

SENDER: Complete items 1 and 2 when additional services are desired, and complete items 3 and 4. Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.

1. Show to whom delivered, date, and addressee's address. (Extra charge) 2. Restricted Delivery (Extra charge)

3. Article Addressed to: Mr. Robert H. Herndon Environmental Coordinator Star Enterprise P. O. Box 5140 Maitland, FL 32751	4. Article Number P 407 853 169
5. Signature - Addressee X	Type of Service: <input type="checkbox"/> Registered <input type="checkbox"/> Insured <input checked="" type="checkbox"/> Certified <input type="checkbox"/> COD <input type="checkbox"/> Express Mail <input type="checkbox"/> Return Receipt for Merchandise
6. Signature - Agent X <i>R.H. Herndon</i>	Always obtain signature of addressee or agent and DATE DELIVERED.
7. Date of Delivery 3-4-91	8. Addressee's Address (ONLY if requested and fee paid)

PS Form 3811, Apr. 1989 *U.S.G.P.O. 1989-238-815 DOMESTIC RETURN RECEIPT

P 407 853 169
RECEIPT FOR CERTIFIED MAIL
 NO INSURANCE COVERAGE PROVIDED
 NOT FOR INTERNATIONAL MAIL
 (See Reverse)

PS Form 3800, June 1985 *U.S.G.P.O. 1989-234-555

Sent to Mr. Robert H. Herndon, Star	
Enterprise	
Street and No. P. O. Box 5140	
P.O., State and ZIP Code Maitland, FL 32751	
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt showing to whom and Date Delivered	
Return Receipt showing to whom, Date, and Address of Delivery	
TOTAL Postage and Fees	\$
Postmark or Date Mailed: 2-27-91 Permit: AC 06-188031	



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
NOTICE OF PERMIT

Mr. Robert H. Herndon, Environmental Coordinator
Star Enterprise
P. O. Box 5140
Maitland, Florida 32751

February 26, 1991

Enclosed is construction permit AC 06-188031 for an air stripper tower system to treat contaminated water from fuel storage tanks at your petroleum products terminal located at 1200 SE 28th Street, Port Everglades, Broward County, Florida. This permit is issued pursuant to Section 403, Florida Statutes.

Any party to this permit has the right to seek judicial review of the permit pursuant to Section 120.68, Florida Statutes, by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date this permit is filed with the Clerk of the Department.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

Copy furnished to:

Isidore Goldman, SE District
Al Linero, Broward County
John Reese, P.E.

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this NOTICE OF PERMIT and all copies were mailed before the close of business on 2-27-91.

FILING AND ACKNOWLEDGEMENT
FILED, on this date, pursuant to
§120.52(9), Florida Statutes, with
the designated Department Clerk,
receipt of which is hereby
acknowledged.

Lynn Cohen
Clerk

2-27-91
Date

Final Determination

Star Enterprise
Broward County
Port Everglades, Florida

Air Stripper Tower System for
Contaminated Water from Fuel Storage Tanks

Permit No. AC 06-188031

Department of Environmental Regulation
Division of Air Resources Management
Bureau of Air Regulation

February 8, 1991

Final Determination

The Technical Evaluation and Preliminary Determination for the permit to construct an air stripper tower system to treat contaminated water from fuel storage tanks at Star Enterprise's petroleum products terminal located at 1200 SE 28th Street, Port Everglades, Broward County, Florida 33316, was distributed on January 9, 1991. The Notice of Intent to Issue was published in the Fort Lauderdale News/Sun-Sentinel on January 16, 1991. Copies of the evaluation were available for public inspection at the Broward County Environmental Quality Control Board in Fort Lauderdale and the Department's offices in West Palm Beach and Tallahassee.

No comments were submitted on the Department's Intent to Issue the permit. The final action of the Department will be to issue construction permit AC 06-188031 as proposed in the Technical Evaluation and Preliminary Determination.



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

PERMITTEE:

Star Enterprise
P. O. Box 5140
Maitland, Florida 32751

Permit Number: AC 06-188031

Expiration Date: July 1, 1991

County: Broward

Latitude/Longitude: 26°05'10"N

80°07'00"W

Project: Air Stripper Tower System

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 17-2 and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the construction of a 98.7% efficient air stripper system to treat 10 GPM of contaminated water from petroleum fuel storage tanks. The air stripper system consists of two Nepcco Model 120-20 towers that are 1 foot in diameter by 20 feet high columns and contains 15 feet of packing and a demister, 200 CFM air blowers, 10 GPM water pumps, along with oil-water separator, carbon adsorption canisters (for water treatment), 25,000 gallon holding tank, and other associated pump/piping, etc. The air stripping system will be located at the permittee's existing petroleum storage and transfer terminal at 1200 28th Street, Port Everglades, Broward County, Florida 33316.

The UTM coordinates of this site are Zone 17, 586.8 km E and 2884.5 km N.

The source shall be constructed in accordance with the permit application, plans, documents, amendments and drawings, except as otherwise noted in the General and Specific Conditions.

Attachments are listed below:

1. Application received October 12, 1990
2. DER letter dated November 7, 1990
3. Star Enterprise letter dated November 13, 1990

PERMITTEE:
Star Enterprise

Permit Number: AC 06-188031
Expiration Date: July 1, 1991

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "Permit Conditions" and are binding and enforceable pursuant to Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

3. As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

PERMITTEE:
Star Enterprise

Permit Number: AC 06-188031
Expiration Date: July 1, 1991

GENERAL CONDITIONS:

6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at a reasonable time, access to the premises, where the permitted activity is located or conducted to:

- a. Have access to and copy any records that must be kept under the conditions of the permit;
- b. Inspect the facility, equipment, practices, or operations regulated or required under this permit; and
- c. Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

- a. a description of and cause of non-compliance; and
- b. the period of noncompliance, including dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

PERMITTEE:
Star Enterprise

Permit Number: AC 06-188031
Expiration Date: July 1, 1991

GENERAL CONDITIONS:

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Sections 403.73 and 403.111, Florida Statutes. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

11. This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 17-4.120 and 17-30.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit or a copy thereof shall be kept at the work site of the permitted activity.

13. The permittee shall comply with the following:

- a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.
- b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and

PERMITTEE:
Star Enterprise

Permit Number: AC 06-188031
Expiration Date: July 1, 1991

GENERAL CONDITIONS:

records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurements;
- the person responsible for performing the sampling or measurements;
- the dates analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

14. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

SPECIFIC CONDITIONS:

1. The contaminated water flow to the air stripper system shall not exceed 10 GPM. The permittee shall check and record the flow rate to the columns at least once during each day that the system is in operation.

2. The concentration of pollutants in the contaminated tank water shall not exceed the following:

Pollutant	Maximum Water Concentration PPM
Benzene	11.2
Toluene	2840
Ethylbenzene	1640
Xylene	1640

Each batch of storage tank water shall be analyzed prior to treatment by methods approved by the Department and these lab results shall be available for Department inspection for a minimum of 3 years.

PERMITTEE:
Star Enterprise

Permit Number: AC 06-188031
Expiration Date: July 1, 1991

SPECIFIC CONDITIONS:

3. Based on the procedures described in the Department's October 20, 1987, memorandum titled Final Air Stripper Review Procedure or other methods with prior approval of the Department, the emissions from the air stripper system shall not exceed 100 lbs/yr VOC (total) and the following:

Pollutant	Max. Allowable Emissions (lbs/hr - 24 hr avg)
Benzene	0.056
Toluene	14.2
Ethylbenzene	8.2
Xylene	8.2

4. The air stripper system shall not operate more than 300 hrs/yr without prior approval from the Department.

5. The air stripper system shall not discharge air pollutants in quantities that cause or contribute to objectionable odors.

6. The permittee, for good cause, may request that this construction permit be extended. Such a request shall be submitted to the Bureau of Air Regulation prior to 60 days before the expiration of the permit (F.A.C. Rule 17-4.090).

7. An application for an operation permit must be submitted to the Department's Southeast District office at least 90 days prior to the expiration date of this construction permit or within 45 days after completion of compliance testing, whichever occurs first. To properly apply for an operation permit, the applicant shall submit the appropriate application form, fee, certification that construction was completed noting any deviations from the conditions in the construction permit, and compliance test reports as required by this permit (F.A.C. Rule 17-4.220).

Issued this 25 day
of February, 1991

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION



Carol M. Browner, Secretary



State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

For Routing To Other Than The Addressee	
To: _____	Location: _____
To: _____	Location: _____
To: _____	Location: _____
From: _____	Date: _____

Interoffice Memorandum

TO: Carol M. Browner
 FROM: Steve Smallwood *[Signature]*
 DATE: February 8, 1991
 SUBJ: Approval of Construction Permit AC 06-188031
 Star Enterprise

RECEIVED
 FEB 11 1991

Office of the Secretary

Attached for your approval and signature is a permit prepared by the Bureau of Air Regulation for the above mentioned company to construct an air stripper tower system to treat contaminated water from fuel storage tanks at their petroleum products terminal in Port Everglades, Broward County, Florida.

No comments were received during the public notice period.

Day 90, after which this permit will be issued by default, is March 17, 1991.

I recommend your approval and signature.

CF/WH/plm

Attachments

*Please call for
 Bruce Mitchell @
 488-1344 when
 signed. Thanks,*



State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

For Routing To Other Than The Addressee	
To: _____	Location: _____
To: _____	Location: _____
To: _____	Location: _____
From: _____	Date: _____

Interoffice Memorandum

TO: Steve Smallwood
 FROM: Clair Fancy *CAF*
 DATE: February 4, 1991
 SUBJ: Approval of Construction Permit AC 06-188031
 Star Enterprise

*Killard -
 Do you want
 this?
 PA*

Attached for your approval and signature is a permit prepared by the Bureau of Air Regulation for the above mentioned company to construct an air stripper tower system to treat contaminated water from fuel storage tanks at their petroleum products terminal in Port Everglades, Broward County, Florida.

No comments were received during the public notice period.

Day 90, after which this permit will be issued by default, is March 17, 1991.

I recommend your approval and signature.

CF/WH/plm

Attachments

CAF
NO.
The Secretary needs to sign this
SC#2
which method are the Department's who decide?
2-6-91
OK
John G
F Q F -
Please review my problem for

Were these stacks modeled together as a single system or individually (are they allowed twice the emission rate)

[Handwritten signature]

Check Sheet

Company Name: Star Enterprise
Permit Number: AC 06-180037
PSD Number: _____
Permit Engineer: _____

Application:

- | | |
|--|--------------------------|
| <input checked="" type="checkbox"/> Initial Application | Cross References: |
| <input checked="" type="checkbox"/> Incompleteness Letters | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> Responses | <input type="checkbox"/> |
| <input type="checkbox"/> Waiver of Department Action | <input type="checkbox"/> |
| <input type="checkbox"/> Department Response | |
| <input type="checkbox"/> Other | |

Intent:

- Intent to Issue
 - Notice of Intent to Issue
 - Technical Evaluation
 - BACT or LAER Determination
 - Unsigned Permit
- Correspondence with:
- EPA
 - Park Services
 - Other
- Proof of Publication
 - Petitions - (Related to extensions, hearings, etc.)
 - Waiver of Department Action
 - Other

Final

Determination:

- Final Determination
- Signed Permit
- BACT or LAER Determination
- Other

Post Permit Correspondence:

- Extensions/Amendments/Modifications
- Other

StarEnterprise



RECEIVED
DER - MAIL ROOM

1992 JUN -4 AM 10: 56

P O Box 13012
1200 S E 28th Street
Ft Lauderdale FL 33316
305 462 0460 Broward

June 2, 1992

Mr. C. H. Fancy, P.E.
Chief
Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

10-22-92

Patty,
Star Enterprise said
the SE District
extended this.

hmd

Re: Air Stripper Tower System-Extension
Permit #AC 06-188031
Star Enterprise Bulk Storage Terminal Facility
1200 SE 28th St PO Box 13012
Pt. Everglades, FL

This correspondence is intended to request a six month extension of the current air permit (enclosed) for air stripper towers associated with our waste water treatment system at the referenced facility. The current permit expires on July 1 1992 and enclosed is the required \$50.00 fee in order to process the permit extension request.

This permit extension is requested because of delays in receiving an operational permit from Broward County and the necessary replacement of some waste water treatment system equipment. Thank you for your time in reviewing this request and we hope that the extension can be issued by the July 1st deadline.

If you have any further questions please call me at 305-462-0460.

Sincerely
Star Enterprise

Douglas J. Weimer, P.G.
Environmental Coordinator

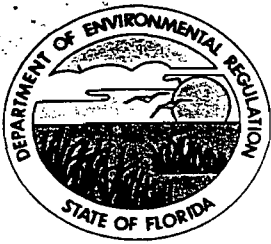
attachment



cc Elwood Brewster, Star Enterprise
Jim Bowen, IT Corporation
Files

H. Banks
J. Kaldman, SED
A. Zinno, BCWRP

1031



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

September 26, 1991

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

(CORRECT
PERMIT)

Mr. Douglas J. Weimer, Environmental Coordinator
Star Enterprise
Post Office Box 13012
Fort Lauderdale, Florida 33316

Dear Mr. Weimer:

Re: AC 06-188031, Air Stripper Tower System

The Department is in receipt of your September 10, 1991, letter requesting the referenced permit for an air stripper tower system at Star Enterprise's petroleum products terminal located at 1200 SE 28th Street, Port Everglades, Broward County, Florida, be amended. The amendments include extending the expiration date, allowing spill prevention containment control system and truck-wash facility water to be treated in the tower, increasing the allowable hours per year of operation, and correcting the units for the emission standard. This request is acceptable and construction permit No. AC 06-188031 is changed:

FROM:

Expiration Date: July 1, 1991

Description: For the construction of a 98.7% efficient air stripper system to treat 10 GPM of contaminated water from petroleum fuel storage tanks. The air stripper system consists of two Nepcco Model 120-20 towers that are 1 foot in diameter by 20 feet high columns and contains 15 feet of packing and a demister, 200 CFM air blowers, 10 GPM water pumps, along with oil-water separator, carbon adsorption canisters (for water treatment), 25,000 gallon holding tank, and other associated pump/piping, etc. The air stripping system will be located at the permittee's existing petroleum storage and transfer terminal at 1200 28th Street, Port Everglades, Broward County, Florida 33316.

Specific Condition No. 3: Based on the procedures described in the Department's October 20, 1987, memorandum titled Final Air Stripper Review Procedure or other methods with prior approval of the Department, the emissions from the air stripper system shall not exceed 100 lbs/yr VOC (total) and the following:

<u>Pollutant</u>	<u>Max. Allowable Emissions (lbs/hr - 24 hr avg)</u>
Benzene	0.056
Toluene	14.2
Ethylbenzene	8.2
Xylene	8.2

Specific Condition No. 4: The air stripper system shall not operate more than 300 hrs/yr without prior approval from the Department.

TO:

Expiration Date: July 1, 1992

Description: For the construction of a 98.7% efficient air stripper system to treat 10 GPM of contaminated water from petroleum fuel storage tanks, spill prevention containment control system, and the truck-wash facility. The air stripper system consists of two Nepcco Model 120-20 towers that are 1 foot in diameter by 20 feet high columns and contains 15 feet of packing and a demister, 200 CFM air blowers, 10 GPM water pumps, along with oil-water separator, carbon adsorption canisters (for water treatment), 25,000 gallon holding tank, and other associated pump/piping, etc. The air stripping system will be located at the permittee's existing petroleum storage and transfer terminal at 1200 28th Street, Port Everglades, Broward County, Florida 33316.

Specific Condition No. 3: Based on the procedures described in the Department's October 20, 1987, memorandum titled Final Air Stripper Review Procedure or other methods with prior approval of the Department, the emissions from the air stripper system shall not exceed 100 lbs/yr BTEX (total) and the following:

<u>Pollutant (BTEX)</u>	<u>Max. Allowable Emissions (lbs/hr - 24 hr avg)</u>
Benzene	0.056
Toluene	14.2
Ethylbenzene	8.2
Xylene	8.2

Specific Condition No. 4: The air stripper system shall not operate more than 600 hrs/yr without prior approval from the Department.

Mr. Douglas J. Weimer
Page 3 of 3

A copy of this letter must be attached to the referenced permit and shall become a part of the permit.

Sincerely,



Carol M. Browner
Secretary

CMB/plm

Attach: Star Enterprise September 10, 1991, letter

c: Pam Houmère, BAMA
Isidore Goldman, SED
Al Linero, Broward Co.

StarEnterprise



RECEIVED
DER - MAIL ROOM

1992 JUN -4 AM 10: 56

P O Box 13012
1200 S E 28th Street
Ft Lauderdale FL 33316
305 462 0460 Broward

June 2, 1992

Mr. C. H. Fancy, P.E.
Chief
Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: Air Stripper Tower System-Extension
Permit #AC 06-188031
Star Enterprise Bulk Storage Terminal Facility
1200 SE 28th St PO Box 13012
Pt. Everglades, FL

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This permit extension is requested because of delays in receiving an operational permit from Broward County and the necessary replacement of some waste water treatment system equipment. Thank you for your time in reviewing this request and we hope that the extension can be issued by the July 1st deadline.

If you have any further questions please call me at 305-462-0460.

StarEnterprise



12700 NORTHBOROUGH DR.
HOUSTON, TEXAS 77067

DRAFT NO. 116226

NOT VALID IN EXCESS OF \$2,500.00

DATE
6/2/92

PAY THIS AMOUNT
\$50.00

PAY TO THE ORDER OF FIFTY DOLLARS & 00/100
FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

VOID IF NOT DEPOSITED WITHIN 60 DAYS

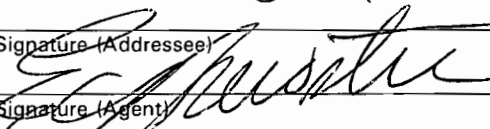
PAYABLE THROUGH
TEXAS COMMERCE BANK NATIONAL ASSOCIATION
HOUSTON, TEXAS

[Signature]
AUTHORIZED SIGNATURE

ENDORSE CHECK EXACTLY AS DRAWN

- Complete items 1 and/or 2 for additional services.
- Complete items 3, and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece next to the article number.

Postmark: FT. LAUDERDALE, FL 7 OCT 1991
 Receive the... (for an extra... fee): PM
 Addressee's Address
 Restricted Delivery
 Consult postmaster for fee.

3. Article Addressed to: Mr. Douglas J. Weimer Star Enterprise P.O. BOX 13012 Ft. Lauderdale, FL 33316	4a. Article Number P 617 884 166
5. Signature (Addressee) 	4b. Service Type <input type="checkbox"/> Registered <input type="checkbox"/> Insured <input checked="" type="checkbox"/> Certified <input type="checkbox"/> COD <input type="checkbox"/> Express Mail <input type="checkbox"/> Return Receipt for Merchandise
6. Signature (Agent)	7. Date of Delivery 10-2-91 8. Addressee's Address (Only if requested and fee is paid)

PS Form 3811, October 1990 ☆ U.S. GPO: 1990-273-861 DOMESTIC RETURN RECEIPT

P 617 884 166



Certified Mail Receipt
 No Insurance Coverage Provided
 Do not use for International Mail
 (See Reverse)

PS Form 3800, June 1990

Send to	
Douglas Weimer	
Street & No.	
Star Enterprise	
P.O., State & ZIP Code	
Ft. Lauderdale, FL	
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, & Address of Delivery	
TOTAL Postage & Fees	\$
Postmark or Date	10-2-91 AC 06-188031



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

September 26, 1991

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Douglas J. Weimer, Environmental Coordinator
Star Enterprise
Post Office Box 13012
Fort Lauderdale, Florida 33316

Dear Mr. Weimer:

Re: AC 06-188031, Air Stripper Tower System

The Department is in receipt of your September 10, 1991, letter requesting the referenced permit for an air stripper tower system at Star Enterprise's petroleum products terminal located at 1200 SE 28th Street, Port Everglades, Broward County, Florida, be amended. The amendments include extending the expiration date, allowing spill prevention containment control system and truck-wash facility water to be treated in the tower, increasing the allowable hours per year of operation, and correcting the units for the emission standard. This request is acceptable and construction permit No. AC 06-188031 is changed:

FROM:

Expiration Date: July 1, 1991

Description: For the construction of a 98.7% efficient air stripper system to treat 10 GPM of contaminated water from petroleum fuel storage tanks. The air stripper system consists of two Nepcco Model 120-20 towers that are 1 foot in diameter by 20 feet high columns and contains 15 feet of packing and a demister, 200 CFM air blowers, 10 GPM water pumps, along with oil-water separator, carbon adsorption canisters (for water treatment), 25,000 gallon holding tank, and other associated pump/piping, etc. The air stripping system will be located at the permittee's existing petroleum storage and transfer terminal at 1200 28th Street, Port Everglades, Broward County, Florida 33316.

Specific Condition No. 3: Based on the procedures described in the Department's October 20, 1987, memorandum titled Final Air Stripper Review Procedure or other methods with prior approval of the Department, the emissions from the air stripper system shall not exceed 100 lbs/yr VOC (total) and the following:

<u>Pollutant</u>	<u>Max. Allowable Emissions (lbs/hr - 24 hr avg)</u>
Benzene	0.056
Toluene	14.2
Ethylbenzene	8.2
Xylene	8.2

Specific Condition No. 4: The air stripper system shall not operate more than 300 hrs/yr without prior approval from the Department.

TO:

Expiration Date: July 1, 1992

Description: For the construction of a 98.7% efficient air stripper system to treat 10 GPM of contaminated water from petroleum fuel storage tanks, spill prevention containment control system, and the truck-wash facility. The air stripper system consists of two Nepcco Model 120-20 towers that are 1 foot in diameter by 20 feet high columns and contains 15 feet of packing and a demister, 200 CFM air blowers, 10 GPM water pumps, along with oil-water separator, carbon adsorption canisters (for water treatment), 25,000 gallon holding tank, and other associated pump/piping, etc. The air stripping system will be located at the permittee's existing petroleum storage and transfer terminal at 1200 28th Street, Port Everglades, Broward County, Florida 33316.

Specific Condition No. 3: Based on the procedures described in the Department's October 20, 1987, memorandum titled Final Air Stripper Review Procedure or other methods with prior approval of the Department, the emissions from the air stripper system shall not exceed 100 lbs/yr BTEX (total) and the following:

<u>Pollutant (BTEX)</u>	<u>Max. Allowable Emissions (lbs/hr - 24 hr avg)</u>
Benzene	0.056
Toluene	14.2
Ethylbenzene	8.2
Xylene	8.2

Specific Condition No. 4: The air stripper system shall not operate more than 600 hrs/yr without prior approval from the Department.

Mr. Douglas J. Weimer
Page 3 of 3

A copy of this letter must be attached to the referenced permit and shall become a part of the permit.

Sincerely,



Carol M. Browner
Secretary

CMB/plm

Attach: Star Enterprise September 10, 1991, letter

c: Pam Houmère, BAMA
Isidore Goldman, SED
Al Linero, Broward Co.



State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

For Routing To Other Than The Addressee	
To: _____	Location: _____
To: _____	Location: _____
To: _____	Location: _____
From: _____	Date: _____

Interoffice Memorandum

TO: Carol Browner
FROM: Steve Smallwood *[Signature]*
DATE: September 26, 1991
SUBJ: Amendment of Permit
Star Enterprise

*Please call
Patty Adams
when signed
8-1344*

Attached for your approval and signature is a letter that will amend a permit to construct an air stripper tower system to treat contaminated water at the Port Everglade terminal of Star Enterprise. The amendment extends the expiration date of the permit, allows water from several other areas in the terminal to be treated in the system, increases the hours per year the system may operate, and corrects the units for the allowable emissions.

I recommend your approval and signature.

Attachment

SS/WH/plm



P O Box 13012
1200 S E 28th Street
Ft Lauderdale FL 33316
305 462 0460 Broward
305 947 6102 Miami

10 September 1991

Mr. C.H. Fancy, P.E.
Chief
Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Star Enterprise Bulk Storage Facility
Port Everglades, Florida
Construction Permit: Air Stripper Tower System
AC 06-188031

RECEIVED
DER-MAIL ROOM
SEP 12 11:43

Dear Mr. Fancy:

This correspondence is intended to present the change in the waste-stream relative to the referenced permit as well as extend the same permit. This proposed change will affect the volume of water treated and the source. A check for \$250.00 is enclosed for fees associated with this change in the permit as instructed by Mr. Hanks of your department.

The source that is permitted in the referenced construction permit is strictly tank bottom water and run off from the Spill Prevention Containment Control (SPCC) system. The proposed source change would add the truck-wash facility and make necessary treatment volume changes.

The volume and quality of the truck-wash facility is critical to the efficient operation of the system. The volume of water generated for truck wash activities is approximately 3000 gallons per month. The concentration of petroleum hydrocarbons, chemical/biochemical oxygen demand and the RCRA 8 metals are less than the concentrations of these parameters revealed in the bottom-water therefore should pose no significant threat to the wastewater treatment efficiency. There does exist a measurable quantity of surfactants (1.8 ug/l) in the proposed new source. Considering the relative quantities (truck-wash water/bottom water-SPCC runoff) this minor component should not reach significant concentrations. Therefore **Star Enterprise** does not believe the truck-wash operations, at their present scope and practice, to pose a significant threat to the treatment of wastewaters with the existing system. The analyses are attached to this letter.

