutions of sodium nitrate and calcium nitrate have been used successfully.

This reaction is biochemical and it will not occur within a sterile solution, i.e., naturally occurring bacteria in sewage

must be present. Additionally, the sulfide removal is not *instantaneous; tests have shown that an "incubation" period* of 24–48 hours is necessary to culture the bacteria and thereafter 3–12 hours for ongoing sulfide removal. It is believed, however, that the incubation period may extend from about 8 to about 96 hours, and the ongoing removal period from about 1.5 to about 20 hours, depending on conditions.

The promotion of biological activity via nitrate addition as described also achieves a reduction in sewage BOD due to the utilization of organic matter in the metabolism described.

## EXAMPLE

With reference to the FIGURE, sodium nitrate was added to a sewer system in Jacksonville, Florida at a master pump station, or feed point B, upstream of a second master pump station comprising a monitoring point A. The feed point B was at a point removed from an intersection C of the feed line and main sewage line, as indicated in the FIGURE.

The treated sewage continued to a downstream waste water treatment plant in Jacksonville, indicated as point D.

Average detention times (based on average daily flows, line sizes and lengths are as follows:

B→C 7 hours

C→A 3.3 hours

B→A 10.3 hours

In terms of the description provided above, the B→C distance and retention time of 7 hours constitutes the incubation period, coupled with the distance C→A and associated retention time of 3.3 hours comprises a total of 10.3 hours from addition of the nitrate station at point B to the monitoring at point A, thereby permitting sufficient time for the bacteria to culture.

The following table shows the change in dissolved hydrogen sulfide at point A, with addition of nitrate occurring at point B.

TABLE I

| DATE | SODIUM NITRATE SOLUTION FEED · GPD | DAILY AVERAGE DISSOLVED $H_2S$ PPM AT POINT A |
|---|---|---|
| 2/22/88 | 0 | 35–40 |
| 2/23/88 | 0 | 30–50 |
| 2/24/88 | 1800 | 30 |
| 2/25/88 | 1800 | 15–20 |
| 2/26/88 | 1800 | 0.1–15 |
| 2/27/88 | 1200 | 0.1– |
| 2/28/88 | 1200 | 0.3– |
| 2/29/88 | 1200 | 0.1–8 |
| 3/01/88 | 650 | 0.7–1.5 |
| 3/02/88 | 650 | 1.0–1.5 |

During the period of time, the average daily $H_2S$ at point B was 25–30 ppm.

It is readily apparent from the above chart that significant reduction in $H_2S$ was achieved over a nine day period of time, commencing about 24 hours after the addition of the sodium nitrate, with maximum reductions occurring after 48 hours.

Subjective sampling also indicated a significant reduction in sewage odors other than hydrogen sulfide.

It was also found that sewage BOD was also reduced or indicated as in the following table:

TABLE II

| | BOD (mg/L) | | |
|---|---|---|---|
| DATE | POINT B | POINT A | POINT D |
| 03/02/88 | 165 | 112 | 138 |
| 03/03/88 | 145 | 55 | 135 |

It will thus be appreciated that the present invention provides for the removal of significant amounts of *existing* dissolved hydrogen sulfide and a corresponding reduction in sewage BOD. By properly feeding sodium nitrate into the sewage or waste, odor and corrosion problems can also be substantially eliminated.

While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiment, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

What is claimed is:

**1.** A process for removing *existing* dissolved hydrogen sulfide from waste systems [comprising the steps] *wherein removal is achieved by a mechanism consisting essentially* of:

(a) adding nitrate ions to the waste in accordance with a ratio of [at least] *about but not less than* 2.4 parts nitrate oxygen for each 1 part *of said existing* dissolved *hydrogen* sulfide in order to provide a source of oxygen for naturally occurring bacteria present in the waste which utilize dissolved hydrogen sulfide in their metabolism;

(b) providing sufficient time to culture said bacteria within said waste systems; and

(c) providing ongoing time sufficient to enable said bacteria to remove *said existing* the dissolved hydrogen sulfide.

**2.** A process according to claim **1** wherein said nitrate ions are provided by the addition of sodium nitrate to the waste.

**3.** A process according to claim **1** wherein said nitrate ions are provided by the addition of calcium nitrate to the waste.

**4.** A process according to claims **2** or **3** wherein a period of from about 8 to about 96 hours is provided in the practice of step (b).

**5.** A process according to claims **2** or **3** wherein a period of from about 24 to about 48 hours is provided in the practice of step (b).

**6.** A process according to claims **2** or **3** wherein a period of from about 1.5 to about 20 hours is provided in the practice of step (c).

**7.** A process according to claims **2** or **3** wherein a period of from about 3 to about 12 hours is provided in the practice of step (c).

**8.** A process according to claim **1** wherein a period of from 8 to about 96 hours is provided in the practice of step (b).

**9.** A process according to claim **8** wherein a period from about 1.5 to about 20 hours is provided in the practice of step (c).

**10.** A process according to claim **8** wherein a period from about 3 to about 12 hours is provided in the practice of step (c).

**11.** A process according to claim **1** wherein a period of from about 24 to about 48 hours is provided in the practice of step (b).

**12.** A process according to claim **11** wherein a period of from about 1.5 to about 20 hours is provided in the practice of step (c).

13. A process according to claim 11 wherein a period of from about 3 to about 12 hours is provided in the practice of step (c).

14. A process according to claim 1 wherein a period of from about 1.5 to about 20 hours is provided in the practice of step (c).

15. A process according to claim 1 wherein a period of from 3 to about 12 hours is provided in the practice of step (c).

16. A process according to claim 1 wherein sewage BOD is also reduced by up to about 70%.

17. A process according to claim 1 wherein said process further eliminates minor odors associated with other sulphur-containing compounds.

[18. A process for removing from waste systems dissolved hydrogen sulfide and other minor odors associated with other sulphur-containing compounds comprising the steps of: providing a source of oxygen in the form of nitrate in the form of nitrate in the waste in sufficient amount to cause naturally occurring bacteria in the waste which utilize dissolved hydrogen sulfide and sulfur in their metabolism to grow, and providing sufficient time for the bacteria to culture in said waste, to thereby initiate a biochemical reaction which has the following half reactions:

$$8\,NO_3^- \rightarrow 4N_2 + 12O_2$$

$$12O_2 + 5H_2S \rightarrow 5SO_4^{2-} + 4H_2O + 2H^+$$]

[19. The process according to claim 18 wherein the source of oxygen comprises sodium nitrate.]

[20. The process according to claim 18 wherein the source of oxygen comprises calcium nitrate.]

