PS Form 3811, July 1983

DOMESTIC RETURN RECEIPT

SENDER: Complete items 1, 2, 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 service(s) requested.

1. ☐ Show to whom, date and address of delivery.
2. ☐ Restricted Delivery.

3. Article Addressed to:
Mr. Garrett Sloan
Miami-Dade Water & Sewer Auth.
3575 South LeJeune Rd.
Miami, Florida 33133

4. Type of Service:	Article Number
☐ Registered ☐ Insured ☒ Certified ☐ COD ☐ Express Mail	0155530

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature – Addressee
X

6. Signature – Agent
X Mario

7. Date of Delivery

APR 3 1985 COCONUT GROVE STA.

8. Addressee's Address (ONLY if requested and fee paid)

No. 0155530

RECEIPT FOR CERTIFIED MAIL

NO INSURANCE COVERAGE PROVIDED—
NOT FOR INTERNATIONAL MAIL

(See Reverse)

SENT TO Mr. Garrett Sloan		
STREET AND NO.		
P.O., STATE AND ZIP CODE		
POSTAGE		$
CONSULT POSTMASTER FOR FEES	CERTIFIED FEE	¢
	SPECIAL DELIVERY	¢
	RESTRICTED DELIVERY	¢
OPTIONAL SERVICES / RETURN RECEIPT SERVICE	SHOW TO WHOM AND DATE DELIVERED	¢
	SHOW TO WHOM, DATE, AND ADDRESS OF DELIVERY	¢
	SHOW TO WHOM AND DATE DELIVERED WITH RESTRICTED DELIVERY	¢
	SHOW TO WHOM, DATE AND ADDRESS OF DELIVERY WITH RESTRICTED DELIVERY	¢
TOTAL POSTAGE AND FEES		$
POSTMARK OR DATE 3/29/85		

PS Form 3800, Apr. 1976

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
NOTICE OF PERMIT

Mr. Garrett Sloan
Miami-Dade Water and Sewer Authority
3575 South LeJeune Road
Miami, Florida 33133

March 28, 1985

Enclosed is Permit Number AC 13-81284 to Miami-Dade Water and Sewer Authority, Virginia Key Sewage Treatment Plant, to construct four 1,200 kW methane gas fueled combustion engines, 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 32301; 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.

Sincerely,

C. H. Fancy

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

Enclosure

cc: Joseph L. Tessitore
John Greenleaf
Tom Tittle
Patrick Wong
Dan Thompson

CERTIFICATION

This is to certify that the foregoing Notice of Permit and all copies requested were mailed before the close of business on 29 MARCH, 1985.

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32301

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.

Patricia G. Adams
Clerk

March 29, 1985
Date

Final Determination

Virginia Key Sewage Treatment Plant
Miami-Dade Water and Sewer Authority
Dade County
Virginia Key, Key Biscayne, Florida

Permit Number:
AC 13-81284

Florida Department of Environmental Regulation
Bureau of Air Quality Management
Central Air Permitting

March 21, 1985

Virginia Key Sewage Treatment Plant
Virginia Key, Key Biscayne, Florida
Dade County

The application to construct four methane burning generators has been reviewed by the department. Public notice of the department's Intent to Issue was published in The Miami Herald on February 7, 1985. Copies of the technical evaluation and preliminary determination were available for public inspection at Dade County's Department of Environmental Resources Management office, the Department's Southeast Florida District office, and the Department's Bureau of Air Quality Management office.

No comments or additional inputs were received, nor were any modifications made.

It is recommended that the construction permit be issued as drafted.

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

PERMITTEE:
Virginia Key Sewage Treatment Plant
Miami-Dade Water and Sewer Authority
3575 South LeJune Road
Miami, Florida 33133

Permit Number: AC 13-81284
Expiration Date: March 31, 1986
County: Dade
Latitude/Longitude: 25° 44' 43" N/ 80° 08' 55" W
Project: Construction of four (4) 1,200 kW methane gas (digester gas) fueled combustion engines, each with an associated electrical generator

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 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 drawing(s), 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/installation of four 1,200 kW methane gas (digester gas) fueled internal combustion engines, each with an associated electrical generator. Each prime mover will have 16 cylinders and will be turbocharged. The UTM coordinates are Zone 17, 585.2 km East and 2848.1 km North. Virginia Key STP is located in Virginia Key, Key Biscayne, Florida.

Construction/installation shall be in accordance with the permit application and plans, documents, and drawings, except as otherwise noted on pages 5 and 6 of the Specific Conditions.

Previously assigned permit numbers AC 13-81290, -81295, and -81297 are replaced by AC 13-81284.

Attachments are as follows:

1. John A. Guidry's letter, dated November 15, 1983.
2. Joseph L. Tessitore's letter with 4 Applications to Construct Air Pollution Sources, DER Form 17-1.202, dated January 16, 1984.
3. Southeast Florida District's Interoffice Memorandum, dated February 10, 1984.
4. C.H. Fancy's letter, dated February 17, 1984.
5. C.H. Fancy's letter, dated July 11, 1984.
6. Joseph L. Tessitore's letter, dated August 3, 1984.
7. C.H. Fancy's letter, dated August 13, 1984.
8. Joseph L. Tessitore's letter with attachments, dated August 17, 1984.
9. C.H. Fancy's letter, dated August 24, 1984.
10. Joseph L. Tessitore's letter with attachments, dated October 1, 1984.
11. Interoffice Memorandum, dated October 11, 1984.
12. C.H. Fancy's letter, dated November 2, 1984.
13. Joseph L. Tessitore's letter with attachments, dated November 14, 1984.
14. Joseph L. Tessitore's letter, dated January 18, 1985.

PERMITTEE:
Virginia Key STP
3575 South LeJune Road
Miami, Florida 33133

Permit Number: AC 13-81284
Expiration Date: March 31, 1986

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is hereby placed on notice that the department will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

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. Nor 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 does not constitute 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 constititute 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, plant or aquatic life or property and penalties therefore caused by the construction or operation of this permitted source, 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:
Virginia Key STP
3575 South LeJune Road
Miami, Florida 33133

Permit Number: AC 13-81284
Expiration Date: March 31, 1986

GENERAL CONDITIONS:

6. The permittee shall at all times 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, access to the premises, at reasonable times, where the permitted activity is located or conducted for the purpose of:

a. Having access to and copying any records that must be kept under the conditions of the permit;

b. Inspecting the facility, equipment, practices, or operations regulated or required under this permit; and

c. Sampling or monitoring 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 notify and provide the department with the following information:

a. a description of and cause of non-compliance; and

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

PERMITTEE:
Virginia Key STP
3575 South LeJune Road
Miami, Florida 33133

Permit Number: AC 13-81284
Expiration Date: March 31, 1986

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 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 arising under the Florida Statutes or department rules, except where such use is proscribed by Sections 403.73 and 403.111, Florida Statutes.

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 17-4.12 and 17-30.30, 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 is required to be kept at the work site of the permitted activity during the entire period of construction or operation.

13. This permit also constitutes:

- ( ) Determination of Best Available Control Technology (BACT)
- ( ) Determination of Prevention of Significant Deterioration (PSD).
- ( ) Compliance with New Source Performance Standards.

14. The permittee shall comply with the following monitoring and record keeping requirements:

a. Upon request, the permittee shall furnish all records and plans required under department rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the department, during the course of any unresolved enforcement action.

PERMITTEE:
Virginia Key STP
3575 South LeJune Road
Miami, Florida 33133

Permit Number: AC 13-81284
Expiration Date: March 31, 1986

GENERAL CONDITIONS:

b. The permittee shall retain 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), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be 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 date(s) analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. 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 submitted or corrected promptly.

SPECIFIC CONDITIONS:

1. Maximum annual hours of operation shall not exceed 8,400 per electrical generating unit (prime mover and associated generator).

2. Maximum total hours of operation, four electrical generating units, shall not exceed 27,200.

3. Each electrical generating unit shall be equipped with a timing device to record the actual time of operation and it shall be electrically interlocked with the starter.

PERMITTEE:
Virginia Key STP
3575 South LeJune Road
Miami, Florida 33133

Permit Number: AC 13-81284
Expiration Date: March 31, 1986

SPECIFIC CONDITIONS:

4. Maximum allowable emissions are as follows:

Source	Pollutant	Maximum Allowable Emission Limit	lbs/hr	TPY
1 Unit	NO_x	700 ppm by volume, at 15% oxygen on a dry basis	18.3	76.9
All Units	NO_x			248.9
All Units	Visible Emissions	less than 20% Opacity		

Note:
- 1 unit - based on 8,400 annual hours of operation.
- All units - based on 27,200 total annual hours of operation.
- NO_x - nitrogen oxides.

5. Objectionable odors shall not be allowed on off-plant property.

6. Compliance tests shall be required in accordance with FAC Rule 17-2.700. NO_x and visible emissions compliance tests shall be performed using EPA Method 7 and 9, respectively. Test reports shall be submitted to the DER's Southeast Florida District office and the Dade County Environmental Resources Management office within 45 days after the last completed test run. For compliance testing, each office shall be notified 30 days prior to testing, or within a time frame coordinated and approved by each office.

7. Prior to 90 days before the expiration date of this permit, a complete application for operating permit and compliance test results shall be submitted to the DER's Southeast Florida District office or its designee. Full operation of the sources may then be conducted in compliance with the terms of this permit until its expiration or receipt of an operating permit.

Issued this 25th day of March, 1985.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

VICTORIA J. TSCHINKEL, Secretary

____ pages attached.

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

D E R
MAR 26 1985
BAQM

For Routing To District Offices And/Or To Other Than The Addressee		
To:	Loctn.:	
To:	Loctn.:	
To:	Loctn.:	
From:	Date:	
Reply Optional [ ]	Reply Required [ ]	Info. Only [ ]
Date Due:	Date Due:	

RECEIVED
MAR 25 1985
Office of the Secretary

TO: Victoria J. Tschinkel

FROM: Clair Fancy

DATE: March 25, 1985

SUBJ: Virginia Key Sewage Treatment Plant

Attached is the Final Determination and Permit to Construct, No. AC 13-81284, which approves the construction of four methane (digester gas) burning generators at the above referenced facility in Virginia Key, Key Biscayne, Dade County, Florida. Public Notice of the department's Intent to Issue the permit was published in The Miami Herald on February 7, 1985. No comments were received on the proposed permit. Day 90, after which the permit would be issued by default, is April 13, 1985.

The bureau recommends your approval and signature of the construction permit.

CHF/BM/s

Check Sheet

Company Name: Miami Dade Sewer and Water Authority
Permit Number: AC 13-81284, -81290, -81295 - 81297
PSD Number:
Permit Engineer:

Application:

ok ☑ ~~Initial Application~~
- ☑ Incompleteness Letters
- ☑ Responses
- ☐ Waiver of Department Action
- ☐ Department Response
- ☐ Other

Cross References:
- ☐
- ☐
- ☐

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

AC13-81290
-81295
-81297 } W/
81284 - APPROVED
1-18-84

Final Determination:

- ☑ Final Determination
- ☑ Signed Permit
- ■ BACT or LAER Determination
  - ☐ Other

Post Permit Correspondence:

- ☑ Extensions/Amendments/Modifications
- ☑ Other

In the folder labeled as follows there are documents, listed below, which were not reproduced in this electronic file. That folder can be found in one of the file drawers labeled Supplementary Documents Drawer. Folders in that drawer are arranged alphabetically, then by permit number.

Folder Name: Miami Dade Sewer and Water Authority

Permit(s) Numbered:

AC	13	-	081284
AC	13	-	081290
AC	13	-	081295
AC	13	-	081297

Period during which document was received:		Detailed Description
APPLICATION 18 JAN 1984	1.	36"×24" BLUEPRINT: COVER PRINT WITH PHOTO OF SITE (DRAWING NUMBER: F 80091)
	2.	36"×24" BLUEPRINT: FIRST FLOOR PLAN AND PARTIAL ROOF PLAN (SHEET: M6 OF 13)
	3.	36"×24" BLUEPRINT: SECTION - TYPICAL ENGINE INSTALLATION (SHEET: M10 OF 13)
	4.	36"×24" BLUEPRINT: 55 MGD ADDITION TO THE CENTRAL DISTRICT WASTEWATER TREATMENT PLANT (DRAWING NUMBER: S-2180-A)

● **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. Garrett Sloan, Director Miami-Dade Water and Sewer Auth. 3575 S. LeJeune Road Post Office Box 330316 Miami, FL 33233-0316	4. Article Number P 274 007 440 Type of Service: ☐ Registered ☐ Insured ☒ Certified ☐ COD ☐ Express Mail Always obtain signature of addressee or agent and DATE DELIVERED.
5. Signature – Addressee X R Rivezung	8. Addressee's Address (*ONLY if requested and fee paid*)
6. Signature – Agent X	
7. Date of Delivery 8 27 88	

PS Form **3811**, Mar. 1987 ★ U.S.G.P.O. 1987-178-268 **DOMESTIC RETURN RECEIPT**

P 274 007 440

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

★ U.S.G.P.O. 1985-480-794

Sent to Mr. Garrett Sloan, MDW&SA	
Street and No. P.O. Box 330316	
P.O., State and ZIP Code Miami, FL 33233-0316	
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: 8-26-88 Permit: AC 13-81284	

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

August 23, 1988

CERTIFIED MAIL - Return Receipt Requested

Mr. Garrett Sloan, Director
Miami-Dade Water and Sewer
Authority Department
3575 S. LeJeune Road
Post Office Box 330316
Miami, Florida 33233-0316

Dear Mr. Sloan:

Re: Amendment to an Air Construction Permit
No. AC 13-81284

The Department is in receipt of your letter dated August 9, 1988, which requested an extension of the expiration date for the above referenced permit. The following shall be changed and added:

Expiration Date:

From: August 31, 1988
To: December 31, 1988

Attachment to be Incorporated:

17. Mr. Garrett Sloan's letter dated August 9, 1988, and received August 11, 1988.

This letter must be attached to the construction permit, No. AC 13-81284, and shall become a part of the permit.

Sincerely,

Dale Twachtmann
Secretary

DT/ks

cc: S. Brooks, SE Dist.
P. Wong, DERM
B. Pittman, Esq., DER

ATTACHMENT 17

BEST AVAILABLE COPY

PHI
8-9-88
Miami, FL

MIAMI-DADE WATER AND SEWER AUTHORITY DEPARTMENT

P. O. BOX 330' 6
MIAMI, FLORIDA 33233-0316

Main Office
3575 S. LeJeune Road
Telephone 665-7471

RECEIVED
AUG 11 1988
DER - BAQM

August 9, 1988

Mr. Bruce Mitchell
Bureau of Air Quality
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399

Re: Air Quality Permit No. 1284, Contract S-279

Dear Mr. Mitchell:

This letter is our request for an extension to December 31, 1988 of the subject permit. The permit is scheduled to expire on August 31, 1988.

We have requested and have received approval from the Department's Bureau of Local Government Wastewater Financial Assistance for a contract extension until December 31, 1988. We are awaiting written confirmation of the extension, which you may verify with Ms. Susan Fleming of that Bureau.

Should you have any questions, please call Mrs. Bonnie Wells at (305) 665-7471, extension 270.

Very truly yours,

Garrett R. Sloan

Garrett Sloan
Director

GS/BPW/cd

cc: Robert A. Cuevas, P.E.
Bonnie P. Wells

copied: I. Goldman, SE Dist.
Patrick Wong, DERM
CHF/BT

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

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

TO: Dale Twachtmann

FROM: Steve Smallwood

DATE: August 23, 1988

SUBJ: Amendment to Construction Permit No. AC 13-81284
Miami-Dade Water and Sewer Authority Department
Virginia Key Sewage Treatment Plant

Attached for your approval and signature is a letter extending the expiration date for the above referenced construction permit.

I recommend your approval and signature.

SS/BM/s

attachment

RECEIVED
AUG 24 1988
Office of the Secretary

RECEIVED
AUG 25 1988
DER - BAQM

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

FAX TRANSMITTAL LETTER

DATE: 5-22-90

TO:

NAME Stephanie Brooks

AGENCY: DER - West Palm

TELEPHONE: (407) 964-1275

NUMBER OF PAGES (INCLUDING COVER SHEET) 4

FROM:

NAME: Bruce Mitchell

AGENCY: DER / BAR

IF ANY OF THE PAGES ARE NOT CLEARLY RECEIVED, PLEASE CALL IMMEDIATELY. PHONE NO. (904) 488-1344

SENDERS NAME: Bruce Mitchell

COMMENTS:

Miami-Dade & Sewer Auth.
Virginia Key STP

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

PERMITTEE:
Virginia Key Sewage Treatment Plant
Miami-Dade Water and Sewer Authority
3575 South LeJune Road
Miami, Florida 33133

Permit Number: AC 13-81284
Expiration Date: March 31, 1986
County: Dade
Latitude/Longitude: 25° 44' 43" N/ 80° 08' 55" W
Project: Construction of four (4) 1,200 kW methane gas (digester gas) fueled combustion engines, each with an associated electrical generator

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 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 drawing(s), 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/installation of four 1,200 kW methane gas (digester gas) fueled internal combustion engines, each with an associated electrical generator. Each prime mover will have 16 cylinders and will be turbocharged. The UTM coordinates are Zone 17, 585.2 km East and 2848.1 km North. Virginia Key STP is located in Virginia Key, Key Biscayne, Florida.

Construction/installation shall be in accordance with the permit application and plans, documents, and drawings, except as otherwise noted on pages 5 and 6 of the Specific Conditions.

Previously assigned permit numbers AC 13-81290, -81295, and -81297 are replaced by AC 13-81284.

Attachments are as follows:

1. John A. Guidry's letter, dated November 15, 1983.
2. Joseph L. Tessitore's letter with 4 Applications to Construct Air Pollution Sources, DER Form 17-1.202, dated January 16, 1984.
3. Southeast Florida District's Interoffice Memorandum, dated February 10, 1984.
4. C.H. Fancy's letter, dated February 17, 1984.
5. C.H. Fancy's letter, dated July 1[illegible], 1984.
6. Joseph L. Tessitore's letter, dated August 3, 1984.
7. C.H. Fancy's letter, dated August 13, 1984.
8. Joseph L. Tessitore's letter with attachments, dated August 17, 1984.
9. C.H. Fancy's letter, dated August 24, 1984.
10. Joseph L. Tessitore's letter with attachments, dated October 1, 1984.
11. Interoffice Memorandum, dated October 11, 1984.
12. C.H. Fancy's letter, dated November 2, 1984.
13. Joseph L. Tessitore's letter with attachments, dated November 14, 1984.
14. Joseph L. Tessitore's letter, dated January 18, 1985.

PERMITTEE:
Virginia Key STP
3575 South LeJune Road
Miami, Florida 33133

Permit Number: AC 13-81284
Expiration Date: March 31, 1986

GENERAL CONDITIONS:

b. The permittee shall retain 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), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be 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 date(s) analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. 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 submitted or corrected promptly.

SPECIFIC CONDITIONS:

1. Maximum annual hours of operation shall not exceed 8,400 per electrical generating unit (prime mover and associated generator).

2. Maximum total hours of operation, four electrical generating units, shall not exceed 27,200.

3. Each electrical generating unit shall be equipped with a timing device to record the actual time of operation and it shall be electrically interlocked with the starter.

PERMITTEE:
Virginia Key STP
3575 South LeJune Road
Miami, Florida 33133

Permit Number: AC 13-81284
Expiration Date: March 31, 1986

SPECIFIC CONDITIONS:

4. Maximum allowable emissions are as follows:

Source	Pollutant	Maximum Allowable Emission Limit		
			lbs/hr	TPY
1 Unit	NO_x	700 ppm by volume, at 15% oxygen on a dry basis	18.3	76.9
All Units	NO_x			248.9
All Units	Visible Emissions	less than 20% Opacity		

Note:
- 1 unit - based on 8,400 annual hours of operation.
- All units - based on 27,200 total annual hours of operation.
- NO_x - nitrogen oxides.

5. Objectionable odors shall not be allowed on off-plant property.

6. Compliance tests shall be required in accordance with FAC Rule 17-2.700. NO_x and visible emissions compliance tests shall be performed using EPA Method 7 and 9, respectively. Test reports shall be submitted to the DER's Southeast Florida District office and the Dade County Environmental Resources Management office within 45 days after the last completed test run. For compliance testing, each office shall be notified 30 days prior to testing, or within a time frame coordinated and approved by each office.

7. Prior to 90 days before the expiration date of this permit, a complete application for operating permit and compliance test results shall be submitted to the DER's Southeast Florida District office or its designee. Full operation of the sources may then be conducted in compliance with the terms of this permit until its expiration or receipt of an operating permit.

Issued this 25th day of March, 1985.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

VICTORIA J. TSCHINKEL, Secretary

____ pages attached.

PM
8-9-88
Miami, FL

file copy

MIAMI-DADE WATER AND SEWER AUTHORITY DEPARTMENT

P. O. BOX 330316
MIAMI, FLORIDA 33233-0316

Main Office
3575 S. LeJeune Road
Telephone 665-7471

RECEIVED
AUG 11 1988
DER - BAQM

August 9, 1988

Mr. Bruce Mitchell
Bureau of Air Quality
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399

Re: Air Quality Permit No. 1284, Contract S-279

Dear Mr. Mitchell:

This letter is our request for an extension to December 31, 1988 of the subject permit. The permit is scheduled to expire on August 31, 1988.

We have requested and have received approval from the Department's Bureau of Local Government Wastewater Financial Assistance for a contract extension until December 31, 1988. We are awaiting written confirmation of the extension, which you may verify with Ms. Susan Fleming of that Bureau.

Should you have any questions, please call Mrs. Bonnie Wells at (305) 665-7471, extension 270.

Very truly yours,

Garrett Sloan
Director

2 — NO LONGER THERE

GS/BPW/cd

cc: Robert A. Cuevas, P.E.
Bonnie P. Wells

copied: I. Goldman, SE Dist.
Patrick Strong, DERM
CHF/BT

DEPARTMENT OF ENVIRONMENTAL REGULATION

ROUTING AND TRANSMITTAL SLIP

ACTION NO

ACTION DUE DATE

1. TO: (NAME, OFFICE, LOCATION)	Initial / Date
Mr. Gene McLoughlin	Initial / Date
2. Miami-Dade Water & Sewer Authority Dept.	Initial / Date
3. P.O. Box 330316	Initial / Date
4. Miami, FL 33233-0316	Initial / Date

REMARKS:

Dear Mr. McLoughlin:

Please find enclosed the last extension of the expiration date.

If there are any questions please give me a call.

Sincerely,

INFORMATION
Review & Return
Review & File
Initial & Forward

DISPOSITION
Review & Respond
Prepare Response
For My Signature
For Your Signature
Let's Discuss
Set Up Meeting
Investigate & Report
Initial & Forward
Distribute
Concurrence
For Processing
Initial & Return

FROM: R Bruce Mitchell

DATE 1/22/88

PHONE (904) 488-1344

PS Form 3811, July 1983 447-845

SENDER: Complete items 1, 2, 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 service(s) requested.

1. XX Show to whom, date and address of delivery.
2. ☐ Restricted Delivery.

3. Article Addressed to: Garrett Sloan, Dir
Miami-Dade Water & Sewer Authority
Department
3575 S. LeJeune Road
P.O. Box 330316
Miami, FL 33233-0316

4. Type of Service:
☐ Registered ☐ Insured
XX Certified ☐ COD
☐ Express Mail

Article Number: P 274 007 668

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature – Addressee
X

6. Signature – Agent
X

7. Date of Delivery

8. Addressee's Address (ONLY if requested and fee paid)

COCONUT GROVE STA. MIAMI, FL. OCT 1987 USPO

DOMESTIC RETURN RECEIPT

P 274 007 668

RECEIPT FOR CERTIFIED MAIL

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

Sent to Garrett Sloan Miami-Dade STP	
Street and No. 3575 S. LeJeune Road/P.O. BOX 330316	
P.O., State and ZIP Code Miami, FL 33233-0316	
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: 10/13/87 Permit: AC 13-81284	

PS Form 3800, June 1985 ☆ U.S.G.P.O. 1985-480-794

File Copy

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

DEPARTMENT OF ENVIRONMENTAL REGULATION
STATE OF FLORIDA

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

October 8, 1987

Mr. Garrett Sloan, Director
Miami-Dade Water and Sewer
Authority Department
3575 S. LeJeune Road
Post Office Box 330316
Miami, Florida 33233-0316

Dear Mr. Sloan:

Re: Expiration Date Extension for Construction Permit
No. AC 13-81284

The Department is in receipt of your letter dated September 28, 1987, which requested an extension of the expiration date for the above referenced permit. The following shall be changed and added:

<u>Expiration Date:</u>

From: October 31, 1987
To: August 31, 1988

<u>Attachment to be Incorporated:</u>

16. Mr. Garrett Sloan's letter dated September 28, 1987, and received October 6, 1987.

This letter must be attached to your construction permit, No. AC 13-81284, and shall become a part of the permit.

Sincerely,

Dale Twachtmann

Dale Twachtmann
Secretary

DT/ks

cc: S. Brooks
P. Wong
B. Pittman, Esq.

ATTACHMENT 16

1 Oct '87
Miami, FL
Certified Mail = P-618-820-807

DER

OCT 6 1987

BAQM

MIAMI-DADE WATER AND SEWER AUTHORITY DEPARTMENT

CERTIFIED MAIL RETURN
RECEIPT REQUESTED NO. P 618 820 807
September 28, 1987

Mr. Bill Thomas
Bureau of Air Quality Management
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301-8241

Re: Virginia Key Sewage Treatment Plant - expiration of the construction permit for the four (4) 1,200 kw methane gas (digester gas) fueled combustion engines, each with an associated electrical generator (#AC 13-81284)

Dear Mr. Thomas:

This letter is written to request on extension on our permit #AC 13-81284 which is due to expire on October 31, 1987.

This request for an extension is due the equipment suppliers delivery of the large engines and generators and other equipment later than anticipated. With large capital equipment this is a common condition because of the long manufacturing time required.

We are requesting a time extension of this permit to August 31, 1988. This will allow two and one-half months for start up and testing and the 90 day application time for operating permit and compliance test results. If you have any questions, please call me or Robert Cuevas at 305-665-7471.

Very truly yours,

Garrett Sloan

Garrett Sloan
Director

GS/REF/fb

Copied. Bruce Mitchell - 10/6-87

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

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

TO: Dale Twachtmann

THRU: Howard Rhodes

FROM: Clair Fancy

DATE: October 7, 1987

SUBJ: Expiration date extension of the construction permit No. AC 13-81284 for Virginia Key Sewage Treatment Plant, issued March 25, 1985.

Attached for your approval and signature is an amendment to the above referenced construction permit.

The Bureau recommends approval and signature.

CHF/BM/m

attachment

RECEIVED
OCT 8 1987
Office of the Secretary

PM,
1 Oct.'87
Miami, FL
Certified Mail = P-618-820-807

File Copy

DER

OCT 6 1987

BAQM

MIAMI-DADE WATER AND SEWER AUTHORITY DEPARTMENT

P. O. BOX 330316

MIAMI, FLORIDA 33233-0316

Main Office
3575 S. LeJeune Road
Telephone 665-7471

CERTIFIED MAIL RETURN
RECEIPT REQUESTED NO. P 618 820 807
September 28, 1987

Mr. Bill Thomas
Bureau of Air Quality Management
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301-8241

Re: Virginia Key Sewage Treatment Plant - expiration of the construction permit for the four (4) 1,200 kw methane gas (digester gas) fueled combustion engines, each with an associated electrical generator (#AC 13-81284)

Dear Mr. Thomas:

This letter is written to request on extension on our permit #AC 13-81284 which is due to expire on October 31, 1987.

This request for an extension is due the equipment suppliers delivery of the large engines and generators and other equipment later than anticipated. With large capital equipment this is a common condition because of the long manufacturing time required.

We are requesting a time extension of this permit to August 31, 1988. This will allow two and one-half months for start up and testing and the 90 day application time for operating permit and compliance test results. If you have any questions, please call me or Robert Cuevas at 305-665-7471.

Very truly yours,

Garrett Sloan
Director

GS/REF/fb

Copied. Bruce Mitchell - 10/6-87

MIAMI-DADE WATER AND SEWER
AUTHORITY DEPARTMENT
P.O. BOX 330316
MIAMI, FLORIDA 33233-0316

CERTIFIED MAIL
P 618 820 807

MIAMI FLA.
OCT - 1 '87
U.S. POSTAGE
1.67

Mr. Bill Thomas
Bureau of Air Quality Management
Florida DER
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32301-8241

P 408 533 211

RECEIPT FOR CERTIFIED MAIL

NO INSURANCE COVERAGE PROVIDED—
NOT FOR INTERNATIONAL MAIL

(See Reverse)

Sent to Mr. Garrett Sloan	
Street and No. 3575 S. LeJeune Road	
P.O., State and ZIP Code Miami, Florida 33233-	
Postage	$ 0316
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	

PS Form 3800, Feb. 1982

PS Form 3811, July 1983

SENDER: Complete items 1, 2, 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 service(s) requested.

1. ☒ Show to whom, date and address of delivery.
2. ☐ Restricted Delivery.

3. Article Addressed to:
Mr. Garrett Sloan
3575 S. LeJeune Road
P.O. Box 330316
Miami, Florida 33233-0316

4. Type of Service:	Article Number
☐ Registered ☐ Insured ☒ Certified ☐ COD ☐ Express Mail	P408533211

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature – Addressee
X

6. Signature – Agent
X

7. Date of Delivery

8. Addressee's Address *(ONLY if requested and fee paid)*

DOMESTIC RETURN RECEIPT

Mla.h F'.'e

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

DER
MAR 18 1986
BAQM

March 14, 1986

Mr. Garrett Sloan, Director
Miami-Dade Water and Sewer
Authority Department
3575 S. LeJeune Road
Post Office Box 330316
Miami, Florida 33233-0316

Dear Mr. Sloan:

Re: Expiration Date Extension for the Construction Permit, AC 13-81284

The Department is in receipt of your letter dated March 11, 1986, which requested an extension of your expiration date for the above referenced permit. The bureau is in agreement with the request and the following shall be changed and added:

<u>Expiration date:</u>

From: March 31, 1986
To: October 31, 1987

<u>Attachment to be incorporated:</u>

15. Mr. Garrett Sloan's letter dated March 11, 1986.

This letter must be attached to your construction permit, No. AC 13-81284, and shall become a part of that permit.

Sincerely,

Victoria J. Tschinkel
Secretary

VJT/ks

enclosure

cc: Stephanie Brooks ✓
Patrick Wong ✓
Reading ✓

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

FOR ROUTING TO OTHER THAN THE ADDRESSEE	
To:	Loctn:
To:	Loctn:
To:	Loctn:
From:	Date:

TO: Victoria J. Tschinkel

FROM: C. H. Fancy, Deputy Chief, BAQM

DATE: March 14, 1986

SUBJ: Approval and signature of an amendment (expiration date extension) to the construction permit, No. AC 13-81284, for Virginia Key Sewage Treatment Plant, issued March 25, 1985.

Enclosed is an amendment to the referenced construction permit and the bureau recommends approval.

CHF/BM/s

DER
MAR 18 1986
BAQM

MIAMI-DADE WATER AND SEWER AUTHORITY DEPARTMENT

P. O. BOX 330316
MIAMI, FLORIDA 33233-0316

Main Office
3575 S. LeJeune Road
Telephone 665-7471

March 11, 1986

DER
MAR 13 1986
BAQM

DER
MAR 18 1986
BAQM

Mr. Bill Thomas
Bureau of Air Quality Management
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301-8241

Re: Virginia Key Sewage Treatment Plant - expiration of the construction permit for the four (4) 1,200 kw methane gas (digester gas) fueled combustion engines, each with an associated electrical generator (#AC 13-81284)

Dear Mr. Thomas:

This letter is written to request an extension on our permit #AC 13-81284 which is due to expire on March 31, 1986.

This request for an extension is due to the fact that the original consulting engineering firm who designed the project went into bankruptcy last year and we had to assume responsibility for finishing the plans and specifications ourselves. After going through the formal bid process and all associated paper work and approvals; we finally had a notice to proceed date of January 13, 1986, with an estimated contract completion date of May 18, 1987.

We are requesting a time extension to October 31, 1987. This will allow two and one-half months for start up and testing and the 90 day application time for operating permit and compliance test results.

Yours truly,

James T Cowgill

for Garrett Sloan
Director

CC: Department of Environmental Resources Management
Attention: Patrick Wong
R. Cuevas
M. Grant

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTHEAST FLORIDA DISTRICT

P.O. BOX 3858
3301 GUN CLUB ROAD
WEST PALM BEACH, FLORIDA 33402-3858

DEPARTMENT OF ENVIRONMENTAL REGULATION STATE OF FLORIDA

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

ROY M. DUKE
DISTRICT MANAGER

February 28, 1986

Dade County
AP-Virginia Key Sewage Treatment Plant
Digester Gas-Driven Generators

DER
MAR 10 1986
BAQM

Mr. Garrett Sloan
Miami-Dade Water and Sewer Authority
3575 S. LeJeune Road
Miami, Florida 33133

Dear Mr. Sloan:

Re: Virginia Key Sewage Treatment Plant - expiration of the construction permit for the four (4) 1,200 kw methane gas (digester gas) fueled combustion engines, each with an associated electrical generator.

Permit #AC 13-81284 for the above referenced facility will expire on March 31, 1986. Florida Administrative Code Rule 17-4.09, requires that prior to sixty (60) days before the expiration of any Department permit, the owner shall apply for a renewal of the permit. It is requested that within thirty (30) days you submit the required fee with the enclosed form for an operation permit if construction is completed, or request an extension of your construction permit. A copy of the completed enclosed form or your request for an extension should be submitted to the Metropolitan-Dade County Environmental Resources Management for their subsequent comments to this office.

If you have any questions please contact Katherine Kolarich of this office, telephone 305/689-5800.

Sincerely,

I. Goldman

I. Goldman, Supervisor
Air Permitting Engineer

IG:kks/j1

Enclosure

cc: Clair Fancy, P.E.
Metropolitan-Dade County Environmental Resources Management
Joseph L. Tessitore, P.E.
John Greenleaf

DEPARTMENT OF ENVIRONMENTAL REGULATION

ROUTING AND TRANSMITTAL SLIP

ACTION NO

ACTION DUE DATE

1. TO: (NAME, OFFICE, LOCATION)	
Clair Fancy, P.E.	Initial MS Date 2/28/86
2. BAQM	Initial Date
3.	Initial Date
4.	Initial Date

REMARKS:

DER
MAR 10 1986
BAQM

INFORMATION	
	Review & Return
	Review & File
	Initial & Forward

DISPOSITION	
	Review & Respond
	Prepare Response
	For My Signature
	For Your Signature
	Let's Discuss
	Set Up Meeting
	Investigate & Report
	Initial & Forward
	Distribute
	Concurrence
	For Processing
	Initial & Return

FROM: DER - W.P.B.