 <p>QUESTIONS? CALL 800-238-5355 TOLL FREE.</p>		<p>AIRBILL PACKAGE TRACKING NUMBER</p> <p style="font-size: 24pt; font-weight: bold;">9482076962</p>															
<p>3244 9482076962</p>		<p>RECIPIENT'S COPY</p>															
<p>From (Your Name) Please Print: Doug Wilmer</p>		<p>To (Recipient's Name) Please Print: C.H. FANCY</p>															
<p>Your Phone Number (Very Important!): 305-462-0460</p>		<p>Recipient's Phone Number (Very Important):</p>															
<p>Company: IP ENTERPRISE</p>		<p>Company: FDER - BUR. OF AIR REG.</p>															
<p>Street Address: 10 SE 28TH STREET</p>		<p>Exact Street Address: (We Cannot Deliver to P.O. Boxes or P.O. Zip® Codes.) 2600 BLAIR STONE ROAD</p>															
<p>City: FT EVERGLADES FL State: FL ZIP Required: 33316</p>		<p>City: TALLAHASSEE, FL State: FL ZIP Required: 32399</p>															
<p>YOUR INTERNAL BILLING REFERENCE INFORMATION (First 24 characters will appear on invoice.)</p>																	
<p>PAYMENT 1 <input checked="" type="checkbox"/> Bill Sender 2 <input type="checkbox"/> Bill Recipient's FedEx Acct. No. 3 <input type="checkbox"/> Bill 3rd Party FedEx Acct. No. 4 <input type="checkbox"/> Bill Credit Card</p>		<p>H IF HOLD FOR PICK-UP: Print FEDEX Address Here Street Address: _____ City: _____ State: _____ ZIP Required: _____</p>															
<p>5 <input type="checkbox"/> Cash/Check</p>		<p>Emp. No.: _____ Date: _____ Federal Express Use</p>															
<p>4 SERVICES (Check only one box)</p> <p>11 <input type="checkbox"/> YOUR PACKAGING 51 <input type="checkbox"/> Standard Overnight Service (Delivery by next business afternoon)</p> <p>16 <input type="checkbox"/> FEDEX LETTER 56 <input type="checkbox"/> FEDEX LETTER</p> <p>12 <input type="checkbox"/> FEDEX PAK 52 <input type="checkbox"/> FEDEX PAK</p> <p>13 <input type="checkbox"/> FEDEX BOX 53 <input type="checkbox"/> FEDEX BOX</p> <p>14 <input type="checkbox"/> FEDEX TUBE 54 <input type="checkbox"/> FEDEX TUBE</p> <p>Economy Two-Day Service (formerly Standard Air) (Delivery by second business day)</p> <p>30 <input type="checkbox"/> ECONOMY TWO-DAY SVC. 70 <input type="checkbox"/> HEAVYWEIGHT**</p> <p>Heavyweight Service (for Extra Large or any package over 150 lbs.)</p> <p>80 <input type="checkbox"/> DEFERRED HEAVYWEIGHT**</p> <p>† Delivery commitment may be later in some areas. ** Call for delivery schedule.</p>		<p>DELIVERY AND SPECIAL HANDLING (Check services required)</p> <p>1 <input type="checkbox"/> HOLD FOR PICK-UP (Fill in Box H)</p> <p>2 <input checked="" type="checkbox"/> DELIVER WEEKDAY</p> <p>3 <input type="checkbox"/> DELIVER SATURDAY (Extra charge) (Not available to all locations)</p> <p>4 <input type="checkbox"/> DANGEROUS GOODS (Extra charge)</p> <p>5 <input type="checkbox"/> DRY ICE _____ Lbs.</p> <p>7 <input type="checkbox"/> OTHER SPECIAL SERVICE _____</p> <p>8 <input type="checkbox"/> SATURDAY PICK-UP (Extra charge)</p> <p>9 <input type="checkbox"/> SATURDAY PICK-UP (Extra charge)</p> <p>10 <input type="checkbox"/> DIM SHIPMENT (Chargeable Weight)</p> <p>11 <input type="checkbox"/> _____</p> <p>12 <input type="checkbox"/> HOLIDAY DELIVERY (if offered) (Extra charge)</p>															
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>PACKAGES</th> <th>WEIGHT in Pounds Only</th> <th>YOUR DECLARED VALUE</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td>Total</td> <td>Total</td> <td>Total</td> </tr> </tbody> </table>		PACKAGES	WEIGHT in Pounds Only	YOUR DECLARED VALUE										Total	Total	Total	<p>Emp. No.: _____ Date: _____ Federal Express Use</p> <p><input type="checkbox"/> Cash Received</p> <p><input type="checkbox"/> Return Shipment <input type="checkbox"/> Third Party <input type="checkbox"/> Chg. To Del. <input type="checkbox"/> Chg. To Hold</p> <p>Street Address: _____</p> <p>City: _____ State: _____ Zip: _____</p> <p>Received By: X S. Adams</p> <p>Date/Time Received: _____ FedEx Employee Number: _____</p> <p>Received At:</p> <p>1 <input type="checkbox"/> Regular Stop 3 <input type="checkbox"/> Drop Box</p> <p>2 <input type="checkbox"/> On-Call Stop 4 <input type="checkbox"/> B.S.C.</p> <p>5 <input type="checkbox"/> Station</p> <p>Release Signature: _____</p> <p>Date/Time: _____</p>
PACKAGES	WEIGHT in Pounds Only	YOUR DECLARED VALUE															
Total	Total	Total															
<p>REVISION DATE 8/90 PART #119501 EXEM 10/90 FORMAT #041</p>		<p>041</p> <p>© 1990 F.E.C. PRINTED IN U.S.A.</p>															



P O Box 13012
1200 S E 28th Street
Ft Lauderdale FL 33316
305 462 0460 Broward
305 947 6102 Miami

The volume change would be non-specific at this time but would allow Star Enterprise the option of increasing the discharge during the rainy season. The increased volume should be as much as twice the permitted volume in any given month, assuming the water quality met the criteria stated in the discharge permit. This volume change will effect the operation time of the system correspondingly. However design parameters of the treatment system in the application received by your office on 12 October 1990 will not change.

We would like to extend the referenced permit until 31 March 1992. This will correspond to the review date of the NPDES permit by the DER in Tallahassee.

The temporary discharge arrangements were extremely time consuming but is now arranged with the City of Hollywood Treatment Works. The effluent will be trucked to the treatment plant upon start-up.

The National Pollutant Discharge Elimination System Permit has been put on hold until the Industrial Wastewater Treatment/Discharge Permit is issued. This matter took several months to be resolved.

Enclosed also is the entire analytical history of the system in operation. This information should serve to satisfy your request.

If you have any questions or comments concerning this subject, please do not hesitate to contact me.

Sincerely,
Star Enterprise

Douglas J. Weimer
Environmental Coordinator

Enclosures: Laboratory Reports
Check

cc: D.M. Killingsworth, Star Enterprise
Jim Bowen, IT Corporation
Files

H. Nank
G. Klunn
S. Brooks, SE Dist.
A. Zinow, BCWRP

IT ENVIRONMENTAL SERVICES

466 S.W. 12TH AVENUE
DEERFIELD BEACH, FL 33442
PH. 305-429-9905

0621

PAY TO THE ORDER OF

9-6 1991
Florida Dept of Environmental Regulation
Two hundred fifty Dollars \$250.00
DOLLARS



037-072
1630 W. Hillsboro Blvd.
Deerfield Beach, Florida 33442

FOR review fee

Tamara J. Carlson

Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Star Enterprise Bulk Storage Facility
Port Everglades, Florida
Construction Permit: Air Stripper Tower System
AC 06-188031

RECEIVED
MAIL ROOM
12 AM 11:43

Dear Mr. Fancy:

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LOG NO: D1-11824

Received: 16 AUG 91

IT Environmental
466 S.W. 12th Avenue
Deerfield Beach, Florida 33442

Project: Star Ent (#585143)

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY
11824-1	Truck Wash O/W Separator (08.16.91)	Client
PARAMETER	11824-1	
Purgeable Aromatics		
Benzene, ug/l		ND
Chlorobenzene, ug/l		ND
1,2-Dichlorobenzene, ug/l		ND
1,3-Dichlorobenzene, ug/l		ND
1,4-Dichlorobenzene, ug/l		ND
Ethylbenzene, ug/l		ND
Toluene, ug/l		37
Xylenes, ug/l		340
Methyl-tert-butyl ether (MTBE), ug/l		ND
Dilution factor		10
Method Number		EPA 602

LOG NO: D1-11824

Received: 16 AUG 91

IT Environmental
 466 S.W. 12th Avenue
 Deerfield Beach, Florida 33442

Project: Star Ent (#585143)

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY
11824-1	Truck Wash O/W Separator (08.16.91)	Client
PARAMETER	11824-1	
Polynuclear Aromatic Hydrocarbons		
Acenaphthene, ug/l		ND
Acenaphthylene, ug/l		ND
Benzo(a)pyrene, ug/l		ND
Benzo(g,h,i)perylene, ug/l		ND
Benzo(b,k)fluoranthene, ug/l		ND
Chrysene + Benzo(a)anthracene, ug/l		ND
Fluoranthene, ug/l		ND
Fluorene, ug/l		ND
Indeno(1,2,3-cd)pyrene+Dibenzo(a,h)anthracene, ug/l		ND
Naphthalene, ug/l		37
Phenanthrene + Anthracene, ug/l		47
Pyrene, ug/l		29
2-Methylnaphthalene, ug/l		190
1-Methylnaphthalene, ug/l		93
Date Extracted	08.19.91	
Dilution factor	1	
Method Number	EPA 610	
Petroleum Hydrocarbons , mg/l		22
Arsenic, mg/l		ND
Barium, mg/l		0.080
Cadmium, mg/l		0.015
Chromium, mg/l		0.010
Lead, mg/l		0.058
Mercury, mg/l		0.00042
Selenium, mg/l		ND

LOG NO: D1-11824

Received: 16 AUG 91

IT Environmental
466 S.W. 12th Avenue
Deerfield Beach, Florida 33442

Project: Star Ent (#585143)

REPORT OF RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY
11824-1	Truck Wash O/W Separator (08.16.91)	Client
PARAMETER	11824-1	
Silver, mg/l	ND	
Surfactants (MBAS), mg/l	1.8	
Total Organic Carbon, mg/l	18	
Biochemical Oxygen Demand (5 Day), mg/l	13	
Chemical Oxygen Demand, mg/l	300	

LOG NO: D1-11824

Received: 16 AUG 91

IT Environmental
 466 S.W. 12th Avenue
 Deerfield Beach, Florida 33442

Project: Star Ent (#585143)

REPORT OF RESULTS

Page 4

LOG NO	SAMPLE DESCRIPTION , REPORT FOR LIQUID SAMPLES	SAMPLED BY				
11824-2	Lab Blank	Client				
11824-3	Accuracy - % Recovery					
11824-4	Precision - Relative % Difference					
11824-5	Detection Limit					
11824-6	Date Analyzed					
PARAMETER	11824-2	11824-3	11824-4	11824-5	11824-6	
Purgeable Aromatics						
Benzene, ug/l	ND	78 %	3.8 %	1.0	08.19.91	
Chlorobenzene, ug/l	ND	89 %	4.5 %	1.0	08.19.91	
1,2-Dichlorobenzene, ug/l	ND	---	---	1.0	08.19.91	
1,3-Dichlorobenzene, ug/l	ND	---	---	1.0	08.19.91	
1,4-Dichlorobenzene, ug/l	ND	---	---	1.0	08.19.91	
Ethylbenzene, ug/l	ND	---	---	1.0	08.19.91	
Toluene, ug/l	ND	86 %	5.8 %	1.0	08.19.91	
Xylenes, ug/l	ND	---	---	1.0	08.19.91	
Methyl-tert-butyl ether (MTBE), ug/l	ND	---	---	10	08.19.91	

LOG NO: D1-11824

Received: 16 AUG 91

IT Environmental
 466 S.W. 12th Avenue
 Deerfield Beach, Florida 33442

Project: Star Ent (#585143)

REPORT OF RESULTS

Page 5

LOG NO	SAMPLE DESCRIPTION , REPORT FOR LIQUID SAMPLES	SAMPLED BY				
11824-2	Lab Blank	Client				
11824-3	Accuracy - % Recovery					
11824-4	Precision - Relative % Difference					
11824-5	Detection Limit					
11824-6	Date Analyzed					
PARAMETER	11824-2	11824-3	11824-4	11824-5	11824-6	
Polynuclear Aromatic Hydrocarbons						
Acenaphthene, ug/l	ND	---	---	10	08.20.91	
Acenaphthylene, ug/l	ND	90 %	4.4 %	10	08.20.91	
Benzo(a)pyrene, ug/l	ND	---	---	10	08.20.91	
Benzo(g,h,i)perylene, ug/l	ND	---	---	10	08.20.91	
Benzo(b,k)fluoranthene, ug/l	ND	---	---	10	08.20.91	
Chrysene + Benzo(a)anthracene, ug/l	ND	---	---	10	08.20.91	
Fluoranthene, ug/l	ND	86 %	1.2 %	10	08.20.91	
Fluorene, ug/l	ND	93 %	0 %	10	08.20.91	
Indeno(1,2,3-cd)pyrene+Dibe nzo(a,h)anthracene, ug/l	ND	---	---	10	08.20.91	
Naphthalene, ug/l	ND	89 %	2.2 %	10	08.20.91	
Phenanthrene + Anthracene, ug/l	ND	---	---	10	08.20.91	
Pyrene, ug/l	ND	90 %	4.4 %	10	08.20.91	
2-Methylnaphthalene, ug/l	ND	---	---	10	08.20.91	
1-Methylnaphthalene, ug/l	ND	---	---	10	08.20.91	
Date Extracted	08.19.91	---	---	---	---	
Petroleum Hydrocarbons , mg/l	ND	72 %	1.4 %	1.0	08.20.91	
Arsenic, mg/l	ND	114 %	0.87 %	0.010	08.23.91	
Barium, mg/l	ND	103 %	0.98 %	0.010	08.20.91	
Cadmium, mg/l	ND	106 %	0.95 %	0.0050	08.20.91	
Chromium, mg/l	ND	100 %	1.0 %	0.010	08.20.91	

LOG NO: D1-11824

Received: 16 AUG 91

IT Environmental
 466 S.W. 12th Avenue
 Deerfield Beach, Florida 33442

Project: Star Ent (#585143)

REPORT OF RESULTS

Page 6

LOG NO	SAMPLE DESCRIPTION , REPORT FOR LIQUID SAMPLES	SAMPLED BY
11824-2	Lab Blank	Client
11824-3	Accuracy - % Recovery	
11824-4	Precision - Relative % Difference	
11824-5	Detection Limit	
11824-6	Date Analyzed	

PARAMETER	11824-2	11824-3	11824-4	11824-5	11824-6
Lead, mg/l	ND	95 %	2.1 %	0.0050	08.21.91
Mercury, mg/l	ND	97 %	2.4 %	0.00020	08.27.91
Selenium, mg/l	ND	105 %	7.6 %	0.010	08.22.91
Silver, mg/l	ND	99 %	1.0 %	0.010	08.20.91
Surfactants (MBAS), mg/l	ND	103 %	2.9 %	0.10	08.15.91
Total Organic Carbon, mg/l	ND	90 %	1.1 %	1.0	08.19.91
Biochemical Oxygen Demand (5 Day), mg/l	ND	95 %	2.1 %	2.0	08.17.91
Chemical Oxygen Demand, mg/l	ND	116 %	0 %	20	08.21.91

Method References: EPA 40 CFR Part 136 and
 EPA 600/4-79-020.


 Sven R. Pavlovics

LOG NO: D1-11345

Received: 13 JUN 91

Mr. J.P. Bowen
 IT Environmental
 466 S.W. 12th Avenue
 Deerfield Beach, Florida 33442

Project: #585148

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY			
11345-1	Influent (06.13.91)	Client			
11345-2	BT-2 (06.13.91) <i>Before Tower 2</i>				
11345-3	BC (06.13.91) <i>Before Carbon</i>				
11345-4	AC (06.13.91) <i>After Carbon</i>				
PARAMETER		11345-1	11345-2	11345-3	11345-4
Purgeable Aromatics					
Benzene, ug/l		1400	15	ND	ND
Chlorobenzene, ug/l		ND	ND	ND	ND
1,2-Dichlorobenzene, ug/l		ND	ND	ND	ND
1,3-Dichlorobenzene, ug/l		ND	ND	ND	ND
1,4-Dichlorobenzene, ug/l		ND	ND	ND	ND
Ethylbenzene, ug/l		110	17	ND	ND
Toluene, ug/l		2000	23	2.4	ND
Xylenes, ug/l		1300	22	8.1	2.6
Methyl-tert-butyl ether (MTBE), ug/l		2500	530	110	47
Date Analyzed		06.18.91	06.19.91	06.23.91	06.17.91
Dilution factor		100	1	1	1
Method Number		EPA 602	EPA 602	EPA 602	EPA 602
Iron					
Iron, mg/l		19	11	12	11
Date Analyzed		07.01.91	07.01.91	07.01.91	07.01.91

SL SAVANNAH LABORATORIES
 & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (305) 421-7400 • Fax (305) 421-2584

LOG NO: D1-11345

Received: 13 JUN 91

Mr. J.P. Bowen
 IT Environmental
 466 S.W. 12th Avenue
 Deerfield Beach, Florida 33442

Project: #585148

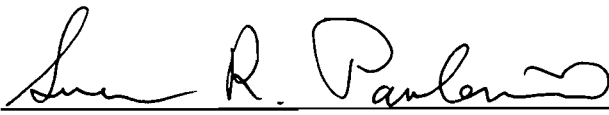
REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , REPORT FOR LIQUID SAMPLES	SAMPLED BY
11345-5	Lab Blank	Client
11345-6	Accuracy - % Recovery	
11345-7	Precision - Relative % Difference	
11345-8	Detection Limit	

PARAMETER	11345-5	11345-6	11345-7	11345-8
Purgeable Aromatics				
Benzene, ug/l	ND	86 %	10 %	1.0
Chlorobenzene, ug/l	ND	92 %	8.7 %	1.0
1,2-Dichlorobenzene, ug/l	ND	---	---	1.0
1,3-Dichlorobenzene, ug/l	ND	---	---	1.0
1,4-Dichlorobenzene, ug/l	ND	---	---	1.0
Ethylbenzene, ug/l	ND	---	---	1.0
Toluene, ug/l	ND	92 %	12 %	1.0
Xylenes, ug/l	ND	---	---	1.0
Methyl-tert-butyl ether (MTBE), ug/l	ND	---	---	10
Date Analyzed	06.17.91	---	---	---
Iron				
Iron, mg/l	ND	88 %	3.4 %	0.050
Date Analyzed	07.01.91	---	---	---

Method References: EPA 40 CFR Part 136 and
 EPA 600/4-79-020.


 Sven R. Pavlovics

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (305) 421-7400 • Fax (305) 421-2584

LOG NO: D1-11163

Received: 23 MAY 91

Mr. Jim Bowen
 IT Environmental
 466 S.W. 12th Avenue
 Deerfield Beach, Florida 33442

Purchase Order: #037664

EZE 48
 Project: STAR WWTP

REPORT OF RESULTS

Page 1

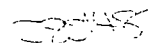
LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY
11163-1	WWTP EFF (05.23.91)	Client
PARAMETER	11163-1	
Oil & Grease , mg/l	2.9	
Iron, mg/l	230	
Lead, mg/l	0.30	
Nickel, mg/l	0.23	
Phenolics, Total Recoverable, mg/l	2.4	
Nitrate-N, mg/l	ND	
Nitrite-N, mg/l	ND	
Total Kjeldahl Nitrogen-N, mg/l	52	
Total Nitrogen, mg/l	52	
5 Day BOD (SM 507), mg/l	510	
Chemical Oxygen Demand, mg/l	1300	
Surfactants (MBAS), mg/l	ND	
Total Dissolved Solids, mg/l	8200	
Suspended Solids, mg/l	188	

LOG NO: D1-11163

Received: 23 MAY 91

Mr. Jim Bowen
IT Environmental
466 S.W. 12th Avenue
Deerfield Beach, Florida 33442

Purchase Order: #037664


Project: STAR WWTP

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , REPORT FOR LIQUID SAMPLES	SAMPLED BY
11163-2	Lab Blank	Client
11163-3	Accuracy - % Recovery	
11163-4	Precision - Relative % Difference	
11163-5	Detection Limit	
11163-6	Date Analyzed	

PARAMETER	11163-2	11163-3	11163-4	11163-5	11163-6
Oil & Grease , mg/l	ND	84 %	8.4 %	1.0	05.29.91
Iron, mg/l	ND	90 %	0 %	0.050	06.05.91
Lead, mg/l	ND	100 %	4.0 %	0.0050	06.03.91
Nickel, mg/l	ND	79 %	2.5 %	0.040	06.06.91
Nitrate-N, mg/l	ND	82 %	2.1 %	0.050	05.27.91
Nitrite-N, mg/l	ND	103 %	0 %	0.050	05.25.91
Total Kjeldahl Nitrogen-N, mg/l	ND	85 %	12 %	0.10	05.30.91
Phenolics, Total Recoverable, mg/l	ND	100 %	0 %	0.010	05.29.91

Method Reference: EPA 600/4-79-020


Sven R. Pavlovics

StarEnterprise



RECEIVED
JAN 28 1991
DER-BAQM
P.O. Box 945140 (32794-5140)
555 Winderley Pl (32751)
Maitland FL
407 875 7600

January 22, 1991

Mr. Barry Andrews
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: Notice of Intent to Issue
AC06-188031

Dear Mr. Andrews:

Please find enclosed the proof of publication required pursuant to the reference. It is our understanding that your receipt of this letter constitutes the beginning of the permits fourteen day waiting period.

We certainly appreciate the expeditious manner in which you handled this matter.

If you have any questions or comments please don't hesitate to call me at (407)875-7620.

Sincerely,
Star Enterprise

David Killingsworth
Environmental Coordinator

cc: James Bowen, IT Corporation (w/a)
REH, DJW (w/a)
Env. File (w/a)
Read File (w/o)

J. Nankis
A. Linero, BCNRP
J. Balderson, SE Dist

FORT LAUDERDALE NEWS/SUN-SENTINEL
PUBLISHED DAILY
FORT LAUDERDALE, BROWARD COUNTY, FLORIDA
BOCA RATON, PALM BEACH COUNTY, FLORIDA
MIAMI, DADE COUNTY, FLORIDA

JAN 18 1991

STATE OF FLORIDA
COUNTY OF BROWARD/PALM BEACH/DADE
BEFORE THE UNDERSIGNED AUTHORITY PERSONALLY
APPEARED T. Benzel WHO ON
OATH SAYS THAT HE/SHE IS A DULY AUTHORIZED
REPRESENTATIVE OF THE CLASSIFIED DEPARTMENT OF
THE FORT LAUDERDALE NEWS/SUN-SENTINEL, DAILY
NEWSPAPERS PUBLISHED IN BROWARD/PALM BEACH/DADE
COUNTY, FLORIDA THAT THE ATTACHED COPY OF
ADVERTISEMENT, BEING A

NOTICE

IN THE MATTER OF

AC 06-188031

IN THE CIRCUIT COURT, WAS PUBLISHED IN SAID
NEWSPAPER IN THE ISSUES OF
C, 1/16, 1X

AFFIANT FURTHER SAYS THAT THE SAID FORT
LAUDERDALE NEWS/SUN-SENTINEL ARE NEWSPAPERS
PUBLISHED IN SAID BROWARD/PALM BEACH/DADE
COUNTY, FLORIDA, AND THAT THE SAID NEWSPAPERS
HAVE HERETOFORE BEEN CONTINUOUSLY PUBLISHED IN
SAID BROWARD/PALM BEACH/DADE COUNTY, FLORIDA,
EACH DAY, AND HAVE BEEN ENTERED AS SECOND
CLASS MATTER AT THE POST OFFICE IN FORT
LAUDERDALE, IN SAID BROWARD COUNTY, FLORIDA,
FOR A PERIOD OF ONE YEAR NEXT PRECEDING THE
FIRST PUBLICATION OF THE ATTACHED COPY OF
ADVERTISEMENT; AND AFFIANT FURTHER SAYS THAT
HE/SHE HAS NEITHER PAID NOR PROMISED ANY PERSON,
FIRM OR CORPORATION ANY DISCOUNT, REBATE,
COMMISSION OR REFUND FOR THE PURPOSE OF
SECURING THIS ADVERTISEMENT FOR PUBLICATION
IN SAID NEWSPAPERS.

T. Benzel
.....
AUTHORIZED REPRESENTATIVE

SWORN TO AND SUBSCRIBED BEFORE ME
THIS 16 DAY OF JANUARY
A.D. 1991

Judith A. Tarrant
.....
(SEAL) NOTARY PUBLIC
Notary Public, State of Florida
My Commission Expires Aug. 31, 1992
Bonded Thru Troy Pain - Insurance Co.

State of Florida
Department of
Environmental
Regulation
Notice of Intent
to Issue
The Department of Environmental Regulation hereby gives notice of its intent to issue a permit (AC 06-188031) to Star Enterprise, P.O. Box 5140, Maitland, Florida 32751. The permit will authorize the construction of an air stripper tower system to treat contaminated water from fuel storage tanks at the terminal located at 1200 SE 28th Street, Port Everglades, Broward County, Florida 33316. The system will emit less than 100 pounds per year of volatile organic compounds. Best Available Control Technology (BACT) and Lowest Achievable Emission Rate (LAER) determinations were not required. These emissions will not interfere with reasonable further progress toward attainment of the ambient air standard for ozone or endanger the health of the public. The Department is issuing this intent to issue for the reasons stated in the Technical Evaluation and Preliminary Determination.
A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, F.S. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within 14 days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative (hearing) under Section 120.57, Florida Statutes.
The Petition shall contain the following information:
(a) The name, address, and telephone number of each petitioner; the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;
(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
(d) A statement of the material facts disputed by the Petitioner, if any;
(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and
(g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.
If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.
The application is available for public inspection during business hours, 6:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:
Department of Environmental Regulation
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida
32399-2400
Broward County Environmental Quality Control Board
621 S. Andrews Ave.
Ft. Lauderdale, Florida
33010
Department of Environmental Regulation
Southeast District
1900 S. Congress Ave.,
Suite A
West Palm Beach, Florida
33406
Any person may send written comments on the proposed action to Mr. Barry Andrews at the Department's Tallahassee address. All comments mailed within 14 days of the publication of this notice will be considered in the Department's final determination.
January 16, 1991



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Bob Martinez, Governor

Dale Twachtmann, Secretary

John Shearer, Assistant Secretary

January 7, 1991

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

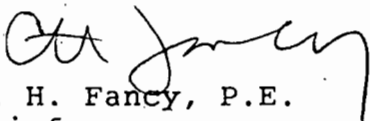
Mr. Robert H. Herndon, Environmental Coordinator
Star Enterprise
P. O. Box 5140
Maitland, Florida 32751

Dear Mr. Herndon:

Attached is one copy of the Technical Evaluation and Preliminary Determination and proposed permit to construct an air stripper tower system to treat contaminated water from fuel storage tanks at your existing terminal in Port Everglades, Broward County, Florida.

Please submit any written comments you wish to have considered concerning the Department's proposed action to Mr. Barry Andrews of the Bureau of Air Regulation.

Sincerely,


C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/WH/plm

Attachments

c: Isidore Goldman, SE District
Al Linero, Broward County
John Reese, P.E.