[21. The process according to claim 18 wherein about 8 to about 96 hours is provided for the bacteria to culture.]

[22. The process according to claim 18 wherein about 24 to about 48 hours is provided for the bacteria to culture.]

23. A process for removing *substantially all existing* dissolved $H_2S$ and reducing sewage BOD in sewer systems [comprising the steps] *wherein removal is achieved by a mechanism consisting essentially* of:

(a) adding a source of oxygen in the form of nitrate to the sewer system in an amount equal to about 2.4 lb. *nitrate* oxygen per lb. *of said existing dissolved hydrogen* sulfide; and

(b) providing about 8 to about 96 hours to allow naturally occurring bacteria already present in the system to culture as a result of the addition of said source of oxygen; and providing about 1.5 to about 20 hours to effect ongoing $H_2S$ removal and sewage BOD reduction.

24. The process according to claim 23 wherein said source of oxygen is sodium nitrate.

25. The process according to claim 23 wherein said source of oxygen is a calcium nitrate.

26. The process according to claim 23 wherein about 24 to about 48 hours is provided to allow bacteria present in the system to culture.

27. The process according to claim 23 wherein about 3 to about 12 hours are provided to effect ongoing $H_2S$ removal and sewage BOD reduction.

28. The process according to claim 23 wherein, during the process, additional minor odors associated with other sulphur-containing compounds are also eliminated.

* * * * *

USFilter

DAVIS PRODUCTS
2650 TALLEVAST ROAD
SARASOTA, FL 34243

TELEPHONE 941-355-2971
FACSIMILE 941-351-4756

# PARTIAL CURRENT REFERENCE LIST
# FOR
# BIOXIDE®

1. CLARK COUNTY SANITATION DISTRICT
   5857 E. FLAMINGO ROAD
   LAS VEGAS, NEVADA 89122
   Dave Jordan
   (702) 434-6602

2. METROPOLITAN GOVERNMENT OF NASHVILLE
   1600 2ND AVENUE NORTH
   NASHVILLE, TENNESSEE 37208
   Bob Carnahan (Consoer Townsend Envirodyne Engineers)
   (615) 244-8864

3. PLAINFIELD AREA REGIONAL SEWERAGE AUTHORITY
   P.O. BOX 11
   DUNNELLEN, NEW JERSEY 08812
   Rob Villee
   (732) 968-2471

4. MANATEE COUNTY, FLORIDA
   2003 BAY ROAD
   BRADENTON, FLORIDA 34207
   Jim Marble / Lynn McDonald
   (941) 755-1853

5. CITY OF LEXINGTON, DIVISION OF SANITARY SEWERS
   1240 LISLE ROAD
   LEXINGTON, KENTUCKY 40505
   Pat McFadden
   (859) 621-3173

# BIOXIDE® PRODUCT SPECIFICATIONS

| | SPECIFICATIONS |
|---|---|
| Description | Aqueous solution of stable, inorganic salts for biological enhancement. |
| $H_2S$ Dosage Requirement | 0.7 gallon/lb. dissolved $H_2S$ |
| Weight/Gallon | 11.8 - 12.2 lbs./gallon |
| pH | 4 - 6 |
| Freezing Point | 0°- 5° F |
| Color | Clear to slightly turbid tan |
| Viscosity | Equivalent to water |
| 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 made of polyethylene, PVC, FRP or stainless steel. |

BIOXIDE® ... THE NATURAL SOLUTION

BIOXIDE® is a patented 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 U.S. Filter/Davis Process, 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.

*Strategically located facilities place our products at your disposal.*

DISTRIBUTION LOCATIONS:

| | |
|---|---|
| Wilmington, DE | Granite City, IL |
| Canton, GA | Temecula, CA |
| Seguin, TX | Florence, SC |

U.S. FILTER DAVIS PROCESS

*Taking care of the world's water.*

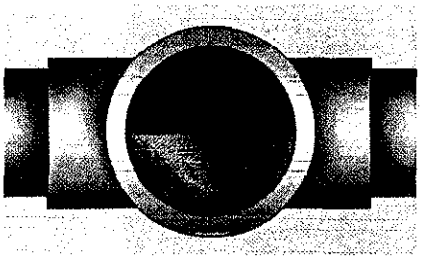
U.S. Filter/Davis Process
2650 Tallevast Road • Sarasota, FL 34243
(941) 355-2971 *phone* • 1-800-345-2983 *toll free*
(941) 351-4756 *fax*
*http://www.usfilter.com*

*BIOXIDE® as used throughout this document is a registered name owned by U.S. FILTER / DAVIS PROCESS. 1990 U.S. Patent # 4,911,843*

## BIOXIDE ... THE NATURAL SOLUTION

To meet the needs of the industry, USFilter's Davis Process Products has developed BIOXIDE® as a means to eliminate the odor, corrosion and safety problems associated with hydrogen sulfide in sewage. In addition, BIOXIDE® combats most other odors commonly found in wastewater treatment systems. BIOXIDE® is a unique, proven product because it achieves sewage odor control naturally, rather than chemically. As a result, BIOXIDE® both ***removes*** dissolved hydrogen sulfide and prevents its formation. This fact makes the BIOXIDE® process ideally suited to provide effective and affordable odor control throughout the entire collection system.

BIOXIDE® is a patented process which controls hydrogen sulfide odors and corrosion biologically. Introduction of nitrate oxygen via addition of BIOXIDE® solution into a waste stream creates an environment in which certain naturally occurring bacteria thrive. These bacteria utilize the dissolved hydrogen sulfide which is present as a part of their metabolism, thereby cost-effectively removing any dissolved hydrogen sulfide from the wastewater. This process eliminates the odor, corrosion and safety problems associated with atmospheric hydrogen sulfide. This removal mechanism, patented by USFilter's Davis Process Products in 1990, allows economical elimination of dissolved hydrogen sulfide for a far broader range of wastewater collection system odor problems than previously considered possible with nitrate addition to prevent anaerobic biological activity. The BIOXIDE® process has a proven track record for controlling hydrogen sulfide in a variety of collection system applications, with over 1,000 installations throughout the U.S. and Canada. Dissolved hydrogen sulfide concentrations of over 50 ppm are reduced to <0.1 ppm in the most severe applications.



## CONTAINS NO HAZARDOUS SUBSTANCES

Many options to control or eliminate odor compromise safety by reaction and flammability. Their storage and handling is often hazardous and costs are high, making them economically impracticable. Based upon the requirements of a particular odor problem, USFilter's Davis Process Products will design and administer a BIOXIDE® solution dosage strategy to stimulate and sustain the biological process. BIOXIDE® is an aqueous solution of non-hazardous nitrate salt (as defined by the EPA CERCLA list). Therefore, the use of BIOXIDE® releases no hazardous substances to the environment, nor does it expose workers or the public to potentially dangerous situations.