DATE 2/28/86

PHONE 305/689-5800

MIAMI-DADE WATER AND SEWER AUTHORITY DEPARTMENT

P. O. BOX 330316
MIAMI, FLORIDA 33233-0316

Main Office
3575 S. LeJeune Road
Telephone 665-7471

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
NO. P 618820994

DER
MAR 4 1985
BAQM

February 27, 1985

Mr. C. H. Fancy, P.E., Deputy Chief
Bureau of Air Quality Management
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301-8241

Re: Public Notice -
Virginia Key Wastewater
Treatment Plant Modification
Permit

Dear Mr. Fancy:

This is in reply to your letter dated January 25, 1985 requesting public notice for the above referenced proposed construction permit covering four methane burning generators.

I am enclosing a copy of the advertisement of public notice along with the required affidavit.

Should you have any questions, please call me at (305) 665-7471.

Very truly yours,

Mary L. McAtee

Mary L. McAtee
Grants Coordinator

MLM/fb

cc: Gene McLoughlin

Best Available Copy

The Miami Herald
A KNIGHT-RIDDER NEWSPAPER

PUBLISHED DAILY
MIAMI — DADE — FLORIDA

STATE OF FLORIDA
COUNTY OF DADE:

Before the undersigned authority personally appeared

Ann Martula

who on oath says that he/she is

Office Manager

of The Miami Herald, a daily newspaper published at Miami in Dade County, Florida; that the attached copy of advertisement was published in said newspaper in the issues of

February 7, 1985

Date 2.22.85
Please code and approve
Thank you
Soni

Affiant further says that the said The Miami Herald is a newspaper published at Miami, in the said Dade County, Florida and that the said newspaper has heretofore been continuously published in said Dade County, Florida, each day and has been entered as second class mail matter at the post office in Miami, in said Dade 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 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 the said newspaper.

Ann Martula

Sworn to and subscribed before me this 8th

day of Feb A.D. 19 85

My commission expires Mary Lou Varone

NOTARY PUBLIC STATE OF FLORIDA
MY COMMISSION EXPIRES SEPT 20 1987
BONDED THRU GENERAL INSURANCE UND

State of Florida
Department of
Environmental Regulation
Notice of Proposed
Agency Action
on Permit Application

The Department of Environmental Regulation gives notice of its intent to issue a permit to Miami-Dade Water and Sewer Authority, Virginia Key Sewage Treatment Plant to modify an existing facility by constructing/installing four new 1200 KW methane gas fueled internal combustion engines (prime movers) and associated electrical generators. Each prime mover will have 16 cylinders and will be turbocharged. Virginia Key Sewage Treatment Plant is located in Virginia Key, Key Biscayne, Dade County, Florida. A determination of best available control technology (BACT) was not required.

Persons 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 conform to the requirements of Chapters 17-103 and 28-5, Florida Administrative Code, and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Twin Towers Office Building, Tallahassee, Florida 32301, within fourteen (14) days of publication of this notice. Failure to file a request for hearing 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.

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 preliminary statement. Therefore, persons who may not object to the proposed agency action may wish to intervene in the proceeding. A petition for intervention must be filed pursuant to Model Rule 28-5.207 at least five (5) days before the final hearing and be filed with the hearing officer if one has been assigned at the Division of Administrative Hearings, Department of Administration, 2009 Apalachee Parkway, Tallahassee, Florida 32301. If no hearing officer has been assigned, the petition is to be filed with the Department's Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32301. Failure to petition to intervene within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, Florida Statutes.

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

Dept. of Environmental Regulation
Southeast Florida District
3301 Gun Club Road
W. Palm Beach, Fla 33402

Dade County Dept of Environmental Resources Management
909 Southeast 1st Avenue,
Brickell Plaza
Miami, Florida 33131

Dept. of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Fl 32301

Any person may send written comments on the proposed action to Mr. Bill Thomas at the department's Tallahassee address. All comments mailed within 30 days of the publication of this notice will be considered in the department's final determination.

RULES OF THE ADMINISTRATIVE COMMISSION
MODEL RULES OF PROCEDURE
CHAPTER 28-5
DECISIONS DETERMINING SUBSTANTIAL INTERESTS

28-5.15 Requests for Formal and Informal Proceeding

(1) Requests for proceedings shall be made by petition to the agency involved. Each petition shall be printed, typewritten or otherwise duplicated in legible form on white paper of standard legal size. Unless printed, the impression shall be on one side of the paper only and lines shall be double spaced and indented.

(2) All petitions filed under these rules should contain:

(a) The name and address of each agency affected and each agency's file or identification number, if known;

(b) The name and address of the petitioner or petitioners;

(c) All disputed issues of material fact. If there are none, the petition must so indicate;

(d) A concise statement of the ultimate facts alleged, and the rules, regulations and constitutional provisions which entitle the petitioner to relief;

(e) A statement summarizing any informal action taken to resolve the issues, and the results of that action;

(f) A demand for the relief to which the petitioner deems himself entitled; and

(g) Such other information which the petitioner contends is material.

Feb. 7, 1985
Ad. No. 357-036R

S-279
Ams
337.00
E-191

MIA
WATER AND S
REC
FEB
GENERAL

PS Form 3811, Jan. 1979

RETURN RECEIPT, REGISTERED, INSURED AND CERTIFIED MAIL

SENDER: Complete items 1, 2, and 3.
Add your address in the "RETURN TO" space on reverse.

1. The following service is requested (check one.)
- [x] Show to whom and date delivered .... ¢
- [ ] Show to whom, date and address of delivery... ¢
- [ ] RESTRICTED DELIVERY
  Show to whom and date delivered .... ¢
- [ ] RESTRICTED DELIVERY.
  Show to whom, date, and address of delivery. $____

(CONSULT POSTMASTER FOR FEES)

2. ARTICLE ADDRESSED TO:
Mr. Garrett Sloan
3575 S. LeJeune Road
Miami, FL 33133

3. ARTICLE DESCRIPTION:

REGISTERED NO.	CERTIFIED NO.	INSURED NO.
	0155808	

(Always obtain signature of addressee or agent)

I have received the article described above.
SIGNATURE ☐Addressee ☐Authorized agent

Mario Alonso

4. DATE OF DELIVERY — POSTMARK

USPO MIAMI, FLA. GROVE STA. JAN 31 1985

5. ADDRESS (Complete only if requested)

6. UNABLE TO DELIVER BECAUSE: — CLERK'S INITIALS

M

☆GPO : 1979-300-459

No. 0155808

RECEIPT FOR CERTIFIED MAIL

NO INSURANCE COVERAGE PROVIDED—
NOT FOR INTERNATIONAL MAIL

(See Reverse)

SENT TO: Mr. Garrett Sloan		
STREET AND NO.		
P.O., STATE AND ZIP CODE		
POSTAGE		$
CONSULT POSTMASTER FOR FEES	CERTIFIED FEE	¢
OPTIONAL SERVICES	SPECIAL DELIVERY	¢
OPTIONAL SERVICES	RESTRICTED DELIVERY	¢
RETURN RECEIPT SERVICE	SHOW TO WHOM AND DATE DELIVERED	¢
RETURN RECEIPT SERVICE	SHOW TO WHOM, DATE, AND ADDRESS OF DELIVERY	¢
RETURN RECEIPT SERVICE	SHOW TO WHOM AND DATE DELIVERED WITH RESTRICTED DELIVERY	¢
RETURN RECEIPT SERVICE	SHOW TO WHOM, DATE AND ADDRESS OF DELIVERY WITH RESTRICTED DELIVERY	¢
TOTAL POSTAGE AND FEES		$
POSTMARK OR DATE: 1/25/85		

PS Form 3800, Apr. 1976

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

January 25, 1985

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Garrett Sloan
Miami-Dade Water and Sewer Authority
3573 South LeJeune Road
Miami, Florida 33133

Dear Mr. Sloan:

Attached is one copy of the Technical Evaluation and Preliminary Determination, and proposed permit to construct four methane burning generators at the Virginia Key Sewage Treatment Plant, Key Biscayne, Dade County, Florida.

Before final action can be taken on your draft permit, you are required by Florida Administrative Code Rule 17-103.150 to publish the attached Notice of Proposed Agency Action in the legal advertising section of a newspaper of general circulation in Dade County no later than fourteen days after receipt of this letter. The department must be provided with proof of publication within seven days of the date the notice is published. Failure to publish the notice may be grounds for denial of the permit.

Please submit, in writing, any comments which you wish to have considered concerning the department's proposed action to Mr. Bill Thomas of the Bureau of Air Quality Management.

Sincerely,

Bill Thomas for

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

CHF/pa
Attachments
cc: Joseph L. Tessitore
John Greenleaf
Tom Tittle
Patrick Wong
Dan Thompson

State of Florida
Department of Environmental Regulation
Notice of Proposed Agency Action
on Permit Application

The Department of Environmental Regulation gives notice of its intent to issue a permit to Miami-Dade Water and Sewer Authority, Virginia Key Sewage Treatment Plant to modify an existing facility by constructing/installing four new 1200 KW methane gas fueled internal combustion engines (prime movers) and associated electrical generators. Each prime mover will have 16 cylinders and will be turbocharged. Virginia Key Sewage Treatment Plant is located in Virginia Key, Key Biscayne, Dade County, Florida. A determination of best available control technology (BACT) was not required.

Persons 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 conform to the requirements of Chapters 17-103 and 28-5, Florida Administrative Code, and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Twin Towers Office Building, Tallahassee, Florida 32301, within fourteen (14) days of publication of this notice. Failure to file a request for hearing within this time period shall constitutes a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

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 preliminary statement. Therefore, persons who may not object to the proposed agency action may wish to intervene in the proceeding. A petition for intervention must be filed pursuant to Model Rule 28-5.207 at least five (5) days before the final hearing and be filed with the hearing officer if one has been assigned at the Division of Administrative Hearings, Department of Administration, 2009, Apalachee Parkway, Tallahassee, Florida 32301. If no hearing officer has been assigned, the petition is to be filed with the Department's Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32301. Failure to petition to intervene within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, Florida Statutes.

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

Dept. of Environmental Regulation
Southeast Florida District
3301 Gun Club Road
West Palm Beach, Florida 33402

Dade County Dept. of Environmental Resources Management
909 Southeast 1st Avenue, Brickell Plaza
Miami, Florida 33131

Dept. of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32301

Any person may send written comments on the proposed action to Mr. Bill Thomas at the department's Tallahassee address. All comments mailed within 30 days of the publication of this notice will be considered in the department's final determination.

RULES OF THE ADMINISTRATIVE COMMISSION
MODEL RULES OF PROCEDURE
CHAPTER 28-5
DECISIONS DETERMINING SUBSTANTIAL INTERESTS

28-5.15 Requests for Formal and Informal Proceedings

(1) Requests for proceedings shall be made by petition to the agency involved. Each petition shall be printed typewritten or otherwise duplicated in legible form on white paper of standard legal size. Unless printed, the impression shall be on one side of the paper only and lines shall be double spaced and indented.

(2) All petitions filed under these rules should contain:

(a) The name and address of each agency affected and each agency's file or identification number, if known;

(b) The name and address of the petitioner or petitioners;

(c) All disputed issues of material fact. If there are none, the petition must so indicate;

(d) A concise statement of the ultimate facts alleged, and the rules, regulations and constitutional provisions which entitle the petitioner to relief;

(e) A statement summarizing any informal action taken to resolve the issues, and the results of that action;

(f) A demand for the relief to which the petitioner deems himself entitled; and

(g) Such other information which the petitioner contends is material.

BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

In the Matter of an Application for Permit by Virginia Key Sewage Treatment Plant Miami-Dade Water and Sewer Authority 3575 South LeJeune Road Miami, Florida 33133	DER File No. AC 13-81284

INTENT TO ISSUE

The Department of Environmental Regulation hereby gives notice of its Intent to Issue, and proposed order of issuance for, a permit pursuant to Chapter 403, Florida Statutes, 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, Virginia Key Sewage Treatment Plant, Miami-Dade Water and Sewer Authority, applied on January 18, 1984, to the Department of Environmental Regulation for a permit for the construction/installation of four new 1,200 KW methane gas fueled internal combustion engines (prime movers) and associated electrical generators at the Virginia Key Sewage Treatment Plant, Key Biscayne, Dade County, Florida.

The Department has permitting jurisdiction under Chapter 403, Florida Statutes and Florida Administrative Code Rules 17-2 and 17-4. The project is not exempt from permitting procedures. The applicant was officially notified by the Department that air construction permits were required for the proposed work.

This intent to issue shall be placed before the Secretary for final action unless an appropriate petition for a hearing pursuant to the provisions of Section 120.57, Florida Statutes, is filed within fourteen (14) days from receipt of this letter or publication of the public notice (copy attached) required pursuant to Rule 17-103.150, Florida Administrative Code, whichever occurs first. The petition must comply with the requirements of Section 17-103.155 and Rule 28-5.201, Florida Administrative Code (copy attached) and be filed pursuant to Rule 17-103.155(1) in the Office of General Counsel of the Department of Environmental Regulation at 2600 Blair Stone Road, Tallahassee, Florida 32301.

Petitions which are not filed in accordance with the above provisions are subject to dismissal by the Department. In the event a formal hearing is conducted pursuant to Section 120.57(1), all parties shall have opportunity to respond, to present evidence and argument on all issues involved, to conduct cross-examination of witness and submit rebuttal evidence, to submit proposed findings of facts and orders, to file exception to any order or hearing officer's recommended order, and to be represented by counsel. If an informal hearing is requested, the agency, in accordance with its rules of procedure, will provide affected persons or parties or their counsel an opportunity, at a convenient time and place, to present to the agency or hearing officer, written or oral evidence in opposition to the agency's action or refusal to act, or a written statement challenging the grounds upon which the agency has chosen to justify its action or inaction, pursuant to Section 120.57(2), Florida Statutes.

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 proposed agency action. Therefore, persons who may not wish to file a petition, may wish to intervene in the proceeding. A petition for intervention must be filed pursuant to Model Rule 28-5.207 at least five (5) days before the final hearing and be filed with the hearing officer if one has been assigned at the Division of

Administrative Hearings, 2009 Apalachee Parkway, Tallahassee, Florida 32301. If no hearing officer has been assigned, the petition is to be filed with the Department's Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32301. Failure to petition to intervene within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, Florida Statues.

Executed the 25 day of January 1985, in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

for DR Thomas

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

Copies furnished to:

Garrett Sloan
Joseph L. Tessitore
John Greenleaf
Tom Tittle
Patrick Wong
Dan Thompson

Technical Evaluation
and
Preliminary Determination

Virginia Key Sewage Treatment Plant
Miami - Dade Water and Sewer Authority
Dade County
Virginia Key, Key Biscayne, Florida

Permit Number:
AC 13-81284

Florida Department of Environmental Regulation

Bureau of Air Quality Management

Central Air Permitting

January 25, 1985

I. Applicant and Source Location

A. Applicant

Virginia Key Sewage Treatment Plant
Miami - Dade Water and Sewer Authority
3575 South LeJeune Road
Miami, Florida 33133

B. Project and Location

The applicant proposes to modify an existing facility by constructing/installing 4 new 1200 KW methane gas fueled internal combustion engines (prime movers) and associated electrical generators. Each prime mover will have 16 cylinders and will be turbocharged.

Virginia Key Sewage Treatment Plant is located at Virginia Key, Key Biscayne, Florida, with UTM coordinates of Zone 17, 582.2 km East and 2848.1 km North. The facility is also located in an area designated nonattainment for the pollutant ozone.

C. Process and Controls

Methane gas is generated from the digesting of sewage sludge. The collected gas is scrubbed, using chlorinated effluent water to remove hydrogen sulfide (H_2S) gas, which is a contaminant in digester methane gas. Carbon dioxide (CO_2) is also partially removed when the digester gas is scrubbed. Scrubbed digester gas is approximately 72% methane, 28% CO_2, with some traces of H_2S.

After scrubbing the gas, it is stored in two 40-foot diameter and one 32-foot diameter storage spheres. Total storage capacity is estimated to be 313,230 scf at 40 psig.

The gas is then transferred from the storage tanks to the prime movers for combustion. Of the combustion products, nitrogen oxides (NO_x) will be the pollutant of most concern. Since NO_x emission control techniques are essentially designed modifications and not add-on equipment, the applicant will be requiring that all contractor's bids for the proposed project include engine design that will at least meet the NO_x emission limit as presented in the proposed new source performance standard (NSPS), 40 CFR 60, Subpart FF.

Of the four proposed new sources, the applicant proposes to operate only three of the new sources at a maximum of 8,400 hours each per year, while the other new source will be placed on a stand-by basis. The total annual hours of operation, all units, shall not exceed 27,200.

II. Rule Applicability

The proposed project is subject to preconstruction review under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code (FAC) Rule 17-2. The application was complete November 16, 1984.

The existing facility is a major facility in accordance with FAC Rule 17-2.100(98), because the potential emissions of the pollutant NO_x (nitrogen oxides) are greater than 100 tons per year (TPY).

The existing facility does not belong to any of the facility categories listed in Table 500-1, Major Facility Categories, and the sum of the potential emissions of all the pollutants emitted from all of the existing sources are not equal to or greater than 250 TPY. The proposed modification to the existing facility does not belong to any of the facility categories listed in Table 500-1, Major Facility Categories, and the sum of the potential emissions (see Table 1) of all the pollutants projected to be emitted from the proposed sources are not equal to or greater than 250 TPY. Therefore, the proposed modification is not subject to new source review requirements pursuant to FAC Rule 17-2.500, Prevention of Significant Deterioration, in accordance with FAC Rule 17-2.500(2).

The existing facility to be modified is located in Dade County, which is an area designated nonattainment for the pollutant ozone, pursuant to FAC Rule 17-2.410(1)(d). VOC, which is defined in FAC Rule 17-2.100(179), are precursors to ozone and are therefore reviewed in accordance with FAC Rule 17-2.510, New Source Review for Nonattainment Areas.

The existing facility is estimated to emit 7.1 TPY of the affected pollutant VOC, which will be reduced by an estimated 0.8 TPY through the retirement and dismantling of two existing digester gas/diesel fueled electrical generating units (a 1953, 410 hp and a 1953, 480 hp).

Both the existing facility and the proposed modification emit less than 100 TPY potential emissions of the nonattainment affected pollutant VOC. Therefore, the projected potential VOC emissions for the proposed modification are subject to the provisions of FAC Rule 17-2.510(2)(d)3., pursuant to FAC Rule 17-2.510(2)(d)4.b., which exempts the proposed modification from new source review in accordance with FAC Rule 17-2.510(4). Consequently, the proposed modification is subject to the provisions of FAC Rule 17-2.520, Sources Not Subject to Prevention of Significant Deterioration of Nonattainment Requirements.

Table 1

Source	Projected Potential Pollutant Emissions							
	NO_x		SO_2		CO		VOC	
	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY
1 Unit	18.3	76.9	1.5	6.3	5.2	21.9	1.6	6.9
All Units		248.9		20.4		70.7		22.3

Note:

° Unit: An internal combustion engine with an associated generator.

° SO_2 - sulfur dioxide CO - carbon monoxide

° Based on 8,400 hours of operation per source, with a maximum total hours of operation, all units, of 27,200.

° One of the four proposed new sources is on a stand-by basis.

° NO_x potential emissions are based on 700 ppm by volume, at 15 percent O_2 on a dry basis.

° SO_2 emissions are based on the projected H_2S input, assuming that 100% of the H_2S is converted to SO_2-SO_3 upon combustion.

° CO emission estimated from AP-42 Emission Factors, Table 3.3.2-1.

° VOC emissions estimated at 10% of the total HC (hydrocarbon) found in AP-42 Emission Factors, Table 3.3.2-1.

For these proposed new sources, there is not an emission limiting and performance standard contained in FAC Rule 17-2.600, Specific Source Emission Limiting Standards, nor in FAC Rule 17-2.650(1), Reasonably Available Control Technology - Volatile Organic Compounds. Therefore, the proposed modification shall be permitted in accordance with FAC Rule 17-2.610(2), General Visible Emissions Standard, and FAC Rule 17-2.620(2), General Pollutant Emission Limiting Standards - Objectionable Odors Prohibited.

In accordance with FAC Rule 17-2.610(2), no person shall cause, let, permit, suffer or allow to be discharged into the atmosphere any air pollutants from new, or existing sources, the density of which is equal to or greater than that designated as Number 1 on the Ringelmann Chart, the opacity of which is equal to or greater than 20 percent.

In accordance with FAC Rule 17-2.620(2), no person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor. Therefore, objectionable odors, related to the proposed modification, shall not be allowed on off-plant property.

The applicant requested a NO_x emission limit of 700 ppm by volume, at 15% oxygen on a dry basis, which is the same limit for NO_x as presented in the proposed new source performance standard, 40 CFR 60, Subpart FF. With this emission limit and by placing a cap on the total annual hours of operations, all units, the proposed modification is not subject to new source review pursuant to FAC Rule 17-2.500, Prevention of Significant Deterioration. The bureau finds the request acceptable and will adopt the emission limiting standard in the attached draft permit.

Compliance tests for visible emissions and NO_x shall be required and shall be performed in accordance with FAC Rule 17-2.700, Stationary Point Source Emisssions Test Procedure. Visible Emissions tests shall be performed using EPA Method 9. NO_x emissions tests shall be performed using EPA Method 7. Frequency of tests, reporting, notification, etc. shall be in accordance with FAC Rule 17-2.700.

III. SUMMARY OF EMISSIONS AND AIR QUALITY ANALYSIS

A. Emission Limitations

The regulated pollutant emissions from this facility are NO_x and visible emissions, in accordance with the emission limiting standard established at the request of the applicant and FAC Rule 17-2.610(2), respectively. Table 2 will display the pollutants, their emission limiting standards, and the allowable emission limits for the proposed new sources:

Table 2

Source	Pollutant	Emission Limiting Standard	Allowable Emission Limit lbs/hr	TPY
1 Unit	NO_x	700 ppm by volume, at 15% oxygen on a dry basis	18.3	76.9
All Units	NO_x			248.9
All Units	Visible Emissions		Less than 20% Opacity	

Note:

- ° Allowable emission limit is based on 8,400 hours per unit, with a maximum total hours of operation, all units, of 27,200.
- ° One of the four proposed new sources is on a stand-by basis.

The permitted emissions are in compliance with all applicable requirements of FAC Chapter 17-2.

B. Air Quality Impacts

From a technical review of the applications, the construction and operation of the proposed new sources will not have a significant impact on the ambient air quality standards.

IV. CONCLUSIONS

The emission limits for NO_x propsed by the applicant of 700 ppm by volume, at 15% oxygen on a dry basis, have been determined to be acceptable and shall become a condition in the proposed construction permit.

The permitted emissions should not have a significant impact on the ambient air quality standards.

The General and Specific Conditions listed in the proposed construction permit (attached) will assure compliance with all applicable requirements of FAC Chapter 17-2.

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

PERMITTEE:
Virginia Key Sewage Treatment Plant
Miami-Dade Water and Sewer Authority
3575 South LeJune Road
Miami, Florida 33133

Permit Number: AC 13-81284
Expiration Date: March 31, 1986
County: Dade
Latitude/Longitude: 25° 44' 43" N/ 80° 08' 55" W
Project: Construction of four (4) 1,200 kW methane gas (digester gas) fueled combustion engines, each with an associated electrical generator

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 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 drawing(s), 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/installation of four 1,200 kW methane gas (digester gas) fueled internal combustion engines, each with an associated electrical generator. Each prime mover will have 16 cylinders and will be turbocharged. The UTM coordinates are Zone 17, 585.2 km East and 2848.1 km North. Virginia Key STP is located in Virginia Key, Key Biscayne, Florida.

Construction/installation shall be in accordance with the permit application and plans, documents, and drawings, except as otherwise noted on pages 5 and 6 of the Specific Conditions.

Previously assigned permit numbers AC 13-81290, -81295, and -81297 are replaced by AC 13-81284.

Attachments are as follows:

1. John A. Guidry's letter, dated November 15, 1983.
2. Joseph L. Tessitore's letter with 4 Applications to Construct Air Pollution Sources, DER Form 17-1.202, dated January 16, 1984.
3. Southeast Florida District's Interoffice Memorandum, dated February 10, 1984.
4. C.H. Fancy's letter, dated February 17, 1984.
5. C.H. Fancy's letter, dated July 11, 1984.
6. Joseph L. Tessitore's letter, dated August 3, 1984.
7. C.H. Fancy's letter, dated August 13, 1984.
8. Joseph L. Tessitore's letter with attachments, dated August 17, 1984.
9. C.H. Fancy's letter, dated August 24, 1984.
10. Joseph L. Tessitore's letter with attachments, dated October 1, 1984.
11. Interoffice Memorandum, dated October 11, 1984.
12. C.H. Fancy's letter, dated November 2, 1984.
13. Joseph L. Tessitore's letter with attachments, dated November 14, 1984.
14. Joseph L. Tessitore's letter, dated January 18, 1985.

PERMITTEE:
Virginia Key STP
3575 South LeJune Road
Miami, Florida 33133

Permit Number: AC 13-81284
Expiration Date: March 31, 1986

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is hereby placed on notice that the department will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

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. Nor 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 does not constitute 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, plant or aquatic life or property and penalties therefore caused by the construction or operation of this permitted source, 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:
Virginia Key STP
3575 South LeJune Road
Miami, Florida 33133

Permit Number: AC 13-81284
Expiration Date: March 31, 1986

GENERAL CONDITIONS:

6. The permittee shall at all times 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, access to the premises, at reasonable times, where the permitted activity is located or conducted for the purpose of:

a. Having access to and copying any records that must be kept under the conditions of the permit;

b. Inspecting the facility, equipment, practices, or operations regulated or required under this permit; and

c. Sampling or monitoring 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 notify and provide the department with the following information:

a. a description of and cause of non-compliance; and

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

PERMITTEE:
Virginia Key STP
3575 South LeJune Road
Miami, Florida 33133

Permit Number: AC 13-81284
Expiration Date: March 31, 1986

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 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 arising under the Florida Statutes or department rules, except where such use is proscribed by Sections 403.73 and 403.111, Florida Statutes.

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 17-4.12 and 17-30.30, 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 is required to be kept at the work site of the permitted activity during the entire period of construction or operation.

13. This permit also constitutes:

( ) Determination of Best Available Control Technology (BACT)
( ) Determination of Prevention of Significant Deterioration (PSD).
( ) Compliance with New Source Performance Standards.

14. The permittee shall comply with the following monitoring and record keeping requirements:

a. Upon request, the permittee shall furnish all records and plans required under department rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the department, during the course of any unresolved enforcement action.

PERMITTEE:
Virginia Key STP
3575 South LeJune Road
Miami, Florida 33133

Permit Number: AC 13-81284
Expiration Date: March 31, 1986

GENERAL CONDITIONS:

b. The permittee shall retain 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), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be 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 date(s) analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. 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 submitted or corrected promptly.

SPECIFIC CONDITIONS:

1. Maximum annual hours of operation shall not exceed 8,400 per electrical generating unit (prime mover and associated generator).

2. Maximum total hours of operation, four electrical generating units, shall not exceed 27,200.

3. Each electrical generating unit shall be equipped with a timing device to record the actual time of operation and it shall be electrically interlocked with the starter.

PERMITTEE:
Virginia Key STP
3575 South LeJune Road
Miami, Florida 33133

Permit Number: AC 13-81284
Expiration Date: March 31, 1986

SPECIFIC CONDITIONS:

4. Maximum allowable emissions are as follows:

Source	Pollutant	Maximum Allowable Emission Limit	lbs/hr	TPY
1 Unit	NO_x	700 ppm by volume, at 15% oxygen on a dry basis	18.3	76.9
All Units	NO_x			248.9
All Units	Visible Emissions	less than 20% Opacity		

Note:
- ° 1 unit - based on 8,400 annual hours of operation.
- ° All units - based on 27,200 total annual hours of operation.
- ° NO_x - nitrogen oxides.

5. Objectionable odors shall not be allowed on off-plant property.

6. Compliance tests shall be required in accordance with FAC Rule 17-2.700. NO_x and visible emissions compliance tests shall be performed using EPA Method 7 and 9, respectively. Test reports shall be submitted to the DER's Southeast Florida District office and the Dade County Environmental Resources Management office within 45 days after the last completed test run. For compliance testing, each office shall be notified 30 days prior to testing, or within a time frame coordinated and approved by each office.

7. Prior to 90 days before the expiration date of this permit, a complete application for operating permit and compliance test results shall be submitted to the DER's Southeast Florida District office or its designee. Full operation of the sources may then be conducted in compliance with the terms of this permit until its expiration or receipt of an operating permit.

Issued this_____day of_______________,
19___.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

____
VICTORIA J. TSCHINKEL, Secretary

____ pages attached.

CROSS/TESSITORE & ASSOCIATES, P.A.
4759 S. CONWAY ROAD, SUITE D
ORLANDO, FLORIDA 32812
305/851-1484

January 18, 1985

Mr. Bruce Mitchell
Bureau of Air Quality Management
State of Florida, Department of
Environmental Regulation
Koger Center, Montgomery Building
2562 Executive Center Circle East
Tallahassee, Florida 32301

SUBJECT: Virginia Key Methane Gas Generating Units
Construction Permit Applications

Dear Bruce:

It is requested that the subject applications be amended so that the total operating hours for the methane combustion units will be limited to no greater than 27,200 hours per year. Using this hourly limitation, an emission rate of 18.3 lbs/hr will yield a total NO_x emission rate of 248.9 tons per year which is below the threshold of 250 tons per year.

If you have any questions concerning the above, do not hesitate to call upon me.

Sincerely,

Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Vice President

JLT:kim

cc: John Greenleaf, P.E.

CROSS/TESSITORE & ASSOCIATES, P.A.
4759 S. CONWAY ROAD, SUITE D
ORLANDO, FLORIDA 32812
305/851-1484

November 14, 1984

Mr. Bruce Mitchell
Bureau of Air Quality Management
State of Florida, Department of
Environmental Regulation
Koger Center, Montgomery Building
2562 Executive Center Circle East
Tallahassee, Florida 32301

SUBJECT: Applications to construct air pollution sources
Virginia Key Sewage Treatment Plant
Miami-Dade Water and Sewer Authority

Dear Bruce:

Attached is the application permit for the existing methane combustion units at Virginia Key.

The estimated emissions are attached to the permit applications.

If you have any questions, and/or require any additional information, be sure to call.

Sincerely,

Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Vice President

JLT:kim
Enc.a/s

Copy to Mr. Greenleaf w/enclosure
Copy to Mr. Hammond, w/enclosure

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTHEAST FLORIDA DISTRICT

3301 GUN CLUB ROAD
P.O. BOX 3858
WEST PALM BEACH, FLORIDA 33402

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

ROY DUKE
DISTRICT MANAGER

NOV 16 1984

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Methane Burning Generators [ ] New[1] [x] Existing[1]

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

COMPANY NAME: Virginia Key Sewage Treatment Plant COUNTY: Dade

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

SOURCE LOCATION: Street Virginia Key, Key Biscayne, Florida City Miami

UTM: East 782,000 585.2 North 516,000 2848.1

Latitude 25 ° 45 ' ___ "N (44 43) Longitude 80 ° 09 ' ___ "W (08 55)

APPLICANT NAME AND TITLE: Garrett Sloan, Director

APPLICANT ADDRESS: 3575 South LeJeune Road, Miami, FL 33133

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Miami-Dade Water and Sewer Authority

I certify that the statements made in this application for a n operation 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, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I 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 permitted establishment.

*Attach letter of authorization

Signed: Garrett Sloan

Garrett Sloan, Director
Name and Title (Please Type)

Date: 10/30/84 Telephone No. 305-665-7471

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 the permit application. There is reasonable assurance, in my professional judgment, that

[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 [signature]

Joseph L. Tessitore, P.E.

Name (Please Type)

Cross/Tessitore & Associates, P.A.

Company Name (Please Type)

4759 South Conway Road, Orlando, Florida 32812

Mailing Address (Please Type)

Florida Registration No. 23374 Date: 10/29/84 Telephone No. 305-851-1484

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.

The operation of six existing digestor gas fueled generators. See attached list for horsepower rating and year of installation.

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

Start of Construction ________ Completion of Construction ________

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.)

N/A

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

N/A

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Signed Joseph L. Tessitore

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Name (Please Type)

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N/A

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

N/A

E. Requested permitted equipment operating time: hrs/day_____; days/wk_____; wks/yr_____;

if power plant, hrs/yr_____; if seasonal, describe:

Please see attached list for operating hours.

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? No

   b. If yes, has "Lowest Achievable Emission Rate" been applied? No

   c. If yes, list non-attainment pollutants. Oxidants

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. No

3. Does the State "Prevention of Significant Deterioriation" (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 justification for any answer of "No" that might be considered questionable.

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

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

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

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

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

2. Product Weight (lbs/hr): ______

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

Name of Contaminant	Emission[1]		Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/~~yr~~ hr	T/yr	
SO_2	2.90	6.80		Not applicable	2.90	6.80	
NO_x	74.88	175.00			74.88	175.00	
CO	9.70	22.60			9.70	22.60	
Opacity	<20%		<20%				
VOC	1.60	7.10			1.60	7.10	

[1] See Section V, Item 2.

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

[3] Calculated from operating rate and applicable standard.

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

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

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	Type	% Wt		

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

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

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[3] Calculated from operating rate and applicable standard.

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

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)

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Methane (CH_4)	0.0194	0.0332	23.24

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

Fuel Analysis:

Percent Sulfur: ____________ Percent Ash: ____________

Density: ____________ lbs/gal Typical Percent Nitrogen: ____________

Heat Capacity: ____________ BTU/lb ____________ BTU/gal

Other Fuel Contaminants (which may cause air pollution): H_2S

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

Annual Average ____________ Maximum ____________

G. Indicate liquid or solid wastes generated and method of disposal.

None

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

Stack Height: * ft. Stack Diameter: * ft.

Gas Flow Rate: * ACFM ______ DSCFM Gas Exit Temperature: 875 °F.

Water Vapor Content: ______ % Velocity: * FPS

*See attached table.

SECTION IV: INCINERATOR INFORMATION

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste ______

Total Weight Incinerated (lbs/hr) ______ Design Capacity (lbs/hr) ______

Approximate Number of Hours of Operation per day ______ day/wk ______ wks/yr. ______

Manufacturer ______

Date Constructed ______ Model No. ______

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

Stack Height: ______ ft. Stack Diamter: ______ Stack Temp. ______

Gas Flow Rate: ______ ACFM ______ DSCFM* Velocity: ______ 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.

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ______

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

Stack Height: * ft. Stack Diameter: * ft.

Gas Flow Rate: * ACFM ______ DSCFM Gas Exit Temperature: 875 °F.

Water Vapor Content: ______ % Velocity: * FPS

*See attached table.