*Original sent
Env. Exp. 1-9-91
Inst # 103 875 439*



BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

In the Matter of
Application for Permit by:

Star Enterprise
P. O. Box 5140
Maitland, Florida 32751

DER File No. AC 06-188031

INTENT TO ISSUE

The Department of Environmental Regulation hereby gives notice of its intent to issue an air construction permit (copy attached) for the proposed project as detailed in the application specified above. The Department is issuing this Intent to Issue for the reasons stated in the attached Technical Evaluation and Preliminary Determination.

The applicant, Star Enterprise, applied on October 12, 1990, to the Department of Environmental Regulation for a permit to construct an air stripper tower system to treat contaminated water from fuel storage tanks at the existing terminal located at 1200 SE 28th Street in Port Everglades, Broward County, Florida 33316.

The Department has permitting jurisdiction under Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 17-2 and 17-4. The project is not exempt from permitting procedures. The Department has determined that an air construction permit is required for the proposed work.

Pursuant to Section 403.815, F.S. and DER Rule 17-103.150, F.A.C., you (the applicant) are required to publish at your own expense the enclosed Notice of Intent to Issue Permit. The notice shall be published one time only within 30 days, in the legal ad section of a newspaper of general circulation in the area affected. For the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. The applicant shall provide proof of publication to the Department, at the address specified within seven days of publication. Failure to publish the notice and provide proof of publication within the allotted time may result in the denial of the permit.

The Department will issue the permit with the attached conditions unless a petition for an administrative proceeding (hearing) is filed pursuant to the provisions of Section 120.57, F.S.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Petitions filed by the permit applicant and the parties listed below must be filed within 14 days of receipt of this intent. Petitions filed by other persons must be filed within 14 days of publication of the public notice or within 14 days of receipt of this intent, whichever first occurs. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

The Petition shall contain the following information:

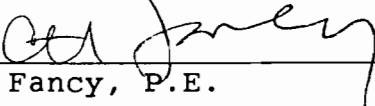
- (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;
- (b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
- (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
- (d) A statement of the material facts disputed by Petitioner, if any;
- (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
- (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and
- (g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application(s) have the right to petition to become a party to the proceeding. The petition must conform to the requirements

specified above and be filed (received) within 14 days of publication of this notice in the Office in General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION



C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

Copies furnished to:

Isidore Goldman, SE District
Al Linero, Broward County
John Reese, P.E.

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this NOTICE OF INTENT TO ISSUE and all copies were mailed before the close of business on 1-9-91.

FILING AND ACKNOWLEDGEMENT
FILED, on this date, pursuant to
§120.52(9), Florida Statutes, with
the designated Department Clerk,
receipt of which is hereby
acknowledged.

Heri Cohen
Clerk

1-9-91
Date

State of Florida
Department of Environmental Regulation
Notice of Intent to Issue

The Department of Environmental Regulation hereby gives notice of its intent to issue a permit (AC 06-188031) to Star Enterprise, P. O. Box 5140, Maitland, Florida 32751. The permit will authorize the construction of an air stripper tower system to treat contaminated water from fuel storage tanks at the terminal located at 1200 SE 28th Street, Port Everglades, Broward County, Florida 33316. The system will emit less than 100 pounds per year of volatile organic compounds. Best Available Control Technology (BACT) and Lowest Achievable Emission Rate (LAER) determinations were not required. These emissions will not interfere with reasonable further progress toward attainment of the ambient air standard for ozone or endanger the health of the public. The Department is issuing this Intent to Issue for the reasons stated in the Technical Evaluation and Preliminary Determination.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within fourteen (14) days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

The Petition shall contain the following information:

- (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;
- (b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
- (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
- (d) A statement of the material facts disputed by Petitioner, if any;
- (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
- (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and

(g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

The application is available for public inspection during business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Department of Environmental Regulation
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Broward County Environmental
Quality Control Board
621 S. Andrew Ave.
Ft. Lauderdale, Florida 33010

Department of Environmental Regulation
Southeast District
1900 S. Congress Ave., Suite A
West Palm Beach, Florida 33406

Any person may send written comments on the proposed action to Mr. Barry Andrews at the Department's Tallahassee address. All comments mailed within 14 days of the publication of this notice will be considered in the Department's final determination.

Technical Evaluation
and
Preliminary Determination

Star Enterprise
Broward County
Port Everglades, Florida

Air Stripper Tower System for
Contaminated Water from Fuel Storage Tanks

File No. AC 06-188031

Department of Environmental Regulation
Division of Air Resources Management
Bureau of Air Regulation

January 7, 1991

I. General Information

A. Applicant

Star Enterprise
P. O. Box 5140
Maitland, Florida 32751

B. Request

On October 10, 1990, Star Enterprise submitted an application for a permit to construct an air stripper tower system to treat contaminated water from fuel storage tanks at their existing terminal (SIC 5171) located at 1200 SE 28th Street, Port Everglades, Broward County, Florida 33316. The UTM coordinates of this terminal are Zone 17, 586.8 km E and 2884.5 km N. The application was considered complete on receipt of Star Enterprises November 13, 1990, letter (November 16, 1990).

C. Process

The air stripper will be used to treat accumulated bottom water from petroleum fuel storage tanks prior to discharging the water through a carbon adsorption system to the drainage system. The applicant expects benzene, toluene, ethylbenzene, xylene, and M-tert butyl ether to be present in the air emissions from the stripper. Based on the applicant's knowledge of the process, other air pollutants are not expected to be present in the air emissions.

Ten gallons per minute (GPM) of contaminated water will be passed through an oil/water separator and then to two Nepcco Model 120-20 air stripper towers in series. Each tower will be 1 foot in diameter, 20 feet high, contain 15 feet of packing followed by a demister, and use a 200 cubic feet per minute (CFM) air blower to obtain the design volumetric air/water ratio of 150. The contaminated air will be discharged through a 0.5 foot diameter stack at an elevation of 25 feet. The water from the stripping towers will pass through a granular activated carbon adsorption system to a 25,000 gallon holding tank. After analysis, the water will be either discharged to the surface drainage system or retreated by the air stripper tower system.

The system will be operated approximately 1 day per month.

D. Emissions

Based on a limited number of contaminated water samples, the applicant estimates the air pollutant emission from the system as follows:

<u>Pollutant</u>	<u>Emissions (lbs/hr)</u>
Benzene	0.0026
Toulene	0.0169
Ethylbenzene	0.0029
Xylene	0.213
MTBE	0.20

II. Rule Applicability

The proposed project, construction of an air stripper tower system, is subject to preconstruction review under the provisions of Chapter 403, Florida Statutes, and Chapter 17-2, Florida Administrative Code (F.A.C.).

The source will be located at a major facility, a petroleum storage and transfer unit (SIC 5171). This facility is on Table 500-1, Major Facility Categories, of Chapter 17-2, F.A.C. Allowable emissions of volatile organic compounds (VOC) from this facility exceed 100 TPY.

The proposed source will be located in an area designated nonattainment for ozone and total suspended particulate (F.A.C. Rule 17-2.410), unclassifiable for PM₁₀ and sulfur dioxide (F.A.C. Rule 17-2.430), and attainment for the other criteria pollutants (F.A.C. Rule 17-2.420).

The maximum VOC emissions from the proposed source are less than the significant emission rates listed in F.A.C. Rule 17-2, Table 500-2. Therefore, the proposed project is not subject to F.A.C. Rule 17-2.510, New Source Review for Nonattainment Areas. It is subject to F.A.C. Rule 17-2.620, General Pollutant Emission Limiting Standards. The Department will require the applicant to control the operation so that the emissions of air pollutants will not cause an exceedance of the ambient air concentrations established under the air toxic policy.

III. Technical Evaluation

The air stripper column system will process 10 GPM of contaminated water for up to 24 hrs/day and emit BTEX and MTBE pollutants.

The acceptable ambient air concentrations of the BTEX air pollutants from this source for 24 hrs/day operation, based on the Department's toxic policy, are summarized in the following table. Data is not available for MTBE.

<u>Pollutant</u>	<u>Max. Conc. (mg/m³) for 24 hrs/day operated</u>
Benzene	0.0071
Toluene	1.786
Ethylbenzene	1.036
Xylene	1.036

Calculations, using the EPA approved Screen-1.1 Model and the stack parameters listed in the application, show that an emission rate of 1 gram/sec from the proposed system will have a maximum ambient air impact 1 mg/m³ (8 hr).

The Department has calculated maximum concentration of the pollutant that can be in the contaminated water and the maximum emissions from the proposed source that can occur without exceeding the acceptable ambient air concentration for the BTEX compounds. The results of these calculations are summarized in the following table:

Pollutant	Maximum Emissions		Maximum Conc. in Water PPM
	grams/second	lbs/hr	
Benzene	0.0071	0.056	11.2
Toluene	1.786	14.2	2840
Ethylbenzene	1.036	8.2	1640
Xylene	1.036	8.2	1640

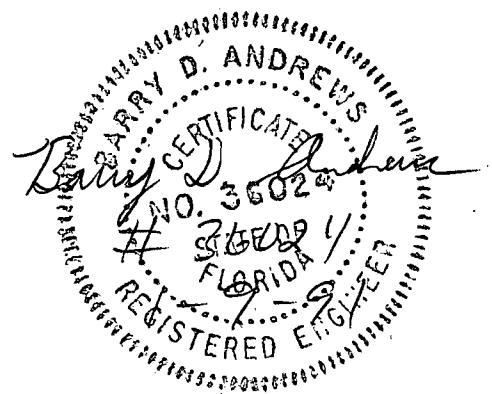
The applicant estimates that the emissions from the air stripper column system will be below the values shown above.

IV. Ambient Air Impact

Based on the modeled impact of the estimated emissions of the BTEX compounds, the operation of the air stripper tower system will not create a health hazard or cause/contribute to an ambient air quality violation.

V. Conclusion

Based on the information provided by Star Enterprise, the Department has reasonable assurance that the proposed construction/installation of an air stripper tower system, as described in this evaluation, and subject to the conditions proposed herein, will not cause or contribute to a violation of any air quality standard, PSD increment, or any other technical provision of Chapter 17-2 of the Florida Administrative Code.





Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Bob Martinez, Governor

Dale Twachtman, Secretary

John Shearer, Assistant Secretary

PERMITTEE:

Star Enterprise
P. O. Box 5140
Maitland, Florida 32751

Permit Number: AC 06-188031

Expiration Date: July 1, 1991

County: Broward

Latitude/Longitude: 26°05'10"N

80°07'00"W

Project: Air Stripper Tower System

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 17-2 and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the construction of a 98.7% efficient air stripper system to treat 10 GPM of contaminated water from petroleum fuel storage tanks. The air stripper system consists of two Nepcco Model 120-20 towers that are 1 foot in diameter by 20 feet high columns and contains 15 feet of packing and a demister, 200 CFM air blowers, 10 GPM water pumps, along with oil-water separator, carbon adsorption canisters (for water treatment), 25,000 gallon holding tank, and other associated pump/piping, etc. The air stripping system will be located at the permittee's existing petroleum storage and transfer terminal at 1200 28th Street, Port Everglades, Broward County, Florida 33316.

The UTM coordinates of this site are Zone 17, 586.8 km E and 2884.5 km N.

The source shall be constructed in accordance with the permit application, plans, documents, amendments and drawings, except as otherwise noted in the General and Specific Conditions.

Attachments are listed below:

1. Application received October 12, 1990
2. DER letter dated November 7, 1990
3. Star Enterprise letter dated November 13, 1990

PERMITTEE:
Star Enterprise

Permit Number: AC 06-188031
Expiration Date: July 1, 1991

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "Permit Conditions" and are binding and enforceable pursuant to Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.
2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.
3. As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.
4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.
5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

PERMITTEE:
Star Enterprise

Permit Number: AC 06-188031
Expiration Date: July 1, 1991

GENERAL CONDITIONS:

6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at a reasonable time, access to the premises, where the permitted activity is located or conducted to:

- a. Have access to and copy any records that must be kept under the conditions of the permit;
- b. Inspect the facility, equipment, practices, or operations regulated or required under this permit; and
- c. Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

- a. a description of and cause of non-compliance; and
- b. the period of noncompliance, including dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

PERMITTEE:
Star Enterprise

Permit Number: AC 06-188031
Expiration Date: July 1, 1991

GENERAL CONDITIONS:

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Sections 403.73 and 403.111, Florida Statutes. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

11. This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 17-4.120 and 17-30.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit or a copy thereof shall be kept at the work site of the permitted activity.

13. The permittee shall comply with the following:

- a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.
- b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and

PERMITTEE:
Star Enterprise

Permit Number: AC 06-188031
Expiration Date: July 1, 1991

GENERAL CONDITIONS:

records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurements;
- the person responsible for performing the sampling or measurements;
- the dates analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

14. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

SPECIFIC CONDITIONS:

1. The contaminated water flow to the air stripper system shall not exceed 10 GPM. The permittee shall check and record the flow rate to the columns at least once during each day that the system is in operation.

2. The concentration of pollutants in the contaminated tank water shall not exceed the following:

Pollutant	Maximum Soil Concentration
	PPM
Benzene	11.2
Toluene	2840
Ethylbenzene	1640
Xylene	1640

Each batch of storage tank water shall be analyzed prior to treatment by methods approved by the Department and these lab results shall be available for Department inspection for a minimum of 3 years.

PERMITTEE:
Star Enterprise

Permit Number: AC 06-188031
Expiration Date: July 1, 1991

SPECIFIC CONDITIONS:

3. Based on the procedures described in the Department's October 20, 1987, memorandum titled Final Air Stripper Review Procedure or other methods with prior approval of the Department, the emissions from the air stripper system shall not exceed 100 lbs/yr VOC (total) and the following:

Pollutant	Max. Allowable Emissions (lbs/hr - 24 hr avg)
Benzene	0.056
Toluene	14.2
Ethylbenzene	8.2
Xylene	8.2

4. The air stripper system shall not operate more than 300 hrs/yr without prior approval from the Department.

5. The air stripper system shall not discharge air pollutants in quantities that cause or contribute to objectionable odors.

6. The permittee, for good cause, may request that this construction permit be extended. Such a request shall be submitted to the Bureau of Air Regulation prior to 60 days before the expiration of the permit (F.A.C. Rule 17-4.090).

7. An application for an operation permit must be submitted to the Department's Southeast District office at least 90 days prior to the expiration date of this construction permit or within 45 days after completion of compliance testing, whichever occurs first. To properly apply for an operation permit, the applicant shall submit the appropriate application form, fee, certification that construction was completed noting any deviations from the conditions in the construction permit, and compliance test reports as required by this permit (F.A.C. Rule 17-4.220).

Issued this _____ day
of _____, 1990

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

STEVE SMALLWOOD, P.E., Director
Division of Air Resources
Management



November 13, 1990

RECEIVED

NOV 16 1990

DER-BAQM

C. H. Fancy, P.E.
Chief
Bureau of Air Regulation
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: File No. AC 29-188372, Tampa Air Stripper
File No. AC 06-188031, Pt. Everglades Air Stripper

Dear Mr. Fancy:

This letter is in response to your letter (attached) reflecting a preliminary review of the above applications. This communication will be formatted in a "question/response" format in the order in which the questions were posed in your letter dated November 7, 1990.

- 1) "The applications list emissions for benzene, toluene, ethylbenzene, xylene, and MTBE based on the analysis of one sample. Will the system be used to treat water with higher concentrations of these pollutants? If so, what will be the maximum concentrations and emissions of these pollutants?"

The analyses presented in the applications were taken from the collection tanks used in the accumulation of the waste stream. The basis for the design of this waste-water treatment system is that these are representative analyses. Dissolved hydrocarbons are not expected to vary in concentration or composition a great deal. A 25% safety factor has been used throughout the design.

However, real-time data collected with the system in operation will provide the final answer to the question. If the emissions were to approach the A.A.C., the systems operation could be adjusted to reduce the air to water ratio therefore, reducing emissions.

- 2) "The applications also list phenol, 2-nitrophenol, 2,4-dichlorophenol, 2-chlorophenol, and 4-chloro-3-methylphenol as being present in the bottom water. Will the air stripper systems discharge these pollutants or other air pollutants that are not listed in the applications? What are the recommended occupational exposure levels (consult Material Safety Data Sheets), acceptable ambient air concentrations, and estimated maximum concentrations in the ambient air of these pollutants resulting from these operations?"

The phenolic compounds, detected in the water samples obtained in the collection tank, are a minor component of the dissolved contaminants reflected by analysis. The attached graph shows the extent to which phenol is effected by air stripping. This reflects that the solubility of phenol in water does not lend itself to volatilization. The phenolic compounds are not removed from the water by the air strippers, but by carbon absorption after the air strippers.

The knowledge of processes that lead to the accumulation of this waste stream have aided in the characterization of the emissions from the proposed air stripping towers. Air stripping design guidance documents, produced by the F.D.E.R, have been reviewed against the list of suspected and known compounds present in the subject stream. The maximum ambient concentrations have been presented for the compounds subject to emissions with this technology.

- 3) "Will the air pollutants emitted from the systems cause or contribute to objectionable odors?"

The locations of the subject air stripping towers are in the interior of large industrial parks with many bulk fuel storage facilities. The contributed odors of the air strippers will be insignificant.

Upon start up of these waste-water treatment systems, interested regulatory officials, including yourself, are invited to attend. There will be a portable G.C. on-site providing for quantification of V.O.A. compounds.

If additional information is required please contact me at (407)875-7620.

Sincerely,

Star Enterprise on behalf of
Texaco Refining and Marketing Inc.

David M. Killingsworth /aw

David M. Killingsworth
Environmental Coordinator

DMK

cc: REH, EKW, AGR, JMD, ROB, RHH, Star Enterprise
J. P. Bowen, IT Corporation, Deerfield Beach, FL
Env. File
Darrel Graziani, Air Permitting - HCEPC
Bill Thomas, F.D.E.R., S.W. District
Isadore Goldman, F.D.E.R., S.E. District
A. Finero, BC FOOB



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Bob Martinez, Governor

Dale Twachtman, Secretary

John Shearer, Assistant Secretary

November 7, 1990

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Robert H. Herndon, Environmental Coordinator
Star Enterprise
P. O. Box 5140
Maitland, Florida 32751

Dear Mr. Herndon:

Re: File No. AC 29-188372, Tampa Air Stripper
File No. AC 06-188031, Port Everglades Air Stripper

Star Enterprise ORLANDO OPERATIONS		
WSWI	REK	CLAY
REN	DMR	ANN
NOV 1 2 1990		
AGB	BRB	IRAS
CHP	EVD	DSV
REN	KRB	NBL
REL	ERG	
<input type="checkbox"/>	PERM	<input checked="" type="checkbox"/> ROUTINE

The Department has made a preliminary review of your applications for permits to construct air stripper tower systems to treat contaminated water from fuel storage tanks at your existing terminals in Tampa and Port Everglades. Before these applications can be processed, we need the following information:

1. The applications list emissions for benzene, toluene, ethylbenzene, xylene, and MTBE based on the analysis of one sample. Will this system be used to treat water with higher concentrations of these pollutants? If so, what will be the maximum concentrations and emissions of these pollutants?
2. The applications also list phenol, 2-nitrophenol, 2,4-dichlorophenol, 2-chlorophenol, and 4-chloro-3-methylphenol as being present in the bottom water. Will the air stripper systems discharge these pollutants or other air pollutants that are not listed in the applications? What are the recommended occupational exposure levels (consult Material Safety Data Sheets), acceptable ambient air concentrations, and estimated maximum concentrations in the ambient air of these pollutants resulting from these operations?
3. Will the air pollutants emitted from the systems cause or contribute to objectionable odors?



Mr. Robert H. Herndon
Page 2

The Department will resume processing these applications after we receive your reply to this letter. If you have any questions on this matter, please write to me or call Willard Hanks at 904-488-1344.

Sincerely,



C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/WH/plm

c: Bill Thomas, SW Dist.
Jerry Campbell, HCEPC
Isidore Goldman, SE Dist.
Patrick Wong, DERM
John Reese, P.E.

TEXACO - PORT EVERGLADES

BATCH AIR STRIPPING OF COLLECTION TANK WATER BOTTOMS

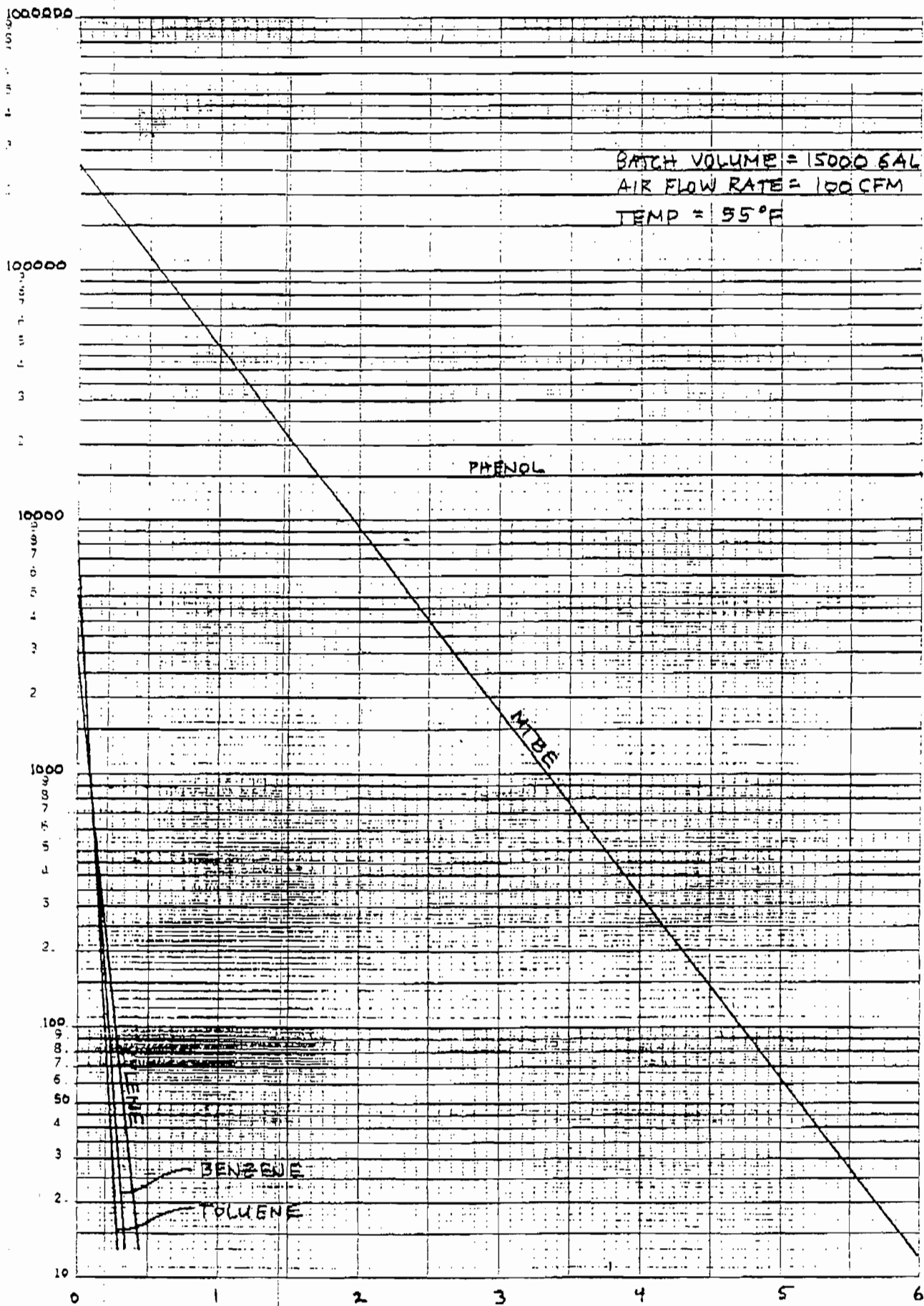
PROJ # 585148

BEST AVAILABLE COPY

46 6290

K&E SEMI-LOGARITHMIC 5 CYCLES x 72 DIVISIONS
NEWELL & ESSER CO. MILWAUKEE

CONCENTRATION OF CONTAMINANT IN TANK WATER (PPB)



TIME (DAYS)

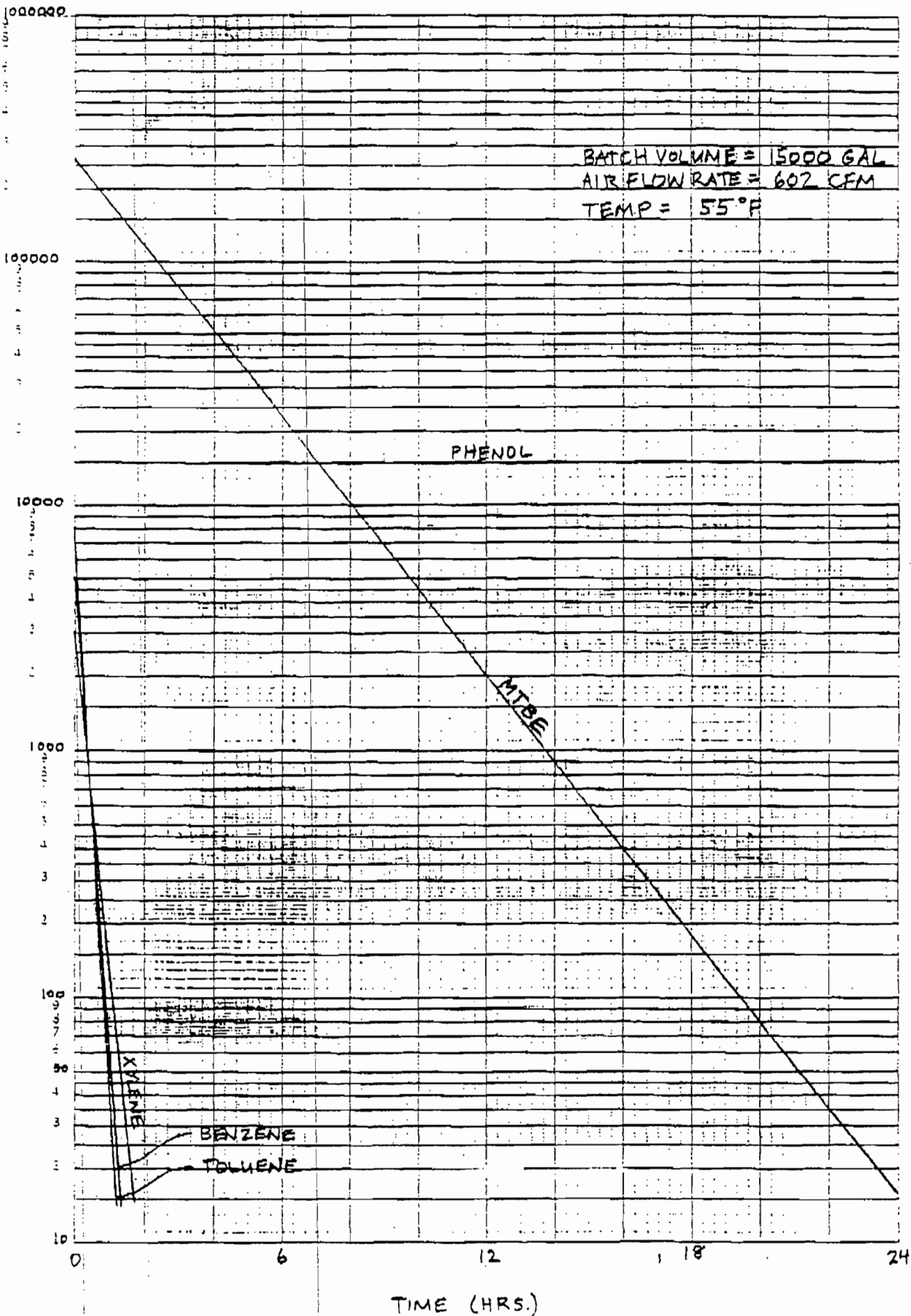
TEXACO - PORT EVERGLADES

BATCH AIR STRIPPING OF COLLECTION TANK WATER BOTTOMS

PROJ # 585148

BEST AVAILABLE COPY

CONCENTRATION OF CONTAMINANT IN TANK WATER (PPB)



BEST AVAILABLE COPY

● SEN
3 and
Put your ac
from being r
the date of delivery, for r: jtr... ing service...
and check box(es) for additional service(s) requested.