## REDUCES BOD

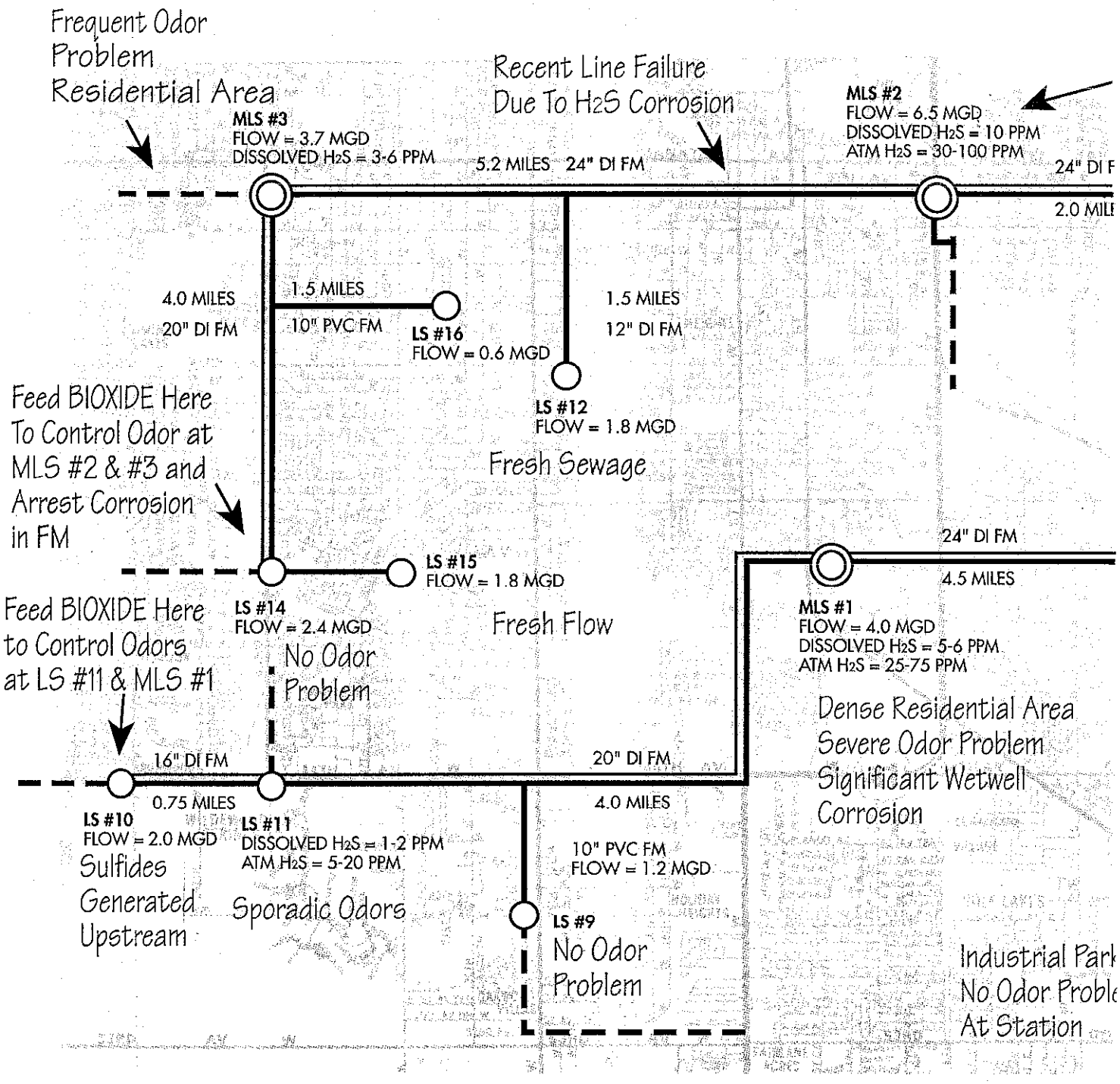
Because BIOXIDE® achieves odor control biologically, an additional benefit of its use is sewage BOD reduction. Therefore, a potential secondary benefit of BIOXIDE® is reduced BOD loading and increased treatment plant capacity where BOD loading is limiting.

## TREATS OTHER COMMON SEWAGE ODORS

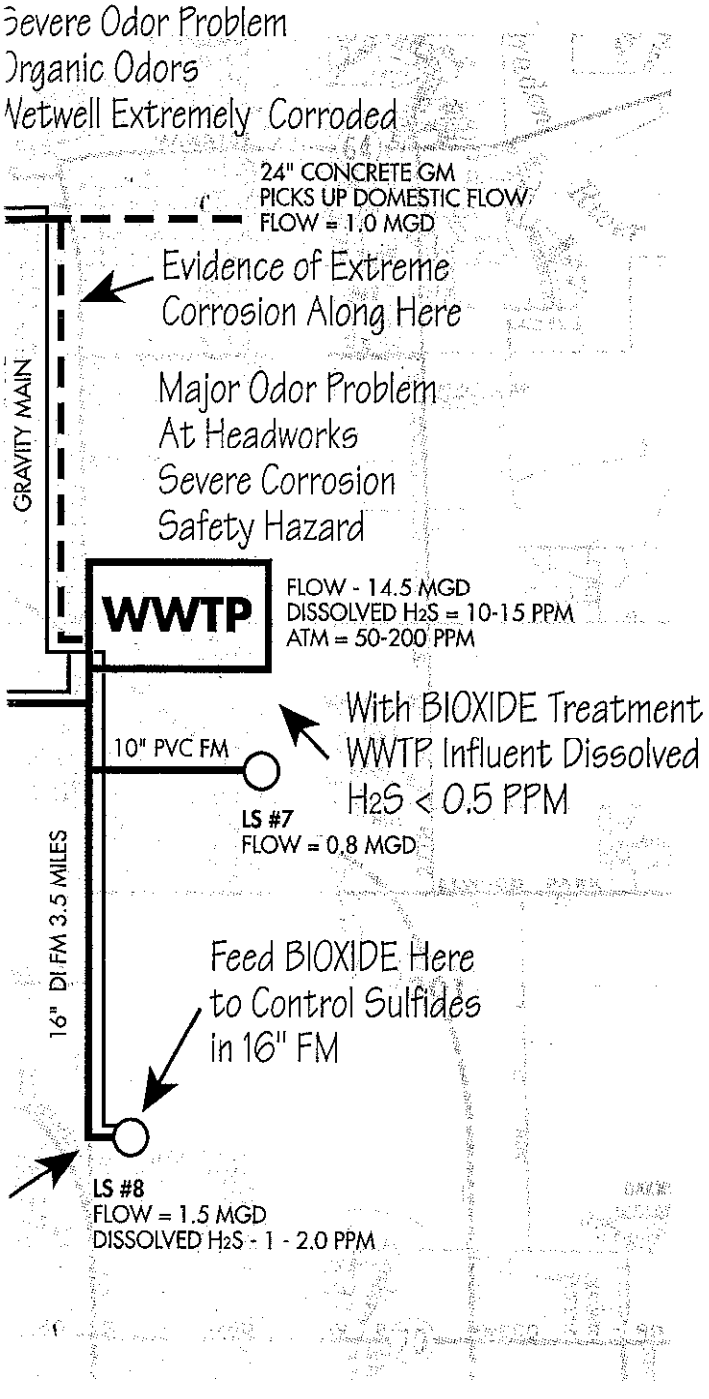
Hydrogen sulfide is normally the predominant sewage odor problem. However, other odorous sulfur compounds such as mercaptans and organic sulfides can also contribute to odor problems. The biological environment created by BIOXIDE® will effectively remove these problem compounds as well.