SECTION IV: INCINERATOR INFORMATION

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Patholog-ical)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Inciner-ated							
Uncon-trolled (lbs/hr)							

Description of Waste ______

Total Weight Incinerated (lbs/hr) ______ Design Capacity (lbs/hr) ______

Approximate Number of Hours of Operation per day ______ day/wk ______ wks/yr. ______

Manufacturer ______

Date Constructed ______ Model No. ______

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			Type	BTU/hr	
Primary Chamber					
Secondary Chamber					

Stack Height: ______ ft. Stack Diamter: ______ Stack Temp. ______

Gas Flow Rate: ______ ACFM ______ DSCFM* Velocity: ______ 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.

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ______

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

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, 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.

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

2. 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.

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

4. 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.)

5. 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).

6. 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.

7. 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).

8. 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.

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

10. 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

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

[ ] Yes [ ] No

Contaminant	Rate or Concentration

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

[ ] Yes [ ] No

Contaminant	Rate or Concentration

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

Contaminant	Rate or Concentration

D. Describe the existing control and treatment technology (if any).

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:

*Explain method of determining

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1. Control Device/System:
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*Explain method of determining

MIAMI-DADE WATER AND SEWER AUTHORITY DEPARTMENT

P. O. BOX 330316
MIAMI, FLORIDA 33233-0316

Main Office
3575 S. LeJeune Road
Telephone 665-7471

October 15, 1984

Mr. Joe Tessitore
Cross/Tessitore & Associates
4759 South Conway Road
Orlando, FL 32812

Subject: Contract No. S-279
Air Permit

Dear Mr. Tessitore:

The existing engines at Virginia Key are as tabulated:

	HORSEPOWER	FUEL	YEAR INSTALLED	HOURS RUN/YEAR
1.	480	Gas/Diesel	1953	50
2.	410	Gas/Diesel	1953	4000
3.	410	Gas/Diesel	1953	4000
4.	410	Gas	1953	4000
5.	410	Gas	1953	4000
6.	1000	Gas/Diesel	1971	8000

These engines have no air permits that I am aware of. No emission data is available for any of them. The first two engines listed will be removed as a part of this contract.

If further information is required, please call me at 665-7471.

Sincerely,

Crispen N. Hammond
Chief Engineer

CNH/fb

cc: John Greenleaf, Greenleaf-Telesca

Emission Calculations For Existing Methane Combustion Engines

The emissions for the existing units are based on Emission Factors in Table 3.3.2.1 of AP-42

NO_x Emissions

UNIT	HORSEPOWER	EMISSION FACTOR	HOURLY EMISSIONS lbs/hr	ANNUAL HOURS	ANNUAL EMISSIONS Tons/yr
1	480	24 lb/10^3hp-hr	11.52	50	0.29
2	410	"	9.84	4000	19.68
3	410	"	9.84	4000	19.68
4	410	"	9.84	4000	19.68
5	410	"	9.84	4000	19.68
6	1000	"	24.00	8000	96.00
					175.01

CO Emissions

UNIT	HORSEPOWER	EMISSION FACTOR	HOURLY EMISSIONS lbs/hr	ANNUAL HOURS	ANNUAL EMISSIONS Tons/yr
1	480	3.1 lb/10^3hp-hr	1.49	50	0.04
2	410	"	1.27	4000	2.54
3	410	"	1.27	4000	2.54
4	410	"	1.27	4000	2.54
5	410	"	1.27	4000	2.54
6	1000	"	3.10	8000	12.40
					22.60

VOC Emissions*

UNIT	Hp	EMISSION FACTOR	HOURLY EMISSIONS lbs/hr	ANNUAL HOURS	ANNUAL EMISSIONS Tons/yr
1	480	0.97 lbs/10^3hp-hr	0.47	50	0.01
2	410	"	0.40	4000	0.80
3	410	"	0.40	4000	0.80
4	410	"	0.40	4000	0.80
5	410	"	0.40	4000	0.80
6	1000	"	0.97	8000	3.88
					7.09

*VOC Emissions are approximately 10% of Total Hydrocarbon Emissions.

SO_2 Emissions**

UNIT	Hp	(Hp)old/(Hp)new	HOURLY EMISSIONS lbs/hr	ANNUAL HOURS	ANNUAL EMISSIONS Tons/yr
1	480	0.298	0.45	50	0.01
2	410	0.255	0.38	4000	0.76
3	410	0.255	0.38	4000	0.76
4	410	0.255	0.38	4000	0.76
5	410	0.255	0.38	4000	0.76
6	1000	0.622	0.93	8000	3.72
					6.77

**SO_2 Emissions are based on H_2S Content of digestor gases and were obtained by proportioning emissions calculated for new combustion units according to horsepower ratio.

Methane Gas Consumption

Total Horsepower = 3120

Fuel Requirement = 7450 BTU/BHP-hr

Fuel Heating Value = 700 BTU/SCF

Methane Consumption

Unit	Hp	Maximum SCFM
1	480	85.1
2	410	72.7
3	410	72.7
4	410	72.7
5	410	72.7
6	1000	177.4
		553.3

Maximum BTU Input = $(553.3)(700) = 23.24 \times 10^6 \frac{BTU}{hr}$

EXISTING METHANE ENGINES EXHAUST CONDITIONS

UNIT	STACK DIAMETER (in)	HEIGHT (ft)	GAS TEMPERATURE (°F)	GAS FLOW (ACFM)	STACK VELOCITY (FPS)
1	10	35	875	2794	85.44
2	8	35	875	2387	113.99
3	8	35	875	2387	113.99
4	8	35	875	2387	113.99
5	8	35	875	2387	113.99
6	14	35	875	5821	90.75

BEST AVAILABLE COPY

1. TO: (NAME, OFFICE, LOCATION)

1. Bruce Mitchell	Date
2. BAQM	Initial / Date
3. Tall.	Initial / Date
4.	Initial / Date

REMARKS:

Virginia Key calculations (8 pp.)

Operations Report 79 to 82

INFORMATION
Review & Return
Review & File
Initial & Forward

DISPOSITION
Review & Respond
Prepare Response
For My Signature
For Your Signature
Let's Discuss
Set Up Meeting
Investigate & Report
Initial & Forward
Distribute
Concurrence
For Processing
Initial & Return

DE
NOV 1
BA

FROM: IJf.

DATE 11/8/84

PHONE

BEST AVAILABLE COPY

Emissions worst case
1,2 & 5 burning #2 fuel oil
3 & 4 burning digester gas
Full year operation, full capacity

	1	2	3	4	5	Total (tons/yr)
Particulate	4.31	4.31	0	0	9.44	18.06
NO_x	43.1	43.1	43.1	43.1	94.39	307.18
CO	11.48	11.48	5.56	5.56	21.24	55.32
VOC	2.69*	2.69*	1.74	1.74	5.91*	20.72
SO_2	5.04	5.04	0.007	0.007	2.51	12.60

* Burning dual fuel instead

Full year operation, 50% capacity

	1	2	3	4	5	Total
Particulate	2.16	2.16	0	0	4.72	9.03
NO_x	26.6	26.6	26.6	26.6	47.19	153.59
CO	5.74	5.74	2.78	2.78	10.62	27.66
VOC non CH_4	1.35*	1.35*	.87	.87	2.96*	10.36
SO_2	2.52	2.52	0.004	0.004	1.26	6.31

BEST AVAILABLE COPY

410 hp (#1 & #2)   #2 fuel oil

Particulate = $\frac{2.4\ lb}{10^3\ hp\ hr}$ × 410 hp

= 0.984 lb/hr = 4.31 tons/yr

NO_x = $\frac{24\ lb}{10^3\ hp\ hr}$ × 410 hp

= 9.84 lb/hr = 43.1 tons/yr

CO = $\frac{6.4\ lb}{10^3\ hp\ hr}$ × 410 hp

= 2.62 lb/hr = 11.48 tons/yr

$VOC_{non\ CH_4}$ = $\frac{.63\ lb}{10^3\ hp\ hr}$ × 410 hp

= 0.258 lb/hr = 1.13 tons/yr

SO_2 = $\frac{2.8\ lb}{10^3\ hp\ hr}$ × 410 hp

= 1.15 lb/hr = 5.04 tons/yr

BEST AVAILABLE COPY

410 hp ... dual fuel (3.3.4-1)

$NO_x = \frac{18 lb}{10^3 hp h} \times 410 hp$

$= 7.38\ lb/hr = 32.32\ tons/yr$

$CO = \frac{5.9 lb}{10^3 hp hr} \times 410 hp$

$= 2.42\ lb/hr = 10.6\ tons/yr$

$VOC_{nonCH_4} = \frac{1.5 lb}{10^3 hp hr} \times 410 hp$

$= 0.615\ lb/hr = 2.69\ tons/yr$

$SO_2 = \frac{0.7 lb}{10^3 hp hr}$ ...

$= 0.287\ lb/hr = 1.26\ tons/yr$

BEST AVAILABLE COPY

Emissions for 2x4 [illegible] natural gas (3.3.2-1)

$NO_x = \dfrac{24\ lb}{10^3\ hp\text{-}hr} \times 410\ hp$

$= 9.84\ lb/hr = 43.1\ tons/yr$

$CO = \dfrac{3.1\ lb}{10^3\ hp\text{-}hr} \times 410\ hp$

$= 1.27\ lb/hr = 5.56\ tons/yr$

$HC = \dfrac{9.7\ lb}{10^3\ hp\text{-}hr} \times 410\ hp$

$= 3.98\ lb/hr = 17.43\ tons/yr$

$VOC_{nonmethane} \approx 10\%$ of total $= 0.398\ lb/hr = 1.74\ t$

$SO_2 = \dfrac{0.004\ lb}{10^3\ hp\text{-}hr} \times 410\ hp$

$= 0.0016\ lb/hr = 0.007\ tons/yr$

BEST AVAILABLE COPY

5 burning #1 2 fuel oil

Particulates = $\frac{2.4 \text{ lb}}{10^3 \text{ hp hr}} \times 900 \text{ hp}$

$= 2.16 \text{ lb/hr} = 9.4\cancel{3} \text{ tons/yr}$

$NO_x = \frac{24}{10^3 \text{ hp hr}} \times 900 \text{ hp}$

$= 21.6 \text{ lb/hr} = 94.39 \text{ tons/yr}$

$CO = \frac{6.4 \text{ lb}}{10^3 \text{ hp hr}} \times 900 \text{ hp}$

$= 4.86 \text{ lb/hr} = 21.24 \text{ tons/yr}$

$VOC_{\text{non } CH_4} = \frac{0.63}{10^3 \text{ hp hr}} \times 900 \text{ hp}$

$= .567 \text{ lb/hr} = 2.51 \text{ tons/yr}$

900 hp engine dual fuel (3.3.4-1)

$NO_x = \frac{18\ lb}{10^3\ hp\text{-}hr} \times 900\ hp$

$= 16.2\ lb/hr = 70.96\ tons/yr$

$CO = \frac{5.9\ lb}{10^3\ hp\text{-}hr} \times 900\ hp$

$= 5.31\ lb/hr = 23.26\ tons/yr$

$VOC_{nonCH_4} = \frac{1.5\ lb}{10^3\ hp\text{-}hr} \times 900\ hp$

$= 1.35\ lb/hr = 5.91\ tons/yr$

$SO_2 = \frac{.7\ lb}{10^3\ hp\text{-}hr} \times 900\ hp$

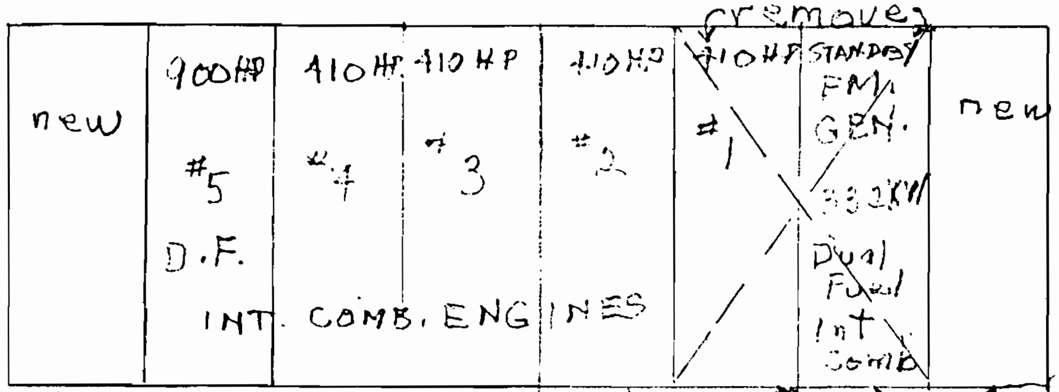
$= 0.63\ lb/hr = 2.76\ tons/yr$

MDWSA

VIRGINIA KEY PLANT

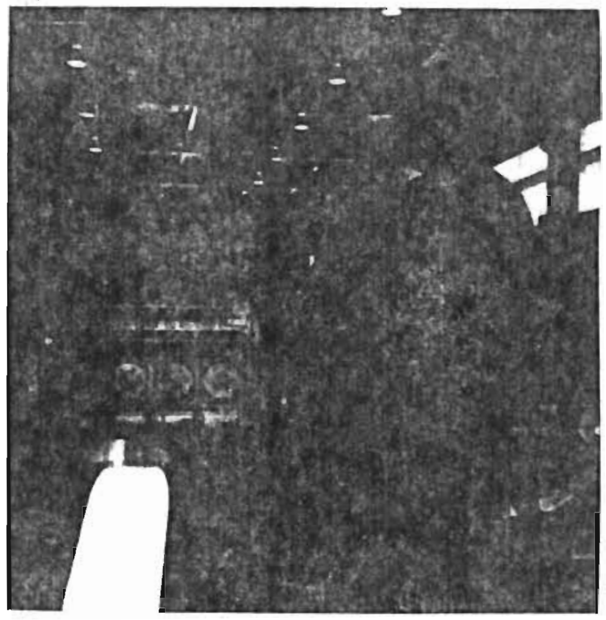
Dual Fuel methane gas (10-15% #2 oil or 100% #2 oil)

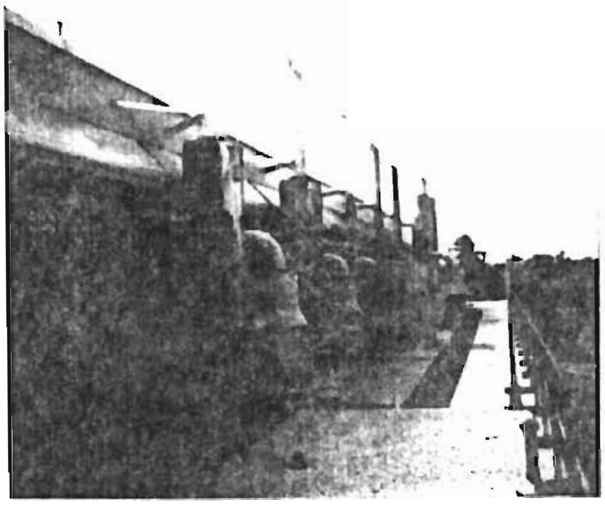
remove

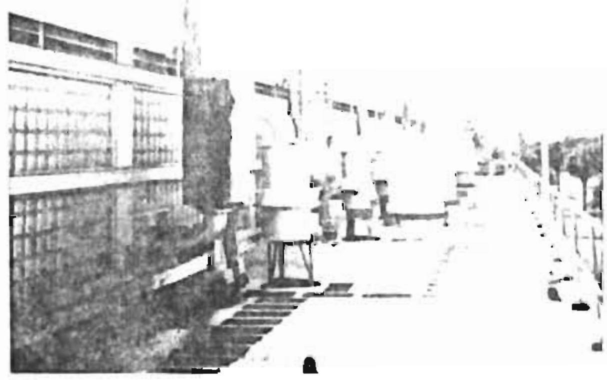


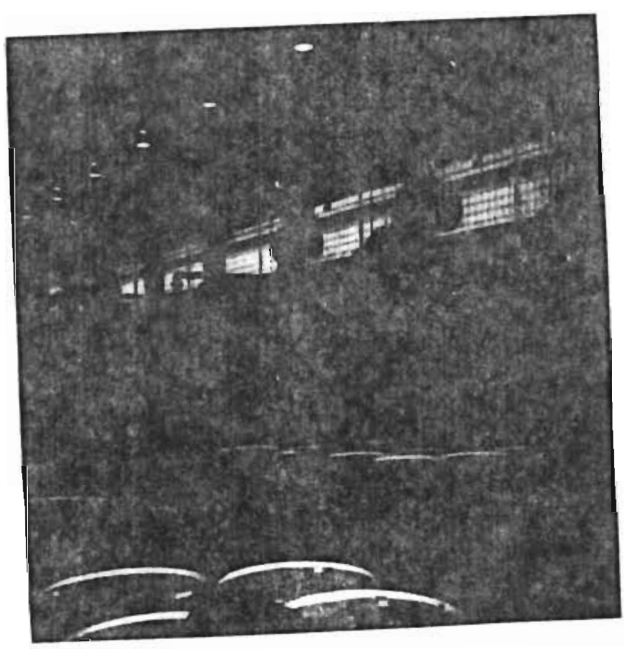
These drive air blowers

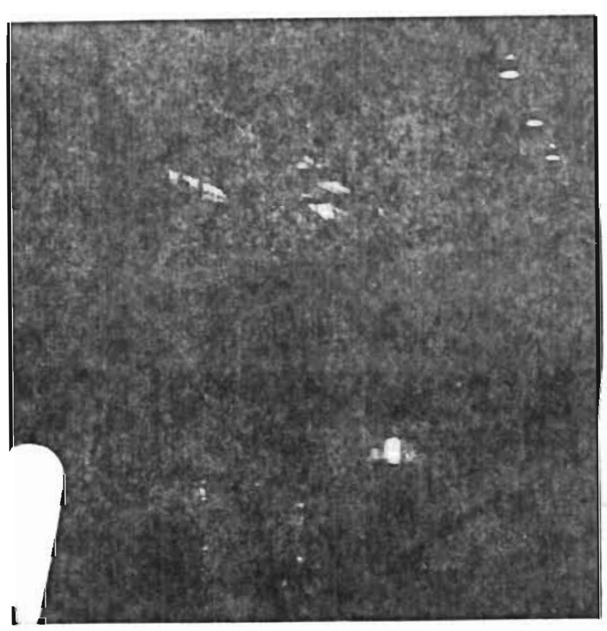
4 new generators to be installed











PS Form 3811, Jan. 1979

RETURN RECEIPT, REGISTERED, INSURED AND CERTIFIED MAIL

SENDER: Complete items 1, 2, and 3.
Add your address in the "RETURN TO" space on reverse.

1. The following service is requested (check one.)
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2. ARTICLE ADDRESSED TO:

Mr. Garrett Sloan
3575 S. Le Jeune Rd.
Miami, FL 33133

3. ARTICLE DESCRIPTION:

REGISTERED NO.	CERTIFIED NO.	INSURED NO.
	0155767	

(Always obtain signature of addressee or agent)

I have received the article described above.
SIGNATURE ☐ Addressee ☐ Authorized agent

Mario Alonso

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☆GPO : 1979-300-459

No. 0155767

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SENT TO Mr. Garrett Sloan		
STREET AND NO.		
P.O., STATE AND ZIP CODE		
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CONSULT POSTMASTER FOR FEES	CERTIFIED FEE	¢
OPTIONAL SERVICES	SPECIAL DELIVERY	¢
	RESTRICTED DELIVERY	¢
RETURN RECEIPT SERVICE	SHOW TO WHOM AND DATE DELIVERED	¢
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	SHOW TO WHOM AND DATE DELIVERED WITH RESTRICTED DELIVERY	¢
	SHOW TO WHOM, DATE AND ADDRESS OF DELIVERY WITH RESTRICTED DELIVERY	¢
TOTAL POSTAGE AND FEES		$
POSTMARK OR DATE 11/2/84		

PS Form 3800, Apr. 1976

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

November 2, 1984

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Garrett Sloan
Miami-Dade Water and Sewer Authority
3575 South LeJeune Road
Miami, Florida 33133

Dear Mr. Sloan:

RE: Completion Review for the Applications to Construct Air Pollution Sources: Permit Nos. AC 13-81284,-81290,-81295, -81297

The department is in receipt of your letter dated October 1, 1984, which was a response to the bureau's letter dated August 24, 1984. The bureau still finds the above referenced applications and supplementary material to be incomplete and the following information, including calculations, assumptions and reference documents, shall be submitted to the bureau before the status of your applications can, again, be ascertained:

- o Submit an entire facility inventory of all air polluting sources, including their potential pollutant emissions and quantifiable fugitive pollutant emissions in tons per year, each source's construction date, and each source's construction permit number and subsequent operating permit number(s).

- o If applicable, submit a PSD application with modeling, addressing all applicable requirements of FAC Rule 17-2.500.

- o If applicable, propose BACT (Best Available Control Technology) for all affected pollutants subject to new source review requirements as set forth in FAC Rule 17-2.500(2)(f). BACT determination shall be in accordance with FAC Rule 17-2.630.

- o If applicable, propose LAER for VOC (volatile organic compounds) if the potential pollutant emissions exceed 100 tons per year total. If the facility is already emitting 100 TPY or more of VOC, then LAER determination would be required if emissions would increase by more than 40 TPY total. LAER determination shall be in accordance with FAC Rule 17-2.640.

If there are any questions, please call Bruce Mitchell at (904) 488-1344, or write to me at the above address.

Sincerely,

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

CHF/BM/agh

cc: Joseph L. Tessitore
Tom Tittle
Patrick Wong
John Greenleaf
Bill Blommel
Dan Thompson

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices And/Or To Other Than The Addressee	
To:	Loctn.:
To:	Loctn.:
To:	Loctn.:
From:	Date:
Reply Optional [ ]	Reply Required [ ] Info. Only [ ]
Date Due:	Date Due:

TO: Dan Thompson

THRU: Bill Thomas BT
Clair Fancy CHF

FROM: Bruce Mitchell BM

DATE: October ~~11~~ 29, 1984

SUBJ: Virginia Key Sewage Treatment Plant
Dade County

Based on discussions with Tom Tittle (DER's Southeast Florida District) and Pat Wong/Art Bolivar (DERM), it has become apparent that the above referenced facility does have six (6) existing air pollution sources that do not have construction permits nor operating permits.

Miami-Dade Water and Sewer Authority has applied for four (4) new air pollution source construction permits and their assigned permit numbers are: AC 13-81284, -81290, -81295, -81297.

An incompleteness letter (attached) was sent to the applicant on August 24, 1984, requesting an entire facility inventory of all air pollution sources, their current and previous permit numbers, and their construction dates. The applicant's response dated October 1, 1984, failed to address this request.

BM/ks

cc: Roy Duke
Rafael Rodon
Nancy Wright
Bill Blommel

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

August 24, 1984

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Garrett Sloan
Miami-Dade Water and Sewer Authority
3575 South LeJeune Road
Miami, Florida 33133

Dear Mr. Sloan:

Re: Completeness Review for the Applications to Construct Air Pollution Sources: Permit Nos. AC 13-81284, -81290, -81295, -81297

The department is in receipt of your letter dated August 17, 1984, which was a response to the bureau's letter dated August 13, 1984. The DER's letters dated November 15, 1983, February 17 and August 13, 1984, contained a request for a copy of the document(s) of the pollutant emission factors that were used in the calculations of the pollutants emissions cited in the above referenced application packages. The purpose of the request was to establish the validity and credibility of the emission factors cited, specifically, for the pollutant NO_x (nitrogen oxides). Since the bureau has not received documentation of the emission factors used, the bureau's calculations projecting pollutant emissions, based on AP-42 Emission Factors, Table 3.3.2-1 and half-time operation (4380 hours per year), shows the facility emitting greater than 250 tons per year of the pollutant NOx and subject to PSD (Prevention of Significant Deterioration) review. Therefore, the above referenced applications are still incomplete and the following information, including calculations, assumptions and reference documents, shall be submitted to the bureau before further processing of your permit applications:

- Submit a PSD application with modeling, addressing all applicable requirements of FAC Rule 17-2.500.
- Since the calculations for the projected pollutant emissions were based on the assumption of half-time operations, meaning 4380 hours per year, there will be an enforceable permit condition in each of the permit's "Specific Conditions" restricting the operation of the source to a maximum of 4380 hours annually.

- Submit an entire facility inventory of all air polluting sources, including their potential pollutant emissions and quantifiable fugitive pollutant emissions in tons per year, each source's construction date, and each source's construction permit number and subsequent operating permit number(s).

- Propose BACT (Best Available Control Technology) for all affected pollutants subject to new source review requirements as set forth in FAC Rule 17-2.500(2)(f). BACT determination shall be in accordance with FAC Rule 17-2.630.

- Propose LAER for VOC (volatile organic compounds) if the potential pollutant emissions exceed 100 tons per year total. If the facility is already emitting 100 TPY or more of VOC, then a LAER determination would be required if emissions would increase by more than 40 TPY total. LAER determination shall be in accordance with FAC Rule 17-2.640.

- Since the products of combustion of H_2S are SO_2-SO_3, quantify the potential emissions and list the pollutant emissions in the appropriate application section.

If there are any questions, please call Bruce Mitchell at (904)488-1344, or write to me at the above address.

Sincerely,

for C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

CHF/BM/s

cc: Joseph L. Tessitore
Tom Tittle
Patrick Wong
John Greenleaf
Bill Blommel
Dan Thompson
Nancy Wright

CROSS/TESSITORE & ASSOCIATES, P.A.
4759 S. CONWAY ROAD, SUITE D
ORLANDO, FLORIDA 32812
305/851-1484

October 1, 1984

DER
OCT 3 1984
BAQM

Mr. Clare H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality Management
2562 Executive Center Circle East
Koger Center, Montgomery Bldg.
Tallahassee, FL 32301

Subject: Application to Construct Air Pollution Sources: Permit Nos. AC 13-81284, -81290, -81295, and -81297

Dear Mr. Fancy,

In response to your letter of August 24, 1984, and recent telephone conversations with Mr. Bruce Mitchell, revised permit applications and emission estimate calculations are submitted. The revised NO_x emission rates are based on the Proposed NSPS for Stationary Internal Combustion Engines of 700 ppm @ 15% O_2 dry combustion products.

These emissions are based on running only three engines at a time with one engine on a stand-by basis, and 8400 hours per year operating time. These assumptions are based on the attached letter from the Miami-Dade Water and Sewer Authority Department.

I have also included a copy of correspondence from Cooper Energy Services which presents the emission limits quoted in the previous application.

If you have any questions on the above and/or require any additional information, please do not hesitate to call upon me.

Sincerely,

Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Vice President

JLT:kbw
cc: John Greenleaf
    Crispen N. Hammond

G-2

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTHEAST FLORIDA DISTRICT

3301 GUN CLUB ROAD
P.O. BOX 3858
WEST PALM BEACH, FLORIDA 33402

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

ROY DUKE
DISTRICT MANAGER

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Methane Burning Generators [ ] New[1] [ ] Existing[1]

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

COMPANY NAME: Virginia Key Sewage Treatment Plant COUNTY: Dade

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) Methane Generator No. 1

SOURCE LOCATION: Street Virginia Key, Key Biscayne, FL City Miami

UTM: East 782,000 North 516,000

Latitude 25 ° 45 ' ___ "N Longitude 80 ° 09 ' ___ "W

APPLICANT NAME AND TITLE: Garrett Sloan, Director

APPLICANT ADDRESS: 3575 South LeJeune Road, Miami, FL 33133

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Miami-Dade Water and Sewer Authority

I certify that the statements made in this application for a construction permit 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, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I 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 permitted establishment.

*Attach letter of authorization

Signed: [signature]

Garrett Sloan, Director
Name and Title (Please Type)

Date: 1/13/84 Telephone No. 305-665-7471

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 the permit application. There is reasonable assurance, in my professional judgment, that

[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 Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Name (Please Type)

Cross/Tessitore & Associates, P.A.
Company Name (Please Type)

4759 South Conway Road, Orlando, FL 32812
Mailing Address (Please Type)

Florida Registration No. 23374 Date: ______ Telephone No. (305) 851-1484

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.

The construction and operation of a 1200 KW Methane gas fueled generator (one of a total of four at intended project site). Also an existing 400 KW Methane gas fueled generator is being retired.

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

Start of Construction ______ Completion of Construction ______

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.)

N/A

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

N/A

E. Requested permitted equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 50 ;

if power plant, hrs/yr _____; if seasonal, describe: ______________________

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? NO

   b. If yes, has "Lowest Achievable Emission Rate" been applied? NO

   c. If yes, list non-attainment pollutants. OZONE

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. YES

3. Does the State "Prevention of Significant Deterioriation" (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 justification for any answer of "No" that might be considered questionable.

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

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

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

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

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

2. Product Weight (lbs/hr): ______________________

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

Name of Contaminant	Emission[1] Maximum lbs/hr	Emission[1] Actual T/yr	Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission lbs/yr	Potential[4] Emission T/yr	Relate to Flow Diagram
VOC	1.6	6.9	N/A	N/A	1.6	6.9	
NO_x	18.3	76.9	"	Proposed NSPS 700 ppm	18.3	76.9	
CO	5.2	21.9	"	N/A	5.2	21.9	
SO_2	1.5	6.3	"	N/A	1.5	6.3	
Opacity	<20%		<20%				

[1]See Section V, Item 2.

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

[3]Calculated from operating rate and applicable standard.

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

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)

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Digestor Gas	0.018	0.018	12.62

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

Fuel Analysis:

Percent Sulfur: ____________ Percent Ash: ____________

Density: ____________ lbs/gal Typical Percent Nitrogen: ____________

Heat Capacity: ____________ BTU/lb ____________ BTU/gal

Other Fuel Contaminants (which may cause air pollution): ____________

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

Annual Average ____________ Maximum ____________

G. Indicate liquid or solid wastes generated and method of disposal.

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

Stack Height: 38 ft. Stack Diameter: 1.5 ft.

Gas Flow Rate: 10,259 ACFM 3,567 DSCFM Gas Exit Temperature: 875 °F.

Water Vapor Content: ≅11 % Velocity: 97 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.)
Actual lb/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste ____________________

Total Weight Incinerated (lbs/hr) __________ Design Capacity (lbs/hr) __________

Approximate Number of Hours of Operation per day ______ day/wk ______ wks/yr. ______

Manufacturer ____________________

Date Constructed __________ Model No. __________

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

Stack Height: ______ ft. Stack Diamter: ______ Stack Temp. ______

Gas Flow Rate: ______ ACFM ______ DSCFM* Velocity: ______ 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.

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ____________________

REVISED EMISSION CALCULATIONS FOR VIRGINIA KEY METHANE COMBUSTION ENGINES

NO_x EMISSIONS

DIGESTOR GAS PROPERTIES

Based on testing data of Dr. Moore and Mr. Pascul as shown in attached Table 2

% CH_4 (Average after scrubbing) = 72.1

% CO_2 (Average after scrubbing) = 27.8

HHV BTU/SCF = 617 (Pre-scrubbing)

703 (Post-scrubbing)

Use HHV BTU/SCF = 700

H_2S = 31 grains/100 SCF

ENGINE SPECIFICATIONS AND PERFORMACE

4 Digestor Combustion Units

Electrical Output - 1200 KW

Generator Efficiency - 95%

Fuel Requirement = 7450 BTU/BHP-hr

Fuel Heating Value 700 BTU/SCF

A) Fuel Gas Flow Required (For Single Unit)

$$BHP_{in} = \frac{(1.341)(1200)}{(0.95)} = 1694$$

$$BTU/hr = (7450)(1694) = 12.62 \times 10^6$$

$$\text{Fuel Gas Flow} = (12.62 \times 10^6)\ \frac{BTU}{hr}\ \frac{SCF}{(700)\,BTU}$$

$$= 18{,}026\ SCF/hr = 300.5\ SCFM$$

B) Products of Combustion

Volume of Dry Combustion Products (at 0% Excess Air)

= Volume of Fuel [% CH_4 x (0.0856) + % Inerts x (0.01)]

= (300.5) [(72.1)(0.0856) + (27.8)(0.01)]

= (300.5) [6.17 + 0.278] = 1938 SCFM

Assuming 15% O_2 in combustion gases,

$$\text{Excess Airflow} = \frac{(1938)(0.15)}{(1-0.15)} \quad \frac{1}{(0.21)} = 1629 \text{ SCFM}$$

Total Exhaust Flow Volume = 1938 + 1629 = 3567 SCFM

For exhaust temperature of 875 °F;

$$\textbf{Total Exhaust Flow Volume} = (3567) \left[\frac{460 + 875}{460 + 60} \right]$$

= <u>9158 ACFM</u>

C) Pollutant Emission Rates (For Single Unit)

H_2S Emissions

For scrubbed digestor gas, H_2S concentration is 31 grains/100 SCF of Digestor Gas. This is an average value obtained from Table 4 for the calendar year 1980.

$$H_2S \text{ Input Rate} = (18{,}026) \frac{\text{SCF}}{\text{hr}} \times \frac{(31)}{(100)} \frac{\text{gr}}{\text{SCF}} \times \frac{\text{lb}}{(7000)\text{gr}}$$

= 0.80 lbs/hr

NO_x Emissions

Using proposed EPA Standards for stationary gas engines.

NO_x in exhaust gases would be less than or equal to 700 ppm at 15% oxygen (O_2) on a dry basis.