1. Show to whom delivered, date, and addressee's address. (Extra charge) 2. Restricted Delivery (Extra charge)

<p>3. Article Addressed to: Robert H. Herndon Star Enterprise P.O. Box 5140 Maitland, FL 32751</p>	<p>4. Article Number P 280 742 407</p> <p>Type of Service: <input checked="" type="checkbox"/> Registered <input type="checkbox"/> Insured <input checked="" type="checkbox"/> Certified <input type="checkbox"/> COD <input type="checkbox"/> Express Mail <input type="checkbox"/> Return Receipt for Merchandise</p> <p>Always obtain signature of addressee or agent and DATE DELIVERED.</p>
<p>5. Signature - Addressee X</p>	<p>8. Addressee's Address (ONLY if requested and fee paid)</p>
<p>6. Signature - Agent X Kenneth Hall</p>	
<p>7. Date of Delivery</p>	

PS

RECEIPT

P 280 742 407

RECEIPT FOR CERTIFIED MAIL

NO INSURANCE COVERAGE PROVIDED
NOT FOR INTERNATIONAL MAIL
(See Reverse)

U.S.G.P.C. 1985-234-555

<p>Sent to Robert Herndon</p>	
<p>Street and No. Star Enterprise</p>	
<p>P.O. State and ZIP Code P.O. Box 5140</p>	
<p>Postage Maitland FL</p>	
<p>Certified Fee</p>	
<p>Special Delivery Fee</p>	
<p>Restricted Delivery Fee</p>	
<p>Return Receipt showing to whom and Date Delivered</p>	
<p>Return Receipt showing to whom, Date, and Address of Delivery</p>	
<p>TOTAL Postage and Fees</p>	<p>\$</p>
<p>Postmark or Date 11-8-90 AC 29-188372 " 031</p>	

PS Form 3800, June 1985



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Bob Martinez, Governor

Dale Twachtmann, Secretary

John Shearer, Assistant Secretary

November 7, 1990

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Robert H. Herndon, Environmental Coordinator
Star Enterprise
P. O. Box 5140
Maitland, Florida 32751

Dear Mr. Herndon:

Re: File No. AC 29-188372, Tampa Air Stripper
File No. AC 06-188031, Port Everglades Air Stripper

The Department has made a preliminary review of your applications for permits to construct air stripper tower systems to treat contaminated water from fuel storage tanks at your existing terminals in Tampa and Port Everglades. Before these applications can be processed, we need the following information:

1. The applications list emissions for benzene, toluene, ethylbenzene, xylene, and MTBE based on the analysis of one sample. Will this system be used to treat water with higher concentrations of these pollutants? If so, what will be the maximum concentrations and emissions of these pollutants?
2. The applications also list phenol, 2-nitrophenol, 2,4-dichlorophenol, 2-chlorophenol, and 4-chloro-3-methylphenol as being present in the bottom water. Will the air stripper systems discharge these pollutants or other air pollutants that are not listed in the applications? What are the recommended occupational exposure levels (consult Material Safety Data Sheets), acceptable ambient air concentrations, and estimated maximum concentrations in the ambient air of these pollutants resulting from these operations?
3. Will the air pollutants emitted from the systems cause or contribute to objectionable odors?

Mr. Robert H. Herndon
Page 2

The Department will resume processing these applications after we receive your reply to this letter. If you have any questions on this matter, please write to me or call Willard Hanks at 904-488-1344.

Sincerely,



C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/WH/plm

c: Bill Thomas, SW Dist.
Jerry Campbell, HCEPC
Isidore Goldman, SE Dist.
Patrick Wong, DERM
John Reese, P.E.

10-29-90
16:49:24

*** SCREEN-1.1 MODEL RUN ***
*** DRAFT VERSION XXXXX ***

MAX 1hr impact of g/s emission = 1409ug
MAX 8hr, 1hr x 0.7 = 986.3ug/m² ~ 1mg/m²
MAX 24hr, 1hr x 0.4 = 563.6ug/m² ~ 0.6mg/m²

star enterprises, tampa

SIMPLE TERRAIN INPUTS:

SOURCE TYPE = POINT
EMISSION RATE (G/S) = 1.000
STACK HEIGHT (M) = 7.62
STK INSIDE DIAM (M) = .15
STK EXIT VELOCITY (M/S) = 5.18
STK GAS EXIT TEMP (K) = 303.00
AMBIENT AIR TEMP (K) = 293.00
RECEPTOR HEIGHT (M) = .00
IOPT (1=URB,2=RUR) = 2
BUILDING HEIGHT (M) = .00
MIN HORIZ BLDG DIM (M) = .00
MAX HORIZ BLDG DIM (M) = .00

BUOY. FLUX = .01 M**4/S**3; MOM. FLUX = .15 M**4/S**2.

*** FULL METEOROLOGY ***

*** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	0	.0	.0	.0	.0	.0	.0	
100.	1398.	3	1.0	1.0	320.0	10.0	12.5	7.5	NO
200.	1208.	4	1.0	1.0	320.0	10.0	15.6	8.5	NO
300.	827.2	4	1.0	1.0	320.0	10.0	22.6	12.1	NO
400.	608.2	6	1.0	1.0	5000.0	12.9	14.7	7.2	NO
500.	662.2	6	1.0	1.0	5000.0	12.9	18.0	8.5	NO
600.	643.6	6	1.0	1.0	5000.0	12.9	21.3	9.8	NO
700.	595.8	6	1.0	1.0	5000.0	12.9	24.5	11.0	NO
800.	539.4	6	1.0	1.0	5000.0	12.9	27.7	12.1	NO
900.	486.5	6	1.0	1.0	5000.0	12.9	30.8	13.1	NO
1000.	439.0	6	1.0	1.0	5000.0	12.9	33.9	14.0	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
93. 1409. 3 1.0 1.0 320.0 10.0 11.8 7.1 NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

1.41 mg/m² (1hr)

*** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	1409.	93.	0.

StarEnterprise



RECEIVED

OCT 17 1990

Dept. of Environmental Reg.
West Palm Beach

October 16, 1990

Mr. Tiddle
Department of Environmental Regulation
Air Permits Department
1900 S. Congress Avenue
West Palm Beach, FL 33406

Re: Air Permits
1200 SW 28th St
Ft. Lauderdale, FL

Dear Mr. Tiddle:

Enclosed is a check for \$200.00 for Air Permit Review Fees for the above referenced facility.

If you have any questions please contact Mr. David M. Killingsworth at (407) 875-7620.

Sincerely,

Star Enterprise

John G. Curry
Regional Manager

Attachment

cc: REH, EKW, AGR, DMK
E.C. Brewster
IT-Bowen-Deerfield Beach
Files - Env, Reading

October 1, 1990



Application to
Operate/Construct
Air Pollution Sources
Star Enterprise-Port Everglades
Bulk Storage Facility
1200 S.W. 28th Street
Fort Lauderdale, Florida

ENVIRONMENTAL ENGINEERING
AND
SERVICES PROJECT 585-148

RECEIVED

1 7 1990
Dept. of Environmental Reg.
West Palm Beach

Prepared By

A handwritten signature in black ink, appearing to read 'Randy Whitesell', written over a horizontal line.

Randy Whitesell
Project Engineer

Reviewed By

A handwritten signature in black ink, appearing to read 'James P. Bowen', written over a horizontal line.

James P. Bowen
Project Manager

RECEIVED

OCT 17 1990

Dept. of Environmental Reg.
West Palm Beach

Permit Data Form

Project Source Name STAR ENTERPRISE
 Type Code: AC Subcode 1E Check # GF Exempt
 Permit Processor's Initial BS Data Entry Operator's Initial BF
 Correct Fee 200
 Amount Received 200
 Amount Returned 0

AC 06-188031



StarEnterprise

12700 NORTHBOROUGH DR.
HOUSTON, TEXAS 77067

DRAFT NO. 013244

DATE
10-4-90

PAY THIS AMOUNT
\$200.00

PAY **Florida Department Environmental Regulation**
TO THE
ORDER OF

VOID IF NOT DEPOSITED WITHIN 60 DAYS.
NOT VALID IF IN EXCESS OF \$2500.

EXACTLY \$200.00 DOLLARS

PAYABLE THROUGH
TEXAS COMMERCE BANK NATIONAL ASSOCIATION
HOUSTON, TEXAS

J. L. Gugen

AUTHORIZED SIGNATURE

ENDORSE CHECK EXACTLY AS DRAWN.



AC 06-188031



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

RECEIVED
OCT 17 1990

DER Form 17-1.202(1)
Form Title
Filing Date
DER Application No. (Print or by DER)

Dept. of Environmental Reg.
West Palm Beach

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Air Stripper [X] New¹ [] Existing¹

APPLICATION TYPE: [X] Construction [] Operation [] Modification

COMPANY NAME: Star Enterprise COUNTY: Broward

Identify the specific emission point source(s) addressed in this application (i.e. Lin
Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired)

SOURCE LOCATION: Street 1200 SW 28th Street City Ft. Lauderdale

UTM: East _____ North _____

Latitude 26 ° 05 ' 10 "N Longitude 80 ° 07 ' 00 "W

APPLICANT NAME AND TITLE: _____

APPLICANT ADDRESS: P.O. Box 5140, Maitland, FL 32751

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Star Enterprise

I certify that the statements made in this application for a Air permit are true, correct and complete to the best of my knowledge and belief. Further I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Fl Statutes, and all the rules and regulations of the department and revisions thereof also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permit establishment.

*Attach letter of authorization

Signed: D.M. Kellinsworth

Environmental Coordinator
Name and Title (Please Type)

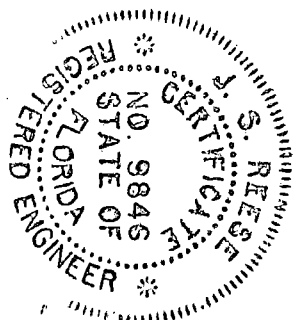
Date: 10/14/90 Telephone No. (407) 875-2620

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in permit application. There is reasonable assurance, in my professional judgment,

¹ See Florida Administrative Code Rule 17-2.100(57) and (104)

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.



Signed John S. Reese
JOHN S. REESE
Name (Please Type)

NEPCO EQUIPMENT DIVISION
Company Name (Please Type)

2140-300 NE 36TH AVE OCALA, FL 32670
Mailing Address (Please Type)

Florida Registration No. 9846 Date: 10/5/90 Telephone No. 904 867-7482

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

Star Enterprise intends to treat the tank water of their operations at this facility.

The water treatment system has been designed to meet air pollution criteria set by the FDER. For additional details see attached report pages 1-3.

B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction 10/10/90 Completion of Construction 11/10/90

C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

The estimated costs for the subject system is \$171,000. For breakdown, please refer to Appendix F of the attached report.

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

This is a new source.

E. Requested permitted equipment operating time: hrs/day____; days/wk____; wks/yr____
if power plant, hrs/yr____; if seasonal, describe:_____
25 hours/month - 12 months/year

F. If this is a new source or major modification, answer the following questions.
(Yes or No)

1. Is this source in a non-attainment area for a particular pollutant? Yes
 - a. If yes, has "offset" been applied? N/A
 - b. If yes, has "Lowest Achievable Emission Rate" been applied? N/A
 - c. If yes, list non-attainment pollutants. Ozone and V.O.C. Regulated
2. Does best available control technology (BACT) apply to this source?
If yes, see Section VI. No
3. Does the State "Prevention of Significant Deterioration" (PSD)
requirement apply to this source? If yes, see Sections VI and VII. No
4. Do "Standards of Performance for New Stationary Sources" (NSPS)
apply to this source? No
5. Do "National Emission Standards for Hazardous Air Pollutants"
(NESHAP) apply to this source? No

- H. Do "Reasonably Available Control Technology" (RACT) requirements apply
to this source? No
- a. If yes, for what pollutants? N/A
 - b. If yes, in addition to the information required in this form,
any information requested in Rule 17-2.650 must be submitted.

Attach all supportive information related to any answer of "Yes". Attach any justifi-
cation for any answer of "No" that might be considered questionable.

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

Raw Materials and Chemicals Used in your Process, if applicable:

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		
N/A				

Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lbs/hr): N/A

2. Product Weight (lbs/hr): N/A

Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

For additional detail see attached report Appendix D.

Name of Contaminant	Emission ¹		Allowed Emission Rate per Rule 17-2	Allowable Emission ³ lbs/hr * mg/m ³	Potential ⁴ Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual lbs/yr			lbs/hr	lbs/yr	
Benzene	0.0313	9.4	N/A	0.208	0.0313	274.2	N/A
Toulene	0.0560	16.8	N/A	52.0	0.0560	490.6	N/A
Ethylbenzene	0.0	0.0	N/A	30.2	0.0	0.0	N/A
Xylene	0.0188	5.6	N/A	30.2	0.0188	164.7	N/A
MTBE	1.62	486.0	N/A	34.7	1.62	14,191.2	N/A

See Section V, Item 2.

Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, . (1) - 0.1 pounds per million BTU heat input)

Calculated from operating rate and applicable standard.

Emission, if source operated without control (See Section V, Item 3).

* The Allowable Emission (lb/hr) is the intermittent Allowable Ambient Concentration Levels (AAC in Appendix D).

Control Devices: (See Section V, Item 4)

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)
N/A				

Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
N/A			

*Units: Natural Gas--MMCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, other--lbs/hr.

Analysis: N/A
 Percent Sulfur: N/A Percent Ash: N/A
 Density: N/A lbs/gal Typical Percent Nitrogen: N/A
 Heat Capacity: N/A BTU/lb N/A BTU/gal
 Major Fuel Contaminants (which may cause air pollution): N/A

If applicable, indicate the percent of fuel used for space heating.

Annual Average N/A Maximum N/A

Indicate liquid or solid wastes generated and method of disposal.

N/A

Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: 25 ft. Stack Diameter: 0.5 ft.
 Flow Rate: 200 ACFM 190.5 DSCFM Gas Exit Temperature: 85°F °F.
 Water Vapor Content: Saturated % Velocity: 17.0 FPS

SECTION IV: INCINERATOR INFORMATION

Type of Waste	Type 0 (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Waste Incinerated	N/A						
Waste Controlled							

Description of Waste N/A
 Actual Weight Incinerated (lbs/hr) N/A Design Capacity (lbs/hr) N/A
 Approximate Number of Hours of Operation per day N/A day/wk N/A wks/yr. N/A
 Manufacturer N/A
 Constructed N/A Model No. N/A

	Volume (ft) ³	Heat Release (BTU/hr)	Fuel		Temperature (°F)
			Type	BTU/hr	
Primary Chamber	N/A				
Secondary Chamber					

Stack Height: N/A ft. Stack Diameter: N/A Stack Temp. N/A
 Flow Rate: N/A ACFM N/A DSCFM* Velocity: N/A FPS

If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air. N/A

Type of pollution control device: Cyclone Wet Scrubber Afterburner
 Other (specify) _____

Brief description of operating characteristics of control devices: N/A

Estimate disposal of any effluent other than that emitted from the stack (scrubber water, etc.):

N/A

Note: Items 2, 3, 4, 6, 7, 8, and 10 in Section V must be included where applicable.

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

Total process input rate and product weight -- show derivation [Rule 17-2.100(127)]

To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.

Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).

With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, design pressure drop, etc.)

With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3 and 5 should be consistent: actual emissions = potential (1-efficiency).

An 8 1/2" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.

An 8 1/2" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Example: Copy of relevant portion of USGS topographic map).

An 8 1/2" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.

Form 17-1.202(1)

Effective November 30, 1982

The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.

With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit.

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

N/A

[] Yes [] No

Contaminant

Rate or Concentration

N/A

Has EPA declared the best available control technology for this class of sources (If yes, attach copy)

[] Yes [] No N/A

Contaminant

Rate or Concentration

N/A

What emission levels do you propose as best available control technology?

Contaminant

Rate or Concentration

N/A

Describe the existing control and treatment technology (if any). N/A

1. Control Device/System:

2. Operating Principles:

3. Efficiency:*

4. Capital Costs:

Main method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

Contaminant

Rate or Concentration

N/A

10. Stack Parameters N/A

a. Height:

ft.

b. Diameter:

ft.

c. Flow Rate:

ACFM

d. Temperature:

°F.

e. Velocity:

FPS

Describe the control and treatment technology available (As many types as applicable, use additional pages if necessary).

1. N/A

a. Control Device:

b. Operating Principles:

c. Efficiency:¹

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:²

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

2. N/A

a. Control Device:

b. Operating Principles:

c. Efficiency:¹

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:²

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

plain method of determining efficiency.

ergy to be reported in units of electrical power - KWH design rate.

.. Applicability to manufacturing processes:

.. Ability to construct with control device, install in available space, and operate within proposed levels:

.. N/A

. Control Device: b. Operating Principles:

. Efficiency:¹ d. Capital Cost:

. Useful Life: f. Operating Cost:

. Energy:² h. Maintenance Cost:

. Availability of construction materials and process chemicals:

. Applicability to manufacturing processes:

. Ability to construct with control device, install in available space, and operate within proposed levels:

. N/A

. Control Device: b. Operating Principles:

. Efficiency:¹ d. Capital Costs:

. Useful Life: f. Operating Cost:

. Energy:² h. Maintenance Cost:

. Availability of construction materials and process chemicals:

. Applicability to manufacturing processes:

. Ability to construct with control device, install in available space, and operate within proposed levels:

Describe the control technology selected: N/A

. Control Device: 2. Efficiency:¹

. Capital Cost: 4. Useful Life:

. Operating Cost: 6. Energy:²

. Maintenance Cost: 8. Manufacturer:

. Other locations where employed on similar processes:

. (1) Company:

2) Mailing Address:

3) City: (4) State:

Main method of determining efficiency.

Efficiency to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:¹

Contaminant

Rate or Concentration

N/A

(8) Process Rate:¹

b. (1) Company: N/A

(2) Mailing Address:

(3) City:

(4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:¹

Contaminant

Rate or Concentration

N/A

(8) Process Rate:¹

10. Reason for selection and description of systems: N/A

Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION

Company Monitored Data N/A

1. _____ no. sites _____ TSP _____ () SO²+ _____ Wind spd/dir

Period of Monitoring _____ / _____ / _____ to _____ / _____ / _____
month day year month day year

Other data recorded _____

Attach all data or statistical summaries to this application.

Specify bubbler (B) or continuous (C).

2. Instrumentation, Field and Laboratory N/A

a. Was instrumentation EPA referenced or its equivalent? [] Yes [] No

b. Was instrumentation calibrated in accordance with Department procedures?

[] Yes [] No [] Unknown

Meteorological Data Used for Air Quality Modeling N/A

1. ____ Year(s) of data from ____/____/____ to ____/____/____
month day year month day year

2. Surface data obtained from (location) _____

3. Upper air (mixing height) data obtained from (location) _____

4. Stability wind rose (STAR) data obtained from (location) _____

Computer Models Used N/A

1. _____ Modified? If yes, attach description.

2. _____ Modified? If yes, attach description.

3. _____ Modified? If yes, attach description.

4. _____ Modified? If yes, attach description.

Attach copies of all final model runs showing input data, receptor locations, and principle output tables.

Applicants Maximum Allowable Emission Data N/A

Pollutant	Emission Rate
TSP	_____ grams/sec
SO ²	_____ grams/sec

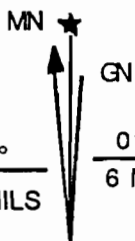
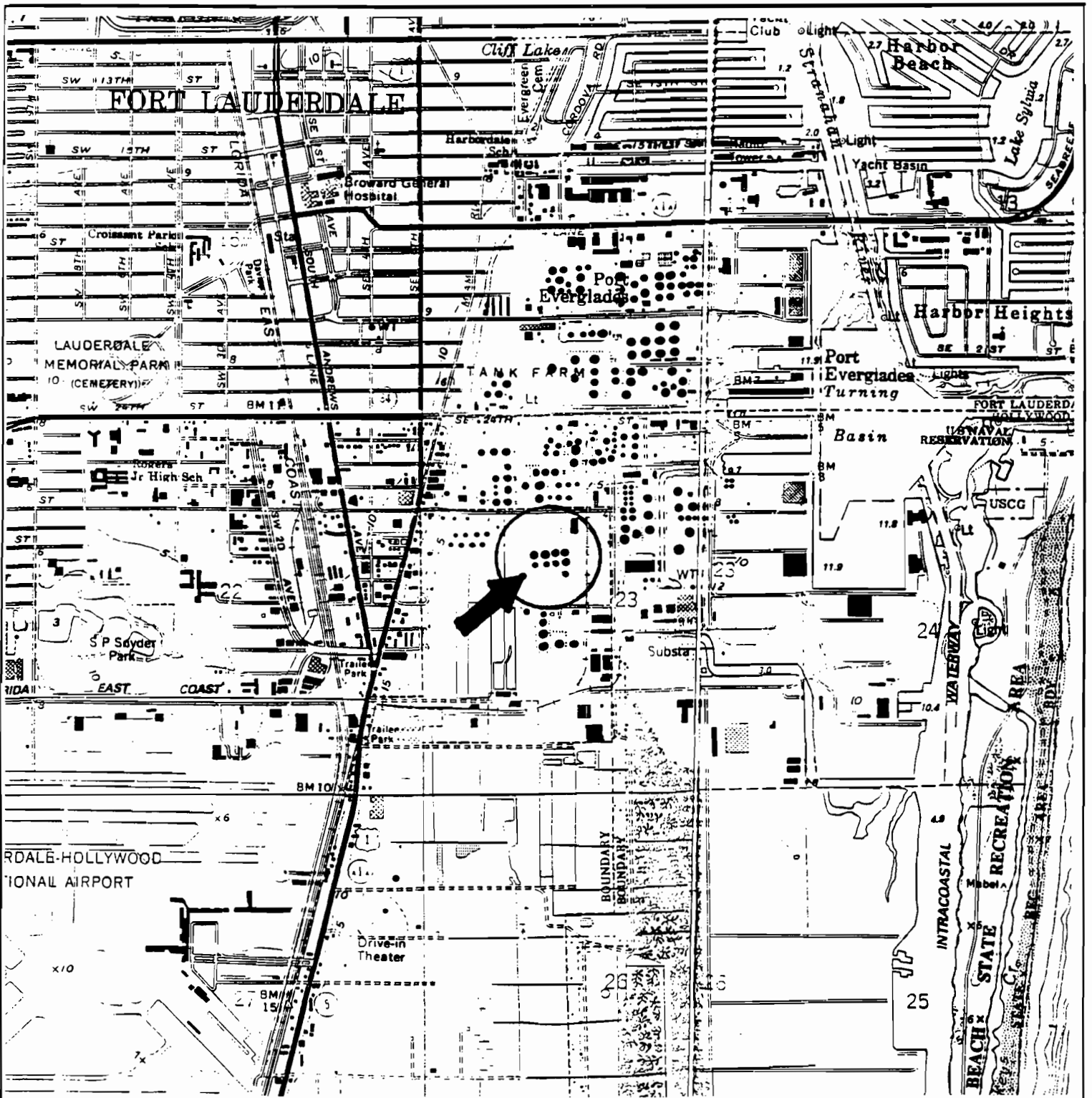
Emission Data Used in Modeling N/A

Attach list of emission sources. Emission data required is source name, description of point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

Attach all other information supportive to the PSD review. N/A

Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e., jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources. N/A

Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology. N/A



UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SCALE 1:24000

1 MILE

0°21'
6 MILS

FT. LAUDERDALE SOUTH QUADRANGLE 4000 FEET
FLORIDA-BROWARD COUNTY
7.5 MINUTE SERIES (TOPOGRAPHIC)

1 KILOMETER

IT INTERNATIONAL
TECHNOLOGY
CORPORATION
ENVIRONMENTAL SERVICES, INC.