## ARRESTS CORROSION

Collection system and treatment plant equipment and structures of concrete or metal are severely corroded by atmospheric hydrogen sulfide. While no product can reverse the damage already caused by existing corrosion, BIOXIDE® reduces further corrosion by effectively eliminating dissolved hydrogen sulfide, the source of atmospheric hydrogen sulfide.




*The system illustrated above is an example of a sewage collection system with widespread odor problems that USFilter's Davis Process Products can solve with BIOXIDE®. As shown, a limited number of key feed locations can control $H_2S$ and other odor compounds throughout a collection system. This approach results in maximum odor control for a minimal cost. Let USFilter's Davis Process Products develop a similar "system-wide" solution to your odor problem.*




The BIOXIDE® System for odor control is a complete program which is guaranteed to solve specific odor problems within wastewater collection and treatment systems. USFilter's Davis Process Products guarantees your 100% satisfaction with the ability of BIOXIDE® to deliver the results which it has been employed to attain. In order to provide such a guarantee, USFilter's Davis Process Products thoroughly analyzes each odor control problem using our experienced technical personnel to survey your system characteristics. The survey results are then analyzed by our staff to determine the optimum application. Once this analysis is complete, a proposal is then submitted identifying the particular odor problems in the system and the effectiveness of BIOXIDE® as a corrective measure.

Upon completion of the survey, a field test is arranged to demonstrate the effectiveness of BIOXIDE®. USFilter's Davis Process Products designs a custom BIOXIDE® solution feed program with the optimum application locations for cost effective sulfide removal, based on our survey. Our trained technicians then install and start up the system. This installation is supported by thorough operator training, follow-up evaluation and troubleshooting services.

## WHEN COMPARED TO ALTERNATIVE METHODS, BIOXIDE® EXCELS IN EFFICIENCY, SAFETY AND COST EFFECTIVENESS

### BIOXIDE® VS. OXIDIZERS

Chemical oxidizers such as Chlorine, Hydrogen Peroxide and Potassium Permanganate are commonly used to control hydrogen sulfide odors. In comparison to BIOXIDE®, these materials have several negatives. There are high reactivity and flammability risks involved in the use of such oxidizers. These safety hazards make expensive storage and handling techniques and equipment a necessity. While these costly steps reduce the risks involved with using these oxidizers, the liability associated with their use remains.

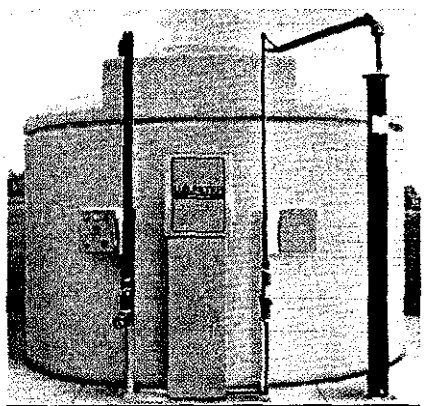
In addition, oxidizers trigger a chemical, rather than a biological reaction within the system. The oxidizing mechanism of these products is not specific to hydrogen sulfide and therefore excess dosage (compared to theoretical) is the norm. This contributes to the relatively high cost. However, BIOXIDE® is a biological process specific to odor compounds and, unlike oxidizers, it is also effective in preventing the formation of dissolved hydrogen sulfide.

### BIOXIDE® VS. PH ADJUSTMENTS

Another alternative method to controlling Hydrogen Sulfide odors is the use of Sodium Hydroxide to adjust the pH. This method kills many helpful organisms which are present in the sewage, making it detrimental to plant operations. BIOXIDE® enhances biological organism growth thereby complementing the natural operation of the plant. Furthermore, caustic treatment such as pH adjustment cannot be sustained on a continuous basis. In contrast, BIOXIDE® is suited for continuous treatment making it a much more effective, and consistent method of odor control.

### BIOXIDE® VS. BACTERIA ADDITION

The addition of volumes of "new" bacteria is not effective in controlling hydrogen sulfide because the sewage is not conducive to their growth. The difficulty in achieving consistent dosage and lack of stability contribute to the ineffectiveness and high cost of bacteria addition. In contrast, the BIOXIDE® process provides the nutrients via a stable, easily metered aqueous solution, which promotes the growth of naturally occurring bacteria within the sewage collection system.



*Typical BIOXIDE® Above-Ground Storage and Metered Delivery System*

### BIOXIDE® VS. METAL SALTS

Metal salts are normally the most economical means of dissolved hydrogen sulfide control. However, metal salts are specific to the removal of hydrogen sulfide, therefore they commonly leave other odor compounds untreated. BIOXIDE® can provide equivalent effectiveness and economy in a natural manner rather than via a chemical process while treating a broader range of odor causing compounds. In addition, BIOXIDE® provides extra benefits in the form of BOD reduction.

### BIOXIDE® VS. VAPOR PHASE TREATMENT

Vapor phase technologies such as adsorption systems or air scrubbers control odors by ventilating and treating the atmosphere in one geographic area. BIOXIDE® controls odor compounds within the sewage preventing their release to the atmosphere. In short, BIOXIDE® prevents an odor problem from its source, while vapor phase technologies treat the problem after it exists. Similarly, BIOXIDE® eliminates the severe corrosion caused by atmospheric hydrogen sulfide making it a significantly more effective means of reducing corrosion than vapor phase treatment. These differences make BIOXIDE® a better value for odor and corrosion control in most cases.