Assume NO_2 @ 875°F

$$\mu g/m^3 = \frac{\text{PPM X Molecular Wt x 1000}}{\text{Volume in liters}}$$

$$T = 5/9\ [875-32] = 468.3\ °C$$

$$°K = 273 + 468.3 = 741.3$$

$$\text{Volume} = (22.4)\ \left[\frac{741.3}{273}\right] = 60.82 \text{ liters}$$

$$\mu g/m^3 = \frac{(700) \times (14 + 32) \times (1000)}{(60.82)} = 529{,}431$$

$$mg/m^3 = 529.43$$

$$NO_x \text{ Emission Rate} = (9158)\ \text{ACFM} \times (529.43)\ \frac{mg}{m^3}$$

$$\times\ (60)\ \frac{min}{hr} \times \frac{1}{(1000)}\ \frac{gm}{mg} \times \frac{1}{(454)}\ \frac{lb}{gm} \times \frac{1}{(35)}\ \frac{m^3}{ft^3}$$

= 18.3 lbs/hr

CO Emissions

CO Emission Rate = 1.4 gm/BHP-hr (Table 3.3.2-1 AP-42)

$$\text{CO Emissions Rate} = (1.4)\ \frac{gm}{BHP\text{-}hr} \times (1694)\ BHP \times \frac{lb}{(454)\ gm}$$

= 5.22 lb/hr

HC Emissions (Total)

HC Emission Rate = 4.4 gm/BHP-hr (Table 3.3.2-1 AP-42)

$$\text{HC Emission Rate} = (4.4)\ \frac{gm}{BHP\text{-}hr} \times (1694)\ BHP \times \frac{lb}{(454)\ gm}$$

= 16.4 lbs/hr

VOC Emissions

VOC = (0.10) X (Total HC) = 1.64 lbs/hr

from Table 3.3.2-1 AP-42, Note C

Sulfur Dioxide

Sulfur Input = $(0.8)\ \frac{lb}{hr}\ X\ \frac{(32)}{34}$ = 0.75 lbs/hr

SO_2 Emission Rate = $(0.75)\ \frac{lbs}{hr}$ X (2) = 1.50 lbs/hr

D) Operating Hours (Single Engine)

Hours Per Year = (24) x (7) x (50) = 8400

Note only 3 units will operate at one time with one unit as stand-by

E) Emission Summary

Pollutant	Emission Rate (1 Unit)		Emission Rate (3 Units)	
	lbs/hr	tons/yr	lbs/hr	tons/yr
NO_x	18.30	76.90	54.90	230.70
CO	5.22	21.90	15.66	65.70
VOC*	1.64	6.89	4.92	20.67
SO_2	1.50	6.30	4.50	18.90

F) Net Emissions

Assuming an older 400 KW unit is retired and the air emissions are in proportion to the new 1200 KW air emissions, the expected increase in air emissions would be as follows:

*VOC = (0.10)x(Total HC) from Table 3.3.2-1 AP-42, Note C

Pollutant	Net Emission Rate (3 Units)	
	lbs/hr	tons/yr
NO_x	48.80	204.96
CO	13.92	58.40
VOC*	4.37	18.37
SO_2	4.00	16.80

*VOC = (0.10) x (Total HC) from Table 3.3.2-1 AP-42, Note C

TABLE 2
DIGESTER GAS CHARACTERISTICS

	BEFORE SCRUBBING		AFTER SCRUBBING	
	Dr. Moore	Mr. Pascul	Dr. Moore	Mr. Pascul
$*CH_4\%$	66.2	63.4	71.6	72.6
$CO_2\%$	33.8	36.6	28.4	27.4
HHV BTU/SCF	617	N/A	703	N/A

*Note $CH_4\%$ - 100 - $CO_2\%$ assumed

TABLE 3
RAW GAS HYDROGEN SULFIDE LEVEL - GRAINS/100 SCF

MONTH	1976	1977	1978	1979	1980	1981
January	290	400	350	500	540	N/A
February	225	350	250	353	515	N/A
March	285	300	390	395	905	N/A
April	325	320	350	365	514	
May	305	305	310	600	N/A	
June	345	280	290	315	N/A	
July	255	348	290	360	N/A	
August	340	185	223	320	N/A	
September	285	285	260	435	245	
October	215	245	260	450	N/A	
November	310	400	285	470	N/A	
December	380	400	325	345	N/A	

TABLE 4
SCRUBBED GAS HYDROGEN SULFIDE LEVEL - GRAINS/100 SCF

MONTH	1976	1977	1978	1979	1980	1981
January	41.2	42	30	40	41	20
February	42	38	30	34	38	18.2
March	33.4	35	35	36	39	26
April	34	47	41	25	37	
May	34	41	35	33	37	
June	35	40	39	26	32	
July	30	35	35	25	32	
August	36	35	35	30	28	
September	38	25	40	30	30	
October	43	27	38	30	20	
November	37	33	40	30	20	
December	43	27	39	37	19	

TABLE 4
SCRUBBED GAS HYDROGEN SULFIDE LEVEL - GRAINS/100 SCF

MONTH	1976	1977	1978	1979	1980	1981
January	41.2	42	30	40	41	20
February	42	38	30	34	38	18.2
March	33.4	35	35	36	39	26
April	34	47	41	25	37	
May	34	41	35	33	37	
June	35	40	39	26	32	
July	30	35	35	25	32	
August	36	35	35	30	28	
September	38	25	40	30	30	
October	43	27	38	30	20	
November	37	33	40	30	20	
December	43	27	39	37	19	

MIAMI-DADE WATER AND SEWER AUTHORITY DEPARTMENT

P. O. BOX 330316
MIAMI, FLORIDA 33233-0316

Main Office
3575 S. LeJeune Road
Telephone 665-7471

September 26, 1984

Mr. Joe Tessitore
Cross/Tessitore & Associates
4759 South Conway Road
Orlando, FL 32812

Subject: Contract No. S-279
Air Permit

Dear Mr. Tessitore:

Per our telephone conversation of today, I am confirming the following items:

1) The Department will run only three engines at a time. The fourth engine is a stand-by.

2) The engines will each be shutdown at least two weeks per year for routine maintenance.

3) Two existing digester gas fueled engines will be removed to make space for the new engines.

If any additional information is required, please call me.

Sincerely,

Crispen N. Hammond
Chief Engineer

CNH/fb

cc: John Greenleaf

COOPER INDUSTRIES

COOPER ENERGY SERVICES

GREENLEAF / TELESCA

DATE SEP 04 '84

JWG | ROR
FET |
BRB |
RAC | NV
RBS |
AC | FEB
CAD |
RJF |
AF |
SH |
FDM |
PMR |

FILE: 1708

August 29, 1984

Mr. John Greenleaf
GREENLEAF-TELESCA
2650 S.W. 27th Avenue
Miami, Florida 33133

Subject: Tabulation of Field Exhaust Emissions Tests

Dear Mr. Greenleaf:

To establish our exhaust emission guarantess, we have conducted extensive testing on the five clean burn engines located in our R & D Lab. In addition to this testing, at least 25 Superior clean burn engines have been successfully tested at various customer locations. Attached is a summary of these tests, most of which were conducted by independent testing services. Although offered with various engine ratings and number of cylinders, each of these engines utilize the same bore, stroke and combustion chamber geometry.

To establish the effects of digester fuel on exhaust emissions, a CO_2 - methane fuel blending system was constructed at our Springfield facility and was utilized to conduct development testing on a laboratory clean burn engine.

Fuel composition effects derived from this testing were utilized to adjust our quoted emissions. Levels quoted for your application were as follows, expressed as grams/bhp/hr:

NOx	CO
2.0	5.0

We believe that this information clearly indicates that, when properly adjusted, Superior clean burn engines can be expected to reliably maintain quoted emission levels.

Sincerely,

Harold Ballard P.E.
Supervisor, Emissions Control

/sln
Enclosure

cc: Jay Serve'

BEST AVAILABLE COPY

Superior - Clean Burn Field Tests

Customer	Engine Model	NOx Gm/Bhp-hr Guarantee	State	Test Method
Columbia Gas	8GTLA	1.8	Virginia	EPA Method 20, Methods 1, 2, 3, 4
Getty Oil Co.	8GTLA	2.0	California	CARB Method 1-100, EPA Methods 1, 2, 3, F Factor (Chemiluminescent analyzer, pilot tube)
	8GTLA	2.0	"	
	8GTLA	2.0	"	
	6GTLA	2.0	"	
	6GTLA	2.0	"	
	6GTLA	2.0	"	
United Gas Pipeline	12SGTA	4.0	Texas	Modified Method 20, 2, 3, &
Transwestern Co.	8GTLA	2.0	New Mexico	EPA F-Factor (40 CFR 60.45) (Chemiuminescent analyzer)
	8GTLA	2.0	"	
	8GTLA	2.0	"	
	8GTLA	2.0	"	
	16SGTA	2.0	"	
Llano	8GTLA	2.0	New Mexico	EPA Method 7 (Wet chemical NOx), F Factor
	8GTLA	2.0	"	
Lonestar Gas Co.	8GTLA	1.5	Texas	EPA 1979 Heavy Duty Engine Method (Chemiluminescent analyzer - carbon balance) Federal register Vol. 42 - No. 172 - 9/8/77
	8GTLA	1.5	"	
	8GTLA	1.5	"	
Tufco	16SGTA	2.0	"	EPA 1979 Heavy Duty Engine Method
	16SGTA	2.0	"	
Perry Gas Co.	8GTLA	2.0		Method 7
Amoco	12GTLA		Michigan	Modified DEMA Method
Michigan-Wisconsin	12SGTA	2.0	Oklahoma	
Florida Gas	6GTLA	2.0	Louisiana	EPA Methods 1, 2, 3, 4, 10, 20, 25a
	6GTLA	2.0	"	
	6GTLA	2.0	"	

7 September 1984

Mr. Joseph L. Tessitore, PE
Vice President
Cross/Tessitore & Associates, P.A.
4759 S. Conway Road, Suite D
Orlando, FL 32812

Re: Applications to DER, Virginia Key Gas Engine Generating Plant - Job No. 1708

Joe, I very much appreciate your letter of 4 September outlining your proposed steps in order to resolve any remaining problems with FDER.

I have just talked to Cris Hammond, who indicated that he wished for each engine to be able to operate on a 24-hour day, 7-day week, 50-week annual cycle. Inasmuch as individual permits are issued for each engine, this would allow flexibility in selecting engine operation if sufficient fuel was not available to operate the four proposed engines.

Information previously furnished to you by Morris Kaufmann indicated that at the present time sufficient gas would be available only for the operation of two engines. Cris points out that the existing engine-driven compressors may well be retired from service and replaced with electric motors, in which case, gas now being consumed by these engines would be available for use on the new equipment.

I trust that this gives you the information which you need in order to submit required requirements to FDER. Should you need additional information or confirmation, please let me know.

Sincerely,

John W. Greenleaf, Jr., PE
Chairman/Chief Executive Officer

JWG:ipg

cc: Cris Hammond, PE

STATISTICAL OPERATION REPORT

CENTRAL DISTRICT WASTEWATER TREATMENT PLANT

FISCAL YEARS 1979-80, 1980-81, 1981-82

MIAMI-DADE WATER AND SEWER AUTHORITY

DADE COUNTY, FLORIDA

Memo

TO: B.M.

Date 8/27/84

Subject VIRGINIA KEY STP

FROM: A.B.

DER

AUG 30 1984

Bruce BAQM

Here are copies of some pages from WASA's book with a description of their units. I can't guarantee, however, that this is the "real thing."
If you happen to need anything else, please give me a call.

Art

107.07-33

TABLE OF CONTENTS

Chlorination

Dose, ppm at 68.5 mgd	22
Pounds/day at 68.5 mgd	12,500
Number of units	5
Provision for pre-chlorination at inlet to grit chambers, post chlorination at inlet to outfall, chlorination of final sludge, chlorination of excess sludge and chlorination of flushing water (slime control only with 400 pound machine).	
Detention in outfall at 153 mgd, min.	22

Aeration Air Blowers

Number of blowers	5
Unit capacity, units 1 thru 4, each blower, cfm	10,600
Unit capacity, unit 5, cfm	20,000
Total capacity, 5 blowers, cfm	61,600
Maximum pressure for blower design, psig	7.5
Type of blower	Rotary positive displacement
Type of blower drive	
Units 1 and 2	Diesel engine
Units 3 and 4	Digester gas engine
Unit 5	Dual Fuel-Diesel/gas engine
Horsepower	
Units 1 thru 4	410
Unit 5	900
Maximum engine speed, rpm	514
Number of dual fuel engines	3
Number of spark ignition gas engines	2

Standby Generator

Number of generators, present	1
Capacity KW	332
Type of generator drive	Dual fuel engine
Engine hp	480
Engine speed rpm	514
Generator, future	2
Auxiliary engine, KW (oil fuel)	200

Plant Effluent Water Treatment Plant

Process plant effluent for fresh water system	
Gravity sand filters	2
Capacity - gpd	500,000
Ground Water Storage Reservoir - capacity - gal	400,000

PS Form 3811, Jan. 1979

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Mr. Garrett Sloan
3575 South LeJeune Rd.
Miami, Florida 33133

3. ARTICLE DESCRIPTION:

REGISTERED NO.	CERTIFIED NO.	INSURED NO.
	0156551	

(Always obtain signature of addressee or agent)

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4. DATE OF D

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AUG 28 1984

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☆GPO : 1979-300-459

No. 0156551

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PS Form 3800, Apr. 1976

Main File

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

DEPARTMENT OF ENVIRONMENTAL REGULATION
STATE OF FLORIDA

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

August 24, 1984

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Garrett Sloan
Miami-Dade Water and Sewer Authority
3575 South LeJeune Road
Miami, Florida 33133

Dear Mr. Sloan:

Re: Completeness Review for the Applications to Construct Air Pollution Sources: Permit Nos. AC 13-81284, -81290, -81295, -81297

The department is in receipt of your letter dated August 17, 1984, which was a response to the bureau's letter dated August 13, 1984. The DER's letters dated November 15, 1983, February 17 and August 13, 1984, contained a request for a copy of the document(s) of the pollutant emission factors that were used in the calculations of the pollutants emissions cited in the above referenced application packages. The purpose of the request was to establish the validity and credibility of the emission factors cited, specifically, for the pollutant NO_x (nitrogen oxides). Since the bureau has not received documentation of the emission factors used, the bureau's calculations projecting pollutant emissions, based on AP-42 Emission Factors, Table 3.3.2-1 and half-time operation (4380 hours per year), shows the facility emitting greater than 250 tons per year of the pollutant NOx and subject to PSD (Prevention of Significant Deterioration) review. Therefore, the above referenced applications are still incomplete and the following information, including calculations, assumptions and reference documents, shall be submitted to the bureau before further processing of your permit applications:

- Submit a PSD application with modeling, addressing all applicable requirements of FAC Rule 17-2.500.

- Since the calculations for the projected pollutant emissions were based on the assumption of half-time operations, meaning 4380 hours per year, there will be an enforceable permit condition in each of the permit's "Specific Conditions" restricting the operation of the source to a maximum of 4380 hours annually.

- Submit an entire facility inventory of all air polluting sources, including their potential pollutant emissions and quantifiable fugitive pollutant emissions in tons per year, each source's construction date, and each source's construction permit number and subsequent operating permit number(s).

- Propose BACT (Best Available Control Technology) for all affected pollutants subject to new source review requirements as set forth in FAC Rule 17-2.500(2)(f). BACT determination shall be in accordance with FAC Rule 17-2.630.

- Propose LAER for VOC (volatile organic compounds) if the potential pollutant emissions exceed 100 tons per year total. If the facility is already emitting 100 TPY or more of VOC, then a LAER determination would be required if emissions would increase by more than 40 TPY total. LAER determination shall be in accordance with FAC Rule 17-2.640.

- Since the products of combustion of H_2S are SO_2-SO_3, quantify the potential emissions and list the pollutant emissions in the appropriate application section.

If there are any questions, please call Bruce Mitchell at (904)488-1344, or write to me at the above address.

Sincerely,

for C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

CHF/BM/s

cc: Joseph L. Tessitore
Tom Tittle
Patrick Wong
John Greenleaf
Bill Blommel
Dan Thompson
Nancy Wright

CROSS/TESSITORE & ASSOCIATES, P.A.
4759 S. CONWAY ROAD, SUITE D
ORLANDO, FLORIDA 32812
305/851-1484

DER
AUG 20 1984
BAQM

August 17, 1984

TO: Bruce Mitchell, FDER Tallahassee Bureau of Air Quality Management

SUBJECT: Completeness Review for the Application to Construct Air Pollution Sources: Permit Nos. AC 13-81284,-81290,-81295,-81297

Dear Bruce:

In response to Mr. Steve Smallwood's letter of August 13, 1984 concerning the subject permits, the following information is submitted:

1) The H_2S emissions are based on the emissions measured by Dr. Howard Moore of Florida International University for the year 1980 as shown in the attached table. An emission factor of 31 grains/SCF is an annual average for 1980 measurements.

2) The NO_x and CO emissions are based on the following emission factors:

NO_x Emission Factor = 2 gm NO_x/(BHP-hr)

CO Emission Factor = 5 gm CO/(BHP-hr)

These emission factors were obtained from a methane combustion engine manufacturer, Superior Engines, and are considered representative of the emissions for this general class of engines. Since these engines have not been purchased, there is the possibility that another manufacturer will be chosen with slightly different emission factors; however, the changes in emissions are not expected to be substantial. When an engine supplier is chosen, the detailed emission factors will be supplied to FDER.

If you have any questions concerning the above, do not hesitate to call upon me.

Sincerely,

Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Vice President

JLT:kbw
cc: Mr. Garret Sloan
Mr. John Greenleaf

TABLE 4
SCRUBBED GAS HYDROGEN SULFIDE LEVEL - GRAINS/100 SCF

MONTH	1976	1977	1978	1979	1980	1981
January	41.2	42	30	40	41	20
February	42	38	30	34	38	18.2
March	33.4	35	35	36	39	26
April	34	47	41	25	37	
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November	37	33	40	30	20	
December	43	27	39	37	19	

PS Form 3811, Jan. 1979

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2. ARTICLE ADDRESSED TO:

Mr. Garrett Sloan
3575 S. LeJeune Rd.
Miami, Florida 33133

3. ARTICLE DESCRIPTION:

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STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

August 13, 1984

CERTIFIED MAIL - RECEIPT REQUESTED

Mr. Garrett Sloan, Director
Miami-Dade Water and Sewer Authority
3575 South LeJeune Road
Miami, Florida 33133

Dear Mr. Sloan:

Re: Completeness Review for the Applications to Construct Air Pollution Sources: Permit Nos. AC 13-81284, -81290, -81295, -81297

The department is in receipt of your submittal dated August 3, 1984, which was a response to the bureau's incompleteness letter dated February 17, 1984. The bureau still finds the above referenced applications incomplete and the following information will have to be submitted before further processing will resume:

1. Cite and copy for the bureau the emission factors used to calculate the pollutant emissions.

If there are any questions, please call Bruce Mitchell at (904)488-1344 or write to me at the above address.

Sincerely,

Steve Smallwood, P.E.
Chief
Bureau of Air Quality
Management

CHF/BM/s

cc: J. Tessitore
P. Wong
J. Greenleaf
T. Tittle
N. Wright
D. Thompson

CROSS/TESSITORE & ASSOCIATES, P.A.
4759 S. CONWAY ROAD, SUITE D
ORLANDO, FLORIDA 32812
305/851-1484

DER
AUG 06 1984
BAQM

August 3, 1984

TO: C. H. Fancy, P. E., Deputy Bureau Chief
Bureau of Air Quality Management

FROM: Joseph L. Tessitore

SUBJECT: Completeness Review for Applications to Construct Air Pollution Sources. Permit Nos. Assigned: AC 13-81284, AC 13-81290, AC 13-81295, and AC 13-81297 (February 17, 1984).

In response to your questions from the subject letter, the following information is submitted:

1. The prime movers are stationary internal combustion engines. Engines numbered 1 through 4 will be identical.

2. The prime movers are new and will be purchased under the following specification:

   "Sixteen (16) cylinder, turbocharged gas engines, rated at 1,760 brake horsepower, operating at 720 revolutions per minute, designed for sewage gas (methane) operation at a rate not to exceed 7,450 British thermal units per brake horsepower hours, and for continuous full-load duty."

3. Prime movers are identical.

4. See Item 2 above.

5. No.

6. Construction is dependent on an EPA grant which is anticipated will be received shortly. The bid documents require that the work be completed in 390 calendar days after commencement of the work.

7. UTM coordinates: N 513,830; E 782,000 - Lat 25°-44'-42" - Long 80°-09'-09".

8. See attached revisions.

9. Digester gas, after scrubbing, has been used as the sole fuel on three of the existing blower engines since 1954 with satisfactory results. The analysis of this gas indicates that it has a BTU value of approximately 700 BTU/cubic feet. Data from attached Table 2 shows that the scrubbed digestor gas is approximately 72% methane and 28% carbon dioxide. Other constituents of this digestor gas are insignificant with respect to combustion products, therefore the use of 100% methane is a reasonable approximation for combustion products.

10. There are no plans to use supplementary fuel on these engines.

11. There are a total of 24 digesters manifolded together into the system. We do not anticipate any condition in which no digester gas will be available.

12. Leaving the scrubbers at about 23" w.g., the scrubbed gas is further pressurized to 40 psig and stored in two 40-foot diameter and one 32-foot diameter storage spheres at the new and old plant respectively. Total storage capacity is estimated in Table 1.

TABLE 1

PRESSURE, PSIG	CAPACITY, SCF	EQUIVALENT HOURS OF AVERAGE GENERATION
0	84,177	1.30/.873 = 1.49
5	112,808	1.75/.873 = 2.00
10	141,440	2.19/.873 = 2.51
15	170,071	2.64/.873 = 2.45
20	198,703	3.08/.873 = 3.53
25	227,335	3.52/.873 = 4.03
30	255,966	3.97/.873 = 4.55
35	284,598	4.41/.873 = 5.05
40	313,230	4.86/.873 = 5.57

13. Booster pumps transfer the collected gas to a gas scrubbing system using chorinated effluent water as scrubbing fluid. Both hydrogen sulfide and carbon dioxide are partially absorbed and removed rendering a scrubber gas with more heat value and safer to use. The scrubbing water is circulated to the scrubbers after it has been used as cooling water for engine jacket water and lube oil.

14. Recent efforts in analyzing digester gas samples by testing have been unsuccessful. The only available data are results of tests performed by Dr. Howard Moore of Florida International University on October 21, 1980, on the old plant gas scrubber.

    Dr. Moore's test method basically involved gas chromatographic analyses using an FID detector through which methane was determined to be the only combustible gas present. The spectrometric analyses performed detected methane, carbon dioxide and minute amounts of nitrogen and water vapor.

    Norman Pascul, plant chemist, also analyzed the gas CO_2 percentage just prior to Dr. Moore's sampling (both raw gas and scrubbed gas are subject to regular testing at the plant and results are documented on the plant monthly operating records). Table 2 shows their reported results.

TABLE 5
*DIGESTER GAS CARBON DIOXIDE LEVEL, %

TEST NO.	DIGESTER RAW GAS No. 1	No. 2	No. 3	No. 4	SCRUBBED GAS
1	25.8	31.4	50.6	27.6	-
2	32.4	33.9	>50	30.5	-
3	-	36.0	30.2	37.3	-
4	-	36.7	35.4	36.4	-
5	-	35.8	35.5	37.2	-
6	-	37.0	35.2	39.7	23.5
7	-	36.5	35.3	40.9	24.3
8	-	37.1	36	38	-
9	-	36.2	35.2	39.9	26.3
10	-	34.9	33.8	36.3	20.8
11	-	35.3	34.7	37.5	20
12	-	35.6	34.5	36.5	26.5
13	-	34.9	34.2	35.4	24.9

*Weekly analyses by Normal Pascul during 1980-1981

15. Turbocharged.

16. Prime movers will be spark-ignited with a pre-combustion chamber.

17. See Items 9 and 14 and Tables 2, 3, 4, and 5.

18. The system will be maintained at approximately 40 psi.

19. Brake mean effective pressure will be 147 psi.

20. 720 rpm.

21. No.

22. No.

Please contact me if you need further explanation on any of the above points.

Joseph L. Tessitore

Joseph L. Tessitore
Vice President

JLT/mer

E. Requested permitted equipment operating time: hrs/day_____; days/wk_____; wks/yr_____;
if power plant, hrs/yr 4368; if seasonal, describe: N/A

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 (Ozone)

   a. If yes, has "offset" been applied? No

   b. If yes, has "Lowest Achievable Emission Rate" been applied? No

   c. If yes, list non-attainment pollutants. ~~No~~

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. Yes

3. Does the State "Prevention of Significant Deterioriation" (PSD) requirement apply to this source? If yes, see Sections VI and VII. Yes

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 justification for any answer of "No" that might be considered questionable.

PS Form 3811, Jan. 1979

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Mr. Garret Sloan
3575 S. LeJeune Rd., Key Biscayn
Miami, Florida 33133

3. ARTICLE DESCRIPTION:

REGISTERED NO.	CERTIFIED NO.	INSURED NO.
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(Always obtain signature of addressee or agent)

I have received the article described above.
SIGNATURE ☐Addressee ☐Authorized agent

K Rollins

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GPO : 1979-300-459

No. 0156527

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PS Form 3800, Apr. 1976

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

July 11, 1984

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Garret Sloan, Director
Virginia Key Sewage Treatment Plant
3575 South LeJeune Road
Virginia Key, Key Biscayne
Miami, Florida 33133

Re: Completeness Review of Applications to Construct Air Pollution Sources: Permit Nos. Assigned: AC 13-81284, -81290, -81295, and -81297.

Dear Mr. Sloan:

On February 17, 1984, the bureau sent you an incompleteness letter requesting additional information on the above referenced applications. Since there has been no response, the bureau would like to know if you still intend to pursue the proposed project? If so, when can the bureau expect a response to the incompleteness letter? If you do not intend to pursue the proposed project, the bureau requests that you withdraw your applications.

If there are any questions, please call Bruce Mitchell at (904) 488-1344 or write to me at the above address.

Sincerely,

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

CHF/BM/agh

cc: Nancy Wright
Tom Tittle
Patrick Wong
Joseph L. Tessitore
John Greenleaf

PS Form 3811, Jan. 1979

RETURN RECEIPT, REGISTERED, INSURED AND CERTIFIED MAIL

SENDER: Complete items 1, 2, and 3.
Add your address in the "RETURN TO" space on reverse.

1. The following service is requested (check one.)
- [x] Show to whom and date delivered............ ¢
- [ ] Show to whom, date and address of delivery...... ¢
- [ ] RESTRICTED DELIVERY
  Show to whom and date delivered............ ¢
- [ ] RESTRICTED DELIVERY.
  Show to whom, date, and address of delivery. $____

(CONSULT POSTMASTER FOR FEES)

2. ARTICLE ADDRESSED TO:
Mr. Garret Sloan
3575 South LeJeune Road
Miami, FL 33133

3. ARTICLE DESCRIPTION:

REGISTERED NO.	CERTIFIED NO.	INSURED NO.
	0158249	

(Always obtain signature of addressee or agent)

I have received the article described above.
SIGNATURE ☐Addressee ☒Authorized agent

Mario Alonso

4. DATE OF DELIVERY | POSTMARK

COCONUT GROVE STA. MIAMI, FLA. FEB 28 1984

5. ADDRESS (Complete only if requested)

6. UNABLE TO DELIVER BECAUSE: | CLERK'S INITIALS

☆GPO : 1979-300-459

No. 0158249

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

SENT TO Mr. Garret Sloan		
STREET AND NO.		
P.O., STATE AND ZIP CODE		
POSTAGE		$
CONSULT POSTMASTER FOR FEES	CERTIFIED FEE	¢
OPTIONAL SERVICES	SPECIAL DELIVERY	¢
	RESTRICTED DELIVERY	¢
RETURN RECEIPT SERVICE	SHOW TO WHOM AND DATE DELIVERED	¢
	SHOW TO WHOM, DATE, AND ADDRESS OF DELIVERY	¢
	SHOW TO WHOM AND DATE DELIVERED WITH RESTRICTED DELIVERY	¢
	SHOW TO WHOM, DATE AND ADDRESS OF DELIVERY WITH RESTRICTED DELIVERY	¢
TOTAL POSTAGE AND FEES		$
POSTMARK OR DATE 2/17/84		

PS Form 3800, Apr. 1976

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

February 17, 1984

CERTIFIED MAIL - RECEIPT REQUESTED

Mr. Garret Sloan, Director
Virginia Key Sewage Treatment Plant
3575 South LeJeune Road
Virginia Key, Key Biscayne
Miami, Florida 33133

Re: Completeness Review For Applications To Construct Air Pollution Sources: Permit Nos. Assigned: AC 13-81284, AC 13-81290, AC 13-81295, and AC 13-81297

Dear Mr. Sloan:

The bureau is in receipt of the above referenced applications for the construction/installation of four 1200 KW methane gas-fueled generators, Nos. 1-4, at the applicant's existing facility located at the above address. The applications have been deemed incomplete and the following information, including all assumptions and calculations, shall be submitted to the bureau before further processing will resume:

1. What type of a combustion source are these prime movers, stationary gas turbine(s) and/or stationary internal combustion engine(s). Identify each type of engine by its assigned facility I.D., Nos. 1-4.

2. Are the prime movers new, used, or rebuilt/refurbished? Described each prime mover and submit vendor(s) specifications.

3. Are the prime movers identical? Describe the differences per prime mover if not identical.

4. What are the engine specifications for each prime mover?

5. Will more than 1/3 of the potential electric output capacity per any of the prime movers be for sale to any utility power distribution system? Identify the prime mover that will be used for this purpose.

6. What are the dates of "start of construction" and "completion of construction"? Submit these dates on an amended application in the appropriate section.

7. What are the UTM coordinates to the nearest 100 meters? What are the seconds (to the nearest 3 seconds) of the latitude and longitude? Submit these data on an amended application in the appropriate section.

8. Item II. F.1. is incorrect in the applications (4) submitted. Correct and submit on an amended application. The facility is in an area designated nonattainment for ozone.

9. For such a low "fuel heating value", methane cannot be assumed as the combustion fuel and the products of combustion cannot be based on just methane. Calculate the products of combustion based on the firing of digester gas and submit in the appropriate section of an amended application.

10. What other fuels will be used at 100% or as a supplement to the digester gas? Quantify and calculate the products of combustion and submit in the appropriate sections of an amended application.

11. Will the prime movers be shut-down if there is no digester gas available?

12. Will there be any type of digester gas storage tanks/system prior to combusting in the prime movers? Describe.

13. Will there be any precleaning of the digester gas prior to combusting in the prime movers? Describe.

14. Cite and copy for the bureau all documents used in the calculations and assumptions.

15. What type of carburation will the prime movers have, naturally aspirated or turbocharged?

16. Will the prime movers be spark, compression, and/or stage ignited?

17. What is the ultimate anlaysis of the digester gas to be combusted? Analyze on a % by volume. Also, include the higher heating value - Btu/cu.ft. at 60°F and 30 in.Hg.

18. What kind of gas transport system will be employed, low or high pressure?

19. What is the brake mean effective pressure in psig for each prime mover?

20. What is the engine speeds in rpm for each prime mover?

21. Will there be any pre-heating of the gas prior to combusting?

22. Will there be any catalytic denitrification?

If there are any questions, please call Bruce Mitchell at (904)488-1344 or write to me at the above address.

Sincerely,

for J. H. Thomas P.E.

C. H. Fancy, P.E.
Deputy Bureau Chief
Bureau of Air Quality Management

CHF/BM/s

cc: Nancy Wright
Joseph L. Tessitore
Tom Tittle
Patrick Wong
John Greenleaf

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices And/Or To Other Than The Addressee		
To:	Loctn.:	
To:	Loctn.:	
To:	Loctn.:	
From:	Date:	
Reply Optional [ ]	Reply Required [ ]	Info. Only [ ]
Date Due:	Date Due:	

DER
FEB 13 1984
BAQM

TO: Clair H. Fancy, BAQM

FROM: I. Goldman, T. Tittle, J. Gundry -- DER/West Palm Beach

DATE: February 10, 1984

RE: Comments on Construction Permit Application for Methane Burning Generators at the Virginia Key Sewage Treatment Plant in Key Biscayne

---

Please note the following comments on the above referenced application.

a) We need UTM's to nearest 100 meters (or latitude/longitude to nearest 3 seconds.)

b) Does applicant have any idea as to when project will be started and completed?

c) Since this plant is a new source and it is in a non-attainment area for ozone, item F on page 3 is filled out incorrectly.

d) Since this plant is not on the list of 28 major source categories and under 250 tons/yr omissions, it seems that BACT and PSD do not apply.

e) As each unit does not seem to be able to generate more than 50 tons/yr of CO, the fee of $250 per unit is appropriate. (But restricting each unit to 50 T/yr on the basis of fee does not seem to be an appropriate way to restrict emissions. A better way should be developed under the basic air permitting rules)

f) Where did the emission factors in the calculations come from? (no source is cited).

h) What test methods, (other than gas sample analysis for initial operation and visible emissions), could apply to this facility?

IG:TT:
JG:lp

DEPARTMENT OF ENVIRONMENTAL REGULATION

ROUTING AND TRANSMITTAL SLIP

ACTION NO

ACTION DUE DATE

TO: (NAME, OFFICE, LOCATION)	
1. Ms. Clair H. Fancy	INITIAL / DATE
2. BAQM DER, Tallahassee	INITIAL / DATE
3. ~~Bill~~ BS	INITIAL / DATE
4. File	INITIAL / DATE

REMARKS:

Bruce Has a copy

Patty

INFORMATION
- REVIEW & RETURN
- REVIEW & FILE
- INITIAL & FORWARD

DISPOSITION
- REVIEW & RESPOND
- PREPARE RESPONSE
- FOR MY SIGNATURE
- FOR YOUR SIGNATURE
- LET'S DISCUSS
- SET UP MEETING
- INVESTIGATE & REPT
- INITIAL & FORWARD
- DISTRIBUTE
- CONCURRENCE
- FOR PROCESSING
- INITIAL & RETURN

FROM:

STATE OF FLORIDA
DEPT. OF ENVIRONMENTAL REGULATION
P.O. BOX 3858
WEST PALM BEACH, FL 33402

DATE Feb. 10, 1984

PHONE

Start & Completion of Construction
New or Used
Complete operating schedule
digester gas composition by volume

CH_4 66%
CO_2 28.3%
H_2O 5.7%

H_2, H_2S, N_2 very small

1 Ft^3 combusted → 619 Btu
619 Btu/SCF

1200 KW methane gas fired

IC Engine

cubic inch displacement per cylinder

TOTAL TO DIGESTERS – Lbs/day (dry wt)
PERCENT VOLATILES
DIGESTER GAS COMPOSITION
BTU/CF (STD) – sludge heating value

cu" displacement / cylinder and the # of cylinders
Will each engine be the same type of engine? If not, describe
will the units be fired when not enough digester gas
Digester gas simultaneously – i.e. operating schedule
natural gas/engine
diesel/engine
If gas tur
simple
regenerative
combined
manufacturer etc

see subpart GG

Ultimate Analysis of the constituents on a "% by wt." basis
% volatile solids & ttl. combustibles

NOx emissions/engine

Since assumed the emission based on NG combustion,
∴ what cleaning process will be used to clean the
H_2S from the gas stream prior to combustion?

treatment to remove
H_2S, CO_2, H_2O

particulates - sedimentation traps and cyclonic separators.

$H_2S \rightarrow SO_2 + SO_3$

Stack 350° - 400°F

not use in intermittent service due to condensation

Reciprocating
dual-fuel (compression ignited) blend diesel + digester gas
Spark ignited or compression engines

carbureted naturally air aspirated or turbocharged

brake mean effective pressure
700 - 1000 RPM
Heavy duty

Gas turbines - Possible
reciprocating - BACT catalytic denitrification
low pressure ratio turbines - staged ignition.