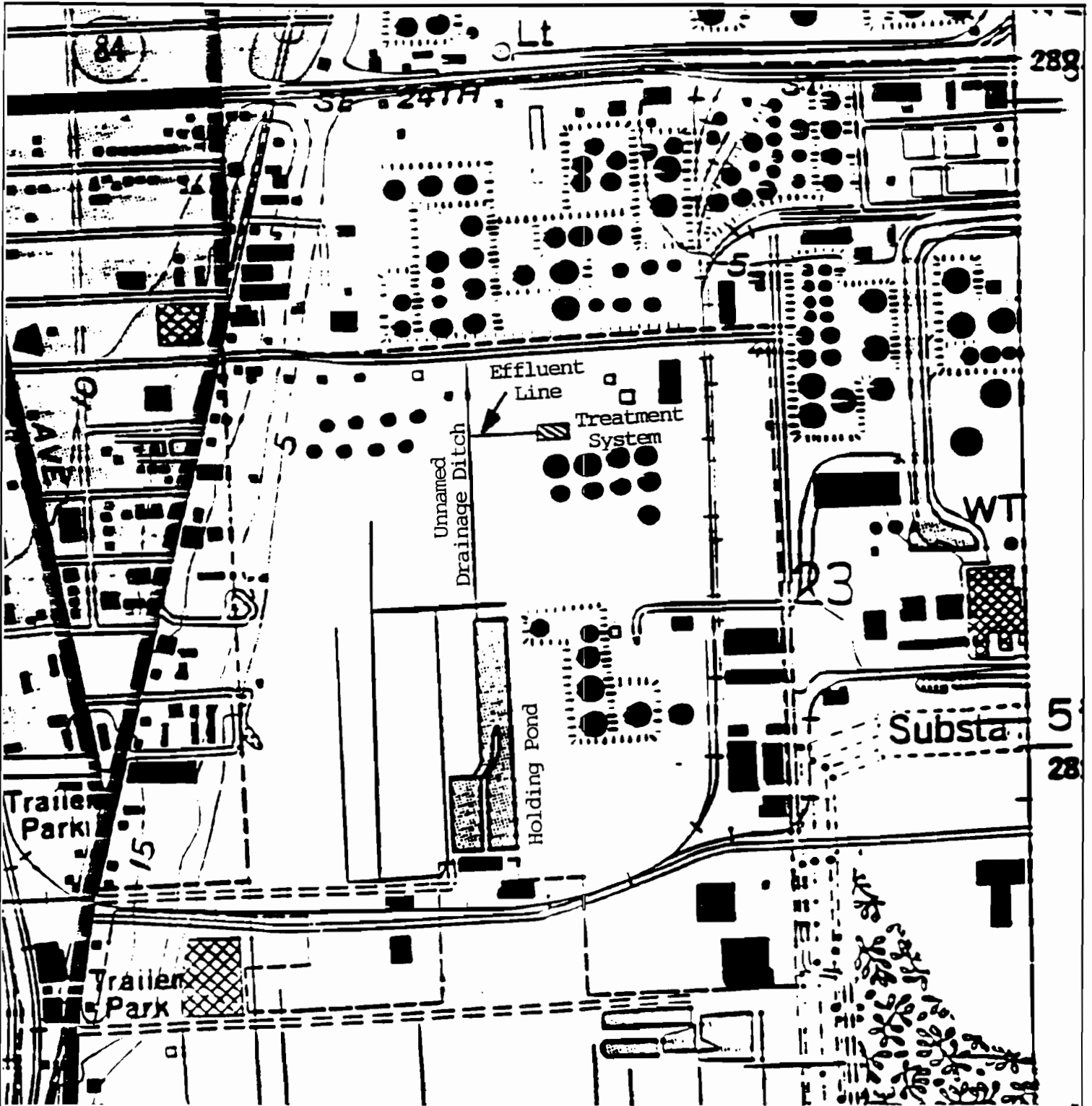
INDEX MAP
Star Enterprise Port Everglades
Bulk Storage Facility

Date: 8/15/90

Revised by: FLW

Project# 585148

Scale: 1:24000



UNITED STATES
 DEPARTMENT OF THE INTERIOR
 GEOLOGICAL SURVEY

FT. LAUDERDALE SOUTH QUADRANGLE
 FLORIDA-BROWARD COUNTY
 7.5 MINUTE SERIES (TOPOGRAPHIC -NOT TO SCALE)



INTERNATIONAL
 TECHNOLOGY
 CORPORATION
 ENVIRONMENTAL SERVICES, INC.

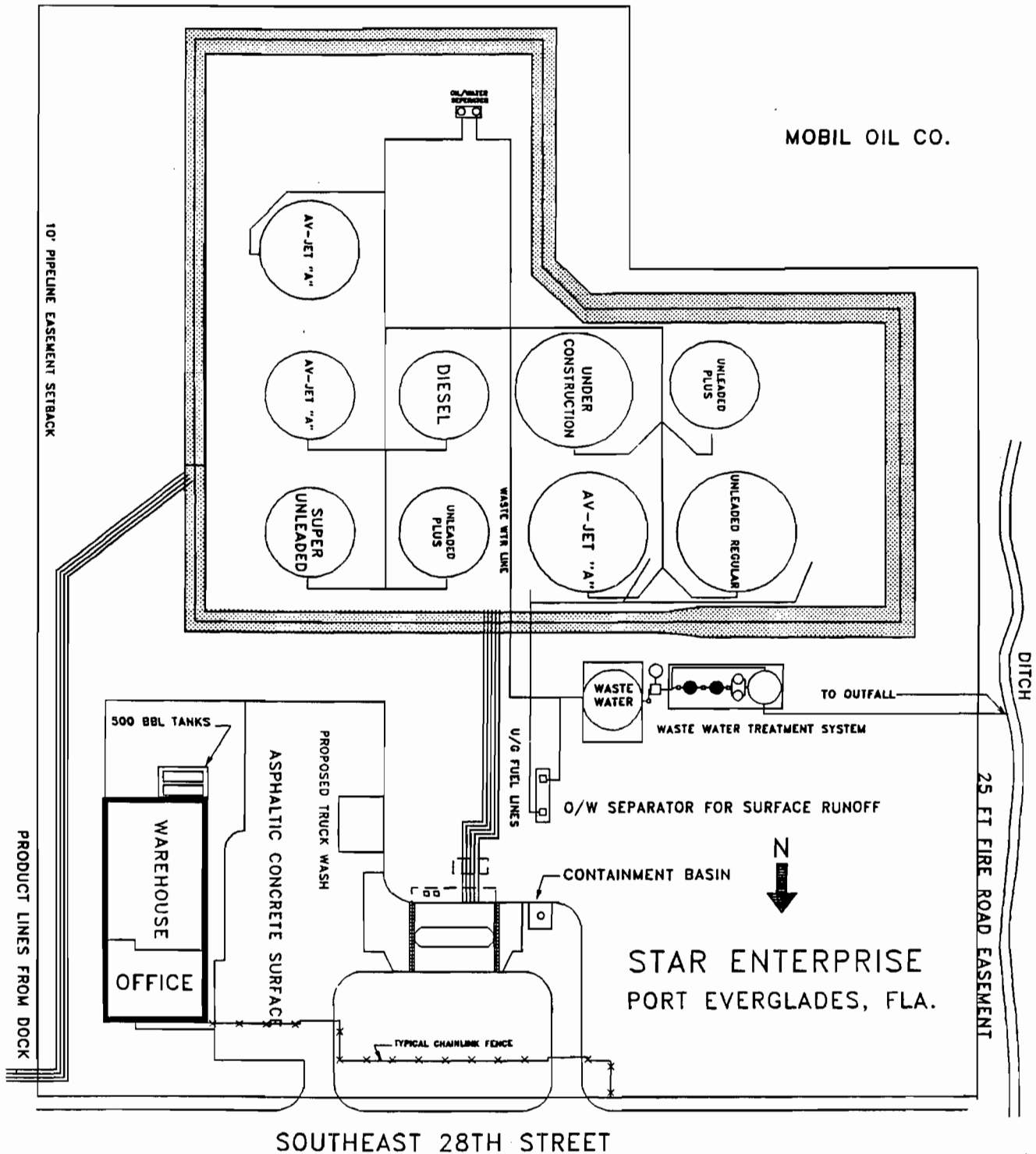
DRAINAGE DETAIL
 Star Enterprise Port Everglades
 Bulk Storage Facility


Date: 8/15/90

Revised by: FLW

Project# 585148

Scale: NONE



 INTERNATIONAL TECHNOLOGY CORPORATION	DATE: 7-18-90	DRAWN BY: SBD/DPB/JPB
	SCALE: 1"=100'	PROJECT NO: 585148

July 11, 1990



Wastewater Treatment Plan

Star Enterprise Port Everglades
Bulk Storage Facility
1200 S.W. 28th Street
Fort Lauderdale, Florida

ENVIRONMENTAL ENGINEERING
AND
SERVICES PROJECT 585-148

Prepared By:

James P. Bowen
Project Manager

Prepared By:

Dennis Boudreaux
Project Engineer

INTRODUCTION

Star Enterprise is preparing to treat accumulated bottom water from above ground bulk storage tanks at their Port Everglades Storage Facility. The proposed system is designed to return this contaminated bottom water to concentrations well below the standards indicated in Chapter 17-3 (Florida Administrative Code) for Class III surface waters. Once these standards are met the decontaminated water would be ready for release. The discharge point for this water is a holding pond south of the facility that would be reached through existing surface drainage structures. This process will be accomplished while staying within the Acceptable Ambient Concentration Levels as stated by the Florida Department of Environmental Regulations.

WASTEWATER TREATMENT

This water treatment system has been designed specifically for the use in this situation and will be maintained solely for the purposes mentioned here. The system has been designed by IT Corporation based on the data collected under an approved Quality Assurance Project Plan (GQAPP #427087G). This analytical data is presented in Table 1 along with target effluent levels.

Table 1
Tank-Bottom Water Analytical Results
Influent-Effluent Criteria

	<u>Influent</u>	<u>Class III Surface Water Standards</u>	<u>Target Effluent Levels</u>
benzene	5,000 ppb	none	< 1.0 ppb
BTEX	16,100 ppb	200 ppb	< 50.0 ppb
m-tert-butyl-ether	260,000 ppb	none	< 50.0 ppb
phenol	15,000 ppb	1.0 ppb	< 1.0 ppb
2-nitrophenol	21,000 ppb	1.0 ppb	< 1.0 ppb
2,4-dichlorophenol	28,000 ppb	1.0 ppb	< 1.0 ppb
2-chlorophenol	7,100 ppb	1.0 ppb	< 1.0 ppb
4-chloro-3 -methylphenol	18,000 ppb	1.0 ppb	<1.0 ppb
recoverable petr. hydrocarbons	4,400 ppm	5 ppm	<5.0 ppm

The combination of air stripping and carbon adsorption is recognized as one of the best techniques for returning contaminated water back to drinking water standards. Therefore it is this combination that becomes the main component of the system. Before reaching this part of the system the contaminate must pass through an oil water separator. The liquid phase hydrocarbons will be separated and then returned to the refinery for reprocessing. From here the separated water will enter two air stripping towers set in series. These towers will then reduce the volatile organic contaminants to levels below those required for Class III surface waters as indicated in the Target Effluent Levels in Table 1. . Once the V.O.C.s are removed, a carbon adsorption system will be used to remove the residual organic contaminants and non volatile compounds. This system is composed of four 55 gallon canisters, containing 165 pounds each of activated carbon, and will be arranged in series. Sample points between canisters will facilitate early detection of contaminant breakthrough. Figures 1 through 4 are scaled engineering drawings depicting the design of each aspect of the treatment system. The water will be treated in a batch process. The treatment process will transfer the water from an existing 63,000 gallon bottom water collection tank to a proposed 25,000 gallon holding tank. The average accumulation of bottom water is 15,000 gallons per month. Considering the relatively small volume of water, 25 hours per month will be required to process the water through the treatment system into the proposed holding tank. The water will remain in this holding tank until sample analyses results are received and verified as acceptable for discharge. Once verified for discharge the water will be drained into existing drainage structure at a rate that will not disturb the surrounding environment

OPERATIONS AND MAINTENANCE

The water treatment system will only run once per month for approximately 25 hours, to process the 15,000 gallons of collected tank bottom water. The day the system is to be run experienced technicians from IT Corporation will prepare the treatment system for operations, record the time, and start up the system. The following day, qualified scientists from IT Corporation will return to the site to secure the system for down time. This will include disconnecting electrical service from the system, and taking samples from the holding tank and the carbon adsorption system for

the appropriate analyses.

The results shown in Table 2 are the contaminant concentrations levels that must be met before the water is released ..

Table 2
Tank-Bottom Water Analytical Results
Recirculation Criteria

	<u>Concentration</u>
BTEX	50.0 ppb
naphthalene	10.0 ppb
recoverable petr. hydrocarbons	5.0 ppm
phenol	1.0 ppb
Lead	50.0 ppb

Analyses above these levels will prompt the water to be recirculated through the treatment system to lower the contaminant levels to below target levels. The effluent valve will be kept locked at all times, except when discharges have been approved. Access to this valve, flow/totalizer readings, maintenance performed to the system and pertinent analyses will be documented in a system log kept on site at all times. Copies of the systems logs, sample documentation and analyses will be made available upon request.

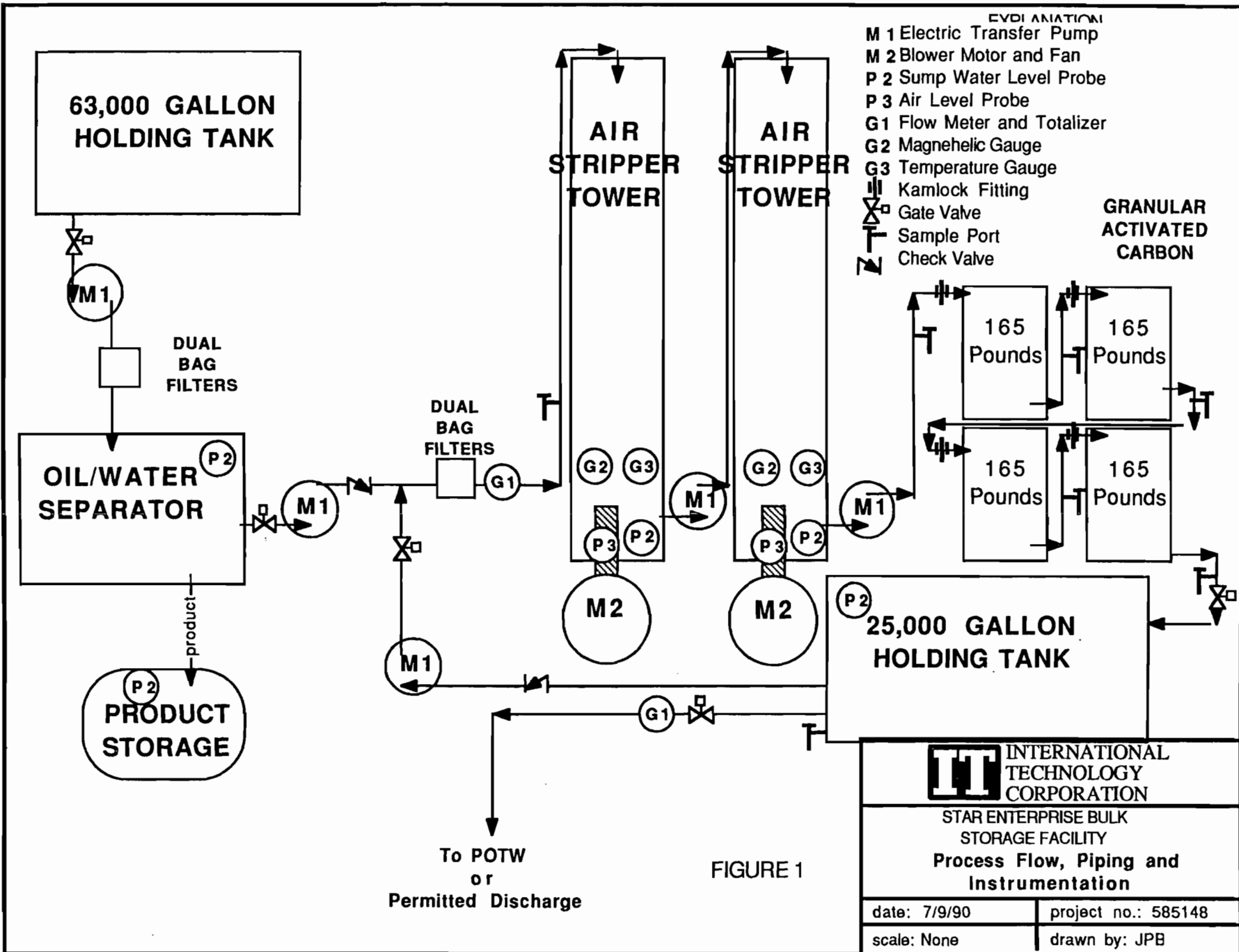


FIGURE 1

IT INTERNATIONAL TECHNOLOGY CORPORATION

STAR ENTERPRISE BULK STORAGE FACILITY
 Process Flow, Piping and Instrumentation

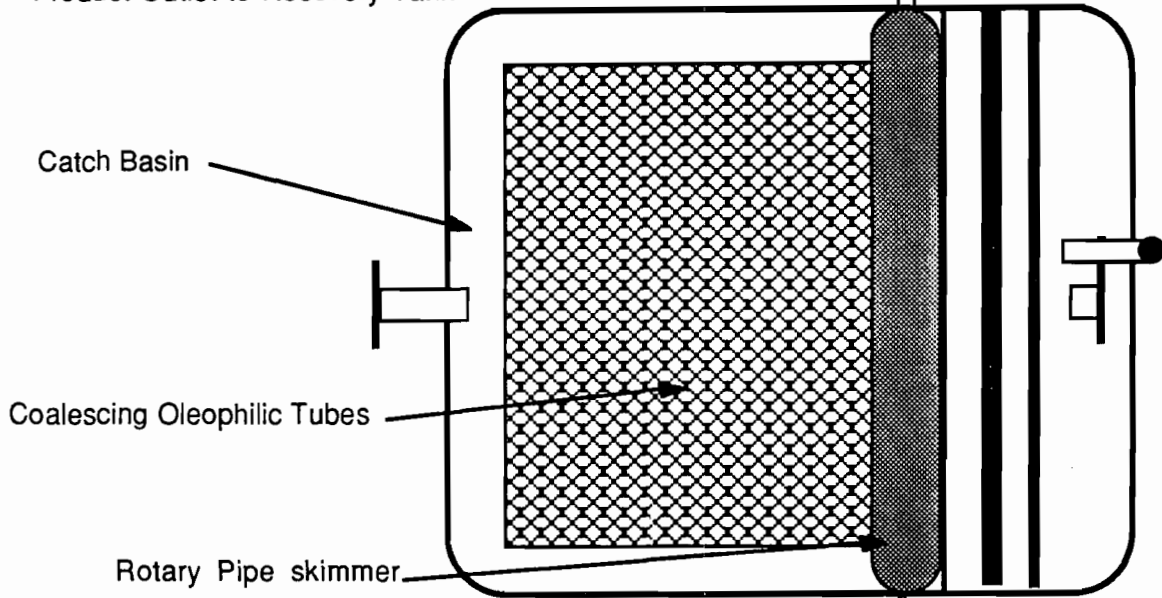
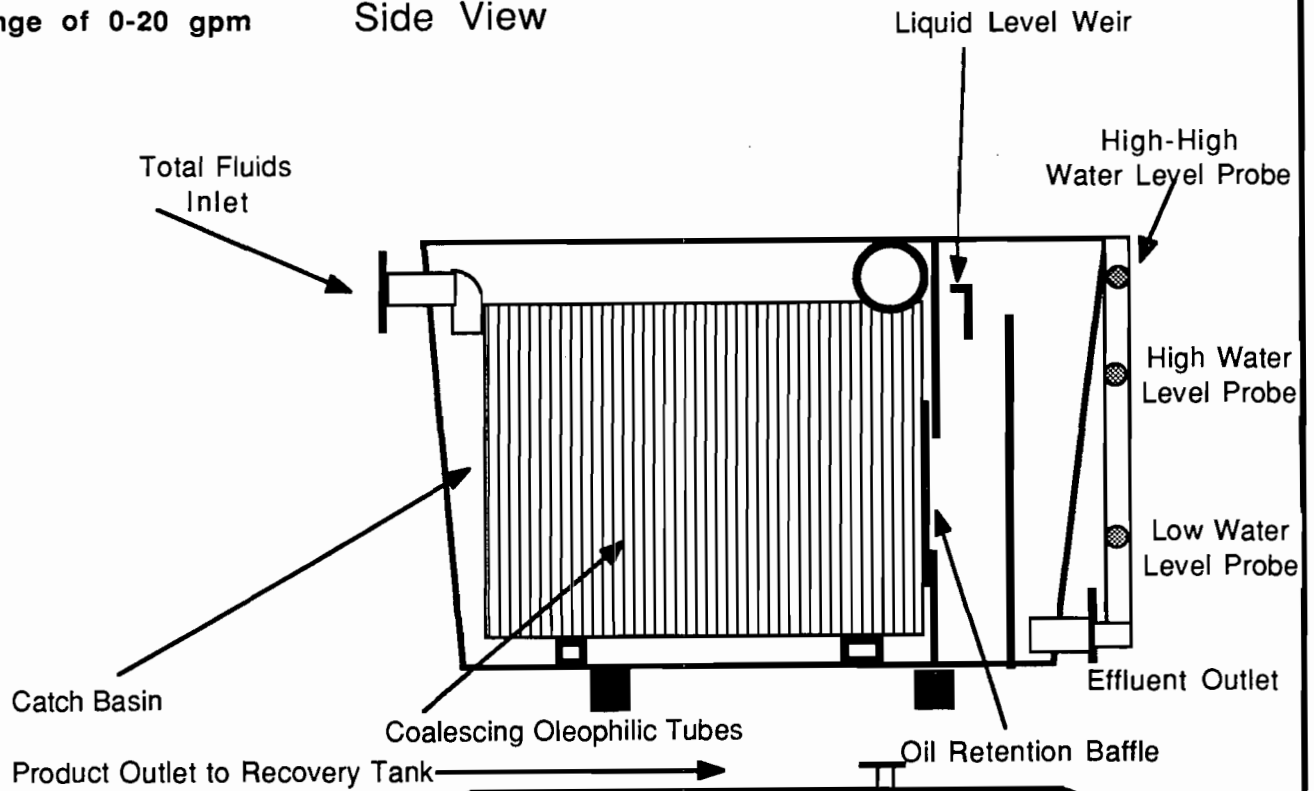
date: 7/9/90	project no.: 585148
scale: None	drawn by: JPB

NEPCCO MODEL:

OPS-010-020

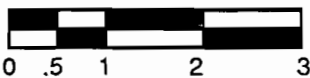
Flow Range of 0-20 gpm

Side View



Plan View

Scale
(Feet)



INTERNATIONAL
TECHNOLOGY
CORPORATION

STAR ENTERPRISE BULK
STORAGE FACILITY

Oil-Water Separator

Figure 2.

Date : 6-26-90

Drawn By: SMD

Scale: 1"=2'

Project No.: 585163



INTERNATIONAL
TECHNOLOGY
CORPORATION

TEXACO PORT EVERGLADES BULK
STORAGE FACILITY
AIR STRIPPER TOWER

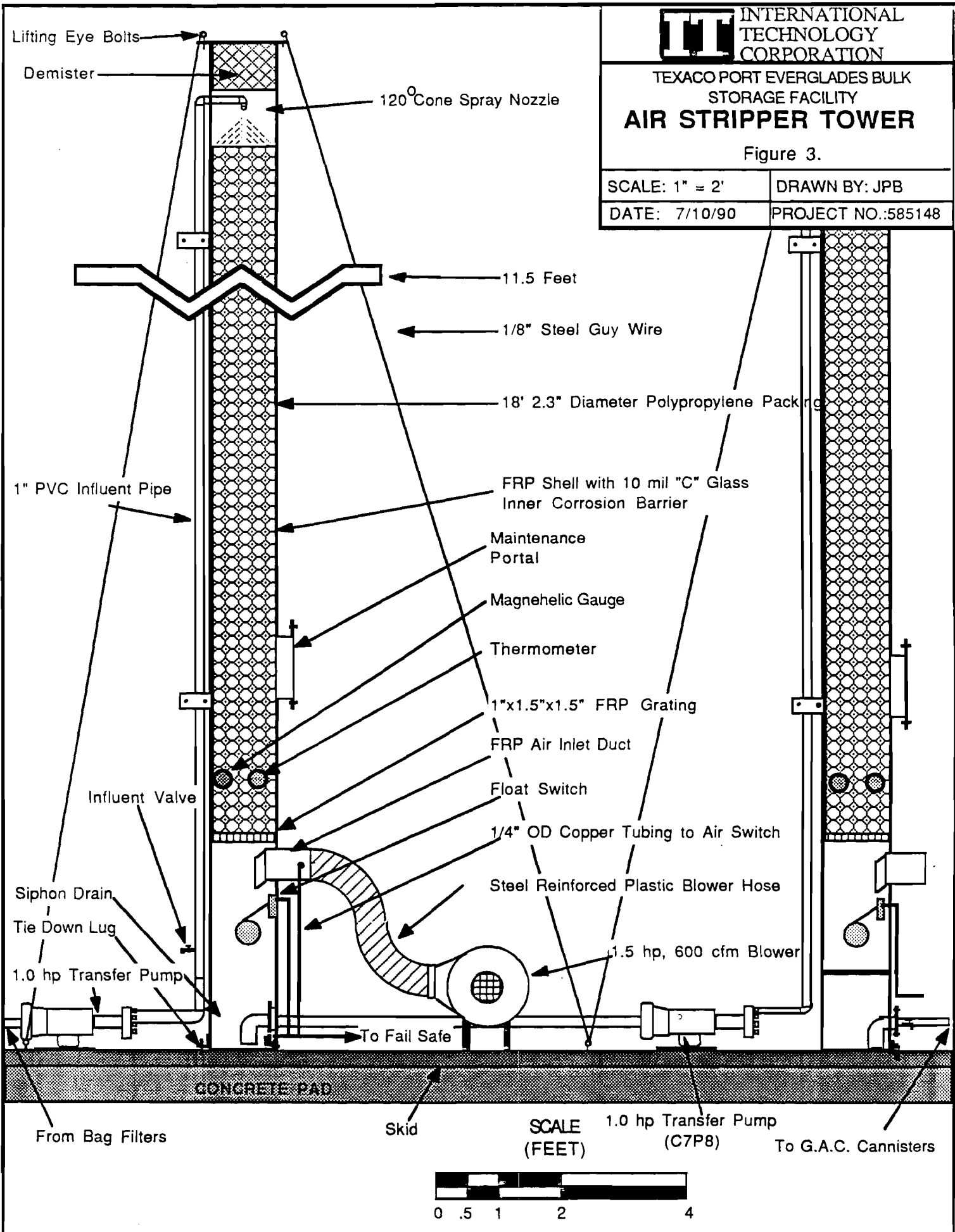
Figure 3.