# -USFilter

# Material Safety Data Sheet

## SECTION 1 – CHEMICAL PRODUCT AND COMPANY INFORMATION

**Product Name:** BIOXIDE®
**Part Number:** None **Chemical Family:** Inorganic Salt Solution

**Manufacturer's Name:** USFilter's Davis Products
**Address:** 2650 Tallevast Road, Sarasota, FL 34243
**Product/Technical Information Phone Number:** 1.941.355.2971
**Medical/Handling Emergency Phone Number:** CHEMTREC 1.800.424.9300
**Transportation Emergency Phone Number:** CHEMTREC 1.800.424.9300

**Issue Date:** March 17, 2000
**Revision Date/Revision Number:** None

## SECTION 2 – COMPOSITION INFORMATION

| Chemical Name | Percent by Weight | CAS# |
|---|---|---|
| Calcium Nitrate Double Salt | Active: 60% $H_2O$: 40% | 15245-12-2 |

## SECTION 3 – HAZARDS IDENTIFICATION

**Appearance & Odor:** Clear or light brown solution.
**Emergency Overview:** Contains no hazardous substances as listed in 40 CFR 302. Major active ingredient – nitrate containing salts.
**Fire & Explosion Hazards:** None.
**Primary Route(s) of Exposure:** Skin and eye contact, ingestion and inhalation.
**Inhalation – Acute Effects:** Spray or dust may irritate respiratory tract.
**Skin Contact – Acute Effects:** May irritate skin.
**Eye Contact – Acute Effects:** May irritate eyes.
**Ingestion – Acute Effects:** Ingestion of large amounts may cause violent gastroenteritis.

## SECTION 4 – FIRST AID MEASURES

**Inhalation First Aid:** Remove affected person from area to fresh air and provide oxygen if breathing is difficult. 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.

## SECTION 4 – FIRST AID MEASURES - continued

**Eye Contact First Aid:** Immediately irrigate eyes with flowing water for 15-20 minutes while holding eyes open. Contacts should be removed before or during flushing. **DO NOT instruct person to neutralize.** Obtain medical attention immediately.
**Ingestion First Aid:** If victim is alert and not convulsing rinse mouth with water and give water to drink. **Induce vomiting.** When vomiting occurs, have affected person lean forward with head down to avoid breathing in of vomitus. Rinse mouth again and give more water to drink. DO NOT have unqualified person induce vomiting. **OBTAIN MEDICAL ATTENTION IMMEDIATELY.**
**Medical Conditions Aggravated:** None known.
**Note to Physician:** Treat patient symptomatically.

## SECTION 5 – FIRE FIGHTING MEASURES

**Flash Point/Method:** Not applicable.
**Auto Ignition Temperature:** Not applicable.
**Upper/Lower Explosion Limits:** Not applicable.
**Extinguishing Media:** Not applicable.
**Fire Fighting Procedures:** Not applicable.
**Fire & Explosion Hazards:** Avoid drying, do not contact with organics, chlorine or hypochlorite products, and caustic products.
**Hazardous Products of Decomposition and/or Combustion:** Decomposition may produce nitrogen oxides, ammonia.

**NFPA Ratings**:
HEALTH- 1 FLAMMABILITY- 0 REACTIVITY- 1 OTHER-None

## SECTION 6 – ACCIDENTAL RELEASE MEASURES

Mop up and containerize, or dilute to acceptable level with water. Recover for recycling or landfill.

DO NOT DUMP ON THE GROUND OR INTO ANY BODY OF WATER. 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

**Handling:** Wash thoroughly after handling, immediately remove and dispose of any spillage. Immediately rinse contaminated clothing thoroughly with water.
**Storage:** Store in dry place at ambient temperatures apart from combustible and other readily oxidizable materials, food, beverage, and excessive heat.
**General Comments:** Rinse empty containers with water.

## SECTION 8 –PERSONAL PROTECTION/ EXPOSURE CONTROL

**Respiratory Protection:** None required under normal use conditions. Use dust mask if product is dry.
**Skin Protection:** Wear protective gloves and other protective clothing as appropriate to prevent skin contact.
**Eye Protection:** Safety glasses or goggles are recommended.
**Ventilation Protection:** Adequate general and mechanical exhaust ventilation
**Other Protection:** Safety showers, with quick opening valves which stay open, and eye wash fountains, or other means of washing the eyes with a gentle flow of cool to tepid tap water should be readily available in all areas where this material is handled or stored. Water should be supplied through insulated and heat-traced lines to prevent freeze-ups in cold weather. Employees should wash their hands and face before eating, drinking, or using tobacco products. Educate and train employees on the safe use and handling of this product.
**Exposure Limits:** No occupational exposure limits have been established for this product. Active ingredient-TXDS orl-hmn LDLo; 500 mg/Kg, orl-LDLo 200 mg/kg

## SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

**Appearance & Odor:** Clear or light brown solution
**Vapor Pressure:** 20
**Vapor Density (Air=1):** 0.03
**Boiling Point:** (of solution) 220° F
**Melting Point:** Not applicable
**Specific Gravity:** at 20 C 1.45
**Solubility in Water:** Complete
**Volatile Percentage:** (water) 40
**pH:** 5.5-7.5
**Flash Point/method:** None
**Auto Ignition Temperature:** None
**Upper/Lower Explosion Limits:** None applicable
**Other:** Apparent viscosity (cP) 1.84

## SECTION 10 – STABILITY AND REACTIVITY

**Stability:** This material is stable under normal use conditions.
**Incompatibilities:** BIOXIDE® is incompatible with organic materials, reducing agents, chlorine or hypochlorite products and caustic products.
**Polymerization:** Hazardous polymerization will not occur.
**Decomposition:** Decomposition may produce nitrogen oxides, ammonia.
**Conditions to Avoid:** Avoid evaporation to dryness, do not place BIOXIDE® in contact with organics, chlorine or hypochlorite products, and caustic products.

## SECTION 11 – TOXICOLOGICAL INFORMATION

**Inhalation – Acute:** BIOXIDE® may irritate respiratory tract.
**Inhalation – Chronic:** No chronic inhalation effects of this product are known.
**Skin Contact – Acute:** This product may irritate skin.
**Skin Contact – Chronic:** No chronic dermal effects for this product are known.
**Eye Contact – Acute:** This product may irritate eyes.