Electric Output 1200 KW 1609

$\frac{(1.2\ MW)}{(.2931\ MW/10^6 Btu)} = 4 \times 10^6$ Btu/hr out generator

95% conversion to elect - then

$\frac{4 \times 10^6}{.95} = 4,210,526$ Btu/hr to Generator

28% Conversion Prime mover

$\frac{4,210,526 \text{ Btu/hr}}{.28} = 15,037,604$ Btu/hr

$(15,037,604)(\frac{1}{60})(.02356) = 5904.7$ Hp $= 5905$ hp

$\frac{15,037,604 \text{ Btu/hr}}{600 \text{ Btu/SCF}} = 25,063$ SCF/hr

---

$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

1. $(.283\ CO_2)(25,063) = 7093$ SCF/hr CO_2

2. $(.66\ CH_4)(25,063) = 16542$ SCF/hr CO_2
   23635 TOTAL CO_2

3. $(2\ ft^3 O_2/ft^3 CH_4)(.10 \text{ excess air})(\frac{.66\ ft^3 CH_4}{ft^3 \text{ digas}})(25,063)$

$= 3308$ SCF/hr O_2

air ratio

4. $(25{,}063)(.66)\left(\frac{[1.10 \times 2]\ Ft^3\ O_2\ delivered}{Ft^3\ CH_4}\right)\left(\frac{.79}{.21}\right)$

$= 136{,}901$ SCF/hr N_2

5. $(.057)(25{,}063) = 1429$ SCF/hr H_2O in di gas

$CH_4 + 2O_2 = 2H_2O + CO_2$

$(25063)(.66)\left(\frac{2\ Ft^3\ H_2O}{Ft^3\ CH_4}\right) = 33{,}083$ SCF/h

TOTAL WATER 34,512 SCF/hr H_2O

TOTAL GAS FLOW

CO_2	23,635
O_2	3,308
N_2	136,901
	.84 163,844 dry
H_2O	34,512
	198,356 TOTA EXHAUST SCF/hr

44 CO_2 $(23635)\left(\frac{44}{359}\right) = 2897$ Lb/hr

28 N_2 $(136{,}901)\left(\frac{28}{359}\right) = 10{,}677$ Lb/hr

$N_2 + 2O_2 \longrightarrow 2NO_2$

32 + 14 = 46, × 2 = 92

$\frac{10677}{28} = \frac{X}{92}$ 35,082 Lb/hr

CROSS/TESSITORE & ASSOCIATES, P.A.
4759 S. CONWAY ROAD, SUITE D
ORLANDO, FLORIDA 32812
305/851-1484

January 16, 1984

DER
JAN 18 1984
BAQM

Mr. Clair H. Fancy
Florida Department of
Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

SUBJECT: Air Pollution Construction Permits for Four Methane Burning Generators at the Virginia Key Sewage Treatment Plant in Key Biscayne, Florida

Dear Claire:

Attached are four applications (4 copies each) for air construction permits for Virginia Key Sewage Treatment Plant methane burning generators.

Also included is a check for $1,000.00 which consists of $250.00 per application.

If you require any additional information, do not hesitate to call upon me.

Sincerely,

Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Vice President

JLT:kim
Enc.a/s

cc: John Greenleaf

Best Available Copy

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

No. 76012

RECEIPT FOR APPLICATION FEES AND MISCELLANEOUS REVENUE

Received from Miami Dade Water & Sewer Authority Date January 18, 1984

Address P.O. Box 330316, Miami, FL 33133 Dollars $ 1,000.00

Applicant Name & Address Same as above

Source of Revenue ~~AC13-81284~~ AC13-81290

Revenue Code 001001 Application Number AC13-81295 AC13-81297

By Patricia G. Adams

MIAMI-DADE WATER AND SEWER AUTHORITY
POOLED CASH FUND
P.O. BOX 330316 • MIAMI, FLORIDA 33133

CHECK NO. 011044

DATE	PAYEE NAME
1/13/84	State of Florida, Dept. of Environmental Regulation

INVOICE DATE	INVOICE NUMBER	AMOUNT	PURCHASE ORDER NUMBER	DESCRIPTION
1/12/84		1,000.00		as a fee accompanying our applicati to operate/construct Air Pollution Sources FDER

MIAMI-DADE WATER AND SEWER AUTHORITY
POOLED CASH FUND
P.O. BOX 330316 • MIAMI, FLORIDA 33133

63-58
660

CHECK NO. 011044

DATE
1/13/84

THE SUM 1 0 0 0 DOLS 0 0 CTS

77214-3

PAY TO THE ORDER OF

AMOUNT
*****1,000.(

State of Florida
Department of Environmental Regulation

SOUTHEAST FIRST NATIONAL BANK OF MIAMI • DOWNTOWN BANKING CENTER • MIAMI, FLA. 33131

[redacted]

AC 13-81284

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTHEAST FLORIDA DISTRICT
3301 GUN CLUB ROAD
P.O. BOX 3858
WEST PALM BEACH, FLORIDA 33402

BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY
ROY DUKE
DISTRICT MANAGER

DER
JAN 18 1984
BAQM

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Methane Burning Generators [ ] New[1] [ ] Existing[1]

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

COMPANY NAME: Virginia Key Sewage Treatment Plant COUNTY: Dade

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) Methane Generator No. 1

SOURCE LOCATION: Street Virginia Key, Key Biscayne, FL City Miami

UTM: East 782,000 North 516,000

Latitude 25 ° 45 ' ___ "N Longitude 80 ° 09 ' ___ "W

APPLICANT NAME AND TITLE: Garrett Sloan, Director

APPLICANT ADDRESS: 3575 South LeJeune Road, Miami, FL 33133

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Miami-Dade Water and Sewer Authority

I certify that the statements made in this application for a construction permit 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, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I 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 permitted establishment.

*Attach letter of authorization

Signed: [signature]

Garrett Sloan, Director
Name and Title (Please Type)

Date: 1/13/84 Telephone No. 305-665-7471

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 the permit application. There is reasonable assurance, in my professional judgment, that

[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 Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Name (Please Type)

Cross/Tessitore & Associates, P.A.
Company Name (Please Type)

4759 South Conway Road, Orlando, FL 32812
Mailing Address (Please Type)

Florida Registration No. 23374 Date: ____________ Telephone No. (305) 851-1484

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.

The construction and operation of a 1200 KW Methane gas fueled generator (one of a total of four at intended project site). Also an existing 400 KW Methane gas fueled generator is being retired.

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

Start of Construction ____________ Completion of Construction ____________

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.)

N/A

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

N/A

E. Requested permitted equipment operating time: hrs/day_____; days/wk_____; wks/yr_____;

if power plant, hrs/yr 4368; if seasonal, describe: N/A

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? No

   a. If yes, has "offset" been applied? No

   b. If yes, has "Lowest Achievable Emission Rate" been applied? No

   c. If yes, list non-attainment pollutants. No

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. Yes

3. Does the State "Prevention of Significant Deterioriation" (PSD) requirement apply to this source? If yes, see Sections VI and VII. Yes

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 justification for any answer of "No" that might be considered questionable.

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

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

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

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

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

2. Product Weight (lbs/hr): ______

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

Name of Contaminant	Emission[1] Maximum lbs/hr	Emission[1] Actual T/yr	Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission lbs/yr	Potential[4] Emission T/yr	Relate to Flow Diagram
H_2S	1.02	2.23		Not Applicable	Same as 1		
NO_x	7.46	16.30					
CO	18.65	40.70					
Opacity	<20%		<20%				

[1]See Section V, Item 2.

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

[3]Calculated from operating rate and applicable standard.

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

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)

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Methane (CH_4)	0.022945	0.022945	12.62

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

Fuel Analysis:

Percent Sulfur: ______________________ Percent Ash: ______________________

Density: ______________________ lbs/gal Typical Percent Nitrogen: ______________________

Heat Capacity: ______________________ BTU/lb ______________________ BTU/gal

Other Fuel Contaminants (which may cause air pollution): H_2S

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

Annual Average ______________________ Maximum ______________________

G. Indicate liquid or solid wastes generated and method of disposal.

None

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

Stack Height: ________________ ft. Stack Diameter: ________________ ft.

Gas Flow Rate: __________ ACFM __________ DSCFM Gas Exit Temperature: ________________ °F.

Water Vapor Content: ________________ % Velocity: ________________ FPS

SECTION IV: INCINERATOR INFORMATION

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Patholog-ical)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Inciner-ated							
Uncon-trolled (lbs/hr)							

Description of Waste ________________________________

Total Weight Incinerated (lbs/hr) ______________ Design Capacity (lbs/hr) ______________

Approximate Number of Hours of Operation per day ______ day/wk ______ wks/yr. ______

Manufacturer ________________________________

Date Constructed ________________ Model No. ________________

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

Stack Height: __________ ft. Stack Diamter: ______________ Stack Temp. ______________

Gas Flow Rate: ______________ ACFM ______________ DSCFM* Velocity: ______________ 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.

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ________________________________

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

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, 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.

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

2. 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.

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

4. 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.)

5. 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).

6. 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.

7. 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).

8. 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.

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

10. 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

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

[ ] Yes [ ] No

Contaminant	Rate or Concentration

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

[ ] Yes [ ] No

Contaminant	Rate or Concentration

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

Contaminant	Rate or Concentration

D. Describe the existing control and treatment technology (if any).

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:

*Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

Contaminant	Rate or Concentration

10. Stack Parameters

a. Height: ft.

b. Diameter: ft.

c. Flow Rate: ACFM

d. Temperature: °F.

e. Velocity: FPS

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

1.

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.

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:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

j. Applicability to manufacturing processes:

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

3.

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:

4.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Costs:

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:

F. Describe the control technology selected:

1. Control Device:

2. Efficiency:[1]

3. Capital Cost:

4. Useful Life:

5. Operating Cost:

6. Energy:[2]

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

10. Reason for selection and description of systems:

[1]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

A. Company Monitored Data

1. ____________ no. sites ____________ TSP ____________ ( ) SO^2* ____________ 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

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

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling

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)______________________________

C. Computer Models Used

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.

D. Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate	
TSP	______________________________	grams/sec
SO^2	______________________________	grams/sec

E. Emission Data Used in Modeling

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.

F. Attach all other information supportive to the PSD review.

G. 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.

H. 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.

SPECIFICATIONS AND ASSUMPTIONS

4 Methane Combustion Units

Electrical Output - 1200KW

Generator Efficiency = 95%

Fuel Requirement = 7450 BTU/BHP-hr

Fuel Heating Value = 550-600 BTU/ft^3

DESIGN CALCULATIONS (For Single Unit)

A) Gas Flow Required

$$BHP_{in} = \frac{(1.341)(1200)}{(0.95)} = 1694$$

$$BTU/hr = (7450)(1694) = 12.62 \times 10^6$$

$$\text{Fuel Gas Flow} = (12.62 \times 10^6)\ \frac{BTU}{hr}\ \frac{ft^3}{(550)BTU} = 22{,}945\ ft^3\ /hr$$

$$= 382\ ft^3/min$$

B) Products of Combustion

Assume products of combustion can be approximated by using data for theoretical combustion of natural gas. From attached data, for theoretical combustion of natural gas with no excess air, we have

11.453 ft^3 Combustion Products/ft^3 of Fuel Gas @60°F

0.840 lb of Combustion Products/ft^3 of Fuel Gas @60°F

$$\Rightarrow \text{Exhaust Products Mass Flow} = (382)\ \frac{ft^3}{min} \times (0.84)\ \frac{lb}{ft^3}\ \text{Fuel Gas}$$

$$= 321\ lbs/min$$

Exhaust Products Volume Flow = $(11.453) \frac{ft^3}{ft^3 \text{ Fuel Gas}}$ x

$$(382) \frac{ft^3 \text{ Fuel Gas}}{min} \times \frac{[875 + 460]}{[60 + 460]} = 11{,}232 \frac{ft^3}{min}$$

= 673,925 ft^3 /hr @875°F

C) Pollutant Emission Rates

H_2S Emissions

For scrubbed digestor gas, H_2S concentration is

31 grains/100 SCF of Methane gas

$$H_2S \text{ Emissions} = (22{,}945) \frac{ft^3}{hr} \times \frac{(31)}{(100)} \frac{gr}{ft^3} \times \frac{lb}{(7000) \text{ grains}}$$

= 1.02 lbs/hour

NO_x Emissions

NO_x Emission Rate = 2 gm/BHP-hr

$$NO_x \text{ Emissions} = (2) \frac{gm}{BHP\text{-}hr} \times (1694) \text{ BHP} \times \frac{lb}{(454) gm} = \underline{7.46} \text{ lb/hr}$$

CO Emissions

CO Emission Rate = 5 gm/BHP-hr

$$CO \text{ Emissions} = (5) \frac{gm}{BHP\text{-}hr} \times (1694) \text{ BHP} \times \frac{lb}{(454) gm} = \underline{18.65} \text{ lb/hr}$$

D) Operating Hours

Fuel Gas availability from digestors allows 50% operation of

methane combustors

=> Hours per year = (24) x (7) x (52) x (0.50) = 4368

E) Emission Summary

Pollutant	Emission Rate (1 Unit)		Emission Rate (4 Units)	
	lbs/hr	tons/yr	lbs/hr	tons/yr
H_2S	1.02	2.23	4.08	8.9
NO_x	7.46	16.3	29.84	65.2
CO	18.65	40.7	74.60	162.9

F) Net Emissions

Assuming an older 400 KW unit is retired and the air emissions are in proportion to the new 1200 KW air emissions, the expected increase in air emissions would be as follows:

Pollutant	Net Emission Rate (4 units)	
	lbs/hr	Tons/year
H_2S	3.74	8.17
NO_x	27.35	59.7
CO	68.38	149.3

AC 13-81295

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTHEAST FLORIDA DISTRICT

3301 GUN CLUB ROAD
P.O. BOX 3858
WEST PALM BEACH, FLORIDA 33402

DER
JAN 18 1984
BAQM

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

ROY DUKE
DISTRICT MANAGER

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Methane Burning Generators [ ] New[1] [ ] Existing[1]

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

COMPANY NAME: Virginia Key Sewage Treatment Plant COUNTY: Dade

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) Methane Generator No. 3

SOURCE LOCATION: Street Virginia Key, Key Biscayne, FL City Miami

UTM: East 782,000 North 516,000

Latitude 25 ° 45 ' ____"N Longitude 80 ° 09 ' ____"W

APPLICANT NAME AND TITLE: Garrett Sloan, Director

APPLICANT ADDRESS: 3575 South LeJeune Road, Miami, FL 33133

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Miami-Dade Water and Sewer Authority

I certify that the statements made in this application for a construction permit 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, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I 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 permitted establishment.

*Attach letter of authorization

Signed: [signature]

Garrett Sloan, Director
Name and Title (Please Type)

Date: 1/16/84 Telephone No. 305-665-7471

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 the permit application. There is reasonable assurance, in my professional judgment, that

[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 Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Name (Please Type)

Cross/Tessitore & Associates, P.A.
Company Name (Please Type)

4759 South Conway Road, Orlando, FL 32812
Mailing Address (Please Type)

Florida Registration No. 23374 Date: ______________ Telephone No. (305) 851-1484

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.

The construction and operation of a 1200 KW Methane gas fueled generator (one of a total of four at intended project site). Also an existing 400 KW Methane gas fueled generator is being retired.

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

Start of Construction ______________ Completion of Construction ______________

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.)

N/A

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

N/A

E. Requested permitted equipment operating time: hrs/day_____; days/wk_____; wks/yr_____;

if power plant, hrs/yr 4368; if seasonal, describe: N/A

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? No

   a. If yes, has "offset" been applied? No

   b. If yes, has "Lowest Achievable Emission Rate" been applied? No

   c. If yes, list non-attainment pollutants. ~~No~~

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. Yes

3. Does the State "Prevention of Significant Deterioriation" (PSD) requirement apply to this source? If yes, see Sections VI and VII. Yes

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 justification for any answer of "No" that might be considered questionable.

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

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

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

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

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

2. Product Weight (lbs/hr): ____

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

Name of Contaminant	Emission[1]		Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/yr	T/yr	
H_2S	1.02	2.23		Not Applicable	Same as 1		
NO_x	7.46	16.30					
CO	18.65	40.70					
Opacity	<20%		<20%				

[1]See Section V, Item 2.

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

[3]Calculated from operating rate and applicable standard.

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

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)

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Methane (CH_4)	0.022945	0.022945	12.62

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

Fuel Analysis:

Percent Sulfur: ______ Percent Ash: ______

Density: ______ lbs/gal Typical Percent Nitrogen: ______

Heat Capacity: ______ BTU/lb ______ BTU/gal

Other Fuel Contaminants (which may cause air pollution): H_2S

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

Annual Average ______ Maximum ______

G. Indicate liquid or solid wastes generated and method of disposal.

None

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

Stack Height: ______________ ft. Stack Diameter: ______________ ft.

Gas Flow Rate: ________ ACFM ________ DSCFM Gas Exit Temperature: ______________ °F.

Water Vapor Content: ______________ % Velocity: ______________ FPS

SECTION IV: INCINERATOR INFORMATION

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste ______________

Total Weight Incinerated (lbs/hr) ______________ Design Capacity (lbs/hr) ______________

Approximate Number of Hours of Operation per day ______ day/wk ______ wks/yr. ______

Manufacturer ______________

Date Constructed ______________ Model No. ______________

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

Stack Height: ________ ft. Stack Diamter: ______________ Stack Temp. ______________

Gas Flow Rate: ______________ ACFM ______________ DSCFM* Velocity: ______________ 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.

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ______________

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

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, 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.

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

2. 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.

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

4. 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.)

5. 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).

6. 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.

7. 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).

8. 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.

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

10. 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

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

[ ] Yes [ ] No

Contaminant	Rate or Concentration

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

[ ] Yes [ ] No

Contaminant	Rate or Concentration

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

Contaminant	Rate or Concentration

D. Describe the existing control and treatment technology (if any).

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:

*Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

Contaminant	Rate or Concentration

10. Stack Parameters

a. Height: ft.

b. Diameter: ft.

c. Flow Rate: ACFM

d. Temperature: °F.

e. Velocity: FPS

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

1.

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.

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:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

j. Applicability to manufacturing processes:

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

3.

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:

4.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Costs:

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:

F. Describe the control technology selected:

1. Control Device:

2. Efficiency:[1]

3. Capital Cost:

4. Useful Life:

5. Operating Cost:

6. Energy:[2]

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

10. Reason for selection and description of systems:

[1]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

A. Company Monitored Data

1. ____________ no. sites ____________ TSP ____________ ( ) SO^2* ____________ 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

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

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling

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)____________________

C. Computer Models Used

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.

D. Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate	
TSP	____________________	grams/sec
SO^2	____________________	grams/sec

E. Emission Data Used in Modeling

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.

F. Attach all other information supportive to the PSD review.

G. 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.

H. 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.

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Fuel Heating Value = 550-600 BTU/ft^3

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$$BTU/hr = (7450)(1694) = 12.62 \times 10^6$$

$$\text{Fuel Gas Flow} = (12.62 \times 10^6)\ \frac{BTU}{hr}\ \frac{ft^3}{(550)BTU} = 22,945\ ft^3\ /hr$$

$= 382\ ft^3/min$

B) Products of Combustion

Assume products of combustion can be approximated by using data for theoretical combustion of natural gas. From attached data, for theoretical combustion of natural gas with no excess air, we have

11.453 ft^3 Combustion Products/ft^3 of Fuel Gas @60°F

0.840 lb of Combustion Products/ft^3 of Fuel Gas @60°F

$$\Rightarrow \text{Exhaust Products Mass Flow} = (382)\ \frac{ft^3}{min} \times (0.84)\ \frac{lb}{ft^3}\ \text{Fuel Gas}$$

$= 321$ lbs/min

$$\text{Exhaust Products Volume Flow} = (11.453)\ \frac{ft^3}{ft^3 \text{ Fuel Gas}} \times$$

$$(382)\ \frac{ft^3 \text{ Fuel Gas}}{min} \times \frac{[875 + 460]}{[60 + 460]} = 11{,}232\ \frac{ft^3}{min}$$

$= 673{,}925\ ft^3/hr$ @875°F

C) <u>Pollutant Emission Rates</u>

<u>H_2S Emissions</u>

For scrubbed digestor gas, H_2S concentration is

31 grains/100 SCF of Methane gas

$$H_2S \text{ Emissions} = (22{,}945)\ \frac{ft^3}{hr} \times \frac{(31)}{(100)}\ \frac{gr}{ft^3} \times \frac{lb}{(7000)\,grains}$$

$= 1.02$ lbs/hour

<u>NO_x Emissions</u>

NO_x Emission Rate = 2 gm/BHP-hr

$$NO_x \text{ Emissions} = (2)\ \frac{gm}{BHP\text{-}hr} \times (1694)\ BHP \times \frac{lb}{(454)\,gm} = \underline{7.46}\ lb/hr$$

<u>CO Emissions</u>

CO Emission Rate = 5 gm/BHP-hr

$$CO \text{ Emissions} = (5)\ \frac{gm}{BHP\text{-}hr} \times (1694)\ BHP \times \frac{lb}{(454)\,gm} = \underline{18.65}\ lb/hr$$

D) <u>Operating Hours</u>

Fuel Gas availability from digestors allows 50% operation of methane combustors

=> Hours per year = (24) x (7) x (52) x (0.50) = 4368

E) Emission Summary

Pollutant	Emission Rate (1 Unit)		Emission Rate (4 Units)	
	lbs/hr	tons/yr	lbs/hr	tons/yr
H_2S	1.02	2.23	4.08	8.9
NO_x	7.46	16.3	29.84	65.2
CO	18.65	40.7	74.60	162.9

F) Net Emissions

Assuming an older 400 KW unit is retired and the air emissions are in proportion to the new 1200 KW air emissions, the expected increase in air emissions would be as follows:

Pollutant	Net Emission Rate (4 units)	
	lbs/hr	Tons/year
H_2S	3.74	8.17
NO_x	27.35	59.7
CO	68.38	149.3

AC 13-81297

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTHEAST FLORIDA DISTRICT

3301 GUN CLUB ROAD
P.O. BOX 3858
WEST PALM BEACH, FLORIDA 33402

DER
JAN 18 1984
BAQM

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

ROY DUKE
DISTRICT MANAGER

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Methane Burning Generators [ ] New[1] [ ] Existing[1]

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

COMPANY NAME: Virginia Key Sewage Treatment Plant COUNTY: Dade

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

SOURCE LOCATION: Street Virginia Key, Key Biscayne, FL City Miami

UTM: East 782,000 North 516,000

Latitude 25 ° 45 ' ___ "N Longitude 80 ° 09 ' ___ "W

APPLICANT NAME AND TITLE: Garrett Sloan, Director

APPLICANT ADDRESS: 3575 South LeJeune Road, Miami, FL 33133

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Miami-Dade Water and Sewer Authority

I certify that the statements made in this application for a construction permit 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, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I 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 permitted establishment.

*Attach letter of authorization

Signed: Garrett Sloan

Garrett Sloan, Director
Name and Title (Please Type)

Date: 1/16/84 Telephone No. 305-665-7471

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 the permit application. There is reasonable assurance, in my professional judgment, that

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 Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Name (Please Type)

Cross/Tessitore & Associates, P.A.
Company Name (Please Type)

4759 South Conway Road, Orlando, FL 32812
Mailing Address (Please Type)

Florida Registration No. 23374 Date: ______ Telephone No. (305) 851-1484

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.

The construction and operation of a 1200 KW Methane gas fueled generator (one of a total of four at intended project site). Also an existing 400 KW Methane gas fueled generator is being retired.

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

Start of Construction ______ Completion of Construction ______

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.)

N/A

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

N/A

E. Requested permitted equipment operating time: hrs/day_____; days/wk_____; wks/yr_____;
if power plant, hrs/yr 4368; if seasonal, describe: N/A

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? No

a. If yes, has "offset" been applied? No

b. If yes, has "Lowest Achievable Emission Rate" been applied? No

c. If yes, list non-attainment pollutants. ~~No~~

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. Yes

3. Does the State "Prevention of Significant Deterioriation" (PSD) requirement apply to this source? If yes, see Sections VI and VII. Yes

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 justification for any answer of "No" that might be considered questionable.

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

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

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

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

1. Total Process Input Rate (lbs/hr): N/A
2. Product Weight (lbs/hr): ____________

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

Name of Contaminant	Emission[1] Maximum lbs/hr	Emission[1] Actual T/yr	Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission lbs/yr	Potential[4] Emission T/yr	Relate to Flow Diagram
H_2S	1.02	2.23		Not Applicable	Same as 1		
NO_x	7.46	16.30					
CO	18.65	40.70					
Opacity	<20%		<20%				

[1]See Section V, Item 2.

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

[3]Calculated from operating rate and applicable standard.

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

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)

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Methane (CH_4)	0.022945	0.022945	12.62

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

Fuel Analysis:

Percent Sulfur: ______ Percent Ash: ______

Density: ______ lbs/gal Typical Percent Nitrogen: ______

Heat Capacity: ______ BTU/lb ______ BTU/gal

Other Fuel Contaminants (which may cause air pollution): H_2S

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

Annual Average ______ Maximum ______

G. Indicate liquid or solid wastes generated and method of disposal.

None

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

Stack Height: ______________ ft. Stack Diameter: ______________ ft.

Gas Flow Rate: __________ ACFM __________ DSCFM Gas Exit Temperature: __________ °F.

Water Vapor Content: ______________ % Velocity: ______________ FPS

SECTION IV: INCINERATOR INFORMATION

Type of Waste	Type 0 (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Patholog-ical)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Inciner-ated							
Uncon-trolled (lbs/hr)							

Description of Waste ______________________________

Total Weight Incinerated (lbs/hr) ______________ Design Capacity (lbs/hr) ______________

Approximate Number of Hours of Operation per day ______ day/wk ______ wks/yr. ______

Manufacturer ______________________________

Date Constructed ______________ Model No. ______________

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

Stack Height: __________ ft. Stack Diamter: ______________ Stack Temp. __________

Gas Flow Rate: ______________ ACFM ______________ DSCFM* Velocity: ______________ 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.

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ______________

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

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, 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.

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

2. 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.

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

4. 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.)

5. 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).

6. 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.

7. 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).

8. 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.

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

10. 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

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

[ ] Yes [ ] No

Contaminant	Rate or Concentration

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

[ ] Yes [ ] No

Contaminant	Rate or Concentration

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

Contaminant	Rate or Concentration

D. Describe the existing control and treatment technology (if any).

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:

*Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

Contaminant	Rate or Concentration

10. Stack Parameters

a. Height: ft.

b. Diameter: ft.

c. Flow Rate: ACFM

d. Temperature: °F.

e. Velocity: FPS

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

1.

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.

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:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

j. Applicability to manufacturing processes:

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

3.

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:

4.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Costs:

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:

F. Describe the control technology selected:

1. Control Device:

2. Efficiency:[1]

3. Capital Cost:

4. Useful Life:

5. Operating Cost:

6. Energy:[2]

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

10. Reason for selection and description of systems:

[1]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

A. Company Monitored Data

1. ____________ no. sites ____________ TSP ____________ ( ) SO^2* ____________ 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

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

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling

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)________________________________

C. Computer Models Used

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.

D. Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate	
TSP	________________________________	grams/sec
SO^2	________________________________	grams/sec

E. Emission Data Used in Modeling

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.

F. Attach all other information supportive to the PSD review.

G. 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.

H. 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.

SPECIFICATIONS AND ASSUMPTIONS

4 Methane Combustion Units

Electrical Output - 1200KW

Generator Efficiency = 95%

Fuel Requirement = 7450 BTU/BHP-hr

Fuel Heating Value = 550-600 BTU/ft^3

DESIGN CALCULATIONS (For Single Unit)

A) Gas Flow Required

$$BHP_{in} = \frac{(1.341)(1200)}{(0.95)} = 1694$$

$$BTU/hr = (7450)(1694) = 12.62 \times 10^6$$

$$\text{Fuel Gas Flow} = (12.62 \times 10^6)\ \frac{BTU}{hr}\ \frac{ft^3}{(550)BTU} = 22{,}945\ ft^3\ /hr$$

$= 382\ ft^3/min$

B) Products of Combustion

Assume products of combustion can be approximated by using data for theoretical combustion of natural gas. From attached data, for theoretical combustion of natural gas with no excess air, we have

11.453 ft^3 Combustion Products/ft^3 of Fuel Gas @60°F

0.840 lb of Combustion Products/ft^3 of Fuel Gas @60°F

$$\Rightarrow \text{Exhaust Products Mass Flow} = (382)\ \frac{ft^3}{min} \times (0.84)\ \frac{lb}{ft^3}\ \text{Fuel Gas}$$

$= 321$ lbs/min

Exhaust Products Volume Flow = $(11.453)\ \dfrac{ft^3}{ft^3 \text{ Fuel Gas}}$ x

$$(382)\ \frac{ft^3 \text{ Fuel Gas}}{min} \times \frac{[875 + 460]}{[60 + 460]} = 11{,}232\ \frac{ft^3}{min}$$

$= 673{,}925\ ft^3\ /hr$ @875°F

C) Pollutant Emission Rates

H_2S Emissions

For scrubbed digestor gas, H_2S concentration is

31 grains/100 SCF of Methane gas

$$H_2S \text{ Emissions} = (22{,}945)\ \frac{ft^3}{hr} \times \frac{(31)}{(100)}\ \frac{gr}{ft^3} \times \frac{lb}{(7000)\,grains}$$

$= 1.02$ lbs/hour

NO_x Emissions

NO_x Emission Rate = 2 gm/BHP-hr

$$NO_x \text{ Emissions} = (2)\ \frac{gm}{BHP\text{-}hr} \times (1694)\ BHP \times \frac{lb}{(454)\,gm} = \underline{7.46}\ lb/hr$$

CO Emissions

CO Emission Rate = 5 gm/BHP-hr

$$CO \text{ Emissions} = (5)\ \frac{gm}{BHP\text{-}hr} \times (1694)\ BHP \times \frac{lb}{(454)\,gm} = \underline{18.65}\ lb/hr$$

D) Operating Hours

Fuel Gas availability from digestors allows 50% operation of methane combustors

=> Hours per year = (24) x (7) x (52) x (0.50) = 4368

E) Emission Summary

Pollutant	Emission Rate (1 Unit)		Emission Rate (4 Units)	
	lbs/hr	tons/yr	lbs/hr	tons/yr
H_2S	1.02	2.23	4.08	8.9
NO_x	7.46	16.3	29.84	65.2
CO	18.65	40.7	74.60	162.9

F) Net Emissions

Assuming an older 400 KW unit is retired and the air emissions are in proportion to the new 1200 KW air emissions, the expected increase in air emissions would be as follows:

Pollutant	Net Emission Rate (4 units)	
	lbs/hr	Tons/year
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CO	68.38	149.3

AC 13-81290

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTHEAST FLORIDA DISTRICT
3301 GUN CLUB ROAD
P.O. BOX 3858
WEST PALM BEACH, FLORIDA 33402

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DISTRICT MANAGER

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Methane Burning Generators [ ] New[1] [ ] Existing[1]

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

COMPANY NAME: Virginia Key Sewage Treatment Plant COUNTY: Dade

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

SOURCE LOCATION: Street Virginia Key, Key Biscayne, FL City Miami

UTM: East 782,000 North 516,000

Latitude 25 ° 45 ' ___ "N Longitude 80 ° 09 ' ___ "W

APPLICANT NAME AND TITLE: Garrett Sloan, Director

APPLICANT ADDRESS: 3575 South LeJeune Road, Miami, FL 33133

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A. APPLICANT

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I certify that the statements made in this application for a construction permit 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, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I 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 permitted establishment.

*Attach letter of authorization

Signed: [signature]

Garrett Sloan, Director
Name and Title (Please Type)

Date: 1/16/84 Telephone No. 305-665-7471

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 the permit application. There is reasonable assurance, in my professional judgment, that

[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 Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Name (Please Type)

Cross/Tessitore & Associates, P.A.
Company Name (Please Type)

4759 South Conway Road, Orlando, FL 32812
Mailing Address (Please Type)

Florida Registration No. 23374 Date: ______ Telephone No. (305) 851-1484

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

Start of Construction ______ Completion of Construction ______

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.)

N/A

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

N/A

E. Requested permitted equipment operating time: hrs/day_____; days/wk_____; wks/yr_____;

if power plant, hrs/yr 4368; if seasonal, describe: N/A

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? No

   a. If yes, has "offset" been applied? No

   b. If yes, has "Lowest Achievable Emission Rate" been applied? No

   c. If yes, list non-attainment pollutants. No

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. Yes

3. Does the State "Prevention of Significant Deterioriation" (PSD) requirement apply to this source? If yes, see Sections VI and VII. Yes

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 justification for any answer of "No" that might be considered questionable.

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

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

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

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

1. Total Process Input Rate (lbs/hr): N/A
2. Product Weight (lbs/hr): __________

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

Name of Contaminant	Emission[1] Maximum lbs/hr	Emission[1] Actual T/yr	Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission lbs/yr	Potential[4] Emission T/yr	Relate to Flow Diagram
H_2S	1.02	2.23		Not Applicable	Same as 1		
NO_x	7.46	16.30					
CO	18.65	40.70					
Opacity	<20%		<20%				

[1]See Section V, Item 2.

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

[3]Calculated from operating rate and applicable standard.

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

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)

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Methane (CH_4)	0.022945	0.022945	12.62

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

Fuel Analysis:

Percent Sulfur: ______________ Percent Ash: ______________

Density: ______________ lbs/gal Typical Percent Nitrogen: ______________

Heat Capacity: ______________ BTU/lb ______________ BTU/gal

Other Fuel Contaminants (which may cause air pollution): H_2S

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

Annual Average ______________ Maximum ______________

G. Indicate liquid or solid wastes generated and method of disposal.

None

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

Stack Height: ______________________ ft. Stack Diameter: ______________________ ft.

Gas Flow Rate: __________ ACFM __________ DSCFM Gas Exit Temperature: __________ °F.

Water Vapor Content: ______________________ % Velocity: ______________________ FPS

SECTION IV: INCINERATOR INFORMATION

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Patholog-ical)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste ____

Total Weight Incinerated (lbs/hr) ______________ Design Capacity (lbs/hr) ______________

Approximate Number of Hours of Operation per day ______ day/wk ______ wks/yr. ______

Manufacturer ____

Date Constructed ______________________ Model No. ______________________

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

Stack Height: __________ ft. Stack Diamter: ______________ Stack Temp. ______________

Gas Flow Rate: ______________ ACFM ______________ DSCFM* Velocity: ______________ 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.

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) ______________________

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

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, 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.

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

2. 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.

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

4. 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.)

5. 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).

6. 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.

7. 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).

8. 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.

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

10. 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

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

[ ] Yes [ ] No

Contaminant	Rate or Concentration

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

[ ] Yes [ ] No

Contaminant	Rate or Concentration

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

Contaminant	Rate or Concentration

D. Describe the existing control and treatment technology (if any).

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:

*Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

Contaminant	Rate or Concentration

10. Stack Parameters

a. Height: ft.

b. Diameter: ft.

c. Flow Rate: ACFM

d. Temperature: °F.

e. Velocity: FPS

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

1.

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.

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:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

j. Applicability to manufacturing processes:

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

3.