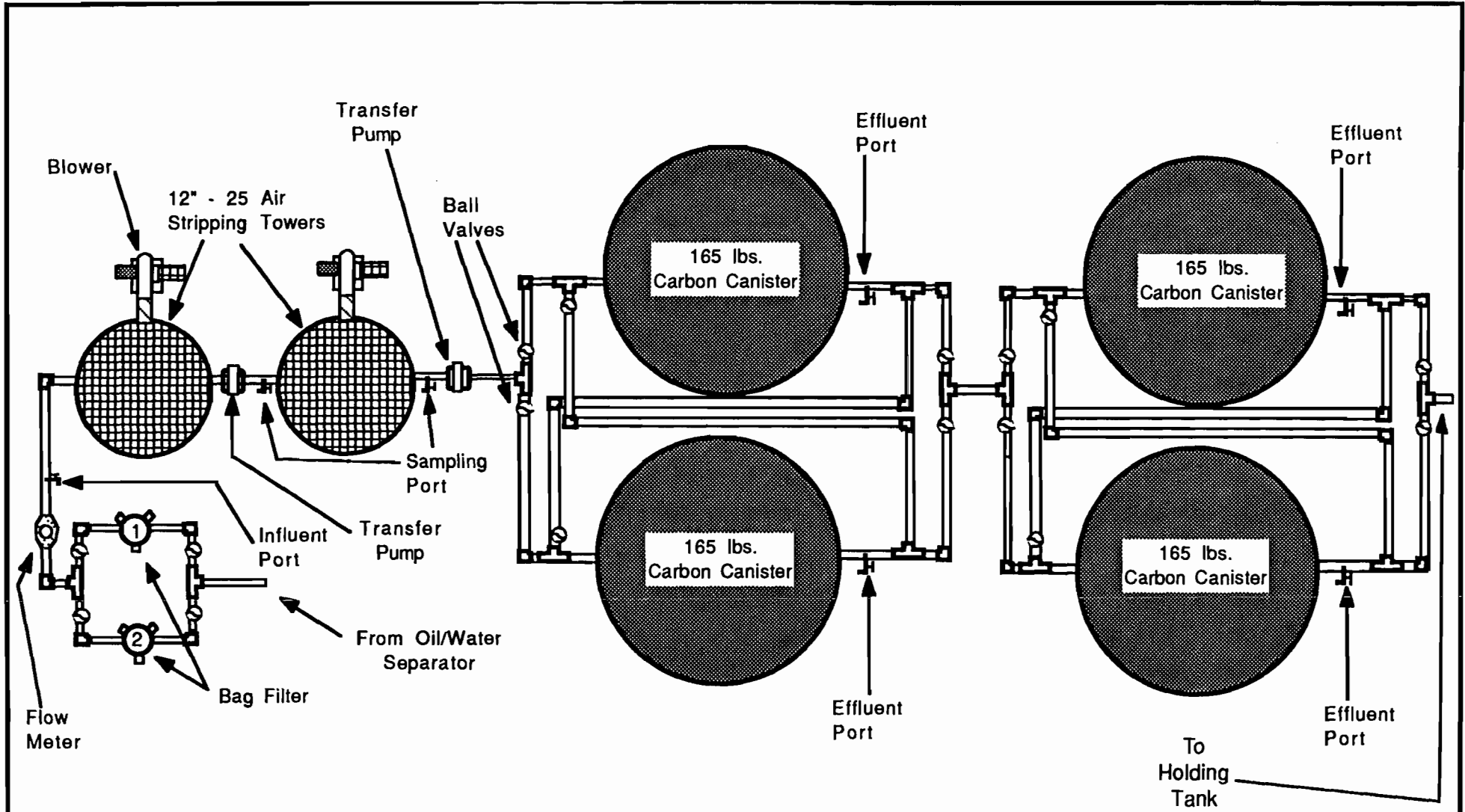
SCALE: 1" = 2'

DRAWN BY: JPB

DATE: 7/10/90

PROJECT NO.: 585148





SCALE
(Feet)

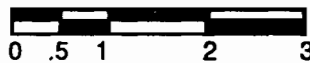


FIGURE 4.



INTERNATIONAL
TECHNOLOGY
CORPORATION

STAR ENTERPRISE BULK
STORAGE FACILITY
**AIR STRIPPING/
CARBON ADSORPTION**
PROCESS FLOW AND PIPING

SCALE: 1" = 2'

REVISED BY: JPB

DATE: 7/18/90

PROJECT NO.: 585162

APPENDIX A

CARBON POLISHING DESIGN

Given

Surface Loading Rate = 2 gpm/ft²

EBCT Target = 15 min.

Flow Rate = 10 gpm

Carbon Density 27 lb/ft³

Carbon Loading Rate = .074 lbs Phenol/lb Carbon

Phenol Concentration 15,000 ppb

REQUIRED VOLUME

$$V = \frac{(15)(10)}{7.485} = 20.04 \text{ ft}^3$$

WEIGHT OF CARBON

$$(20.04)(27) = 541.08 \text{ lbs}$$

Use 4-165 pound 55 gallon canisters in series,

CARBON USEAGE

15,000 ppb = 15 ppm = 15 mg/l

$$15 \text{ mg/l} (8.34) \text{ lbs/1,000,000} = .125 \times 10^{-3}$$

$$(.125 \times 10^{-3} \text{ lb/gal}) (10 \text{ gal/min}) (60 \text{ min/hr}) (24 \text{ hr/day}) = 1.80 \text{ lb/day}$$

$$\frac{1.8}{.074} = 24.3 \text{ lbs/day}$$

$$\frac{165}{24.3} = 6.79 \text{ days of continuous useage per 55 gal canister}$$

APPENDIX B

TOTAL DYNAMIC HEAD (TDH)

LOCATION: COLLECTION TANK TO OIL/WATER SEPARATOR

Q	=	10				
D	=	2.06				
			No.	Fittings	K	No. X K
A	=	0.023	10	90 Ells	0.75	7.5
Q in CFS	=	0.022	0	45 Ells	0.35	0
			1	T Branch	0.40	0.4
V	=	0.96	1	Gate Val-F0	0.17	0.17
			0	Gate Val-.5	0.90	0
Vel. Head	=	1.00E-02	0	Check Valve	10.00	0
			0	Flow Meter	10.00	0
Reynolds No.		15562			TOTAL	8.07
f	=	0.028	Sumation of (K)	=		21.12
L	=	80	Frictional Head Loss	=		0.3
K	=	13.05	Additional Head Losses due to Friction			

Spray Nozzle	=	0
Greensand Filter	=	0
Static Mixer	=	0
Carbon Canister	=	0
Bag Filter	=	12
Total	=	12

Head Loss due to Friction = 12.3
 Head Loss due to Friction with 20% Safety Factor = 14.76

Total Change in Elevation
 Height to Tower Inlet = 4.00
 Depth to Water Level = 0.00

 Total = 4.00

Sum of Head Losses and Total Change in Elevation (TDH)

TDH = 18.76



By DPB Date 7/18/90 Subject PORT EVERGLADES TERM Sheet No. 1 of 1
 Chkd. By _____ Date _____ Proj. No. 585148

COLLECTION TANK TO OIL/WATER SEPARATOR

ASSUMPTIONS:

80' OF 2" PVC PIPE
 10 ELBOWS -
 #

GIVEN:

FLOW RATE - 10 GPM
 BAG FILTER - 12 FOOT HEADLOSS
 $\Delta P = 5 \text{ PSI}$

TDH - 19'

THIS PUMP WILL HAVE TO BE POSITIVE
 DISPLACEMENT TO PREVENT EMULSIFICATION
 THEREFORE:

CH&E 5410 (STATIONARY)
 MODEL

TOTAL DYNAMIC HEAD (TDH)

LOCATION: OIL/WATER SEPARATOR TO FIRST TOWER

Q = 10
D = 2.06

		No.	Fittings	K	No. X	K
A =	0.023	6	90 Ells	0.75		4.5
Q in CFS =	0.022	0	45 Ells	0.35		0
		0	T Branch	0.40		0
V =	0.96	1	Gate Val-F0	0.17		0.17
		0	Gate Val-.5	0.90		0
Vel. Head =	1.00E-02	0	Check Valve	10.00		0
		1	Flow Meter	10.00		10
Reynolds No.	15562			TOTAL		14.67

f = 0.028 Sumation of (K) = 22.83

L = 50 Frictional Head Loss = 0.33

K = 8.16 Additional Head Losses due to Friction

Spray Nozzle	=	23
Greensand Filter	=	0
Static Mixer	=	0
Carbon Canister	=	0
Bag Filter	=	12
Total	=	35

Head Loss due to Friction = 35.33

Head Loss due to Friction
with 20% Safety Factor = 42.4

Total Change in Elevation
Height to Tower Inlet = 20.00

Total = 20.00

Sum of Head Losses and Total Change in Elevation (TDH)

TDH = 62.4



By DPB Date 7/18/90 Subject PORT EVERGLADES TERM Sheet No. 1 of 1
 Chkd. By _____ Date _____ Proj. No. 58548

OIL/WATER SEPERATOR TO FIRST TOWER

ASSUMPTIONS:

- (1) FLOODED SUCTION
- (2) 50' OF 2" PVC PIPE
- (3) 6 ELBOWS

GIVEN:

- (1) FLOW RATE: 10 gpm
- (2) BAG FILTER: 1 ($\Delta P = 5 \text{ psi}$)
- (3) NOZZLE: 1 ($\Delta P = 10 \text{ psi}$)
- (4) FLOW METER: 1
- (5) HEIGHT OF TOWER: 20'

$$\text{TDH} = 62.4$$

CHOOSE: STA-RITE INDUSTRIAL Pump

PERFORMANCE CURVE SHOWS APPROXIMATELY
70' HEAD AT 10 gpm

TOTAL DYNAMIC HEAD (TDH)

LOCATION: FIRST TOWER TO SECOND TOWER

Q	=	10						
D	=	2.06						
			No.	Fittings	K	No. X	K	
A	=	0.023	6	90 Ells	0.75		4.5	
Q in CFS=		0.022	0	45 Ells	0.35		0	
			0	T Branch	0.40		0	
V	=	0.96	0	Gate Val-F0	0.17		0	
			0	Gate Val-.5	0.90		0	
Vel. Head =		1.00E-02	0	Check Valve	10.00		0	
			0	Flow Meter	10.00		0	
Reynolds No.		15562			TOTAL		4.5	
f	=	0.028		Sumation of (K)	=		10.21	
L	=	35		Frictional Head Loss =			0.15	
K	=	5.71		Additional Head Losses due to Friction				

Spray Nozzle	=	23
Greensand Filter	=	0
Static Mixer	=	0
Carbon Canister	=	0
Bag Filter	=	0
Total	=	23

Head Loss due to Friction = 23.15
 Head Loss due to Friction with 20% Safety Factor = 27.78

Total Change in Elevation
 Height to Tower Inlet = 20.00
 Depth to Water Level = 0.00

 Total = 20.00

Sum of Head Losses and Total Change in Elevation (TDH)

TDH = 47.78



By DPB Date 7/18/90 Subject PORT EVERGLADES TERN Sheet No. 1 of 1
 Chkd. By _____ Date _____ Proj. No. 595148

FIRST TOWER TO SECOND TOWER

ASSUMPTIONS:

- (1) FLOODED SUCTION
- (2) 35' OF 2" PVC PIPE
- (3) 6 ELBOWS

GIVEN:

- (1) FLOW RATE: 10 gpm
- (2) NOZZLE: $\Delta P = 10 \text{ psi} = 23'$
- (3) HEIGHT TO TOWER INLET: 20'

$TDH = 47.98$

CHOOSE: STA-RITE INDUSTRIAL PUMP

CT WITH 3.7 IMPELLER
 PERFORMANCE CURVE SHOWS APPROXIMATELY
 54' HEAD AT 10 gpm.

TOTAL DYNAMIC HEAD (TDH)

LOCATION: SECOND TOWER TO HOLDING TANK

Q = 10
D = 2.06

		No.	Fittings	K	No. X	K
A	=	0.023	30	90 Ells	0.75	22.5
Q in CFS	=	0.022	0	45 Ells	0.35	0
			0	T Branch	0.40	0
V	=	0.96	1	Gate Val-FO	0.17	0.17
			0	Gate Val-.5	0.90	0
Vel. Head	=	1.00E-02	0	Check Valve	10.00	0
			0	Flow Meter	10.00	0
Reynolds No.		15562			TOTAL	22.67

f = 0.028 Sumation of (K) = 43.06

L = 125 Frictional Head Loss = 0.62

K = 20.39 Additional Head Losses due to Friction

Spray Nozzle	=	0
Greensand Filter	=	0
Static Mixer	=	0
Carbon Canister	=	0
Bag Filter	=	0
Total	=	0

Head Loss due to Friction = 0.62

Head Loss due to Friction
with 20% Safety Factor = 0.74

Total Change in Elevation
Height to Canister Inlet = 12.00
Height to Tank Inlet = 25.00
Pressure Drop/Canister = 4.33

Total = 41.33

Sum of Head Losses and Total Change in Elevation (TDH)

TDH = 42.07



By DPB Date 7/18/90 Subject PORT EVERGLADES TERM Sheet No. 1 of 1
 Chkd. By _____ Date _____ Proj. No. 595148

SECOND TOWER TO HOLDING TANK

ASSUMPTIONS:

- (1) FLOODED SUCTION
- (2) 125' OF 2" PVC PIPE
- (3) 30 ELBOWS
- (4) ONE VALVE

GIVEN:

FLOW RATE: 10 gpm
 FOUR (4) CARBON CANISTERS IN "SERIES" ($\Delta P = 13" H_2O / CAN$)
 HEIGHT OF CANISTERS: 3'
 HEIGHT TO WATER INLET ON TANK: 25'

$$TDA = 42.07$$

CHOOSE: STA-RITE INDUSTRIAL Pump

C7 WITH 3.7 IMPELLER
 PERFORMANCE CURVE SHOWS APPROXIMATELY
 54' HEAD AT 10 gpm

TOTAL DYNAMIC HEAD (TDH)

LOCATION: HOLDING TANK TO FIRST TOWER

Q = 10
D = 2.06

		No.	Fittings	K	No. X	K
A	=	8	90 Ells	0.75		6
Q in CFS	=	0	45 Ells	0.35		0
		0	T Branch	0.40		0
V	=	1	Gate Val-FO	0.17	0.17	
		0	Gate Val-.5	0.90		0
Vel. Head	=	0	Check Valve	10.00		0
		1	Flow Meter	10.00		10
Reynolds No.				TOTAL		16.17

f = 0.028 Sumation of (K) = 40.64

L = 150 Frictional Head Loss = 0.58

K = 24.47 Additional Head Losses due to Friction

Spray Nozzle	=	23
Greensand Filter	=	0
Static Mixer	=	0
Carbon Canister	=	0
Bag Filter	=	12
Total	=	35

Head Loss due to Friction = 35.58

Head Loss due to Friction
with 20% Safety Factor = 42.7

Total Change in Elevation
Height to Tower Inlet = 20.00

Total = 20.00

Sum of Head Losses and Total Change in Elevation (TDH)

TDH = 62.7



By DPB Date 7/18/90 Subject PORT EVERGLADES TERN Sheet No. 1 of 1

Chkd. By _____ Date _____ Proj. No. 585148

HOLDING TANK TO FIRST TOWER

ASSUMPTIONS:

- (1) FLOODED SUCTION
- (2) 150' OF 2" PVC PIPE
- (3) 8 ELBOWS
- (4) ONE VALVE: (1)
- (5) ONE FLOW METER: (1)

GIVEN:

- (1) FLOW RATE: 10 gpm
- (2) BAG FILTER: (1)
- (3) NOZZLE (1)
- (4) HEIGHT TO TOWER INLET: 20'

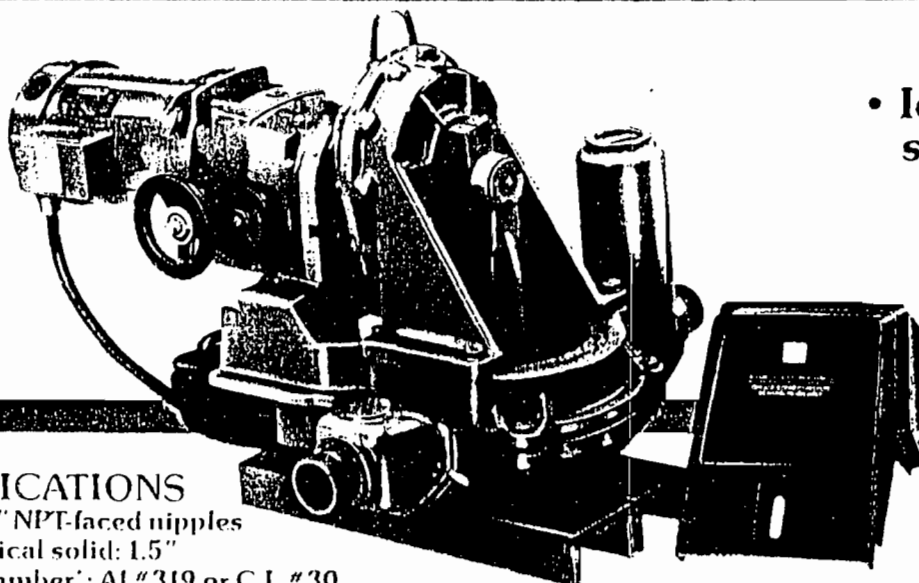
TDH - 62.7

Choose: STA-RITE INDUSTRIAL PUMP

CB WITH 4.2 IMPELLER

PERFORMANCE CURVE SHOWS APPROXIMATELY
70' HEAD AT 10 gpm

2" DIAPHRAGM PUMP



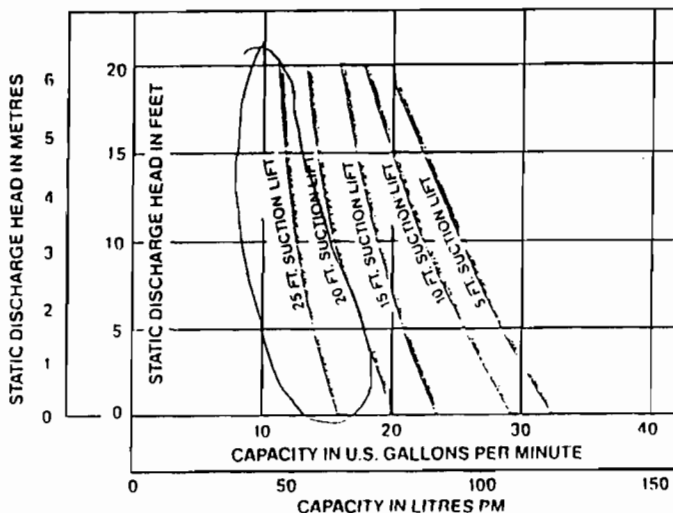
- Ideal for corrosive and sludge, and highly vis up to 6,000 gals. per diameter. • Suitable coupling. • Can 1 HP. or 1½ HP diesel optio

SPECIFICATIONS

- Size: 2" x 2" NPT-faced nipples
- Max. Spherical solid: 1.5"
- Suction chamber: Al #319 or C.I. #30
- Discharge chamber: Al #319 or C.I. #30
- Water box: Al #319 or C.I. #30
- Diaphragm bottom: Al #319 or C.I. #30
- Gaskets: Velumoids
- Crank Arm: Steel CF1018
- Connecting rod: Al Tenzalloy
- Frame: Al Tenzalloy
- Conn. Rod Bearing: Cam roller bearing
- Gear shaft: Steel C1117 hardened
- Output gear: Forged #C1141
- Intermediate gear: Ductile #80-60-03
- Gear case: Al #319
- Gear cover: Al #319
- Bearings: Ball bearings
- Flap valve: Neoprene
- Diaphragm: TPE (Thermal Plastic Elastomer)
- Pinions: Steel HRC1144 hardened
- Valve weights: Steel-Iridite plated
- Thrust washer: Ryvertex #CE
- * Model Number Indicates Aluminum or Cast Iron

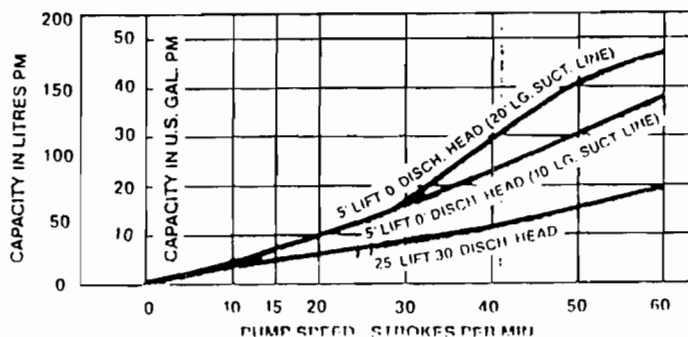
[2" variable speed drive-skid]

CH&E 115411 & 16411 2" DIAPHRAGM PUMP SERIES
2" SUCTION & 2" DISCHARGE (41 STROKES/MIN.)



CH&E 5400/6400
2" VARIABLE SPEED DIAPHRAGM PUMP SERIES
2" SUCTION & 2" DISCHARGE

This graph represents the minimum and maximum capabilities of the 2" variable speed diaphragm pump. The pump will normally operate in the area between the conditions of 5-ft. static suction lift with 0-ft. static discharge head and 25-ft. static suction lift with 30-ft. static discharge head. The colored area represents the increased capacity possible at low suction lifts and discharge heads due to inertia effects created by the use of long suction line (the extra length being under the surface of the liquid.)



SPECIFIC DATA

- Transmission: Enclosed, oil bath, double reduction
- Gear ratio: 43:1
- Output Strokes: 41 per minute
- Input R.P.M.: 1750
- Note: With variable speed, stroke may be adjusted between 8 and 60 strokes per minute.

MOTOR SPECIFICATIONS

- Horsepower: 1 HP.
- Type: TEFC (Totally Enclosed Fan Cooled)
- Frame: 56C
- R.P.M.: 1750
- Voltage: 1 ph. 115/230v 60 cycle
3 ph. 230/460v 60 cycle
- Amp.: (running)

1 HP.	115	7.2
	230	3.6
	460	1.8

CH&E 2" STANDARD

- Close co
- Totally e
- motor
- 1750 R.F
- Skid or v
- NPT face
- Natural i
- and TPE
- OSHA gu
- Strainer
- Lifting b

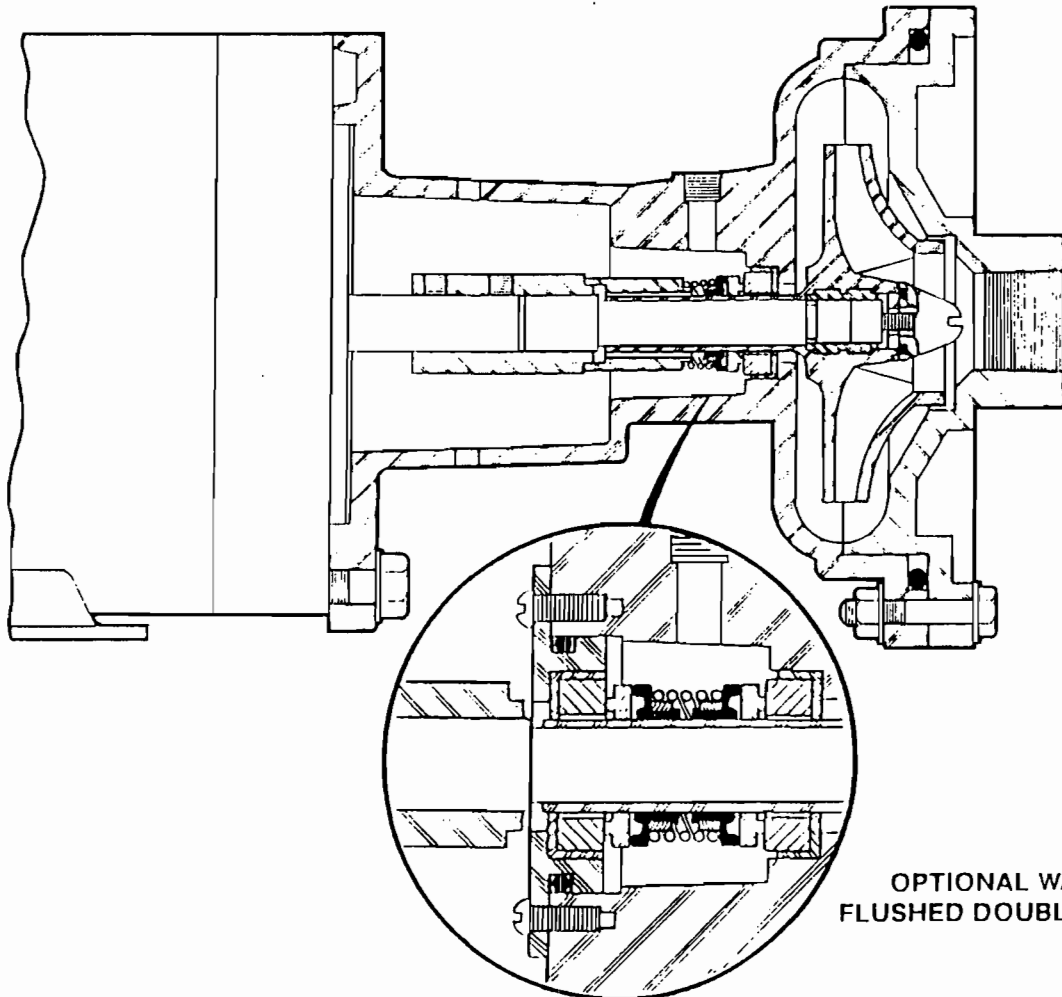
CH&E 2" OPTIONA

- Variable
- 1150 R.P.
- Explosio
- Bronze w
- Spring le
- Neopren
- (Therma
- diaphrag
- Protectiv
- Pipe flan
- V-belt
- Manual s
- protectio

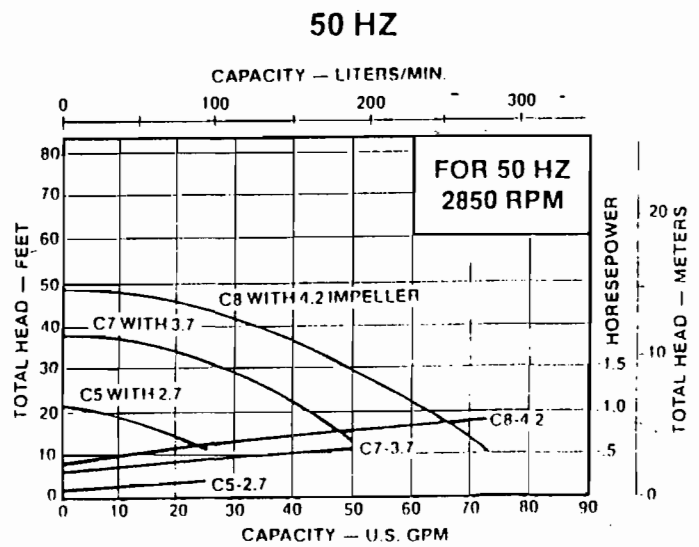
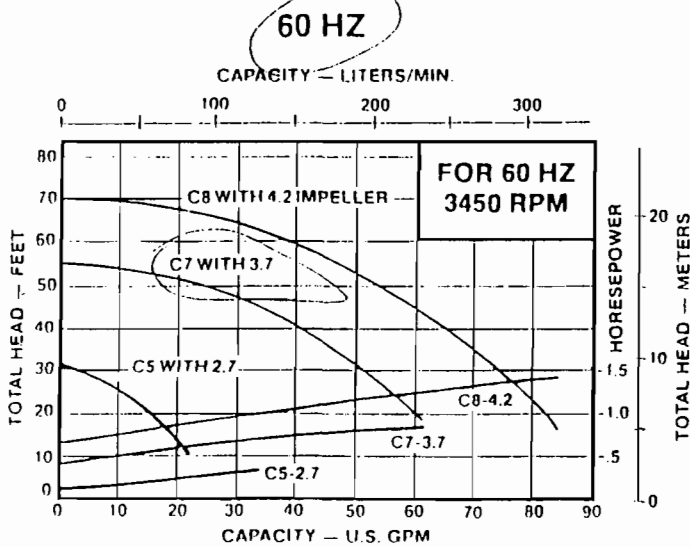


DOF
ATMOS
VOLAI

SECTIONAL VIEW



PERFORMANCE CURVE



All complete pump models are performance tested prior to shipment.
 For larger capacities/heads to 130 GPM and 145 Ft. THD see bulletin S3559 for C10 Series. **NOTE:** CURVES BASED ON 70°F WATER WITH 1.0 SG

APPENDIX C

OVERVIEW

The ability of a particular volatile organic compound to be removed ("stripped") from water is dependent on Henry's law constants and liquid mass transfer coefficients. The actual physical dimensions of an "air stripping tower" are a function of the following parameters:

- particular compound to be removed
- water temperature
- water flow rate (primarily affects tower diameter)
- required stripping efficiency (primarily affects tower height)
- Height of Transfer Unit (HTU) of the selected packing material

Usually, a nominal air to water flow ratio (Acfm/Wcfm) from between 50:1 and 200:1 can be used and still remain between the limits of flooding (excessive water) and channeling (excessive air). Ratios outside these limits can be accommodated with special design considerations if necessary.