## SECTION 11 – TOXICOLOGICAL INFORMATION - continued

**Ingestion – Acute:** Ingestion of large amounts may result in violent gastroenteritis. Active ingredient-TXDS orl-hmn LDLo; 500 mg/Kg, orl-LDLo 200 mg/kg
**Ingestion – Chronic:** No chronic ingestion effects of this product are known.
**Carcinogenicity/Mutagenicity:** No carcinogenic or mutagenic properties of this product are known.
**Reproductive Effects:** No reproductive effects of this product are known.
**Neurotoxicity:** No neurotoxic effects of this product are known.
**Other Effects:** None known.
**Target Organs:** Target organs include the skin and eyes.

## SECTION 12 – ECOLOGICAL INFORMATION

No ecological effects of this product are known.

Safely store product to prevent inadvertent release to the environment and water supplies.

## SECTION 13 – DISPOSAL CONSIDERATIONS

Contains no hazardous substances as listed in 40CFR302.

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. 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.

## SECTION 14 – TRANSPORTATION INFORMATION

**DOT Shipping Description:** Non-regulated.

## SECTION 15 – REGULATORY INFORMATION

Contains no hazardous substances as listed in 40 CFR 302

## 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.

**Created by:** USFilter's Davis Products

# 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

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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

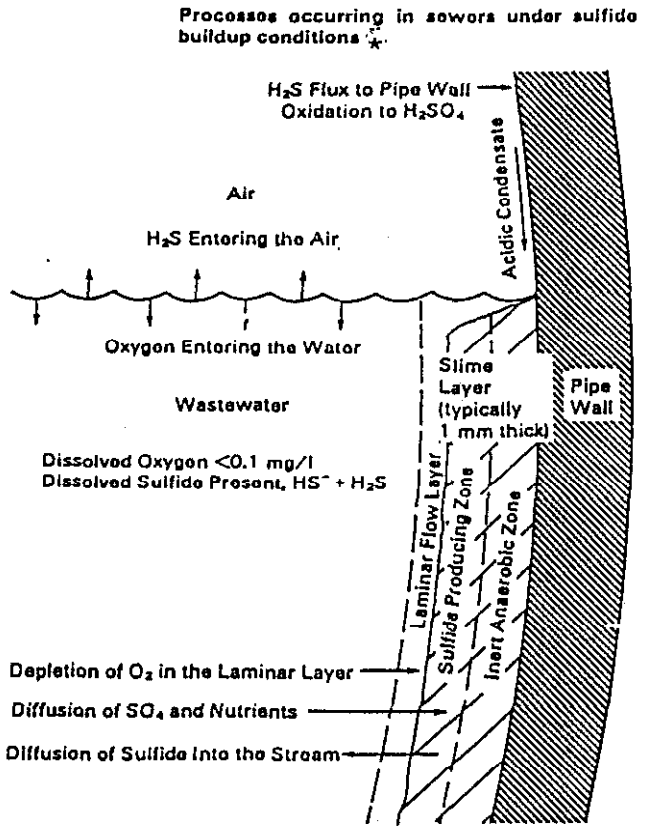
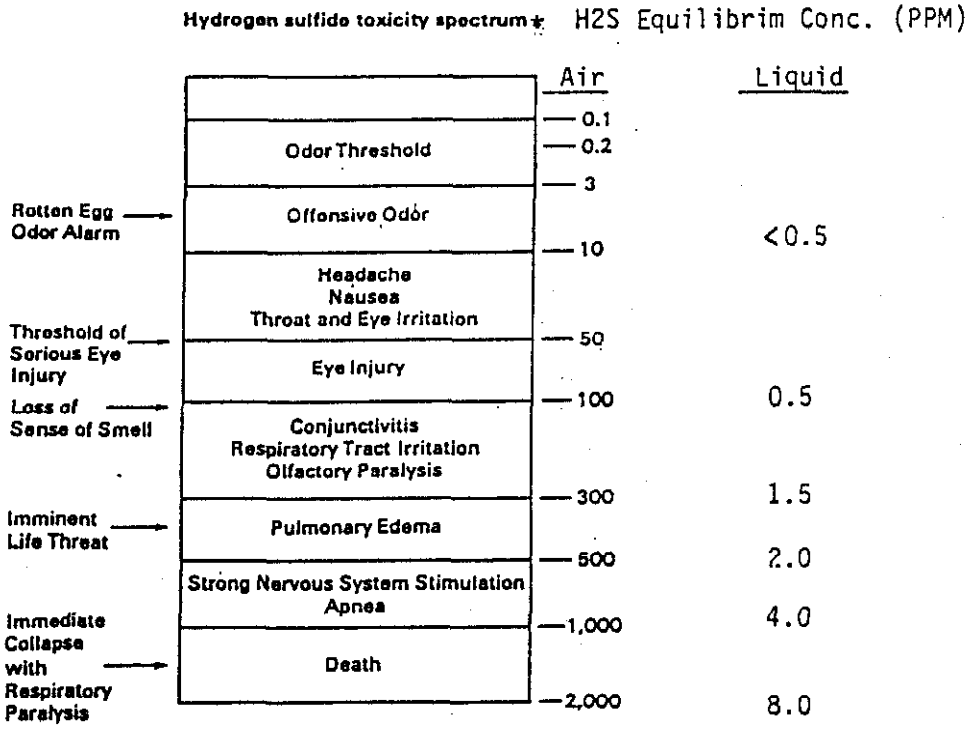
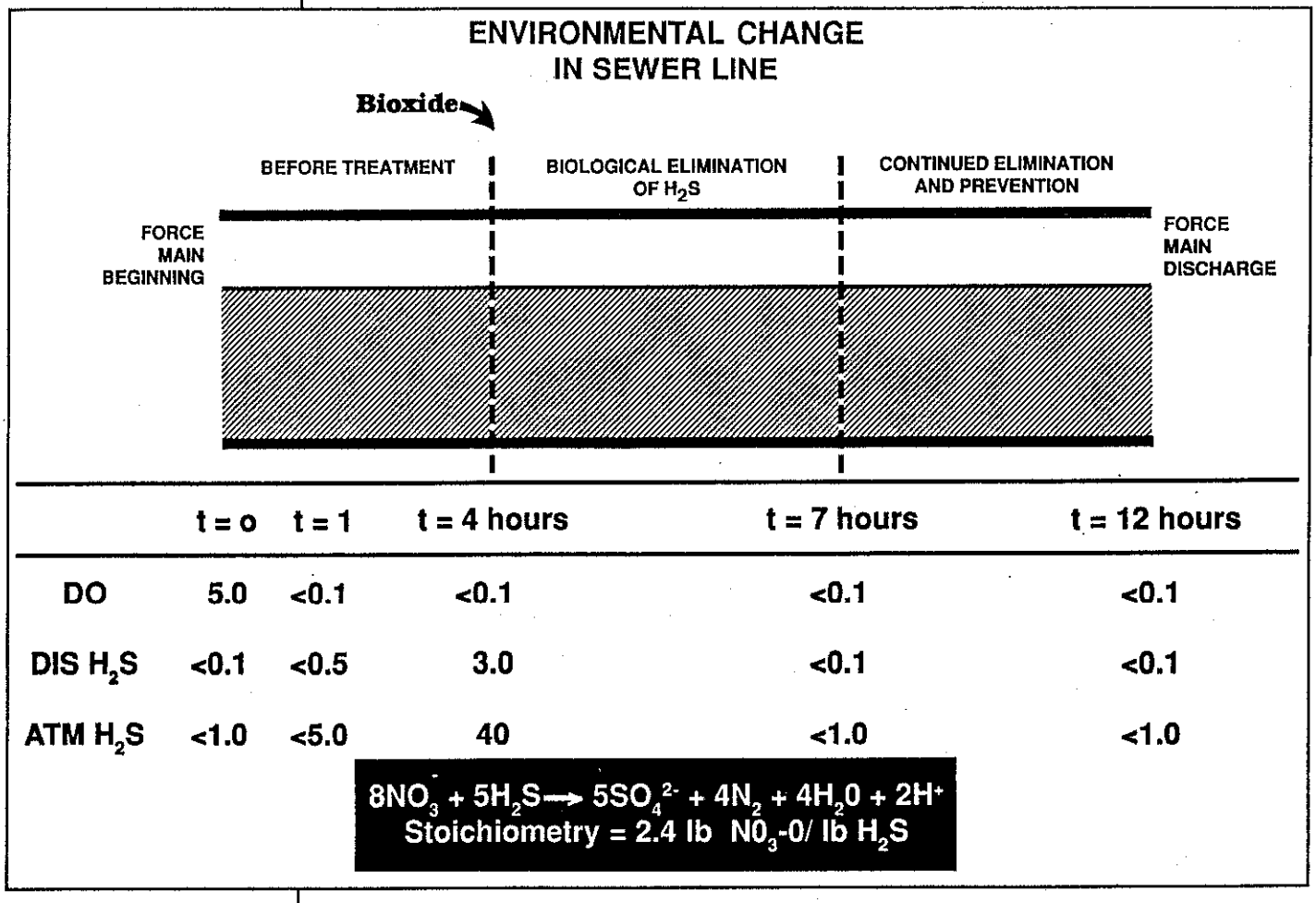