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:

4.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Costs:

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:

F. Describe the control technology selected:

1. Control Device:

2. Efficiency:[1]

3. Capital Cost:

4. Useful Life:

5. Operating Cost:

6. Energy:[2]

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

10. Reason for selection and description of systems:

[1]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

A. Company Monitored Data

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

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

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling

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)________________________

C. Computer Models Used

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.

D. Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate
TSP	________________ grams/sec
SO^2	________________ grams/sec

E. Emission Data Used in Modeling

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.

F. Attach all other information supportive to the PSD review.

G. 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.

H. 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.

SPECIFICATIONS AND ASSUMPTIONS

4 Methane Combustion Units

Electrical Output - 1200KW

Generator Efficiency = 95%

Fuel Requirement = 7450 BTU/BHP-hr

Fuel Heating Value = 550-600 BTU/ft^3

DESIGN CALCULATIONS (For Single Unit)

A) Gas Flow Required

$$BHP_{in} = \frac{(1.341)(1200)}{(0.95)} = 1694$$

$$BTU/hr = (7450)(1694) = 12.62 \times 10^6$$

$$\text{Fuel Gas Flow} = (12.62 \times 10^6)\ \frac{BTU}{hr}\ \frac{ft^3}{(550)BTU} = 22{,}945\ ft^3\ /hr$$

$= 382\ ft^3/min$

B) Products of Combustion

Assume products of combustion can be approximated by using data for theoretical combustion of natural gas. From attached data, for theoretical combustion of natural gas with no excess air, we have

11.453 ft^3 Combustion Products/ft^3 of Fuel Gas @60°F

0.840 lb of Combustion Products/ft^3 of Fuel Gas @60°F

$$\Rightarrow \text{Exhaust Products Mass Flow} = (382)\ \frac{ft^3}{min} \times (0.84)\ \frac{lb}{ft^3}\ \text{Fuel Gas}$$

$= 321$ lbs/min

Exhaust Products Volume Flow = $(11.453)\ \frac{ft^3}{ft^3 \text{ Fuel Gas}}$ x

$$(382)\ \frac{ft^3 \text{ Fuel Gas}}{min} \times \frac{[875 + 460]}{[60 + 460]} = 11{,}232\ \frac{ft^3}{min}$$

$= 673{,}925\ ft^3/hr$ @875°F

C) Pollutant Emission Rates

H_2S Emissions

For scrubbed digestor gas, H_2S concentration is

31 grains/100 SCF of Methane gas

$$H_2S \text{ Emissions} = (22{,}945)\ \frac{ft^3}{hr} \times \frac{(31)}{(100)}\ \frac{gr}{ft^3} \times \frac{lb}{(7000)\text{ grains}}$$

$= 1.02$ lbs/hour

NO_x Emissions

NO_x Emission Rate = 2 gm/BHP-hr

$$NO_x \text{ Emissions} = (2)\ \frac{gm}{BHP\text{-}hr} \times (1694)\ BHP \times \frac{lb}{(454)\ gm} = \underline{7.46}\ lb/hr$$

CO Emissions

CO Emission Rate = 5 gm/BHP-hr

$$CO \text{ Emissions} = (5)\ \frac{gm}{BHP\text{-}hr} \times (1694)\ BHP \times \frac{lb}{(454)\ gm} = \underline{18.65}\ lb/hr$$

D) Operating Hours

Fuel Gas availability from digestors allows 50% operation of methane combustors

=> Hours per year = (24) x (7) x (52) x (0.50) = 4368

E) Emission Summary

Pollutant	Emission Rate (1 Unit)		Emission Rate (4 Units)	
	lbs/hr	tons/yr	lbs/hr	tons/yr
H_2S	1.02	2.23	4.08	8.9
NO_x	7.46	16.3	29.84	65.2
CO	18.65	40.7	74.60	162.9

F) Net Emissions

Assuming an older 400 KW unit is retired and the air emissions are in proportion to the new 1200 KW air emissions, the expected increase in air emissions would be as follows:

Pollutant	Net Emission Rate (4 units)	
	lbs/hr	Tons/year
H_2S	3.74	8.17
NO_x	27.35	59.7
CO	68.38	149.3

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTHEAST FLORIDA
DISTRICT

P.O. BOX 3858
3301 GUN CLUB ROAD
WEST PALM BEACH, FLORIDA 33402-3858

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

ROY M. DUKE
DISTRICT MANAGER

DER
NOV 28 1983
BAQM

November 15, 1983

Mr. Joseph L. Tessitore, P.E.
Vice President
Cross/Tessitore & Associates, P.A.
4759 South Conway Road - Suite D
Orlando, Florida 32812

AP - Dade County
Virginia Key Sewage
Treatment Plant
Four 1200 KW
Sewage Gas-Fueled
Generators

Dear Mr. Tessitore:

Your letter of October 31, 1983 concerning air emissions from 4 sewage-gas-fueled electrical generators indicates that a permit will be required.

Since over 100 tons/yr of an air pollutant is estimated, 3 copies of the attached form (DER Form 17-1.202(1)) with original signatures on each should be sent to Mr. Clair Fancy, Department of Environmental Regulation, Bureau of Air Quality Management, Twin Towers Office Building, 2600 Blair Stone Road, Tallahassee, Florida 32301.

Please include in your application, the sources of your emission factors. Also estimate the SO_2 emissions from any oxidation of sulfur compounds in the fuel.

Based on the maximum CO emission rate of 18,65 lb/hr and 4368 hrs of annual operation (40.7 T/yr.) for each generator, the construction permit fee will be $250 each (1000 total).

If there are any questions please contact I. Goldman at this office, telephone 305/689-5800.

Sincerely,

John A. Guidry
Supervisor
Air Permitting Section

JAG:igj/a

cc: Metro Dade County Environmental Resource Management
Clair Fancy - Bureau of Air Quality Management w/copy of letter

Best Available Copy

CROSS/TESSITORE & ASSOCIATES, P.A.
4759 S. CONWAY ROAD, SUITE D
ORLANDO, FLORIDA 32812
305/851-1484

October 31, 1983

Mr. Tom Tittle
FDER-West Palm Beach
P. O. Box 3858
West Palm Beach FL 33402

SUBJECT: Virginia Key Sewage Treatment Plant
1200 KW Methane Burning Generators (4)
FDER Permit Requirements

Dear Tom:

In response to our telephone conversation, I am enclosing the technical details and emission estimates for the proposed 1200 KW Methane Burning Genrators so that you can determine the FDER permit requirements. The attached analyses show the design calculations for each unit including gas combustion rates, exhaust flow rates, and pollutant emission rates.

The net emission rates in Section F assume that an existing 400 KW generator will be retired, thereby providing a decrease in emissions and a net emission rate as shown.

If you require any additional data in your evaluation, do not hesitate to call upon me.

Sincerely,

Joseph L. Tessitore

Joseph L. Tessitore, P.E.
Vice President

JLT:kim
Enc.a/s

cc: Mr. Morris Kaufmann, P.E., G-T
Mr. Patrick Wong, P.E.

SPECIFICATIONS AND ASSUMPTIONS

4 Methane Combustion Units

Electrical Output - 1200KW

Generator Efficiency = 95%

Fuel Requirement = 7450 BTU/BHP-hr

Fuel Heating Value = 550-600 BTU/ft^3

DESIGN CALCULATIONS (For Single Unit)

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$$BTU/hr = (7450)(1694) = 12.62 \times 10^6$$

$$\text{Fuel Gas Flow} = (12.62 \times 10^6)\ \frac{BTU}{hr}\ \frac{ft^3}{(550)\,BTU} = 22{,}945\ ft^3\ /hr$$

$$= 382\ ft^3/min$$

B) Products of Combustion

Assume products of combustion can be approximated by using data for theoretical combustion of natural gas.

From attached data, for theoretical combustion of natural gas with no excess air, we have

11.453 ft^3 Combustion Products/ft^3 of Fuel Gas @60°F

0.840 lb of Combustion Products/ft^3 of Fuel Gas @60°F

$$\Rightarrow \text{Exhaust Products Mass Flow} = (382)\ \frac{ft^3}{min} \times (0.84)\ \frac{lb}{ft^3}\ \text{Fuel Gas}$$

$$= 321\ lbs/min$$

$$\text{Exhaust Products Volume Flow} = (11.453)\ \frac{ft^3}{ft^3\ \text{Fuel Gas}} \times$$

$$(382)\ \frac{ft^3\ \text{Fuel Gas}}{min} \times \frac{[875 + 460]}{[60 + 460]} = 11,232\ \frac{ft^3}{min}$$

$= 673,925\ ft^3/hr$ @875°F

C) <u>Pollutant Emission Rates</u>

<u>H_2S Emissions</u>

For scrubbed digestor gas, H_2S concentration is

31 grains/100 SCF

Exhaust Gas Volume of 60°F = (11.453) (382) (60) = 262,503 $\frac{ft^3}{hr}$ @ 60°F

$$H_2S\ \text{Emissions} = \left(\frac{262,503}{100}\right) \times (31)\ \text{grains} \times \frac{lb}{(7000)\ \text{grains}} = \underline{11.63}\ \text{lbs/hr}$$

<u>NO_x Emissions</u>

NO_x Emission Rate = 2 gm/BHP-hr

$$NO_x\ \text{Emissions} = (2)\ \frac{gm}{BHP\text{-}hr} \times (1694)\ BHP \times \frac{lb}{(454)\ gm} = \underline{7.46}\ \text{lb/hr}$$

CO Emission Rate = 5 gm/BHP-hr

$$CO\ \text{Emissions} = (5)\ \frac{gm}{BHP\text{-}hr} \times (1694)\ BHP \times \frac{lb}{(454)\ gm} = \underline{18.65}\ \text{lb/hr}$$

D) <u>Operating Hours</u>

Fuel Gas availability from digestors allows 50% operation of methane combustors

=> Hours per year = (24) x (7) x (52) x (0.50) = 4368

E) Emission Summary

Pollutant	Emission Rate (1 Unit)		Emission Rate (4 Units)	
	lbs/hr	tons/yr	lbs/hr	tons/yr
H_2S	11.60	25.3	46.40	101.2
NO_x	7.46	16.3	29.84	65.2
CO	18.65	40.7	74.60	162.9

F) Net Emissions

Assuming an older 400 KW unit is retired and the air emissions are in proportion to the new 1200 KW air emissions, the expected increase in air emissions would be as follows:

Pollutant	Net Emission Rate (4 units)	
	lbs/hr	Tons/year
H_2S	42.5	92.8
NO_x	27.35	59.7
CO	68.38	149.3

Table D7. COMBUSTION CHARACTERISTICS OF NATURAL GAS

Average analysis, volume %[a]

CO_2	0
N_2	5.15
O_2	0
CH_4	81.11
C_2H_6	9.665
C_3H_8	3.505
$i\text{-}C_4H_{10}$	0.19
$n\text{-}C_4H_{10}$	0.24
C_5+	0.09
C_6+	0.05
	100.00

Average gross heat, 1,100 Btu/ft^3

Air required for combustion

Theoretical - 10.360 ft^3/ft^3 gas

20% excess air -- 12.432 ft^3/ft^3 gas

Products of combustion/ft^3 of gas

	Theoretical air		20% excess air	
	Vol	Wt	Vol	Wt
CO_2	1.134 ft^3	0.132 lb	1.134 ft^3	0.132 lb
H_2O	2.083	0.099	2.083	0.099
N_2	8.236	0.609	9.873	0.731
O_2	-		0.435	0.037
Total	11.453 ft^3	0.840 lb	13.525 ft^3	0.999 lb

Available heat, Btu/ft^3 gas,[a] based on latent heat of vaporization of water at 60°F

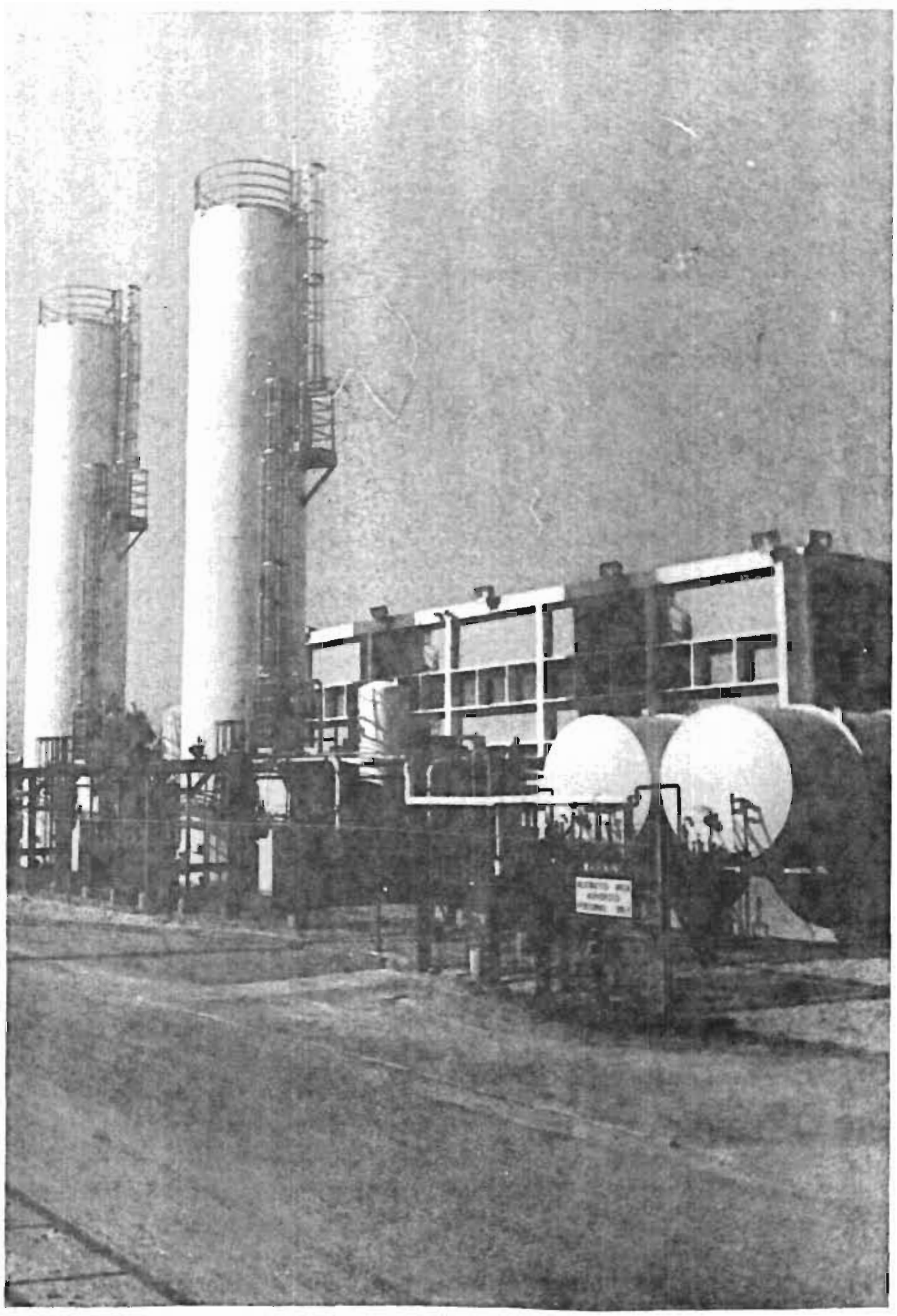
Temp, °F	Available heat, Btu, with theoretical air	Available heat, Btu, 20% excess air
100	988.6	992.2
150	976.1	973.0
200	963.7	958.5
250	952.1	949.9
300	941.0	932.0
350	928.8	917.8
400	917.8	905.1
450	906.2	891.5
500	894.6	878.0
550	882.7	864.1
600	870.9	850.4
700	846.2	821.8
800	820.7	792.3
900	797.7	765.3
1,000	772.6	736.2
1,100	747.2	706.6
1,200	721.3	676.5
1,300	693.0	643.6
1,400	668.6	615.4
1,500	642.7	584.5
1,600	614.6	552.9
1,700	589.8	523.7
1,800	562.3	491.7
1,900	534.8	459.9
2,000	507.5	428.2
2,100	478.7	394.9
2,200	450.7	362.5
2,300	421.9	329.1
2,400	393.0	295.6
2,500	364.6	262.6
3,000	219.1	94.2
3,500	70.4	--

[a] Average of two samples analyzed by Southern Calif. Gas Co., 1956.

STATISTICAL OPERATION REPORT

CENTRAL DISTRICT WASTEWATER TREATMENT PLANT

FISCAL YEARS 1979-80, 1980-81, 1981-82



MIAMI-DADE WATER AND SEWER AUTHORITY

DADE COUNTY, FLORIDA

COVER PHOTO

Cold boxes of two 70 ton per day pure oxygen generators tower 68 feet above the landscape.

TABLE OF CONTENTS

FORWARD

The operational statistical data submitted in this report are for the three fiscal year periods ending June 30, 1980, 1981, and 1982.

The Central District Wastewater Treatment Plant, formerly known as the Virginia Key Plant, is presently composed of two separate operational units identified as Plant No. 1 and Plant No. 2. Plant No. 1 is essentially the original treatment plant placed in operation in 1956. The Modified or High Rate Activated Sludge Process continues to be used in this plant.

Plant No. 2, located adjacent to Plant No. 1, was constructed in the period 1975-80. It utilizes the High Purity Oxygen Activated Sludge Process. Control gates permit the raw sewage to enter the two plants in variable quantities as required for the most efficient operation of both plants. Since Plant No. 2 did not go on stream until June, 1980, the available data are for two fiscal years.

The Dade County Pollution Control Annual Operating Permit, issued for the year December 1, 1981 through November 30, 1982, indicates a sewage flow of 121 M.G.D. for the combined plants. This is divided as 48 M.G.D. for Plant No. 1, and 73 M.G.D. for Plant No. 2.

The City of Miami is the major contributing municipality to the treatment facilities. Also served by the Central District Plant are Coral Gables, South Miami, Miami Springs, Miami Beach, Virginia Gardens, Surfside, North Bay Village, Bal Harbour, Indian Creek Village, Bay Harbor Islands, and other unincorporated areas of Dade County.

This report was prepared by Plant Superintendents D. P. Backmeyer and John W. Caskie of the Sewer Division. Garrett Sloan is Director of the Miami-Dade Water And Sewer Authority.

COMBINED PLANTS NO. 1 AND NO. 2

The information available for the performance of the combined plants is necessarily limited to the two fiscal year periods ending June 30, 1982, since Plant No. 2 was first placed in operation in July 1980. Although Plants No. 1 and No. 2 are sampled and operated as individual units, they are evaluated by the regulatory agencies as a single unit. As of December 1981, the plant capacity as designated by the State of Florida Operating Permit was 121 M.G.D.

The treatment plant is located on Virginia Key directly south of Miami Beach and about three miles east of downtown Miami. It is accessible by the Rickenbacker Causeway. The service area boundaries are shown on the map on page 8 . They can generally be defined as Northwest 79th St. on the north; the Atlantic Ocean on the east; the South District boudary on the south at approximately Southwest 72nd St. (Sunset Drive), except for that portion of the City of Coral Gables that extends south to approximately S.W. 156th St.; and the South District boundary on the west which generally extends along 64th Ave. The flows from the Wastewater Collection Zones in the southern and western edge of the Central District can be shifted at a future date should the need arise. These flows would be diverted to the South District.

The liquid wastes presently tributary to the Central District encompass residential, commercial, manufacturing, industrial, and small agricultural areas. Industry and manufacturing are predominently light in nature. Most industrial wastes are created by dairy product plants, miscellaneous manufacturing plants, and aviation industries located around the Miami International Airport. The aircraft related industries include aircraft repair and metal plating industries which have their own pretreatment facilities. The Central District also has film processing plants and two cement manufacturing plants. The institutional facilities include hospitals, nursing homes, a junior college, and two universities. The majority of the commercial areas are located in the heart of downtown Miami and suburban shopping centers scattered throughout the rest of the district.

The flow pattern for the combined plants is shown on page 9. The treatment facility consists of two plants in parallel. Sewage enters the plants from two large diameter force mains from the City of Miami and the City of Miami Beach. The flow is then split as desired to Plant No. 2 (the new addition) and Plant No. 1, the original plant. The flow pattern is basically the same for both plants.

In Plant No. 1 the flow passes through the grit chambers for grit removal and into the aeration tanks for treatment by the high rate activated sludge process. The flow enters the final settling tanks where the settleable suspended solids are removed from the main flow and are continuously pumped to a sludge distribution chamber where part of the sludge is returned to the aeration tanks and the remainder to waste sludge thickener tanks. The thickened sludge is then pumped to the anaerobic digesters where approximately 45 percent of the solids are converted to sewage gas which can be used as fuel. Following digestion, the solids are dewatered by centrifuges prior to ultimate disposal by landfill.

In Plant No. 2 the flow passes through the grit chambers which remove grit that could damage pumps and mechanical equipment. The flow then enters the oxygenation tanks for treatment by the activated sludge process utilizing pure oxygen. The flow continues to the final settling tanks where the solids are settled and collected in the sludge pumping station. A portion of the sludge is returned to the oxygenation tanks and the remaining sludge is pumped to the sludge concentrators. Sludge from the North District Plant is pumped into these concentrators also. In the concentrators the sludge is thickened and further separated from the liquid carrier. The thickened sludge is then pumped to the sludge digesters where it is decomposed by anaerobic bacteria to form a non-objectionable sludge which is partially dewatered by the use of centrifuges prior to land disposal. The methane gas produced is scrubbed and used as fuel in the plant engines, and for heating the sludge digesters.

The effluents from the final settling tanks in both plants are chlorinated and flow into the effluent pumping station where they are pumped out the ocean outfall line and discharged in 100 feet of water in the Atlantic Ocean 18,800 feet off shore.

The raw sewage flow rates as represented by the average daily flow in M.G. are shown for a twelve year period on page 11. The marked increase in the past two years was due principally to the connection of the City of Miami Beach to the system. The statistical operation data are detailed by months in the tables on pages 12 to 15. A comparative summary for the combined plants is shown on page 10.

The laboratory sampling and testing program provides the basis for process control and produces a record of the performance of the treatment facility. This information keeps the operating personnel informed of plant efficiencies, and helps in predicting problems that might be developing within the system. The evaluation of the efficiency and adequacy of the plant by governing and regulatory agencies also depends to a great extent on the work done in the laboratory. It is therefore essential that the testing program produce a complete and accurate record of the treatment plant performance.

The laboratory is staffed by four chemists and five technicians. The routine analytical work encompasses seventeen or more different laboratory tests. In a typical week, 1,220 determinations are completed on ten different types of samples. In addition to the routine, many physical, chemical, and biological examinations are carried out in the course of the investigative research required for special projects.

The personnel assigned to the combined plants are as follows:

Plant Superintendent

2

Assistant Plant Superintendent

1

Chemist II

2

Chemist I

2

Administrative Secretary I

1

Plant Supervisors

11

Treatment Plant Operator II

9

Treatment Plant Operator I

35

Diesel Plant Operator

15

Laboratory Technicians

5

Clerk II

3

Automotive Equipment Operator III

4

Automotive Equipment Operator II

9

Semi-Skilled Laborer

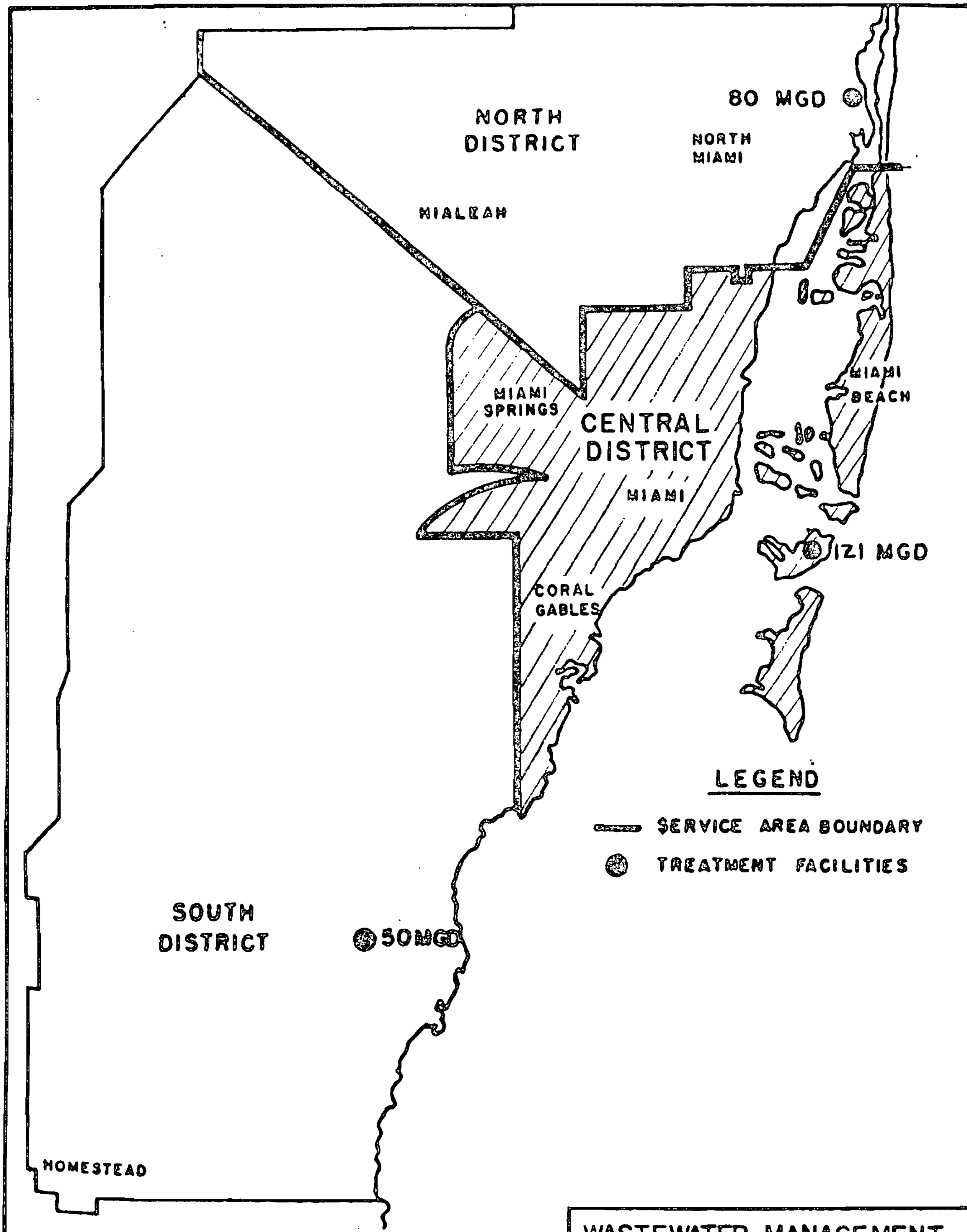
18

Laborer

3

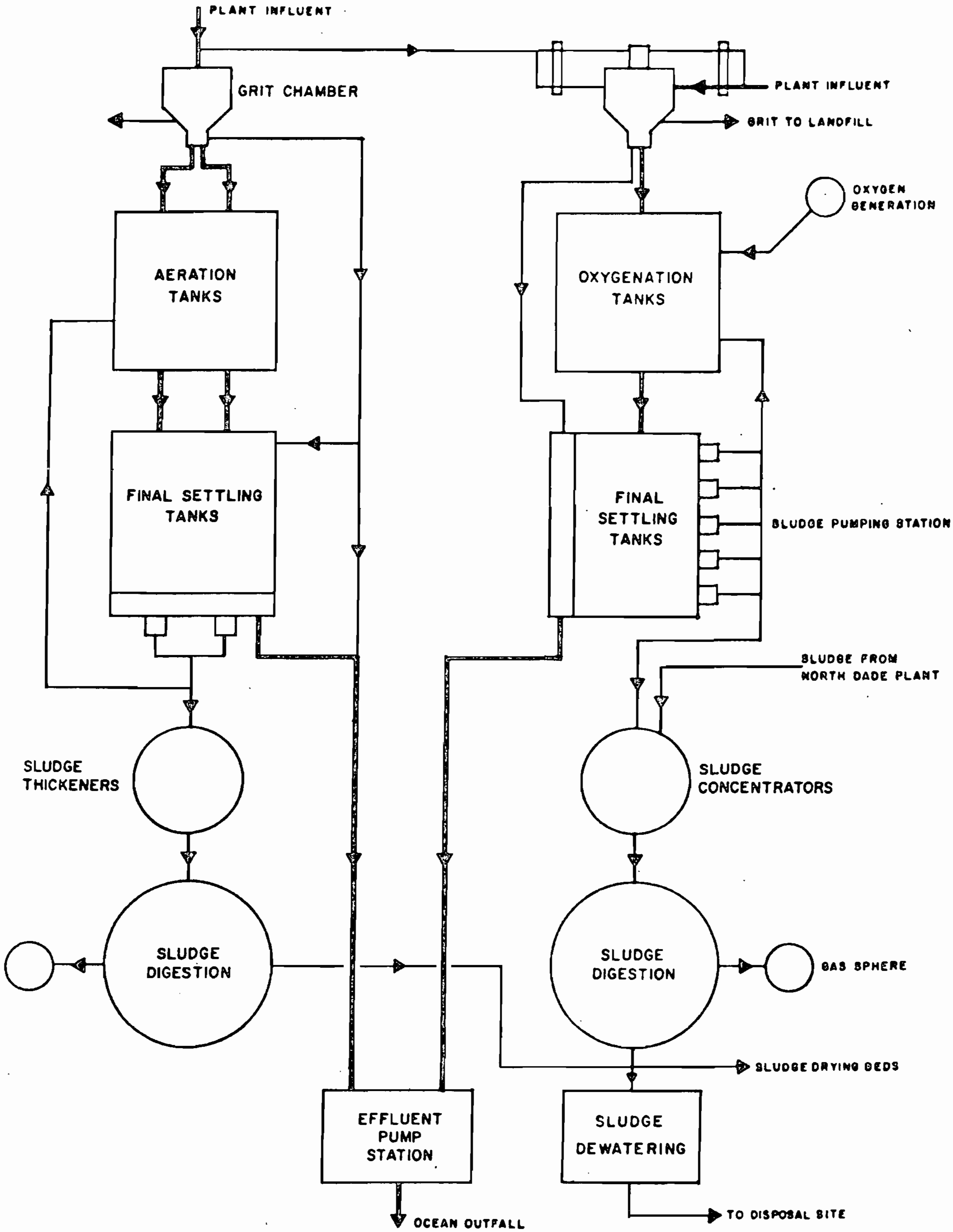
Custodial Worker I

2



WASTEWATER MANAGEMENT DISTRICT BOUNDARIES.

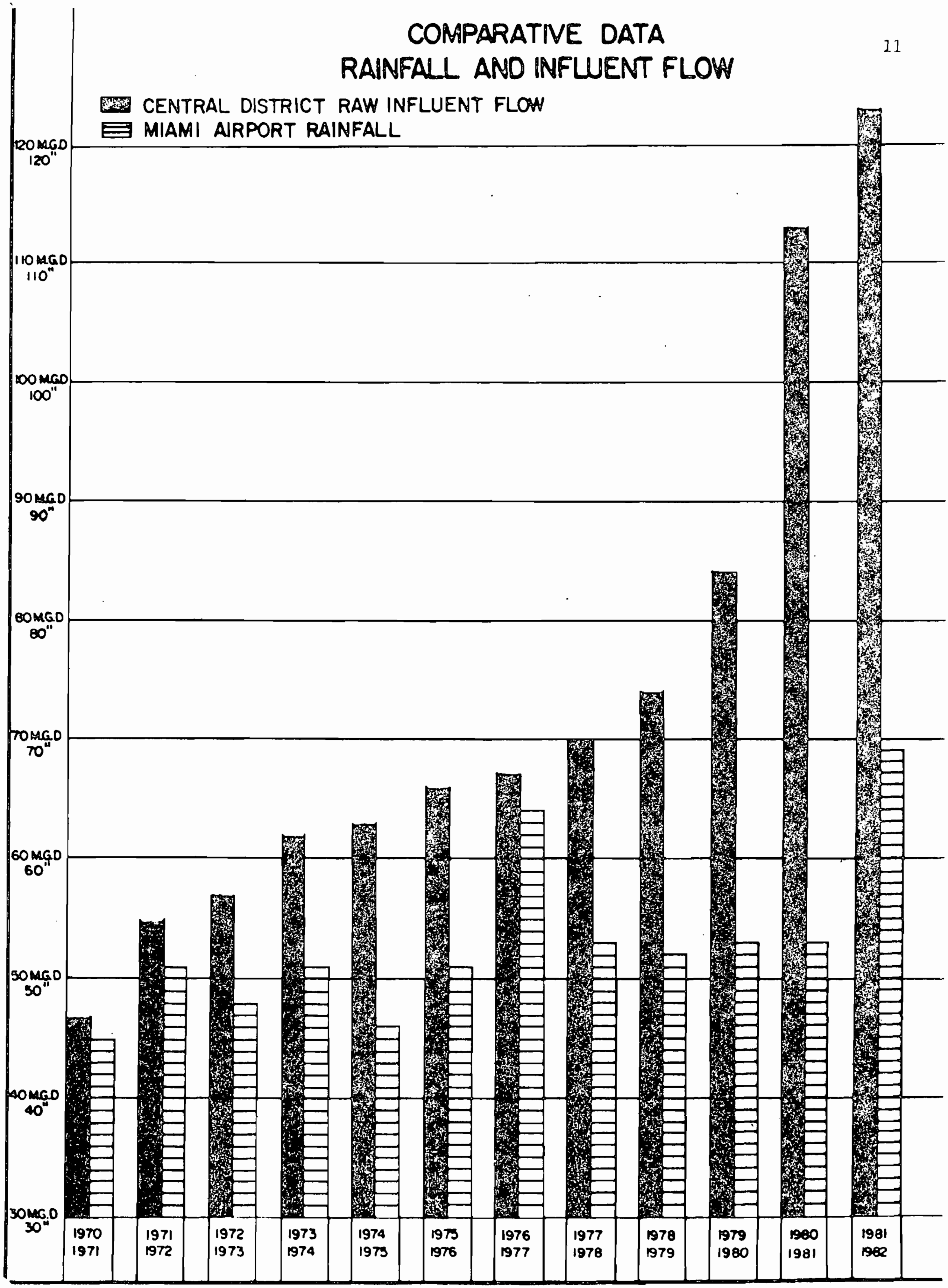
MIAMI-DADE WATER AND SEWER AUTHORITY	
DATE: MARCH 10, 1983	SCALE: NONE
T.C.	C.H.