For a wide range of petroleum hydrocarbon problems, especially gasoline station sites, the predominant component to be removed is benzene. Benzene usually drives the system design because the allowable benzene effluent concentration (1 ppb) is the lowest of all components specified. When benzene is the design driver an air to water ratio of 150:1 is typically used. Other components can necessitate a higher or lower ratio depending on their specific chemical and physical properties.

The following steps summarize the design of an air stripping system:

- STEP 1-List the design driving component and the design input data
- STEP 2-Analyze key parameters and use computer results for STEPS 3 thru 7
- STEP 3-Calculate tower diameter, D
- STEP 4-Calculate tower height, H_t
- STEP 5-Calculate total pressure drop, P
- STEP 6-Calculate Blower Air Flow, A
- STEP 7-Select blower size and horsepower using blower air flow curves

Air Stripper Design V3.0(Cont'd)
Calculations

INTRODUCTION

The following step by step air stripper design sizing uses intermediate results from a copyrighted computer analysis program; AIRSTRIP. The computer program documentation and reference for all calculations are listed in the attached bibliography.

DESIGN CALCULATIONS

IT Project# 585-148 TOWER 1:

STEP 1-List of the design driving component and design input data

- Design Driving Component **MTBE**
- Water flow rate **W-10 gpm**
- Water Volumetric Loading Rate **L-12.8 gpm/ft²**
- Water Temperature **T=90°F**
- Influent concentration **C_i=260 ppm**
- Effluent Concentration desired **C_o < 295 ppb**

STEP 2-Using AIRSTRIP, Calculate and List the following groups of key parameters:

- Physical Constants
- Contaminant Properties
- Packing Properties
- Loading Rates
- Mass Transfer Parameters
- Contaminant Removal

Air Stripper Design V3.0(cont'd)
Computer Analysis Summary page 1/2

PHYSICAL CONSTANTS

Design temperature : 90.0 degrees F.
Density of water : 62.1 lb/ft³
Density of air : 0.0722 lb/ft³
Viscosity of water : 5.16E-04 lb/ft.s
Viscosity of air : 1.23E-05 lb/ft.s
Surface tension of water : 71 dyne/cm
Atmospheric pressure : 1.00 atm

CONTAMINANT PROPERTIES

Name : MTBE-FDER
Molecular weight : 42.0 g/mol
Boiling point : 104 degrees F.
Molal volume at boiling point : 0.1500 L/mol
Henry's Constant : 0.02200
Enthalpy upon dissolution in water : 3800 cal/mol
Molecular diffusivity in air : 1.03E-04 ft²/s
Molecular diffusivity in water : 1.00E-08 ft²/s

PACKING PROPERTIES

Name : Jaeger Tripacks
Packing Material : Plastic
Nominal Size : 1.00 inch
Specific Area : 84.7 ft²/ft³
Critical surface tension : 33 dyne/cm
Packing depth : 15.0 ft
Air friction factor : 28

Air Stripper Design V3.0(cont'd)
Computer Analysis Summary page 2/2

LOADING RATES

Water mass loading rate	:	1.8 lb/ft ² .s	*
Air mass loading rate	:	0.309 lb/ft ² .s	*
Water volumetric loading rate	:	12.79 gpm/ft ²	*
Air volumetric loading rate	:	1919 gpm/ft ²	*
Air pressure gradient	:	0.192 " H2O/ft	#
Volumetric air/water ratio	:	150.0	
Stripping factor	:	6.0	

MASS TRANSFER PARAMETERS

Percentage of packing area wetted	:	41.0 %	
Wetted packing area	:	34.8 ft ² /ft ³	*
Transfer rate constant in water	:	0.000532 ft/s	
Transfer rate constant in air	:	0.068406 ft/s	
Overall transfer rate constant	:	0.000446 ft/s	
Overall mass transfer coefficient	:	0.0155 1/s	
NTU	:	7.9312	
HTU	:	1.8913 ft	

CONTAMINANT REMOVAL

Influent concentration	:	260.0 mg/L	
Effluent concentration	:	292.1 ug/L	
Fraction removed	:	99.9 %	
Mass of contaminant removed	:	39.89114 lb/ft ² .day	*
Concentration in airstream	:	4.55355 mg/ft ² .ft ³	

* Expressed per unit of stripping tower cross-sectional area
Expressed per unit of tower length

Air Stripper Design V3.0(cont'd)
Calculations

From the computer analysis summary, four parameters are used for the remainder of the design process:

Z=15 Packing Depth in feet; Pg 1:Packing Properties

L=12.8 Water Volumetric Loading Rate in gpm/ft²; Pg 2:Loading Rates

ΔP=0.192 Air Pressure Gradient in " H₂O/ft of packing depth; Pg 2:Loading Rates

A/W=150 Volumetric Air/Water Ratio; Page2:Loading Rates

STEP 3-Calculate tower diameter D in inches

$$D = ((W \times 1.273 \times 144) / L)^{1/2}$$

$$D = ((10 \times 1.273 \times 144) / 12.8)^{1/2}$$

D=11.92 inches; Select the nearest available standard tower diameter

D=12 inches

STEP 4-Calculate tower height H_t

H_t=Z + TB + TT + IDH where;

Z= 15 ft; Packing Depth from analysis rounded off to nearest one half foot

TB= 4.0 ft; Tower Bottom fixed height below packing support grate

TT=0.5 ft; Height allowed for top section and demister

IDH= 0.29 ft = (D/(2√3))/12 ft; Influent Distributer Height based on 120 degree spray nozzle pattern

$$H_t = 15 + 4.0 + 0.5 + 0.29 \text{ ft}$$

$$H_t = 19.79 \text{ ft}$$

Select the standard tower height nearest to H_t; Use a 20 ft tower.

STEP 5-Calculate total pressure drop P

$$P = Z \times \Delta P$$

$$P = 15 \times 0.192$$

$$P = 2.9 \text{ inches H}_2\text{O} + 0.25 \text{ inches for demister} = 3.15 \text{ inches H}_2\text{O}$$

Air Stripper Design V3.0(cont'd)
Calculations (cont'd)

STEP 6 Calculate Blower Air Flow, A

where $W_{cfm} = W_{gpm}/7.481$

$W_{cfm} = 10/7.481 = 1.34$

$A = A/W \text{ ratio} \times W_{cfm}$

$A = 150 \times 1.34$

$A = 201 \text{ cfm}$

STEP 7-Use blower chart to look up blower size selection using A(cfm) and P(in inches H₂O). Use a design margin of 30% to 100% in selecting the blower cfm versus pressure drop(ie, if 300 cfm is needed into 1" pressure drop then select blower for 300 cfm into 1.3" to 2"). Include an adjustable air cutoff so that the system may be set up at the proper operating point. The adjustable air flow can be used over the life of the system to periodically increase the flow as modest packing fouling or degradation occurs. The design margin can also be used to adjust for future system changes such as modest changes in water flow rate.

Final Design Summary

Tower Model-Nepcco Model 120-20
Tower Diameter 12 inches
Tower Height 20 ft
Packing Material-Jaeger 1" dia
Packing Height 15 ft
Blower Unit- NYB-95JA or equivalent
Blower Motor 1.0 HP; 3450 rpm
Blower Output 200 cfm @ up to 5.4 inches H₂O

Project Manager: J. Bowen

Reviewed by: J.P. Bowen Date 7/29/90

OVERVIEW

The ability of a particular volatile organic compound to be removed ("stripped") from water is dependent on Henry's law constants and liquid mass transfer coefficients. The actual physical dimensions of an "air stripping tower" are a function of the following parameters:

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- water temperature
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- required stripping efficiency (primarily affects tower height)
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The following steps summarize the design of an air stripping system:

- STEP 1-List the design driving component and the design input data
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- STEP 3-Calculate tower diameter, D
- STEP 4-Calculate tower height, H_t
- STEP 5-Calculate total pressure drop, P
- STEP 6-Calculate Blower Air Flow, A
- STEP 7-Select blower size and horsepower using blower air flow curves

Air Stripper Design V3.0(Cont'd)
Calculations

INTRODUCTION

The following step by step air stripper design sizing uses intermediate results from a copyrighted computer analysis program; AIRSTRIP. The computer program documentation and reference for all calculations are listed in the attached bibliography.

DESIGN CALCULATIONS

IT Project# 585-148 TOWER 2:

STEP 1-List of the design driving component and design input data

Design Driving Component **MTBE**

Water flow rate **W-10 gpm**

Water Volumetric Loading Rate **L-12.8 gpm/ft²**

Water Temperature **T=90°F**

Influent concentration **C_i=292 ppb**

Effluent Concentration desired **C_o < 0.5 ppb**

STEP 2-Using AIRSTRIP, Calculate and List the following groups of key parameters:

Physical Constants

Contaminant Properties

Packing Properties

Loading Rates

Mass Transfer Parameters

Contaminant Removal

Air Stripper Design V3.0(cont'd)
Computer Analysis Summary page 1/2

PHYSICAL CONSTANTS

Design temperature	:	90.0 degrees F.
Density of water	:	62.1 lb/ft ³
Density of air	:	0.0722 lb/ft ³
Viscosity of water	:	5.16E-04 lb/ft.s
Viscosity of air	:	1.23E-05 lb/ft.s
Surface tension of water	:	71 dyne/cm
Atmospheric pressure	:	1.00 atm

CONTAMINANT PROPERTIES

Name	:	MTBE-FDER
Molecular weight	:	42.0 g/mol
Boiling point	:	104 degrees F.
Molal volume at boiling point	:	0.1500 L/mol
Henry's Constant	:	0.02200
Enthalpy upon dissolution in water	:	3800 cal/mol
Molecular diffusivity in air	:	1.03E-04 ft ² /s
Molecular diffusivity in water	:	1.00E-08 ft ² /s

PACKING PROPERTIES

Name	:	Jaeger Tripacks
Packing Material	:	Plastic
Nominal Size	:	1.00 inch
Specific Area	:	84.7 ft ² /ft ³
Critical surface tension	:	33 dyne/cm
Packing depth	:	15.0 ft
Air friction factor	:	28

Air Stripper Design V3.0(cont'd)
Computer Analysis Summary page 2/2

LOADING RATES

Water mass loading rate	:	1.8 lb/ft ² .s	*
Air mass loading rate	:	0.309 lb/ft ² .s	*
Water volumetric loading rate	:	12.79 gpm/ft ²	*
Air volumetric loading rate	:	1919 gpm/ft ²	*
Air pressure gradient	:	0.192 " H2O/ft	#
Volumetric air/water ratio	:	150.0	
Stripping factor	:	6.0	

MASS TRANSFER PARAMETERS

Percentage of packing area wetted	:	41.0 %	
Wetted packing area	:	34.8 ft ² /ft ²	*
Transfer rate constant in water	:	0.000532 ft/s	
Transfer rate constant in air	:	0.068406 ft/s	
Overall transfer rate constant	:	0.000446 ft/s	
Overall mass transfer coefficient	:	0.0155 1/s	
NTU	:	7.9312	
HTU	:	1.8913 ft	

CONTAMINANT REMOVAL

Influent concentration	:	292.1 ug/L	
Effluent concentration	:	0.3 ug/L	
Fraction removed	:	99.9 %	
Mass of contaminant removed	:	0.04482 lb/ft ² .day	*
Concentration in airstream	:	0.00512 mg/ft ² .ft ³	

* Expressed per unit of stripping tower cross-sectional area
Expressed per unit of tower length

Air Stripper Design V3.0(cont'd)
Calculations

From the computer analysis summary, four parameters are used for the remainder of the design process:

Z=15 Packing Depth in feet; Pg 1:Packing Properties

L=12.8 Water Volumetric Loading Rate in gpm/ft²; Pg 2:Loading Rates

ΔP=0.192 Air Pressure Gradient in " H₂O/ft of packing depth; Pg 2:Loading Rates

A/W=150 Volumetric Air/Water Ratio; Page2:Loading Rates

STEP 3-Calculate tower diameter D in inches

$$D = ((W \times 1.273 \times 144) / L)^{1/2}$$

$$D = ((10 \times 1.273 \times 144) / 12.8)^{1/2}$$

D=11.92 inches; Select the nearest available standard tower diameter

D=12 inches

STEP 4-Calculate tower height H_t

H_t=Z + TB + TT + IDH where;

Z= 15 ft; Packing Depth from analysis rounded off to nearest one half foot

TB= 4.0 ft; Tower Bottom fixed height below packing support grate

TT=0.5 ft; Height allowed for top section and demister

IDH= 0.29 ft = (D/(2√3))/12 ft; Influent Distributer Height based on 120 degree spray nozzle pattern

$$H_t = 15 + 4.0 + 0.5 + 0.29 \text{ ft}$$

$$H_t = 19.79 \text{ ft}$$

Select the standard tower height nearest to H_t; Use a 20 ft tower.

STEP 5-Calculate total pressure drop P

$$P = Z \times \Delta P$$

$$P = 15 \times 0.192$$

$$P = 2.9 \text{ inches H}_2\text{O} + 0.25 \text{ inches for demister} = 3.15 \text{ inches H}_2\text{O}$$

Air Stripper Design V3.0(cont'd)
Calculations (cont'd)

STEP 6 Calculate Blower Air Flow, A

where $W_{cfm} = W_{gpm}/7.481$

$W_{cfm} = 10/7.481 = 1.34$

$A = A/W \text{ ratio} \times W_{cfm}$

$A = 150 \times 1.34$

$A = 201 \text{ cfm}$

STEP 7-Use blower chart to look up blower size selection using A(cfm) and P(in inches H₂O). Use a design margin of 30% to 100% in selecting the blower cfm versus pressure drop(ie, if 300 cfm is needed into 1" pressure drop then select blower for 300 cfm into 1.3" to 2"). Include an adjustable air cutoff so that the system may be set up at the proper operating point. The adjustable air flow can be used over the life of the system to periodically increase the flow as modest packing fouling or degradation occurs. The design margin can also be used to adjust for future system changes such as modest changes in water flow rate.

Final Design Summary

Tower Model-Nepcco Model 120-20

Tower Diameter 12 inches

Tower Height 20 ft

Packing Material-Jaeger 1" dia

Packing Height 15 ft

Blower Unit- NYB-95JA or equivalent

Blower Motor 1.0 HP; 3450 rpm

Blower Output 200 cfm @ up to 5.4 inches H₂O

Project Manager: J. Bowen

Reviewed by: J.P. Bowen Date 7/29/90

Air Stripper Design
Bibliography
Computer Program Documentation

HENRY'S LAW

In a gas/liquid system, a contaminant will partition itself between the gas and liquid phases. According to Henry's Law, the concentration of the contaminant in the gas above the solution is proportional to the concentration of the contaminant in the solution. Henry's Law is only valid for relatively dilute contaminant concentrations, and for systems which are at equilibrium. The proportionality constant, Henry's constant, is expressed in different forms, depending on the units chosen for expressing the contaminant concentrations. Throughout AIRSTRIP, we will use the following form:

$$A = H * C \quad \text{with}$$

A = contaminant concentration in air (gram per cubic meter)

H = Henry's constant (dimensionless)

C = contaminant concentration in water (gram per cubic meter)

The following alternative form of Henry's Law is commonly encountered in the chemical literature:

$$pp = H_a * MF \quad \text{with}$$

pp = partial pressure of contaminant in air (atmospheres)

H_a = Henry's constant (atmospheres)

MF = mole fraction of contaminant in solution (dimensionless)

This form of Henry's constant is related to the one used in AIRSTRIP by:

$$H = H_a / (C_o * R * (T + 273.2)) = 0.219 * H_a / (T + 273.2)$$

C_o = molar density of water = 55.6 mole per liter

R = universal gas constant = 0.08206 liter.atm per mole.Kelvin

T = water temperature in degrees Celsius

Like all equilibrium constants, Henry's constant H is strongly influenced by temperature - H increases as the temperature rises. The relationship between H at two different temperatures is:

$$H_2 = H_1 * 10^{\{ [D / R] * [1 / (T_1 + 273.2) - 1 / (T_2 + 273.2)] \}}$$

H₁ = H at temperature T₁ (dimensionless)

H₂ = H at temperature T₂ (dimensionless)

D = enthalpy change upon dissolution in water (cal / mole)

R = universal gas constant; 1.987 cal / degrees Kelvin. mole

T = water temperature (degrees Celsius)

Air Stripper Design
Bibliography
Computer Program Documentation

EQUILIBRIUM CONDITIONS

In a countercurrent aeration tower, where water flows down from the top and air is pumped up from the bottom, a mass balance on the contaminant yields:

$$Q(\text{water}) * [C(\text{in}) - C(\text{out})] = Q(\text{air}) * [A(\text{out}) - A(\text{in})]$$

where the C's and the A's are the water and air concentrations of the contaminant, and the Q's are the volumetric flow rates.

Ideally, the contaminant will be completely stripped, or $C(\text{out}) = 0$. The incoming air will be practically contaminant-free, or $A(\text{in}) = 0$. Also, at the top of the tower where outgoing air meets incoming water, the application of Henry's Law yields:

$$A(\text{out}) = H * C(\text{in})$$

With these substitutions, the mass balance on the contaminant simplifies to

$$Q(\text{water}) = H * Q(\text{air})$$

The above expression can be rearranged to:

$$H * (A/W \text{ ratio}) = 1$$

where A/W ratio is the dimensionless volumetric air /water ratio. The term on the left side is also the expression for the stripping factor R.

This simple derivation is only valid for ideal, equilibrium conditions. In practical terms, it gives the minimum A/W ratio that will completely strip the contaminant from the water with an infinitely tall tower. In order to strip a substantial fraction of the contaminant with a tower of reasonable height, higher A/W ratio (or stripping factor) will be required.

Air Stripper Design
Bibliography
Computer Program Documentation

STRIPPING FACTOR

The stripping factor R was previously defined by the expression:

$$R = H * (A/W \text{ ratio})$$

In the previous section dealing with "Equilibrium Conditions", $R=1$ was derived for the special case when the contaminant was totally stripped in an infinitely tall tower. If $R < 1$, complete stripping cannot occur, even with an infinitely tall tower. If $R > 1$, then complete stripping becomes possible with a tower of finite size.

In practice, complete stripping is seldom required and tower height is limited to a several meters. With these conditions, substantial stripping only becomes possible if $R > 2$. At $R < 2$, the stripping process is limited by the capacity of the air to carry the contaminant away.

When $R > 2$, however, there will be a point where little is to be gained with further increase of the A/W ratio, because stripping will be essentially complete. The ideal design condition, therefore, will exist with the stripping factor somewhere between 2 and the point of diminishing return.

With the more recently available high efficiency polypropylene packing materials such as Jaeger Tri-Packs and Lantec LANPAC, practical A/W ratios (cfm/cfm) vary from about 50:1 to 200:1. Above 200:1, the energy requirement for pumping the air makes the process significantly more expensive than at lower ratios. Since some contaminants can only be effectively stripped at A/W ratios > 200 , tradeoffs are not always possible. The stripping factor is, therefore, limited by the practical A/W ratio. If the Henry's constant H is between about 0.02 and 1.00, the optimum R can be reached simply by adjusting the A/W ratio. If the Henry's constant H is higher than 1.00, then stripping will be essentially complete, even at very low A/W ratios.

If the Henry's constant H is less than about 0.02, the compound is not very volatile and stripping will become poorer with lower H. In these cases, the designer has no other option than to select the highest practical A/W ratio and to increase the tower height, or consider an alternative process.

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MASS TRANSFER EQUATION

The basic mass transfer equation for countercurrent aeration towers is:

$$Z = HTU * NTU$$

where Z = tower height
 HTU = height of transfer units
 NTU = number of transfer units

The following symbols will be used in its derivation:

- | | |
|---------------------------------|---|
| Q = volumetric flow rate | H = Henry's constant |
| L = areal liquid loading rate | J = mass transfer rate per tower volume |
| w = unit mass of water | KLa = mass transfer rate constant |
| B = cross-sectional tower area | R = stripping factor |
| C = concentration in water | i = suffix denoting "in" |
| A = concentration in air | o = suffix denoting "out" |
| dz = infinitesimal height incr. | \$ = suffix denoting "at equilibrium" |

For any infinitesimal tower element of height dz, the mass transfer rate is:

$$J = [Q(\text{water}) * dC] / [B * dz]$$

For the same element, another expression for J is available from the concentration gradient across the water/air interface:

$$J = KLa * [C\$ - C]$$

(C\$ is the water concentration that would have been in equilibrium with the air at that point. The difference between C\$ and the actual concentration C provides the driving force for the mass transfer.)

Setting these two expressions equal, and substituting L/w for Q(water)/B, yields the expression :

$$dz = \frac{L}{w * KLa} * \frac{dC}{(C\$ - C)}$$

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Integration of the left hand term across the tower height simply yields the overall tower height Z. The first factor on the right is unaffected by integration, because it contains nothing that varies over the tower height. This factor is called the HTU (height of transfer units).

The second factor on the right must be integrated between the concentration limits of the contaminant in the water, i.e. from C(in) to C(out). This integration will be developed in a moment. Once integrated, it is called the NTU (number of transfer units). The final expression for the mass transfer equation, in shorthand, becomes:

$$Z = \text{HTU} * \text{NTU}$$

To simplify the integrand in the expression for the NTU, the term C\$ needs to be expressed as a function of the variable C. First apply Henry's Law at the element dz:

$$A = H * C\$$$

Now take a mass balance from the bottom of the tower up to element dz:

$$Q(\text{air}) * (A - A_i) = Q(\text{water}) * (C - C_o)$$

Eliminate A from these two expressions, set $A_i = 0$ (because the incoming air is contaminant-free), solve for C\$, substitute into the integrand and integrate:

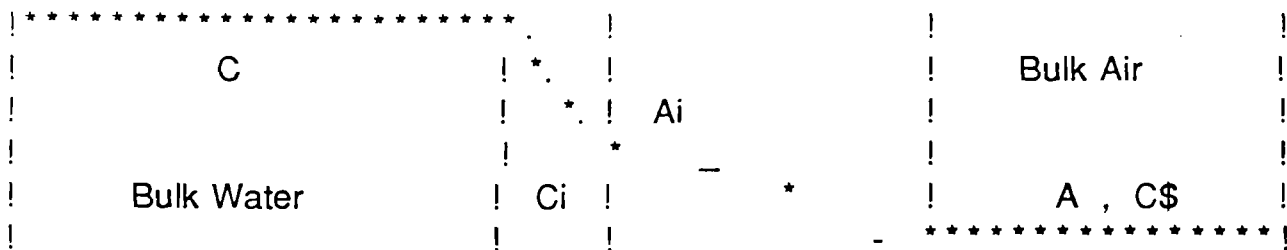
$$\text{NTU} = \frac{R}{R-1} * \ln \left\{ \frac{(R-1) * (C_i / C_o) + 1}{R} \right\}$$

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OVERALL MASS TRANSFER COEFFICIENT

In the mass transfer equation, the mass transfer coefficient appeared as the single term $K_L a$. In reality, it reflects the combined effects of three quite different parameters, which are (1) the mass transfer properties of the laminar air layer, (2) the mass transfer properties of the laminar water film and (3) the total area of the air/water interface. In this section, the relationship between the overall mass transfer rate constant K_L and the mass transfer rate constants k_L and k_g (for the laminar water and air films, respectively) will be derived.