Figure II




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



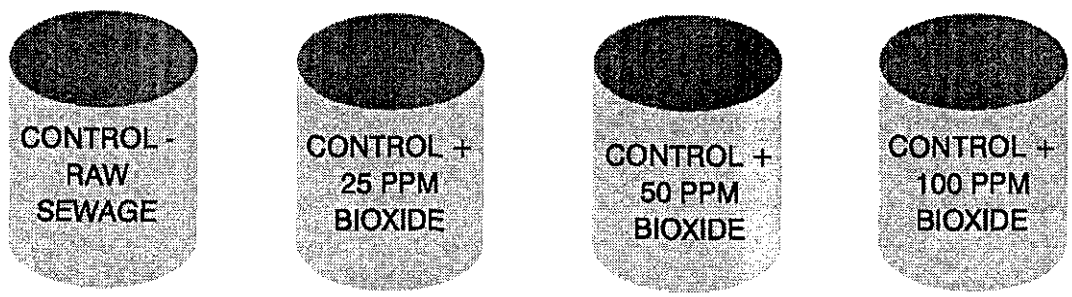

| | t = o | t = 1 | t = 4 hours | t = 7 hours | t = 12 hours |
|---|---|---|---|---|---|
| DO | 5.0 | <0.1 | <0.1 | <0.1 | <0.1 |
| DIS $H_2S$ | <0.1 | <0.5 | 3.0 | <0.1 | <0.1 |
| ATM $H_2S$ | <1.0 | <5.0 | 40 | <1.0 | <1.0 |

$$8NO_3^- + 5H_2S \rightarrow 5SO_4^{2-} + 4N_2 + 4H_20 + 2H^+$$

Stoichiometry = 2.4 lb $N0_3$-0/ lb $H_2S$

Figure III

# *Lab Experiment Results*



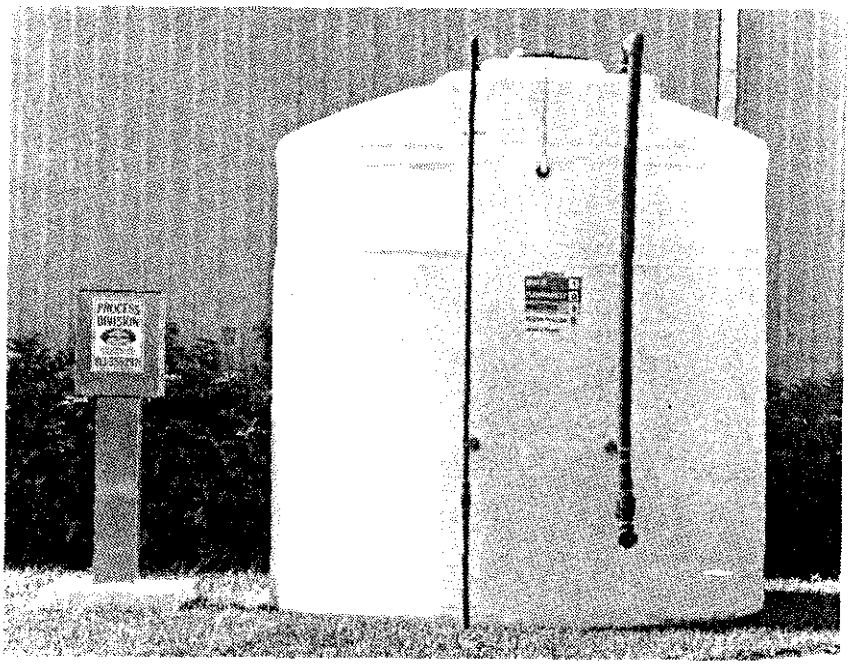

## Dissolved $H_2S$ (ppm)

| | | | | |
|---|---|---|---|---|
| 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