PRIME MODE OF OPERATION

COMPARATIVE SUMMARY DATA FOR TWO FISCAL YEARS
COMBINED PLANTS

	1980-81	1981-82
Million Gallons Sewage Treated Daily	105	122
Raw Sewage Suspended Solids, p.p.m.	140	121
Raw Sewage B.O.D., p.p.m.	126	108
Final Effluent Suspended Solids, p.p.m.	31	13
Final Effluent B.O.D., p.p.m.	26	17
Suspended Solids Percent Removal	78	89
B.O.D. Percent Removal	78	84
Tons of Chlorine used in plants - year total	614	385
Dry Solids added to Digestion System, tons	29,921	39,819
Dry Solids removed from Digesters, tons	12,613	21,556
Volume to Centrifuges, 1000 gal. - year total		221,855
Sludge added to Centrifuges, avg. percent dry solids		2.2
Total dry Solids to Centrifuges - year total		22,151
Total Polymer used at Centrifuges, Lbs.		474,398
Total Polymer cost at Centrifuges		$615,025
Centrifuge Cake, avg. percent dry solids		17.4
Centrate Suspended Solids, p.p.m.		1,851
Cubic yards of Cake produced - year total		137,027
1000 KWH used - year total	805.5	975.9
Sewage Gas produced, 1000 cu. ft. - avg. day	1,192	1,046


COMPARATIVE DATA
RAINFALL AND INFLUENT FLOW
CENTRAL DISTRICT RAW INFLUENT FLOW
MIAMI AIRPORT RAINFALL
120 M.G.D 120"
110 M.G.D 110"
100 M.G.D 100"
90 M.G.D 90"
80 M.G.D 80"
70 M.G.D 70"
60 M.G.D 60"
50 M.G.D 50"
40 M.G.D 40"
30 M.G.D 30"
1970 1971
1971 1972
1972 1973
1973 1974
1974 1975
1975 1976
1976 1977
1977 1978
1978 1979
1979 1980
1980 1981
1981 1982

	Raw Sewage Treated M.G.		Chlorine used	Electric Power 1000 KWH
1981-82	Total Metered	Average Day	Total Lbs.	Avg. Day
July	3,357	110.5	73,905	83.5
Aug	4,160	135.5	60,540	85.3
Sep	4,310	142.9	76,400	89.1
Oct	4,046	130.5	70,775	91.9
Nov	3,854	128.7	63,480	82.9
Dec	3,351	107.9	68,189	79.5
Jan	3,133	101.0	60,965	76.7
Feb	2,897	103.3	61,209	77.2
Mar	3,331	107.6	61,006	72.6
Apr	3,660	121.5	50,905	75.6
May	5,163	127.2	52,480	78.6
June	4,480	149.5	69,740	83.0
Total	45,742		769,594	975.9
Avg	3,812	122.2	64,133	81.3
1980-81				
July	2,616	85.5	87,810	55.1
Aug	2,814	92.2	108,920	52.4
Sep	2,949	101.2	57,200	57.1
Oct	3,540	115.4	96,863	61.1
Nov	3,627	120.0	113,650	67.2
Dec	3,413	108.0	106,197	69.4
Jan	3,281	104.8	128,236	70.0
Feb	3,085	108.5	185,149	69.2
Mar	3,378	106.9	112,810	72.9
Apr	3,138	104.4	76,060	73.4
May	3,361	109.4	78,225	79.3
June				
Total	38,423		1,227,065	805.5
Avg	3,202	105.3	102,255	67.1

	Biochemical Oxygen Demand				Suspended Solids				p.H.
1981-82	Raw Sewage p.p.m.	Final Effluent p.p.m.	Population Equivalent 1000	Percent Removed	Raw Sewage p.p.m.	Final Effluent p.p.m.	Population Equivalent 1000	Percent Removed	Final Effluent
July	102	15	553	85	130	15	541	88	7.1
Aug	94	16	629	83	112	14	564	88	7.3
Sep	79	16	553	80	105	14	573	87	7.2
Oct	85	16	542	81	112	13	555	88	7.2
Nov	100	18	635	82	118	13	577	89	7.2
Dec	108	16	571	85	125	14	514	89	7.2
Jan	123	18	588	85	129	12	495	91	7.3
Feb	138	19	706	86	131	13	514	90	7.3
Mar	134	20	700	85	133	14	541	89	7.2
Apr	121	19	712	84	127	14	582	89	7.0
May	120	17	735	85	121	11	550	91	7.1
June	86	17	635	81	110	11	614	90	7.2
Total Avg	108	17	630	84	121	13	552	89	7.2
1980-81									
July									
Aug									
Sep									
Oct									
Nov	126	33	759	74	117	31	532	74	7.3
Dec	110	21	582	81	141	31	577	77	7.2
Jan	177	38	906	79	146	42	582	71	7.2
Feb	120	20	635	80	144	19	595	86	7.2
Mar	125	27	653	78	143	25	511	83	7.3
Apr	218	25	1,118	88	187	39	741	89	7.2
May	122	15	653	88	132	18	550	86	7.2
June	106	17	553	84	127	17	518	87	7.2
Total Avg	126	26	732	78	140	31	576	78	7.2

For the months of July thru October 1980, see table for Plant No. 1
Both Raw Sewage and Plant Effluent BOD's and Suspended Solids are Weighted Avg. of Plant No. 1 and Plant No. 2.

	Sludge Digestion System		Sewage Gas Production
1981-82	Total Pounds Dry Solids Added 1000	Total Pounds Dry Solids Removed 1000	Total Cu. Ft. 1000
July	7,914	3,627	35,490
Aug	7,179	3,257	32,314
Sep	6,808	2,668	35,534
Oct	6,605	2,793	29,829
Nov	6,953	3,088	37,745
Dec	6,276	4,101	32,601
Jan	7,337	3,571	34,124
Feb	5,880	4,126	26,811
Mar	7,023	3,587	31,611
Apr	5,781	4,025	28,076
May	5,727	3,640	28,553
June	6,154	4,628	29,185
Total	79,637	43,111	381,873
Avg	6,636	3,592	31,823
1980-81			
July	1,201	1,016	12,475
Aug	1,125	1,306	11,537
Sep	1,554	959	12,675
Oct	4,755	602	37,177
Nov	5,998	1,166	26,980
Dec	5,421	806	33,706
Jan	5,176	2,683	32,869
Feb	5,823	2,953	33,116
Mar	6,629	4,622	35,461
Apr	5,971	3,297	34,530
May	7,707	3,309	44,480
June	8,481	2,503	43,607
Total	59,841	25,225	358,613
Avg	4,987	2,102	29,884

SLUDGE DEWATERING BY CENTRIFUGES

1981-82	Centrifuge Volume 1000 gal	Sludge Solids percent	Dry Solids added to Centrifuges tons	Total Lbs. of Polymer used	Lbs. of Polymer per ton of Solids added to Centrifuges
July	17,891	2.29	1,708	18,570	10.87
Aug	19,695	2.02	1,659	39,707	23.94
Sep	17,211	1.90	1,364	53,324	39.11
Oct	19,834	2.01	1,662	66,222	39.84
Nov	18,485	1.85	1,426	70,888	49.71
Dec	19,198	2.30	2,195	35,760	16.29
Jan	18,005	2.08	1,793	26,350	14.69
Feb	19,040	2.22	2,056	26,325	12.81
Mar	16,157	2.09	1,899	19,670	10.36
Apr	15,646	2.38	2,025	23,550	11.63
May	20,104	2.49	2,089	27,650	13.24
June	20,589	2.65	2,274	66,382	29.19
Total	221,855		22,151	474,398	271.68
Avg	18,488	2.19	1,846	39,533	22.64

1981-82	Total Cost of Polymer used	Cost of Polymer per ton of Solids added to Centrifuges	Cake Produced cu. yards	Cake Solids percent	Centrate Suspended Solids
July	$ 49,211	$ 28.80		16.7	
Aug	40,407	24.35	10,912	17.8	
Sep	54,325	39.84	8,880	18.2	1,505
Oct	70,517	42.42	10,943	19.2	1,146
Nov	71,772	50.33	9,145	15.6	1,218
Dec	49,985	22.77	12,960	18.7	1,433
Jan	46,639	26.01	12,369	17.3	1,089
Feb	46,595	22.67	17,174	16.0	826
Mar	34,815	18.33	13,857	16.7	850
Apr	41,684	20.59	13,830	17.4	2,847
May	48,940	23.43	11,687	18.5	3,534
June	60,134	26.44	15,270	16.7	4,366
Total	$615,025	$345.98	137,027		
Avg	51,252	28.83		17.4	1,851

TREATMENT PLANT NO. 1

This section covers the operation statistical data for Treatment Plant No. 1 in the three year period of July 1, 1979, through June 30, 1982. The Basic Design Data for the physical structures of the plant are presented on pages 19 to 21. This is followed by the plant flow diagram on page 22; a three year summary comparative record on page 23, and the statistical tables detailing the operational information by months, on pages 25 to 52. A nine year reference record is also given for each of these tables.

The High Rate activated sludge process was used and the sludge solids generated from the process were anaerobically digested in temperature controlled floating cover tanks. The dewatering of the digested sludge prior to land disposal was by shallow lagoons and centrifuges. The latter was first placed in service in July 1981.

The average daily flow of raw sewage treated decreased from 84 million gallons in fiscal 1979-80, to 41 million in fiscal 1981-82. This resulted from diversion of part of the flow in progressively increasing quantities to Treatment Plant No. 2, following its initial start-up in June of 1980. The decrease in quantities of sludges processed, both raw and digested, and the lower daily sewage gas productions were also attributable to the lower sewage flows.

The efficiency of the process as represented by an average figure for the three years was 78.4 percent removal of suspended solids, and 68.1 percent removal of B.O.D. The use of a polymer coagulant to upgrade the suspended solids and B.O.D.'s of the plant effluent was tried in the period of September 1980 to May 1981. The chemicals were added to the mix-liquor at the effluent of the aeration tanks immediately upstream of the final settling tanks. Very little improvement in effluent quality was shown, and the process was therefore discontinued. The waste sludge from the high rate process was chlorinated when discharged to the sludge concentration tanks. The rate of application ranged from 20 to 40 p.p.m. Polymers or other coagulants were not used. The solids were thickened from 3,000 p.p.m. to 54,000 p.p.m.

A relatively low sludge age, computed from the mix-liquor suspended solids in the system, and the raw sewage suspended solids added to the system, averaged 0.55 days. The quantity of aeration air used per gallon of raw sewage treated averaged 1.1 cubic feet. The average B.O.D. of the raw sewage was 125 p.p.m.

The average percent of total dry solids and total volatile solids of the raw sludge pumped from the sludge concentrators to the sludge digesters was respectively 5.2 and 76.7. Comparable figures for the digested sludge were 3.1 and 62.5 percent. As an average for the three year period, there were 1103 pounds of raw sludge dry solids and 600 pounds of digested dry solids produced per million gallons of raw sewage treated. The yield of sewage gas per pound of raw volatile sludge solids pumped to digestion was 7.9 cubic feet and the quantity of sewage gas produced per million gallons of sewage treated averaged 6,625 cubic feet.

Primary sludge digesters No. 1 and No. 3, and secondary digester No. 4, were taken out of service in October 1980, December 1981 and April 1982 respectively. The covers were lowered to the haunch, and a private contractor was hired to completely remove the remaining top scum, sludge, sand and other trash which normally accumulates in digesters. The cost for each tank was approximately $14,000. The material removed was pumped to a nearby temporary lagoon area thus eliminating the use of tanker trucks for hauling to a dump site. All of the floating covers were found to be in good condition. Painting and minor repairs only were required. These tanks had been in continuous use for periods ranging from 6 to 12 years. It is estimated the effective holding capacity of the tanks was increased by 50 percent by the clean-out operation.

The personnel required to operate the plant and the two raw sewage pumping stations in the mainland assigned to Plant No. 1 were as follows: one Plant Superintendent, one Administrative Secretary I, two Chemists, two Laboratory Technicians, five Treatment Plant Supervisors, fifteen Treatment Plant Operators, fifteen Diesel Plant Operators and ten laborers. The maintenance for the plant is provided by a separate division under the direction of a Maintenance Superintendent. Included are Mechanical, Electrical, Structural, and Grounds personnel. Their activities are not a part of this report.

WASTEWATER TREATMENT PLANT NO. 1

BASIC DESIGN DATA

JUNE 1976

Type Of Treatment: High Rate Activated Sludge

Aerated Grit Channels

Number of channels	2
Width, feet	22.67
Average water depth, feet	13.0
Length, feet	64.0
Detention at 76.5 mgd, minutes	2.61
Air, maximum cfm/lineal feet	8.1

Parshall Flumes - Raw Sewage Flow Measurement

Number of flumes	2
Width of throat, feet	5.0
Head at 76.5 mgd, feet	3.0

Aeration Tanks

Number of tanks	6
Average water depth, feet	13.0
Number of channels per tank	3
Width, each channel, feet	22.0
Length, each channel, feet	210.0
Capacity, cubic feet, Total	1,080,000
Detention at 68.5 mgd, hours	2.83
Return sludge rate, range, mgd	1-10
Return sludge rate, average, mgd	3
Air, cubic feet/gallon, average (5 blowers)	1.1
Air, cubic feet/minimum/lineal feet tank length	13.8
Air, cubic feet/hour/square feet tank area	37.7

Final Settling Tanks

Number of tanks	4
Average water depth, feet	11.0
Number of channels, per tank	3
Width, each channel, feet	18.0
Length, each channel, feet	275.0
Capacity, cubic feet, Total	665,000
Detention at 68.5 mgd, hour	1.75
Surface area, square feet	59,500
Surface loading, average gallon/square feet/day	1,150
Weir length, feet	3,160
Weir rate, average gallon/lineal feet/day	21,600
Number of pumping stations	2

Number of final sludge pumps, each station	3
Capacity, each pump, mgd	0.5-2.5

Concentration Tanks

Number of tanks	2
Average water depth, feet	13.0
Inside diameter, feet	55.0
Capacity, total cubic feet	62,000
Capacity, sludge storage, cubic feet	15,000
Detention at 8% waste sludge, (3.75 mgd), hour	2.2
Surface area, total, square feet	4,750
Surface loading, maximum gallon/square feet/day	790
Number of sludge pumps	2
Capacity, each sludge pump, gpm	175
Number of overflow pumps	3
Capacity, each overflow pump, gpm	2,000

Digestion Tanks

Number of tanks	4
Sidewall water depth, maximum feet	25.87
Cone depth, feet	3.0
Inside diameter, feet	105
Capacity, total, cubic feet	930,600
Capacity, cubic feet/capita (average population)	2.3
Raw solids, dry, pounds/day (average population)	45,700
Raw solids, wet, gallon/day (4% solids)	137,000
Raw solids, loading, cubic feet/pounds	20.3
Digested solids, dry, pounds/day	28,200
Approximate detention, days	66

All tanks to have floating covers and provision for external heating. Primary digesters have gas recirculation.

Gas Production And Storage

Pounds, volatile solids destroyed per day	18,000
Gas, cubic feet/pound, volatile solids destroyed per day	16.0
Gas, cubic feet/day	400,000
Gas, cubic feet/capita	1.02

Spherical Gas Holder

Diameter, feet	32
Capacity, cubic feet	17,150
Capacity, cubic feet/cubic feet/gas produced/day	0.06
Pressure, psig	40

Chlorination

Dose, ppm at 68.5 mgd	22
Pounds/day at 68.5 mgd	12,500
Number of units	5
Provision for pre-chlorination at inlet to grit chambers, post chlorination at inlet to outfall, chlorination of final sludge, chlorination of excess sludge and chlorination of flushing water (slime control only with 400 pound machine).	
Detention in outfall at 153 mgd, min.	22

Aeration Air Blowers

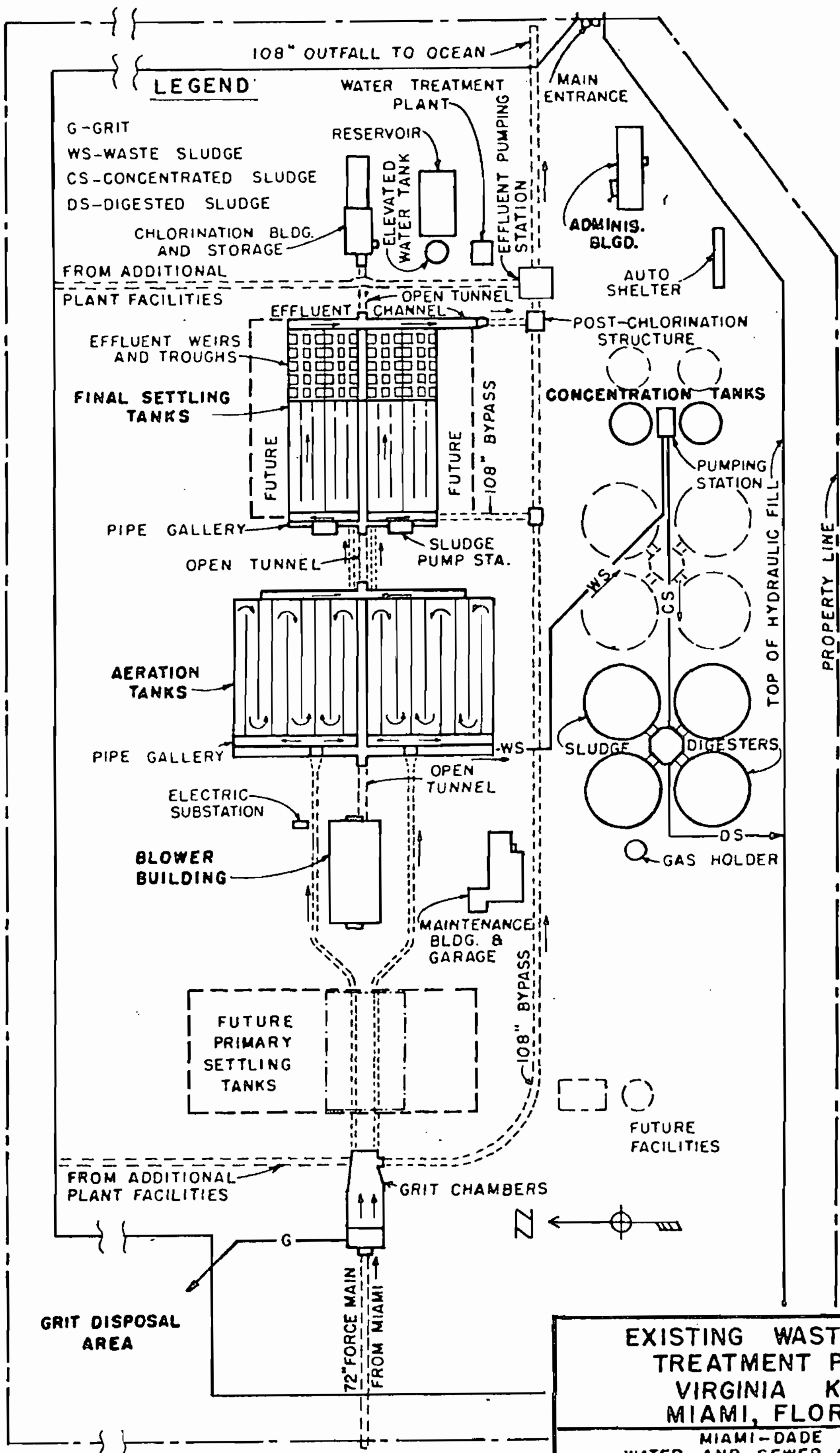
Number of blowers	5
Unit capacity, units 1 thru 4, each blower, cfn	10,600
Unit capacity, unit 5, cfm	20,000
Total capacity, 5 blowers, cfm	61,600
Maximum pressure for blower design, psig	7.5
Type of blower	Rotary positive displacement
Type of blower drive	
Units 1 and 2	Diesel engine
Units 3 and 4	Digester gas engine
Unit 5	Dual Fuel-Diesel/gas engine
Horsepower	
Units 1 thru 4	410
Unit 5	900
Maximum engine speed, rpm	514
Number of dual fuel engines	3
Number of spark ignition gas engines	2

Standby Generator

Number of generators, present	1
Capacity KW	332
Type of generator drive	Dual fuel engine
Engine hp	480
Engine speed rpm	514
Generator, future	2
Auxiliary engine, KW (oil fuel)	200

Plant Effluent Water Treatment Plant

Process plant effluent for fresh water system	
Gravity sand filters	2
Capacity - gpd	500,000
Ground Water Storage Reservoir - capacity - gal	400,000



FLOW DIAGRAM

EXISTING WASTEWATER TREATMENT PLANT
VIRGINIA KEY
MIAMI, FLORIDA

MIAMI-DADE WATER AND SEWER AUTHORITY

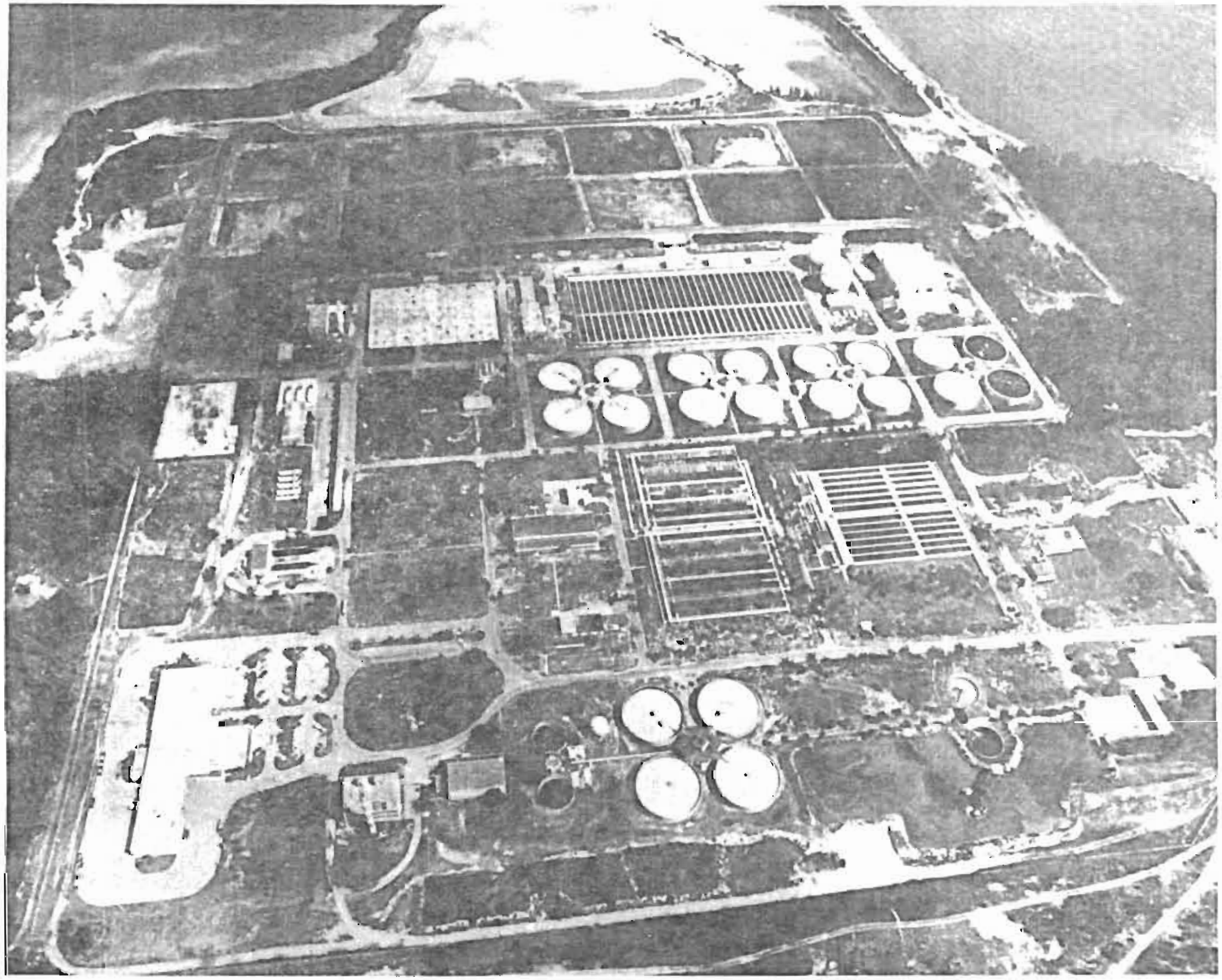
DATE DEC. 1976	SCALE NONE
	S-711-C

DRAWN
CHECKED G. Ch.

COMPARATIVE SUMMARY DATA FOR THREE FISCAL YEARS

PLANT NO. 1

	1979-80	1980-81	1981-82
Million Gallons Sewage Treated, Average Day	84	58	41
Inches of Rainfall, Year Total Recorded at Plant	40.75	51.64	73.65
Raw Sewage Total Solids, p.p.m.	2,073	1,838	1,734
Raw Sewage Chlorides, p.p.m.	799	736	703
Raw Sewage Suspended Solids, p.p.m.	155	147	119
Raw Sewage B.O.D., p.p.m.	118	132	125
Final Effluent Suspended Solids, p.p.m.	44	35	22
Final Effluent B.O.D., p.p.m.	44	41	34
Tons of Chlorine Used in Plant, Year Total	725	394	317
Detention Time in Aeration Tanks, Hours	2.2	3.6	3.4
Mix Liquor Suspended Solids, p.p.m.	709	490	381
Sludge Age in Days (Suspended Solids Basis)	0.43	0.57	0.65
Final Tank Underflow Suspended Solids, p.p.m.	8,133	3,080	1,639
Cubic Feet Aeration Air per gallon Raw Sewage	0.78	1.11	1.30
Gallons Septic Tanker Sludge Processed, Thousands	9,510	8,900	11,496
Septic Tanker Sludge Total Solids, Percent	2.5	2.1	2.1
Percent Dry Solids of Raw Sludge to Digesters	5.7	5.4	4.6
Percent Volatile Solids of Raw Sludge to Digesters	75.0	78.0	77.0
Percent Dry Solids of Digested Sludge	3.5	3.0	2.7
Percent Volatile Solids of Digested Sludge	62.1	63.7	61.6
Dry Solids Added to Digestion System, Tons	20,103	9,964	7,905
Dry Solids Removed from Digesters, Tons	11,333	5,303	4,201
Daily Sewage Gas Production, Thousand Cubic Feet	564	359	286
Percent of Gas Used as Fuel in Plant Engines	82	88	94



CENTRAL DISTRICT WASTEWATER TREATMENT PLANT - 1982

N. W. 4TH STREET PUMPING STATION

PUMPING DATA

	Total Sewage Flow MG	Daily Average Flow MG	Maximum Daily Flow MG	Minimum Daily Flow MG	Wet Screenings Removed 100 Lbs	Potable Water 1000 Gallons	Diesel Oil Gallons	Electric KWH
1981-82								
July	2,212	71.3	75.4	68.2	260	598	185	601,800
Aug	2,747	88.6	109.7	70.0	265	594	4,896	569,000
Sep	2,805	93.5	103.2	85.6	260	490	3,821	787,100
Oct	2,589	83.5	97.3	71.0	250	548	1,805	791,000
Nov	2,359	78.6	95.0	65.0	252	433	775	766,800
Dec	2,018	65.1	70.0	60.0	196	287	183	636,900
Jan	1,917	61.8	67.0	56.0	190	312	131	579,500
Feb	1,757	62.8	69.0	58.0	200	385	243	511,700
Mar	2,009	64.8	87.2	59.0	338	665	280	626,160
Apr	2,319	77.3	105.6	67.0	306	416	1,640	718,020
May	2,545	82.1	105.9	71.8	291	524	1,090	514,720
June	2,969	99.0	123.7	83.1	330	492	7,593	989,240
Total	28,246				3,138	5,744	22,642	8,091,940
Avg	2,354	77.4	92.4	67.9	262			
1980-81								
July	2,035	65.7	72.5	55.7	320	155	225	566,300
Aug	2,065	66.6	90.7	52.5	375	346	795	596,800
Sep	2,152	71.7	80.6	63.2	308	127	1,185	595,468
Oct	2,279	73.5	91.1	65.5	319	135	1,850	658,960
Nov.	2,234	74.5	85.5	65.6	259	250	1,554	650,145
Dec	2,024	65.3	69.9	58.6	316	192	205	566,800
Jan	1,948	62.8	71.6	57.4	326	229	1,350	502,540
Feb	1,738	62.1	85.0	52.9	326	309	940	490,260
Mar	1,976	63.7	66.0	59.0	367	275	180	582,460
Apr	1,913	63.7	68.8	57.6	362	303	130	471,910
May	2,176	70.2	77.8	61.2	370	611	501	711,440
June	2,045	68.2	73.7	62.7	302	371	254	559,520
Total	24,585				3,950	3,303	9,169	6,952,603
Avg	2,049	67.3	77.8	59.3	329			

1979-80								
July	1,837	59.3	66.0	45.5	236	157	1,310	478,000
Aug	1,943	62.7	69.0	54.0	263	202	240	481,600
Sep	2,179	72.6	89.4	61.7	284	189	1,150	531,500
Oct	2,389	77.1	93.5	63.6	268	192	1,030	647,400
Nov	1,984	66.1	72.0	58.0	322	144	320	541,600
Dec	1,969	63.5	75.1	53.4	384	183	910	507,000
Jan	1,938	62.5	69.2	57.1	350	130	230	489,200
Feb	1,741	60.0	65.6	54.0	334	148	980	495,300
Mar	1,806	58.3	78.0	53.3	388	178	550	520,100
Apr	2,033	67.8	36.9	58.6	341	201	810	602,700
May	1,941	62.2	68.5	58.1	296	183	885	532,400
June	1,889	63.0	84.6	55.8	262	157	280	538,600
Total	23,649				3,728	2,064	8,695	6,365,400
Avg	1,971	64.6	76.5	56.1	311			

NINE YEAR COMPARATIVE SUMMARY

1973-74	15,842	43.3	50.6	36.6	4,673	3,247	31,180	2,920,400
1974-75	16,282	44.5	54.0	37.9	4,788	2,142	31,655	2,995,200
1975-76	18,021	49.2	59.6	41.8	4,553	2,433	51,521	2,406,700
1976-77	18,377	50.3	63.8	40.1	3,604	2,532	65,798	3,497,100
1977-78	19,213	52.7	64.4	43.8	3,228	3,337	61,945	3,861,300
1978-79	20,249	55.4	67.8	45.1	2,617	4,553	77,542	4,486,200
1979-80	23,649	64.6	76.5	56.1	3,728	2,064	8,695	6,365,400
1980-81	24,585	67.3	77.8	59.3	3,950	3,303	9,169	6,952,603
1981-82	28,246	77.4	92.4	67.9	3,138	5,744	22,642	8,091,940

N. E. 9TH STREET PUMPING STATION

PUMPING DATA

1981-82	Total Sewage Flow MG	Daily Average Flow MG	Maximum Daily Flow MG	Minimum Daily Flow MG	Wet Screenings Removed 100 Lbs	Potable Water 1000 Gallons	Diesel Oil Gallons	Electric KWH
July	595	19.2	21.5	17.2	163	238	30	139,600
Aug	702	22.7	29.4	17.1	164	673	1,000	198,400
Sep	637	21.2	29.0	20.0	175	578	1,420	198,000
Oct	621	20.0	22.6	17.3	165	153	145	183,700
Nov	629	20.9	24.4	17.1	164	77	145	182,200
Dec	548	17.7	19.2	15.5	166	118	70	147,200
Jan	489	15.8	17.1	14.0	160	106	150	134,000
Feb	446	15.9	18.6	14.1	170	83	150	116,000
Mar	534	17.2	19.5	14.6	195	119	70	138,000
Apr	566	18.8	27.0	15.0	174	163	800	138,000
May	625	20.2	28.6	17.8	179	156	370	161,800
June	730	24.3	31.8	18.4	191	197	2,030	193,600
Total	7,122				2,066	2,661	6,380	1,930,500
Avg	594	19.5	24.1	16.5	172			
1980-81								
July	522	16.9	22.0	13.2	148	118	105	132,000
Aug	508	16.4	19.4	14.5	162	106	50	135,600
Sep	531	17.7	20.6	16.0	155	99	120	132,400
Oct	624	20.1	26.5	16.5	164	181	450	160,400
Nov	574	19.1	22.8	16.3	131	206	130	150,800
Dec	524	16.9	19.1	13.9	167	302	180	130,400
Jan	516	16.7	18.1	15.2	193	219	520	115,300
Feb	495	17.7	21.1	15.8	146	266	80	115,600
Mar	543	17.5	19.3	15.8	180	283	120	124,400
Apr	560	18.7	20.6	16.2	170	298	208	130,800
May	575	18.5	28.6	16.1	195	314	150	135,000
Jun	549	18.3	20.9	16.1	207	248	60	134,400
Total	6,521				2,018	2,640	2,173	1,597,100
Avg	543	17.9	21.6	15.5	168			

1979-80

July	497	16.0	19.9	12.2	128	100	185	128,000
Aug	529	17.1	22.7	10.0	157	44	125	128,800
Sep	556	18.5	21.2	15.9	139	77	1,488	151,200
Oct	609	19.7	22.8	16.7	140	145	2,490	169,800
Nov	547	18.2	20.8	10.1	148	69	640	152,000
Dec	595	19.2	22.8	16.5	143	49	580	164,600
Jan	544	17.6	19.1	16.2	176	50	170	145,600
Feb	507	17.5	18.8	16.4	176	43	160	142,800
Mar	541	17.5	21.1	12.8	181	89	465	134,000
Apr	611	20.4	27.0	17.0	152	118	480	147,800
May	555	17.9	20.7	16.1	135	79	140	141,400
June	522	17.4	19.3	14.9	163	120	165	132,000
Total	6,613				1,838	983	7,088	1,738,000
Avg	551	18.1	21.4	14.6	153			

NINE YEAR COMPARATIVE SUMMARY

1973-74	6,699	18.3	21.8	15.2	3,000	1,043	7,230	1,475,200
1974-75	6,581	18.1	21.5	15.4	2,448	670	2,730	1,152,500
1975-76	5,305	15.9	19.0	13.1	2,333	1,209	1,496	1,407,000
1976-77	5,901	16.2	21.4	12.0	2,332	1,220	5,153	1,455,600
1977-78	5,902	16.2	19.8	13.4	1,982	979	3,090	1,444,000
1978-79	6,223	17.1	20.8	14.9	1,703	973	7,451	1,499,200
1979-80	6,613	18.1	21.4	14.6	1,838	983	7,088	1,738,000
1980-81	6,521	17.9	21.6	15.5	2,018	2,640	2,173	1,597,100
1981-82	7,122	19.5	24.1	16.5	2,066	2,661	6,380	1,930,500