CONCENTRATION PROFILE ACROSS THE TWO-FILM INTERFACE



Three expressions for the mass transfer rate J follow from the concentration profile just given:

$$\text{Through the water film} : J = k_L * a * (C - C_i) \quad \dots (1)$$

$$\text{Through the air film} : J = k_g * a * (A_i - A) \quad \dots (2)$$

$$\text{Through both films} : J = K_L * a * (C - C\$) \quad \dots (3)$$

From equations (1) and (3), the following expression can be derived:

$$k_L * (C - C_i) = K_L * (C - C_i) + K_L * (C_i - C\$) \quad \dots (4)$$

By applying Henry's Law at the interface, and in the bulk air, the following relationship is found:

$$(C_i - C\$) = (A_i - A) / H \quad \dots (5)$$

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Combine equations (1) and (2) to find another expression for $(A_i - A)$:

$$(A_i - A) = (C - C_i) * k_l / k_g \quad \text{..... (6)}$$

Substitute equation (6) into (5):

$$(C_i - C^*) = (C - C_i) * k_l / (H * k_g) \quad \text{..... (7)}$$

Substitute equation (7) into (4), cancel the $(C - C_i)$ terms and divide through by $(K_l * k_l)$:

$$1 / K_l = 1 / k_l + 1 / (H * k_g) \quad \text{..... (8)}$$

Equation (8) is the final expression for combining the mass transfer rate constants of the water and air films into the overall mass transfer rate constant K_l .

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MODELING APPROACHES

The relationship between the different mass transfer rate constants was earlier derived as:

$$1 / K_l = 1 / k_l + 1 / (H * k_g)$$

For highly volatile contaminants (large H), the contribution of the air film rate constant k_g is very small and may be safely ignored. If the contaminant is only slightly volatile (small H), the diffusional resistance in the air layer will obviously become more significant.

The SHERWOOD-HOLLOWAY relationship ignores the effects of the air film and estimates the overall mass transfer coefficient only on the basis of the diffusional resistance in the water film. It will work fine for the highly volatile contaminants, but falls short for the less volatile contaminants.

The ONDA and SHULMAN models are more explicit - they estimate k_l , k_g and the interfacial area a with three separate correlations, which can be combined into an overall mass transfer coefficient. These relationships are, therefore, valid for a wider range of contaminants, regardless of volatility. The SHULMAN model, however, uses a procedure for estimating the interfacial area which is not amenable to computer applications.

For the SHERWOOD-HOLLOWAY model, the properties of the tower packing are entered as a set of specially derived empirical packing constants, which makes it tough to apply it to a new type of packing. The ONDA and SHULMAN models use packing properties which are relatively easy to measure.

AIRSTRIP uses the ONDA correlations throughout. Their validity has been repeatedly verified by a number of studies reported in the environmental engineering literature. The model has emerged as a standard basis for countercurrent packed tower design.

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DESIGN TEMPERATURE

Temperature is the single most important factor affecting the performance of stripping towers. It has dramatic effects on two key variables - Henry's constant, and the mass transfer coefficient. The lower the temperature, the slower the mass transfer at the air/water interface. To be on the safe side, stripping towers should be designed for the coldest expected temperatures.

The derivation of the mass transfer equation implicitly assumed isothermal operation, i.e. both air and water remain at a common, constant temperature throughout the height of the tower. In practice, however, air and water enter the tower at different temperatures, and the water is cooled by its slight evaporation.

Simple thermodynamics allow us to estimate the effect of widely different air and water temperatures. The heat capacity of water is 75 kJ/mol.K, and that of air is 29 kJ/mol.K. A volumetric A/W ratio of 30 (a typical value for full-scale applications) is equivalent to a molar ratio of 0.024.

A heat balance then shows that there will be a 11 degree Celsius change in a temperature for every 0.1 degree Celsius change in water temperature. For even the widest conceivable difference in air and water temperatures, the final equilibrium temperature (assuming it could be reached in the tower) would be within 0.3 degrees Celsius of the incoming water temperature.

Evaporative cooling effects are also very small. At very low air temperature (which are likely to occur during the critical winter months), the moisture-carrying capacity of air is also at its lowest.

For practical purposes, the critical design temperature can, therefore, be assumed to be equal to the coldest expected water temperature.

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TRANSFER RATE CONSTANT IN AIR

The ONDA correlation for the mass transfer rate constant kg through the laminar air film is:

$$kg = CON * factor\ 1 * factor\ 2 * factor\ 3 * factor\ 4$$

$$\begin{aligned} CON &= \text{constant depending on packing size} \\ factor\ 1 &= \{ G / [a * vis(\text{air})] \} ^{0.7} \\ factor\ 2 &= \{ vis(\text{air}) / [den(\text{air}) * D(\text{air})] \} ^{(1/3)} \\ factor\ 3 &= \{ a * dp \} ^{-2} \\ factor\ 4 &= \{ a * D(\text{air}) \} \end{aligned}$$

The explanation of symbols and their units appear below. This correlation was derived with various packing shapes in the gas flow range 0.014 to 1.7 kg/s.m², with packing sizes between 4 and 50 mm.

The following symbols were used in the above correlation :

kg	=	mass transfer rate constant	(m / s)
CON	=	5.23 if $dp > 15$ mm or larger	(-)
CON	=	2.00 if $dp < 15$ mm	(-)
den	=	density	(kg / m ³)
vis	=	absolute viscosity	(kg / m . s)
G	=	areal air loading rate	(kg / m ² . s)
a	=	total specific packing area	(m ² / m ³)
D	=	molecular diffusivity of contaminant	(m ² / s)
dp	=	nominal packing size	(m)

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TRANSFER RATE CONSTANT IN WATER

The ONDA correlation for the mass transfer rate constant k_l through the laminar water film is:

$$k_l = 0.0051 * \text{factor 1} * \text{factor 2} * \text{factor 3} * \text{factor 4}$$
$$\text{factor 1} = \left\{ \frac{\text{den}(\text{water})}{[\text{vis}(\text{water}) * g]} \right\}^{-1/3}$$
$$\text{factor 2} = \left\{ \frac{L}{[a_w * \text{vis}(\text{water})]} \right\}^{2/3}$$
$$\text{factor 3} = \left\{ \frac{\text{vis}(\text{water})}{[\text{den}(\text{water}) * D(\text{water})]} \right\}^{-1/2}$$
$$\text{factor 4} = \{ a * dp \}^{2/5}$$

The explanation of symbols and their units appear below. This correlation was derived from data collected with various packing shapes such as rings, spheres, rods and saddles. The nominal sizes ranged from 4 to 50 mm, and the liquid loading rate from 0.8 to 43 kg/s.m². The accuracy of the estimates is given as plus/minus 20%.

The following symbols were used in the above correlation:

k_l	=	mass transfer rate constant	(m / s)
den	=	density	(kg / m ³)
vis	=	absolute viscosity	(kg / m . s)
g	=	gravitational acceleration	(9.81 m / s ²)
L	=	areal liquid loading rate	(kg / m ² . s)
a	=	total specific packing area	(m ² / m ³)
a_w	=	wetted specific packing area	(m ² / m ³)
D	=	molecular diffusivity of contaminant	(m ² / s)
dp	=	nominal packing size	(m)

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WETTED PACKING AREA

The ONDA correlation for the specific interfacial area (wetted packing area) is given by:

$$aw = a * \{ 1 - \exp [\text{factor 1} * \text{factor 2} * \text{factor 3} * \text{factor 4}] \}$$

$$\text{factor 1} = -1.45 * [\text{cst}(\text{packing}) / \text{st}(\text{water})] ^ { (3/4)}$$

$$\text{factor 2} = \{ L / \{ a * \text{vis}(\text{water}) \} \} ^ { (0.1)}$$

$$\text{factor 3} = \{ L^2 * a / [\text{den}(\text{water})^2 * g] \} ^ { (-0.05)}$$

$$\text{factor 4} = \{ L^2 / [\text{den}(\text{water}) * \text{st}(\text{water}) * a] \} ^ { (1/5)}$$

The explanation of symbols and their units appear on the next screen. This correlation was derived for packing made of different materials such as ceramic, glass, plastic and wax-coated packing. The accuracy of the estimates is plus/minus 20%.

The following symbols were used in the above correlation:

aw	=	specific wetted packing area	(m ² / m ³)
a	=	total specific packing area	(m ² / m ³)
cst(packing)	=	critical surface tension	(kg / s ²)
st(water)	=	surface tension	(kg / s ²)
vis	=	absolute viscosity	(kg / m . s)
den	=	density	(kg / m ³)
L	=	areal liquid loading rate	(kg / m ² . s)
g	=	gravitational acceleration	(9.81 m / s ²)

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MOLECULAR DIFFUSIVITY IN AIR

AIRSTRIP uses the estimation method published by Wilke and Lee:

$$D(\text{air}) = \frac{K * T^{(3/2)} * Mr^{(1/2)}}{P * CL^2 * CI}$$

- D = molecular diffusivity (m²/s)
 K = 0.0001 * [0.00217 - 0.00050 * Mr^(1/2)]
 T = air temperature (deg K)
 Mr = 1 / 28.95 + 1 / Mw(contaminant)
 Mw = molecular weight (gram/mol)
 P = air pressure (atmospheres)
 CL = characteristic length (also called collision radius)
 CI = collision integral

The characteristic length is also known as the collision radius and is the arithmetic mean of the molecular radii of air and the contaminant:

$$CL = [Mr(\text{air}) + Mr(\text{contaminant})] / 0.2 \quad (\text{CL in Angstrom})$$

Mr = molecular radius (nm or nanometer)

$$Mr(\text{air}) = 0.3711 \quad (\text{nm})$$

The molecular radius of the contaminant (in nm) is separately estimated:

$$Mr(\text{contaminant}) = 1.18 * [Vm^{(1/3)}]$$

VM = molal volume at boiling point (liter/mol)

The estimation of the collision integral is a multistep calculation:

$$CI = a / (Ts^b) + c / \exp(Ts*d) + e / \exp(Ts*f) + g / \exp(Ts*h)$$

a = 1.06036	c = 0.19300	e = 1.03587	g = 1.76474
b = 0.15610	d = 0.47635	f = 1.52996	h = 3.89411

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Ts is a dimensionless intermediate parameter:

$$T_s = T / \{ [E(\text{air}) * E(\text{contaminant})]^{(1/2)} \}$$

T = air temperature (deg K)

E = function of molecular attraction and Boltzmann constant

E(air) = 78.6 (deg K)

E(contaminant) = 1.15 * Tb

Tb = boiling point of contaminant (deg K)

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MOLECULAR DIFFUSIVITY IN WATER

The molecular diffusivity in water can be calculated with a correlation developed by Wilke and Chang:

$$D(\text{water}) = 1.173 \cdot 10^{(-16)} \cdot \frac{(A \cdot M_w)^{0.5} \cdot (T + 273.2)}{\text{vis}(\text{water}) \cdot V_m^{0.6}}$$

- D = molecular diffusivity, square meter per second
- A = association parameter, dimensionless
= 2.26 for water according to Hayduk and Laudie
- M_w = molecular weight of water
= 18 mole/liter
- T = water temperature, degrees Celsius
- vis = absolute viscosity, kilogram per meter.sec
- V_m = molar volume of the contaminant as a liquid at boiling point, liter per mole

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PHYSICAL PROPERTIES OF AIR

Density of atmospheric air (expressed in kilogram per cubic meter)

$$= \frac{1.293}{1 + 0.00367 * T} * \frac{P}{101.3}$$

Absolute viscosity of air (expressed in kilogram per meter . sec)

$$= 1.7 * 10^{-7} * (T + 273.2)^{0.818}$$

T = air temperature expressed in degrees Celsius

P = Ambient air pressure expressed in kiloPascal
per square meter or kiloPascal

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PHYSICAL PROPERTIES OF WATER

Density of water (expressed in kilogram per cubic meter)

$$= \frac{999.84 + 16.945 * T - 7.9870 * 10^{-3} * T^2 - 4.6171 * 10^{-5} * T^3}{1 + 1.68799 * 10^{-2} * T}$$

Absolute viscosity of water (expressed in kilogram per meter.sec)

$$= 1.7868 * 10^{-3} - 5.8573 * 10^{-5} * T + 1.1951 * 10^{-6} * T^2 - 1.1146 * 10^{-8} * T^3$$

Surface tension of water (expressed in kilogram per second squared)

$$= 7.5583 * 10^{-2} - 1.3143 * 10^{-4} * T - 4.7616 * 10^{-7} * T^2$$

In all three cases, T is the water temperature expressed in degrees Celsius.

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PROPERTIES OF TOWER PACKING

The **NOMINAL PACKING SIZE** roughly corresponds to the overall dimension of a packing piece and is ultimately determined by the manufacturer. AIRSTRIP does not consider nominal sizes smaller than 25 mm, because it is not practical.

The **PACKING TYPE** relates to the design of the packing, for example RASCHIG and Pall rings, TELLERETTES, BERL and INTALOX saddles, TRIPAC, etc.

The **PACKING MATERIAL** simply denotes what the packing is made of, and could be glass, ceramic, steel or plastic. AIRSTRIP limits itself to plastic (almost exclusively used for full-scale applications) and ceramic (sometimes used for laboratory studies).

The **CRITICAL SURFACE TENSION** determines the physical interaction between the packing and the water. It is a function of the packing material only, and not of the packing shape or size. AIRSTRIP uses the following values:

Plastic 0.033 kg/s²
Ceramic 0.061 kg/s²

the **AIR FRICTION FACTOR** determines the pressure gradient when air is pumped through the tower. It is a dimensionless parameter which is used in a standard graphical procedure for determining the air pressure gradient.

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AIR PRESSURE GRADIENT

The air pressure gradient through packed towers is normally read from a set of empirical curves which are reproduced in a number of standard textbooks on chemical engineering. These curves are valid if the air pressure gradient is between 50 and 1200 Pa/m. The curves have recently been digitized into a set of equations, which is used in AIRSTRIP. The multistep computation is tedious and reversed, i.e. it treats the air pressure gradient as the independent variable. The air pressure gradient, therefore, is most easily calculated by iteration.

First calculate the intermediate values F, A0, A1 and A2:

$$\begin{aligned}
 F &= \log P && (P \text{ is the air pressure gradient in Pa/m}) \\
 A0 &= -6.6599 + 4.3077 \cdot F - 1.3503 \cdot F^2 + 0.15931 \cdot F^3 \\
 A1 &= 3.0945 - 4.3512 \cdot F + 1.6240 \cdot F^2 - 0.20855 \cdot F^3 \\
 A2 &= 1.7611 - 2.3394 \cdot F + 0.8991 \cdot F^2 - 0.11597 \cdot F^3
 \end{aligned}$$

Calculate the intermediate value E from:

$$E = -\log \left[\left(\frac{A}{W} \right) \cdot (S - S^2)^{0.5} \right]$$

A/W = dimensionless volumetric air/water ratio

S = dimensionless air/water density ratio

Use the intermediate values A0, A1, A2 and E to calculate M:

$$M = 10^{(A0 + A1 \cdot E + A2 \cdot E^2)}$$

Calculate the air flow rate from:

$$Q(\text{air}) = \left\{ M \cdot [\text{den}(\text{water}) - \text{den}(\text{air})] / [\text{den}(\text{air}) \cdot C_f \cdot \text{vis}(\text{water})^{0.1}] \right\}^{0.5}$$

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The symbols and units in the equation on the preceding page are:

- Q(air) = mass air loading rate, kg/m².s
- M = intermediate value, dimensionless
- den = density kg/m³
- vis = viscosity kg/m.s
- Cf = dimensionless air friction factor
(see "packing properties")

The above calculation sequence is only valid within certain bounds:

1. The air pressure gradient must be between 50 and 1200 Pa/m,
2. $(A/W) * (S - S^2)^{0.5}$ must be less than 33, and
3. M must be greater than 0.0015.

THEORETICAL LIMITATIONS

AIRSTRIP is based on theory which is commonly and successfully used in practice. Some assumptions have been implicitly made in the earlier derivations that warrant explicit attention:

- The contaminant is entirely strippable. Some reports have indicated that there may be an unstrippable contaminant fraction, but no theoretical explanation has been advanced.
- The contaminant is unreactive. Some compounds, such as carbon dioxide or ammonia, maintain an equilibrium with other chemical species in the water. AIRSTRIP will not be applicable to these contaminants.
- The ONDA correlations are based on experimental data which was collected with packing 50mm and smaller. They appear to work fairly well for packing up to 75mm, but no explicit verification has been published.

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APPENDIX D

AIR STRIPPER ATMOSPHERIC EMISSIONS
Pt. Everglades 1st Tower
Intermittent Operation (25 hrs/mnth)

FLOW RATE 10 (gpm)
STACK HEIGHT 25 (ft)

	CONCEN. (ppb)	1.25 S.F.	INFLUENT FLOW RATE (lbs/hrs)
BENZENE	5000	6250	3.13E-02
TOLUENE	8100	10125	5.06E-02
ETHYL BENZENE	0	0	0.00E+00
XYLENES	3000	3750	1.88E-02
MTBE	260000	325000	1.62E+00

	MAC (mg/m3)	AAC (mg/m3)
BENZENE	7.00E-03	2.08E-01
TOLUENE	1.13E-02	5.20E+01
ETHYL BENZENE	0.00E+00	3.02E+01
XYLENES	4.20E-03	3.02E+01
MTBE	3.64E-01	3.47E+01

DO THE IMPACTS FROM THE BENZENE CONTAMINANTS EXCEED THE "AAC"	NO
DO THE IMPACTS FROM THE TOLUENE CONTAMINANTS EXCEED THE "AAC"	NO
DO THE IMPACTS FROM THE ETHYL BENZENE CONTAMINANTS EXCEED THE "AAC"	NO
DO THE IMPACTS FROM THE XYLENE CONTAMINANTS EXCEED THE "AAC"	NO
DO THE IMPACTS FROM THE MTBE CONTAMINANTS EXCEED THE "AAC"	NO

AIR STRIPPER ATMOSPHERIC EMISSIONS
Pt. Everglades 1st Tower
Continuous Operation

FLOW RATE 10 (gpm)
STACK HEIGHT 25 (ft)

	CONCEN. (ppb)	1.25 S.F.	INFLUENT FLOW RATE (lbs/hrs)
BENZENE	5000	6250	3.13E-02
TOLUENE	8100	10125	5.06E-02
ETHYL BENZENE	0	0	0.00E+00
XYLENES	3000	3750	1.88E-02
MTBE	260000	325000	1.62E+00

	MAC (mg/m3)	AAC (mg/m3)
BENZENE	7.00E-03	7.14E-03
TOLUENE	1.13E-02	1.78E+00
ETHYL BENZENE	0.00E+00	1.04E+00
XYLENES	4.20E-03	1.04E+00
MTBE	3.64E-01	1.19E+00

DO THE IMPACTS FROM THE BENZENE CONTAMINANTS EXCEED THE "AAC"	NO
DO THE IMPACTS FROM THE TOLUENE CONTAMINANTS EXCEED THE "AAC"	NO
DO THE IMPACTS FROM THE ETHYL BENZENE CONTAMINANTS EXCEED THE "AAC"	NO
DO THE IMPACTS FROM THE XYLENE CONTAMINANTS EXCEED THE "AAC"	NO
DO THE IMPACTS FROM THE MTBE CONTAMINANTS EXCEED THE "AAC"	NO

AIR STRIPPER ATMOSPHERIC EMISSIONS
Pt. Everglades 2nd Tower
Continuous Operation

FLOW RATE 10 (gpm)
STACK HEIGHT 25 (ft)

	CONCEN. (ppb)	1.25 S.F.	INFLUENT FLOW RATE (lbs/hrs)
--	------------------	--------------	------------------------------------

BENZENE	0	0	0.00E+00
TOLUENE	0	0	0.00E+00
ETHYL BENZENE	0	0	0.00E+00
XYLENES	0	0	0.00E+00
MTBE	406	507.5	2.50E-03

	MAC (mg/m3)	AAC (mg/m3)
--	----------------	----------------

BENZENE	0.00E+00	7.14E-03
TOLUENE	0.00E+00	1.78E+00
ETHYL BENZENE	0.00E+00	1.04E+00
XYLENES	0.00E+00	1.04E+00
MTBE	6.00E-04	1.19E+00

DO THE IMPACTS FROM THE BENZENE CONTAMINANTS EXCEED THE "AAC"	NO
DO THE IMPACTS FROM THE TOLUENE CONTAMINANTS EXCEED THE "AAC"	NO
DO THE IMPACTS FROM THE ETHYL BENZENE CONTAMINANTS EXCEED THE "AAC"	NO
DO THE IMPACTS FROM THE XYLENE CONTAMINANTS EXCEED THE "AAC"	NO
DO THE IMPACTS FROM THE MTBE CONTAMINANTS EXCEED THE "AAC"	NO

APPENDIX E

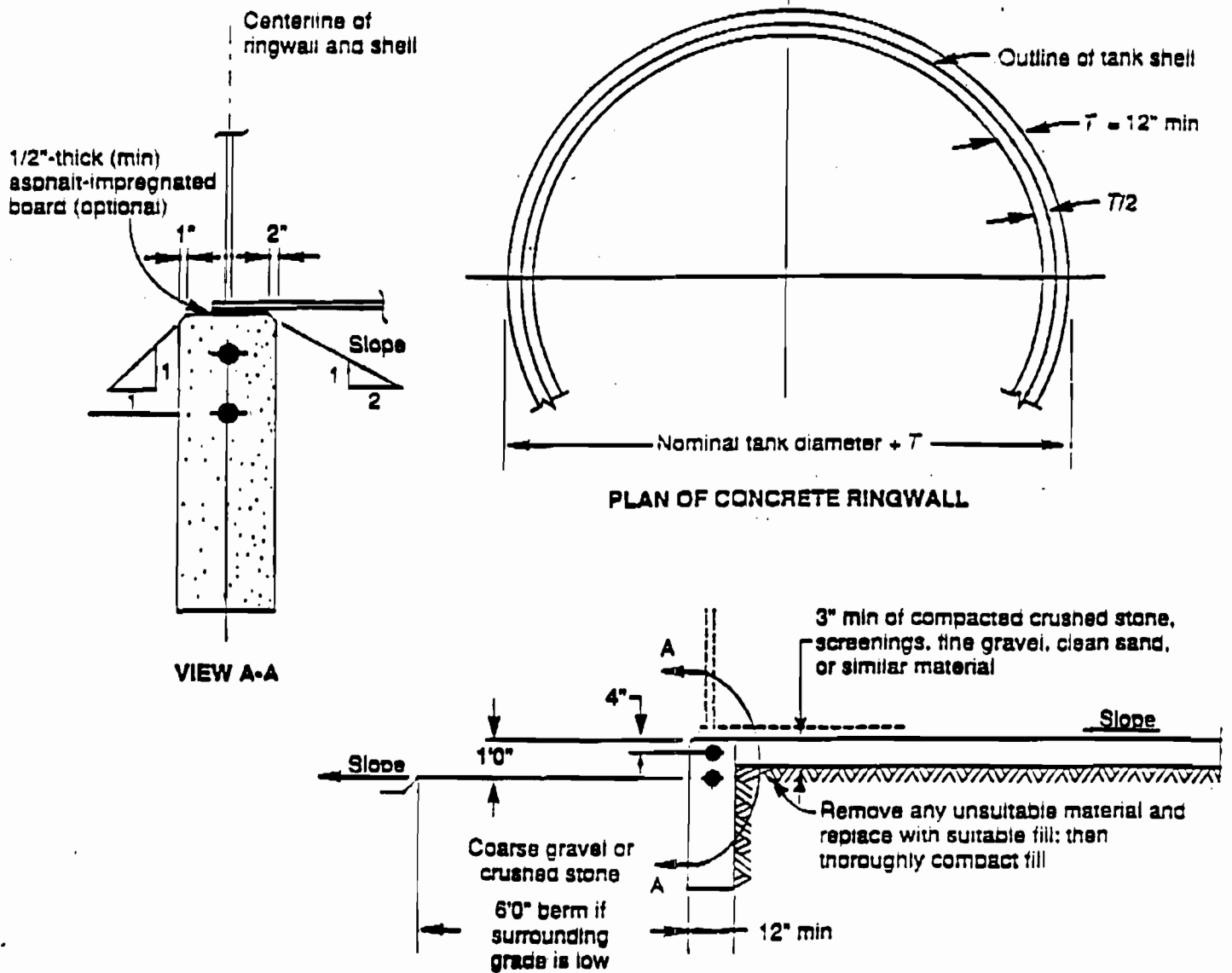
ABOVEGROUND HOLDING TANK SPECIFICATIONS - 25,000 GALS CAPACITY

The subject holding tank will be shop fabricated and shipped to the site for onsite erection. The tank will be an API-650 or an UL-142 atmospheric holding tank that will be used for storage of treated waste water only. The tank will not conform to the RCRA requirements and will not have any spill containment. The following is the summary of the tank design specifications.

- * Tank diameter, ft. = 13.5'
- * Tank height, ft. = 24'
- * Material of construction = 1/4 inch, A36 carbon steel
- * Manholes = Two (2) required, top and side, 24 inch diameter each.
- * Nozzles = Five (5) required, 150 lbs. flanged, location as specified.
- * Coating = zinc oxide - 11 primer on the outside
- * Caged ladder = Ladder to be provided to have access to the top of the tank
- * Inspection = Tank to be spot x-rayed.
- * Stamp = API 650 or UL-142

Delivery will be 4-6 weeks from the date of order. Fabricator will provide shop drawings for approval prior to fabrication. The tank will be installed on a concrete ring wall foundation as shown on the following page.

ABOVEGROUND HOLDING TANK SPECIFICATIONS - 25,000 GALS CAPACITY



The top of the concrete ringwall should be smooth and level. The concrete strength shall be at least 3000 pounds per square inch after 28 days. Reinforcement splices shall be lapped to develop full strength in the bond.

APPENDIX F

Cost Analysis for
Star Enterprise Bulk Storage Facility
Wastewater Treatment System
Port Everglades, Florida

1) Skid	= \$ 15,750
2) Tanks and Filters	= \$ 26,564
3) Pumps and Motors	= \$ 11,090
4) Panels, Power Boxes and Controllers	= \$ 14,290
5) Instrumentation, Sensors, and Gauges	= \$ 5,145
6) Above Ground Storage Tanks	= \$ 45,000
7) Product Storage Tank	= \$ 1,300
8) Other Process Design and Documentation	= \$ 8,400
9) Installation	= \$ 40,000
10) Miscellaneous	= \$ <u>3,455</u>
TOTAL	= \$ 171,000