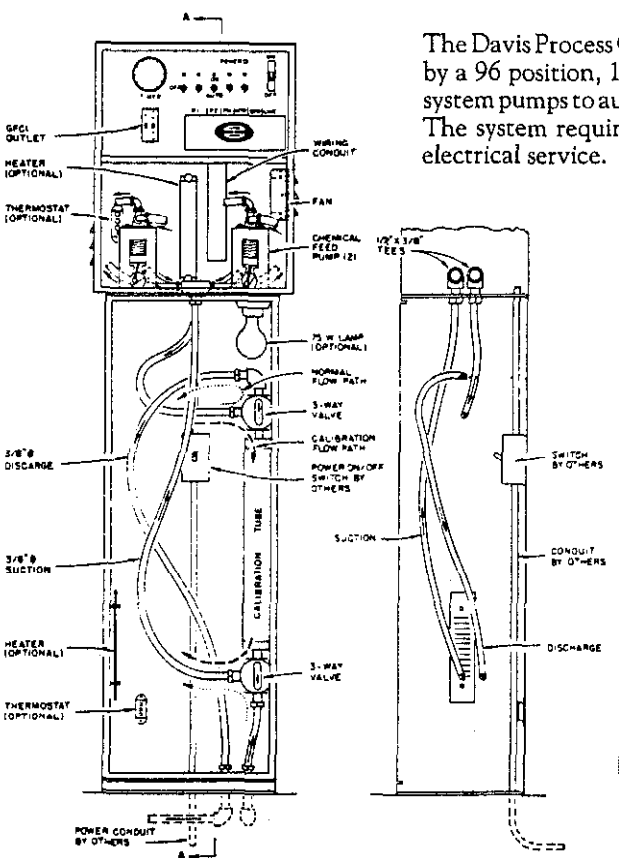
Figure V

## 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.



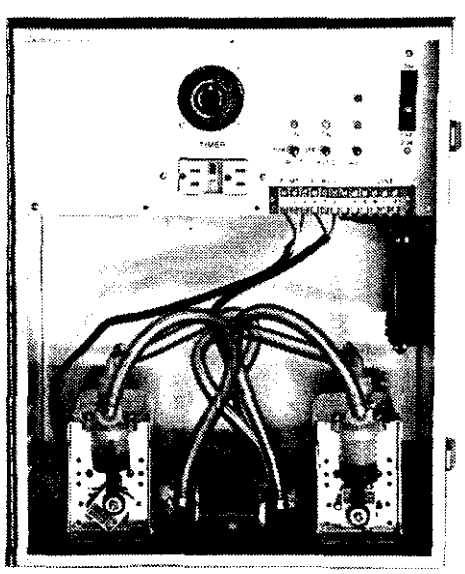



Figure VI

## COLLECTION SYSTEMS FLOW DIAGRAM

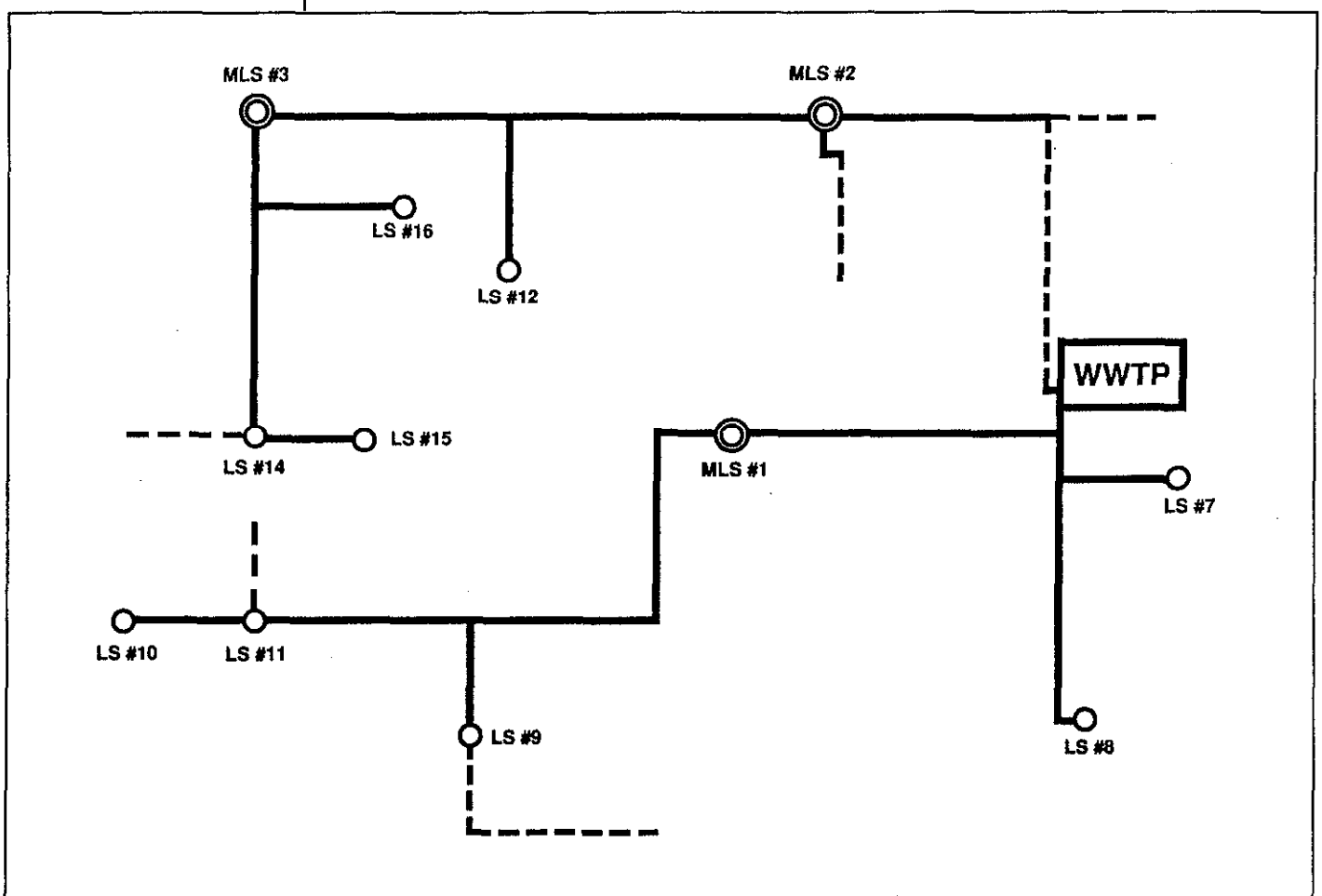


Figure VII

## COLLECTION SYSTEMS FLOW DIAGRAM