RAW SEWAGE METERED, Million Gallons

1981-82	N. W. 4th St. Pumping Station	N. E. 9th St. Pumping Station	Miami Beach	Key Biscayne	Total Metered At Pumping Stations	Total Metered By Parshall Flume At Plant #1	Average Day MGD
July	2,212	595	643	47	3,497	1,114	36
Aug	2,747	702	726	56	4,231	1,500	48
Sep	2,805	637	762	67	4,271	1,688	56
Oct	2,589	621	743	78	4,031	1,574	51
Nov	2,359	629	791	75	3,854	1,413	47
Dec	2,018	548	699	78	3,343	1,001	32
Jan	1,917	489	650	78	3,134	922	30
Feb	1,757	446	614	70	2,887	826	30
Mar	2,009	534	720	78	3,341	930	30
Apr	2,319	566	665	75	3,615	1,021	34
May	2,545	625	682	78	3,930	1,220	39
June	2,969	730	716	75	4,490	1,677	56
Total	28,246	7,122	8,411	855	44,624	14,886	489
Avg							41
1980-81							
July	2,035	522	-	47	2,604	2,641	85
Aug	2,065	508	271	47	2,891	2,860	92
Sep	2,152	531	394	45	3,122	1,718	101
Oct	2,279	624	665	47	3,615	1,788	58
Nov	2,234	574	726	45	3,579	2,006	67
Dec	2,024	524	692	47	3,287	1,401	45
Jan	1,948	516	686	47	3,197	1,468	47
Feb	1,799	495	654	42	2,990	1,271	45
Mar	1,976	544	689	47	3,257	1,602	52
Apr	1,913	560	593	45	3,111	938	31
May	2,176	575	629	47	3,427	999	32
June	2,045	549	571	45	3,210	1,164	39
Total	24,646	6,522	6,570	551	38,290	19,856	694
Avg							58

1979-80

July	1,837	497	None	47	2,381	2,358	77
Aug	1,943	529	"	47	2,518	2,468	81
Sep	2,179	556	"	45	2,780	2,674	93
Oct	2,389	609	"	47	3,044	2,928	98
Nov	1,984	547	"	45	2,577	2,521	86
Dec	1,969	595	"	47	2,611	2,613	84
Jan	1,938	544	"	47	2,495	2,518	80
Feb	1,741	507	"	44	2,291	2,308	79
Mar	1,806	541	"	47	2,391	2,440	77
Apr	2,033	611	"	45	2,689	2,729	90
May	1,941	555	"	47	2,542	2,563	82
June	1,889	522	"	45	2,458	2,471	82
Total	23,649	6,613	None	553	30,777	30,591	1,009
Avg							84

NINE YEAR COMPARATIVE SUMMARY

1973-74	15,842	6,699		442	22,983	22,757	64
1974-75	16,282	6,581		359	23,222	23,234	62
1975-76	18,021	5,828		410	24,259	24,010	66
1976-77	18,377	5,901		415	24,693	24,364	67
1977-78	19,213	5,902		461	25,579	25,698	70
1978-79	20,243	6,223		497	26,956	26,852	74
1979-80	23,649	6,613		553	30,777	30,591	84
1980-81	24,646	6,522	6,570	551	38,290	19,856	58
1981-82	28,246	7,122	8,411	855	44,624	14,886	41

SEWAGE CHLORINATION

	Pounds				Dosage, ppm, Average	
1981-82	Pre at Grit Chamber	Post at Outfall	Other	Total Treatment Plant	Pre at Grit at Chamber	Post at Outfall
July	None	9,720	51,785	61,505	None	1.0
Aug	"	7,280	40,860	48,140	"	0.6
Sep	"	6,600	57,800	64,400	"	0.5
Oct	"	7,070	51,305	58,375	"	0.5
Nov	"	7,600	55,880	63,480	"	0.7
Dec	"	6,740	34,510	41,250	"	0.8
Jan	"	8,890	38,280	47,170	"	1.2
Feb	"	7,270	35,235	42,505	"	1.0
Mar	"	8,080	38,015	46,095	"	1.0
Apr	"	14,030	36,875	50,905	"	1.7
May	"	15,715	36,765	52,480	"	1.5
June	"	15,050	42,690	57,740	"	1.1
Total	None	114,045	520,000	634,045	None	
Avg		9,504	43,333	52,837		1.0
1980-81						
July	None	18,270	69,540	87,810	None	0.8
Aug	"	31,020	77,900	108,920	"	1.3
Sep	"	18,090	39,110	57,200	"	0.7
Oct	"	18,580	40,494	59,074	"	1.2
Nov	"	18,240	50,860	69,100	"	1.1
Dec	"	18,880	39,980	58,860	"	1.6
Jan	"	18,840	40,080	58,920	"	1.5
Feb	"	16,740	52,145	35,405	"	1.6
Mar	"	18,630	50,470	69,100	"	1.4
Apr	"	18,640	37,980	56,620	"	2.4
May	"	17,970	39,485	57,455	"	2.2
June	"	15,140	44,635	59,775	"	1.6
Total	None	229,040	538,044	788,239	None	
Avg		19,087	44,837	64,853		1.5

1979-80

July	17,915	99,490	38,845	156,250	0.9	5.0
Aug	17,300	89,490	35,700	142,490	0.8	4.3
Sep	17,700	75,410	36,890	130,000	0.8	3.4
Oct	15,465	55,070	34,515	105,050	0.6	2.3
Nov	16,765	54,220	36,235	107,220	0.8	2.6
Dec	7,020	26,840	63,655	97,515	0.3	1.2
Jan	None	38,050	70,490	108,540	None	1.8
Feb	"	19,940	65,590	85,530	"	1.0
Mar	"	22,850	89,980	112,830	"	1.1
Apr	"	18,670	137,375	156,045	"	0.8
May	"	17,990	98,020	116,010	"	0.9
June	"	18,780	113,245	132,025	"	0.9
Total	92,165	536,800	820,540	1,449,505		
Avg	7,680	44,733	68,378	120,792	0.7	2.1

NINE YEAR COMPARATIVE SUMMARY

1973-74	207,380	1,903,590	484,370	2,536,470	1.1	10.3
1974-75	192,420	1,870,140	472,230	2,595,340	1.0	9.7
1975-76	272,072	2,299,576	456,643	3,028,291	1.4	11.8
1976-77	214,130	2,446,665	400,230	3,061,025	1.1	12.3
1977-78	217,958	2,461,890	408,232	3,088,080	1.0	11.5
1978-79	255,055	1,784,210	457,995	2,497,260	1.2	8.1
1979-80	92,165	536,800	820,540	1,449,505	0.7	2.1
1980-81	None	229,040	538,044	788,239	None	1.5
1981-82	"	114,045	520,000	634,045	"	1.0

SEPTIC TANK SLUDGE

1981-82	Loads	Gallons 1000	Percent Total Solids	Dry Solids 1000 Pounds
July	350	819	2.1	149
Aug	313	862	1.7	120
Sep	348	903	1.7	127
Oct	361	925	2.0	164
Nov	351	968	1.8	151
Dec	369	921	1.7	131
Jan	348	830	2.4	165
Feb	362	923	2.5	202
Mar	433	1,216	2.8	277
Apr	390	1,120	2.4	233
May	351	980	2.0	168
June	328	1,029	2.4	230
Total	4,304	11,496	25.5	2,117
Avg	359	958	2.1	176

1980-81	Loads	Gallons 1000	Percent Total Solids	Dry Solids 1000 Pounds
July	402	1,175	2.2	216
Aug	364	915	2.3	173
Sep	267	517	2.5	107
Oct	296	594	2.0	101
Nov	259	501	2.4	109
Dec	301	576	2.0	92
Jan	329	697	2.2	134
Feb	334	689	1.8	99
Mar	348	792	2.6	175
Apr	338	845	2.2	151
May	296	685	1.7	108
June	410	914	1.8	138
Total	3,944	8,900	25.7	1,603
Avg	329	742	2.1	134

1979-80

July	308	846	2.5	160
Aug	297	717	2.5	146
Sep	293	658	2.7	141
Oct	287	668	2.8	147
Nov	322	783	2.5	76
Dec	288	602	1.8	66
Jan	344	781	2.3	159
Feb	350	708	2.6	131
Mar	379	773	2.8	179
Apr	385	997	2.1	170
May	375	999	2.8	225
June	386	978	2.5	228
Total	4,014	9,510	29.9	1,828
Avg	335	793	2.5	152

NINE YEAR COMPARATIVE SUMMARY

1973-74	9,427	34,848	2.2	6,472
1974-75	7,089	25,657	2.3	4,869
1975-76	5,394	15,503	2.4	3,127
1976-77	4,216	11,133	2.2	2,070
1977-78	4,446	12,632	2.3	2,374
1978-79	3,860	10,834	2.5	2,415
1979-80	4,014	9,510	2.5	1,828
1980-81	3,944	8,900	2.1	1,603
1981-82	4,304	11,496	2.1	2,117

	TOTAL SOLIDS PPM		CHLORIDES PPM		Potable Water Used At Plant 1000 Gallons	Inches Rainfall Virginia Key
1981-82	Raw Sewage	Final Effluent	Raw Sewage	Final Effluent		
July	1,950	1,860	790	790	2,854	2.60
Aug	1,580	1,490	610	610	2,347	12.25
Sep	1,380	1,310	540	560	1,228	21.90
Oct	1,650	1,590	660	680	1,452	2.30
Nov	2,060	1,990	840	870	1,348	1.40
Dec	1,890	1,810	770	780	6,500	0.20
Jan	1,670	1,640	710	700	1,144	0.90
Feb	1,890	1,720	740	750	7,334	1.90
Mar	1,990	1,840	790	790	9,454	5.00
Apr	1,800	1,720	720	740	5,712	5.90
May	1,660	1,560	700	710	1,121	8.10
June	1,290	1,210	560	560	8,331	11.20
Total			8,430	8,540	48,825	73.65
Avg	1,734	1,645	703	712	4,069	6.14
1980-81						
July	1,670	1,700	660	670	1,883	7.04
Aug	1,720	1,610	680	650	1,959	4.03
Sep	1,830	1,770	760	750	2,546	3.98
Oct	1,720	1,610	690	660	4,157	8.61
Nov	1,830	1,740	720	700	2,420	7.64
Dec	1,810	1,720	740	750	2,107	0.54
Jan	1,880	1,750	760	750	1,985	1.80
Feb	1,930	1,840	750	770	2,220	4.70
Mar	1,940	1,810	770	770	1,616	2.10
Apr	1,900	1,680	740	740	1,700	0.10
May	2,140	1,960	840	900	3,043	6.80
June	1,690	1,570	720	690	2,719	4.30
Total			8,830	8,800	28,355	51.64
Avg	1,838	1,730	736	733	2,360	3.72

1979-80						
July	1,960	1,860	770	770	299	4.03
Aug	1,960	1,870	790	770	962	2.29
Sep	1,970	1,900	780	710	1,530	3.96
Oct	2,000	1,890	750	760	1,642	7.80
Nov	2,210	2,070	890	870	1,631	2.78
Dec	2,170	2,020	830	810	1,292	0.88
Jan	2,240	2,170	840	830	1,366	2.48
Feb	2,110	1,970	820	810	1,452	1.26
Mar	1,950	1,810	730	710	2,951	1.41
Apr	1,990	1,900	740	730	1,557	7.40
May	2,180	2,080	830	810	3,263	4.00
June	2,130	2,030	820	810	3,113	6.42
Total			9,590	9,390	21,058	44.71
Avg	2,073	1,964	799	783	1,755	3.40

NINE YEAR COMPARATIVE SUMMARY

1973-74	2,200	2,400	860	-	5,182	62.60
1974-75	2,400	2,300	820	990	-	38.49
1975-76	2,350	2,270	980	1,000	1,728	50.40
1976-77	2,030	1,940	810	830	1,360	53.85
1977-78	2,088	2,010	740	750	4,300	60.79
1978-79	2,100	1,990	800	800	5,661	50.63
1979-80	2,073	1,964	799	783	1,755	44.71
1980-81	1,838	1,730	736	733	2,360	51.64
1981-82	1,734	1,645	703	712	4,069	73.65

	BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS			
1981-82	Raw Sewagw p.p.m.	Final Effluent p.p.m.	Population Equivalent 1000	Percent Removed	Raw Sewage p.p.m.	Final Effluent p.p.m.	Population Equivalent 1000	Percnet Removed
July	104	30	*	71	129	24	*	82
Aug	98	31		69	115	21		82
Sep	83	28		66	108	22		80
Oct	93	30		68	114	21		82
Nov	104	34		67	121	21		83
Dec	118	32		73	127	21		83
Jan	134	37		72	136	21		85
Feb	155	39		75	143	29		80
Mar	155	40		74	139	22		84
Apr	145	36		74	136	22		84
May	138	38		72	126	20		84
June	102	34		66	111	19		83
Avg	119	34		70	125	21		83
1980-81								
July	101	30	424	70	155	34	500	78
Aug	102	39	459	61	136	56	473	62
Sep	99	25	494	75	124	31	477	74
Oct	110	23	600	78	129	33	564	74
Nov	143	54	*	62	123	40	*	67
Dec	110	38		65	146	35		76
Jan	182	64		65	151	35		77
Feb	125	38		70	143	29		80
Mar	139	51		63	155	39		75
Apr	237	60		75	206	32		84
May	127	30		76	154	26		83
June	114	34		70	143	27		81
Avg	132	41		69	147	35		76

* See combined report for continuation of these data

1979-80

July	94	39	341	58	131	40	364	70
Aug	123	43	465	64	127	35	382	72
Sep	112	42	453	62	118	35	373	68
Oct	95	33	435	64	106	34	377	68
Nov	111	38	441	66	132	35	418	72
Dec	121	41	500	66	160	40	514	75
Jan	132	42	524	68	186	42	573	77
Feb	124	42	482	66	174	36	523	79
Mar	145	51	553	64	194	50	577	74
Apr	117	49	518	58	177	54	609	69
May	123	59	506	51	178	60	559	66
June	113	59	459	48	174	65	541	62
Avg	118	45	473	61	155	44	484	71

NINE YEAR COMPARATIVE SUMMARY

1973-74	160	52	482	66	175	50	402	71
1974-75	130	48	389	62	160	45	384	70
1975-76	109	36	348	66	143	36	355	75
1976-77	107	30	339	71	153	38	379	75
1977-78	120	33	413	72	147	38	391	74
1978-79	109	40	386	62	143	31	393	78
1979-80	118	45	473	61	155	44	484	71
1980-81	132	41	653	69	147	35	557	76
1981-82	119	34	630	70	125	21	552	83

SLUDGE SOLIDS PUMPED TO DIGESTION TANKS

1981-82	Liquid Sludge 1000 Gallons	Percent Dry Solids	Percent Volatile Solids	Dry Pounds Solids 1000
July	3,366	4.3	76	1,201
Aug	2,693	5.0	75	1,125
Sep	4,053	4.6	75	1,554
Oct	4,512	4.3	75	1,595
Nov	4,602	4.3	75	1,597
Dec	3,428	3.9	79	1,089
Jan	2,941	4.5	78	1,090
Feb	2,827	4.8	79	1,109
Mar	3,209	4.9	79	1,303
Apr	3,038	4.5	79	1,166
May	3,088	5.0	78	1,279
June	3,909	5.2	78	1,702
Total	41,666			15,810
Avg	3,472	4.6	77	1,318
Per Day	114			43

1980-81	Liquid Sludge 1000 Gallons	Percent Dry Solids	Percent Volatile Solids	Dry Pounds Solids 1000
July	4,619	4.8	78	1,763
Aug	6,043	3.6	76	1,836
Sep	4,298	4.8	79	1,667
Oct	3,017	6.0	79	1,434
Nov	3,774	5.6	78	1,674
Dec	3,711	5.6	79	1,611
Jan	3,781	6.2	81	1,955
Feb	3,081	5.9	79	1,750
Mar	4,117	5.8	76	1,985
Apr	3,298	5.8	76	1,578
May	3,202	5.1	77	1,349
June	3,123	5.2	75	1,330
Total	46,064			19,927
Avg	3,839	5.4	78	1,661
Per Day	126			55

1979-80				
July	5,545	5.2	78	2,347
Aug	6,062	5.6	79	2,851
Sep	5,409	6.2	78	2,794
Oct	5,722	6.3	78	2,981
Nov	5,657	6.6	75	3,044
Dec	7,981	5.9	73	3,952
Jan	8,682	6.3	74	4,566
Feb	7,723	6.7	74	4,300
Mar	8,140	5.5	75	3,705
Apr	8,198	5.0	74	3,382
May	8,369	5.2	72	3,578
June	7,766	4.2	73	2,706
Total	85,254			40,206
Avg	7,105	5.7	75	3,351
Per Day	234			110

NINE YEAR COMPARATIVE SUMMARY

1973-74	2,814	7.6	77	1,769
1974-75	3,239	7.4	76	1,996
1975-76	2,856	8.0	77	1,870
1976-77	3,502	7.0	78	1,981
1977-78	3,984	7.2	76	2,395
1978-79	5,017	6.4	77	2,667
1979-80	7,105	5.7	75	3,351
1980-81	3,839	5.4	78	1,661
1981-82	3,472	4.6	77	1,318

DIGESTED SLUDGE DISPOSAL

1981-82	Gallons 1000	Percent Dry Solids	Percent Volatile Solids	Dry Solids 1000 Pounds Lagoons	Dry Solids 1000 Pounds Centrifuges
July	3,142	2.6	60.6	None	651
Aug	2,881	2.4	61.4	"	591
Sep	3,599	2.2	59.7	"	628
Oct	2,811	2.7	59.4	"	623
Nov	4,357	3.1	60.9	"	1,168
Dec	3,221	2.9	61.7	"	691
Jan	3,404	2.5	63.4	"	719
Feb	2,341	2.8	63.2	"	542
Mar	3,170	2.8	63.4	"	735
Apr	2,350	2.8	62.9	"	545
May	2,708	3.0	61.2	"	664
June	3,255	3.1	61.2	"	848
Total	37,239	32.9	739.0	None	8,405
Avg	3,103	2.7	61.6	None	700
Per Day	102			None	23
1980-81					
July	4,636	2.6	62.1	590	429
Aug	6,168	2.5	63.2	844	462
Sep	4,650	2.5	63.0	617	342
Oct	2,855	2.5	63.4	530	72
Nov	3,854	3.7	65.3	1,166	None
Dec	2,787	3.2	64.5	806	"
Jan	3,205	3.5	66.5	947	"
Feb	2,799	3.1	64.5	682	31
Mar	3,627	3.1	64.4	380	584
Apr	3,121	3.9	63.6	423	594
May	2,434	3.0	61.0	340	303
June	2,420	2.4	63.0	None	463
Total	42,556	36.0	764.5	7,325	3,280
Avg	3,546	3.0	63.7	610	273
Per Day	117			20	9

1979-80

July	5,410	3.1	65.7	1,387	None
Aug	5,740	3.1	65.8	1,487	"
Sep	5,062	3.2	65.4	1,364	"
Oct	5,338	3.2	63.6	1,431	"
Nov	4,892	3.5	63.4	1,435	"
Dec	7,293	3.7	60.3	2,240	"
Jan	7,675	3.9	60.0	2,469	"
Feb	6,967	3.7	57.9	2,186	"
Mar	7,144	3.5	60.5	2,072	"
Apr	8,021	3.6	61.2	2,405	"
May	7,159	4.2	62.8	2,491	"
June	6,957	3.0	59.6	1,699	"
Total	77,658	41.7	746.2	22,666	"
Avg	6,472	3.5	62.1	1,888	"
Per Day	213			62	"

NINE YEAR COMPARATIVE SUMMARY

1973-74	31,981	4.1	60.0	10,884	None
1974-75	37,645	3.7	58.3	11,607	"
1975-76	36,282	3.6	59.1	10,649	"
1976-77	42,678	3.2	59.9	11,439	"
1977-78	43,577	4.0	58.2	14,398	"
1978-79	56,647	3.7	62.5	17,258	"
1979-80	77,658	3.5	62.1	22,666	"
1980-81	42,556	3.0	63.7	7,325	3,280
1981-82	37,239	2.7	61.6	None	8,405

HIGH RATE ACTIVATED SLUDGE

	AERATION AIR		MIX LIQUOR - AERATION TANKS				FINAL SETTLING TANKS UNDERFLOW		
1981-82	Million Cu. Ft. Compressed	Cu.Ft. Per Gal. Raw Sewage	Suspended Solids p.p.m.	Sludge Age Days	D.O. p.p.m.	Detention Time Hours	Suspended Solids p.p.m.	M.G.D. Avg.	% of Raw Sewage Flow
July	1,574	1.5	400	.70	1.3	4.5	1,760	8.0	23
Aug	1,538	1.1	320	.49	2.2	3.6	1,440	8.0	18
Sept	1,739	1.0	360	.49	2.6	3.1	1,690	8.0	14
Oct	1,823	1.2	402	.56	2.3	3.3	2,030	8.0	16
Nov	1,811	1.2	436	.62	2.6	3.6	2,456	8.0	17
Dec	1,732	1.6	457	.88	2.6	4.8	1,549	8.0	25
Jan	1,350	1.5	420	.87	1.8	5.1	1,605	8.0	27
Feb	1,155	1.4	433	.86	1.1	5.2	1,376	8.0	27
Mar	1,288	1.4	418	.81	1.9	5.1	2,115	8.0	27
Apr	1,240	1.2	312	.57	1.4	4.7	1,271	8.0	24
May	1,276	1.1	345	.58	1.8	4.2	1,183	8.0	21
June	1,269	1.0	269	.34	1.7	3.1	1,187	8.0	15
Total	17,795								254
Avg	1,483	1.3	381	.65	1.9	4.2	1,639	8.0	21
1980-81									
July	1,773	1.19	380	.27	1.6	3.6	2,700	7.7	9
Aug	1,671	.86	830	.51	1.0	3.1	7,800	8.1	9
Sept	1,601	.89	330	.50	1.7	3.0	2,400	8.1	8
Oct	1,658	.89	370	.48	2.8	3.0	2,900	8.1	14
Nov	1,570	.78	650	.66	0.8	2.6	5,300	8.3	13
Dec	1,408	1.01	410	.53	1.2	3.7	2,300	8.3	19
Jan	1,527	1.32	480	.54	1.4	3.5	2,700	7.8	17
Feb	1,353	1.07	460	.60	1.3	3.7	2,400	8.0	18
Mar	1,492	.95	540	.54	1.4	3.3	3,000	8.0	16
Apr	1,323	1.40	600	.80	0.9	4.9	2,100	8.0	26
May	1,635	1.70	530	.92	1.7	5.1	1,700	8.0	25
June	1,430	1.30	350	.53	0.7	4.2	1,700	8.0	21
Total	18,441								194
Avg	1,537	1.11	490	.57	1.4	3.6	3,080	8.0	16

1979-80										
July	1,764	.74	450	.36	0.2	2.3	4,400	8.3	11
Aug	1,859	.76	310	.25	0.5	2.3	3,000	9.1	12
Sept	1,794	.67	290	.23	0.5	2.0	2,900	8.6	10
Oct	1,854	.64	270	.22	0.8	1.9	3,200	8.7	9
Nov.	1.852	.60	440	.33	0.5	2.1	4,100	8.4	10
Dec.	2,249	.87	650	.40	0.6	2.1	5,600	8.3	10
Jan	2,202	.88	500	.27	0.9	2.2	4,500	8.1	10
Feb	2,061	.89	470	.28	1.3	2.2	4,600	8.4	10
Mar	1,963	.81	1.150	.62	0.2	2.3	12,100	8.7	11
Apr	2,077	.76	1,320	.68	0.2	2.0	16,900	8.4	9
May	2,144	.83	1,380	.77	0.2	2.2	16,300	8.4	10
June	2,064	.86	1,280	.75	0.2	2.2	20,000	8.1	10
Total	23,883								122
Avg	1,990	.78	709	.43	0.5	2.2	8,133	8.5	10

NINE YEAR COMPARATIVE SUMMARY

1973-74	1,600	.86	410	.22	1.7	2.0	3,400	6.2	10
1974-75	1,446	.75	320	.18	1.4	1.9	2,300	7.0	11
1975-76	1,494	.76	310	.22	1.3	2.1	2,300	7.0	11
1976-77	1,514	.78	330	.28	1.0	2.7	2,800	7.3	12
1977-78	1,550	.73	310	.27	1.0	2.5	2,825	7.7	11
1978-79	1,720	.78	400	.32	0.6	2.4	3,600	8.1	11
1979-80	1,990	.78	709	.43	0.5	2.2	8,133	8.5	10
1980-81	1,537	1.11	490	.57	1.4	3.6	3,080	8.0	16
1981-82	1,483	1.3	381	.65	1.9	4.2	1,639	8.0	21

SEWAGE GAS PRODUCTION AND USE

1981-82	1000 Total Cu. Ft. Produced	1000 Total Cu. Ft. Gas Waste	1000 Total Cu. Ft. To Gas Scrubber	Hydrogen Sulfide In Sewage Gas Grains Per 100 C.F. Raw	Scrubbed
July	8,092	27	8,065	105	15
Aug	7,849	None	7,849	105	15
Sept	9,101	None	9,101	110	15
Oct	9,831	None	9,831	130	20
Nov	8,723	888	7,835	115	15
Dec	6,208	180	6,028	120	25
Jan	9,197	None	9,197	120	15
Feb	8,530	None	8,530	120	15
Mar	9,173	334	8,839	110	20
Apr	8,408	87	8,321	120	20
May	9,423	15	9,408	105	20
June	9,862	4,301	5,561	135	35
Total	104,397	5,832	98,565	1,395	230
Avg	8,700	486	8,214	116	19
1980-81					
July	12,475	388	12,087	190	30
Aug	11,537	249	11,288	250	30
Sept	12,675	1,159	11,516	160	30
Oct	11,807	1,722	10,085	140	20
Nov	9,175	85	9,090	180	20
Dec	11,250	578	10,672	170	20
Jan	11,181	1,593	9,588	120	10
Feb	10,386	1,126	9,260	140	20
Mar	12,530	1,877	10,653	160	30
Apr	11,184	808	10,376	110	20
May	8,218	2,764	5,454	80	10
June	8,717	2,409	6,308	100	20
Total	131,135	14,758	116,377	1,800	260
Avg	10,928	1,230	9,698	150	22

1979-80					
July	14,562	2,889	11,673	170	25
Aug	17,001	2,375	14,626	175	30
Sept	16,516	2,824	13,692	225	30
Oct	17,622	2,628	14,994	205	30
Nov	17,439	2,841	14,592	190	30
Dec	19,698	3,436	16,262	200	35
Jan	22,315	6,292	16,023	205	40
Feb	21,186	4,528	16,658	220	40
Mar	18,445	6,258	12,187	405	40
Apr	14,739	993	13,746	240	35
May	13,124	439	12,685	225	35
June	13,215	607	12,608	210	30
Total	205,862	36,116	169,746	2,670	400
Avg	17,155	3,010	14,146	223	33

NINE YEAR COMPARATIVE SUMMARY

1973-74	17,555	10,093	7,460	195	35
1974-75	15,400	9,000	6,400	215	40
1975-76	14,239	6,758	7,481	185	35
1976-77	14,522	3,782	10,734	165	40
1977-78	15,541	6,471	9,070	180	35
1978-79	16,216	3,800	12,416	190	35
1979-80	17,155	3,010	14,146	223	33
1980-81	10,928	1,230	9,698	150	22
1981-82	8,700	486	8,214	116	19

PLANT ENGINES - OPERATING STATISTICS

	BLOWER ENGINE NO. 1 - DUAL FUEL				BLOWER ENGINE NO. 2 - DUAL FUEL			
1981-82	Hours Operation	1000 Cu. Ft. Gas Used	Gallons Fuel Oil Used	Cu. Ft. Air Compressed 1000	Hours Operation	Cu. Ft. Gas Used	Gallons Fuel Oil Used	Cu. Ft. Air Compressed 1000
July	313.9	690	869	192,300	1.0	None	21	400
Aug	118.3	342	306	70,100	None	"	None	None
Sep	92.9	290	256	59,400	2.6	"	55	1,600
Oct	74.4	241	292	50,800	None	"	21	700
Nov	343.2	821	969	208,200	"	"	None	None
Dec	338.0	548	1,246	198,200	243.2	472	812	136,100
Jan	426.4	1,602	1.188	261,100	313.8	1,235	1.155	196,300
Feb	519.5	2,031	1,468	321,500	214.2	878	607	214,200
Mar	77.5	207	252	49,600	696.5	2,541	1,993	437,000
Apr	392.5	1,399	1,157	242,300	409.8	1,528	1,214	258,200
May	326.6	1,157	999	216,200	461.2	1,796	1,335	289,800
June	708.0	384	2,335	217,200	23.2	45	187	14,700
Total	3,731.2	9,712	11,337	2,086,900	2,365.5	8,495	7,400	1,549,000
1980-81								
July	383.8	1,557	2,487	233,000	406.4	None	8,458	253,900
Aug	743.9	3,597	2,541	450,900	741.5	"	15,571	465,800
Sep	509.7	2,767	791	315,600	527.5	"	10,980	332,500
Oct	.2	None	4	Test	156.8	"	3,100	91,600
Nov	162.0	35	3,185	94,500	489.1	"	10,235	304,300
Dec	33.0	None	693	20,600	278.8	"	6,003	173,400
Jan	412.9	"	8,689	255,800	498.2	"	10,656	316,400
Feb	224.0	"	4,704	138,400	421.8	"	8,860	261,400
Mar	177.5	"	3,733	110,100	368.1	"	7,731	228,200
Apr	178.9	"	4,215	123,600	18.6	"	392	10,100
May	313.6	"	6,577	194,000	107.1	"	2,232	64,700
June	237.6	"	4,967	146,300	65.3	"	1,370	40,600
Total	3,377.1	7,956	42,586	2,082,800	4,079.2	None	85,588	2,542,900

1979-80								
July	674.0	2,558	3,080	410,500	119.8	None	2,400	73,700
Aug	435.8	1,652	803	222,700	1.1	"	20	800
Sep	109.9	545	319	83,100	2.7	"	60	1,600
Oct	117.3	559	261	73,600	.5	"	10	None
Nov	331.8	1,454	754	205,300	14.0	"	278	9,500
Dec	363.3	1,645	786	226,900	305.6	"	6,125	193,800
Jan	423.0	2,045	953	264,500	403.8	"	8,087	256,200
Feb	679.0	3,274	1,450	423,400	96.6	"	1,935	60,600
Mar	540.4	2,277	1,845	334,700	521.4	"	10,439	328,400
Apr	283.3	1,369	689	176,200	536.1	"	10,930	337,400
May	380.7	1,228	2,944	230,600	517.8	"	10,602	327,200
June	179.3	838	506	110,300	577.5	"	11,992	361,700
Total	4,517.8	19,444	14,390	2,761,800	3,096.9	None	52,078	1,950,900

NINE YEAR COMPARATIVE SUMMARY

1973-74	4,770.8	-	109,174	2,998,200	6,354.9	-	141,265	3,890,700
1974-75	3,588.2	-	81,030	2,244,300	4,776.0	-	103,500	2,966,900
1975-76	4,220.1	-	97,713	3,029,500	2,510.4	-	56,373	1,667,000
1976-77	3,157.9	-	59,115	1,938,100	1,908.0	-	36,077	1,220,400
1977-78	5,005.8	-	96,876	3,132,300	2,328.5	-	45,292	1,672,700
1978-79	3,853.9	10,555	35,762	2,381,300	1,196.9	-	24,828	753,700
1979-80	4,517.8	19,444	14,390	2,761,800	3,096.9	-	62,878	1,950,900
1980-81	3,377.1	7,956	42,586	2,082,800	4,079.2	-	85,588	2,542,900
1981-82	3,731.2	9,712	11,337	2,086,900	2,365.5	8,495	7,400	1,549,000

PLANT ENGINES - OPERATING STATISTICS

	BLOWER ENGINE NO. 3 - GAS FUEL			BLOWER ENGINE NO. 4 - GAS FUEL		
1981-82	Hours Operation	Cu. Ft. Gas Used 1000	Cu. Ft. Air Compressed 1000	Hours Operation	Cu. Ft. Gas Used 1000	Cu. Ft. Air Compressed 1000
July	315.8	980	187,700	707.5	1,951	422,700
Aug	569.7	1,373	323,000	743.9	1,943	10,100
Sep	668.4	1,935	417,100	717.4	2,100	448,700
Oct	691.0	2,004	421,400	738.0	2,213	461,200
Nov	385.5	1,075	239,300	710.9	1,886	444,300
Dec	81.9	216	40,400	727.9	1,343	409,800
Jan	662.1	2,414	405,200	696.4	2,587	427,700
Feb	548.8	2,149	333,700	625.7	2,485	389,700
Mar	729.4	2,572	451,000	743.0	2,631	460,000
Apr	654.9	2,166	405,600	694.1	2,441	433,200
May	683.0	2,491	423,500	739.0	2,491	457,800
June	412.0	811	245,000	502.0	1,121	299,500
Total	6,402.5	20,186	3,902,900	8,345.8	25,192	4,724,700
1980-81						
July	637.5	3,066	365,400	699.9	3,294	397,900
Aug	734.1	3,683	428,600	742.4	3,755	736,800
Sep	698.8	3,590	422,700	648.6	3,399	389,200
Oct	591.9	3,073	335,300	685.3	3,557	382,600
Nov	224.7	965	116,500	457.8	2,031	246,100
Dec	326.6	1,462	183,700	678.3	3,023	380,000
Jan	503.8	2,731	296,900	721.7	3,672	412,100
Feb	557.2	3,062	341,600	518.6	2,781	309,800
Mar	220.9	1,122	131,700	460.3	2,330	277,900
Apr	239.5	1,008	127,600	422.1	1,854	242,800
May	358.2	801	210,100	411.8	1,015	247,000
June	368.6	1,062	223,300	425.8	1,269	258,100
Total	5,461.8	25,625	3,183,400	6,872.6	31,980	3,980,300

1979-80						
July	731.4	3,057	435,700	13.0	61	8,300
Aug	730.4	3,401	447,800	357.8	1,643	215,300
Sep	573.9	2,702	354,900	696.6	3,270	434,300
Oct	729.1	3,491	453,500	697.3	3,367	430,600
Nov	558.0	2,624	347,200	597.9	2,784	371,700
Dec	708.6	3,315	437,900	714.4	3,362	443,500
Jan	733.2	3,484	445,900	737.2	3,552	444,500
Feb	662.7	3,262	409,400	686.4	3,309	421,100
Mar	523.7	2,261	298,400	523.7	3,218	426,600
Apr	597.8	2,815	602,000	563.2	2,604	332,000
May	578.2	2,085	275,900	625.1	2,680	352,300
June	707.8	3,014	405,300	716.9	3,039	408,500
Total	7,834.8	35,516	4,913,900	6,929.5	32,889	4,288,700

NINE YEAR COMPARATIVE SUMMARY

1973-74	5,735.4	30,090,000	3,289,500	6,364.5	33,340,000	3,684,100
1974-75	4,523.2	20,884,000	2,489,800	4,367.5	23,263,000	2,573,300
1975-76	6,018.5	32,384,000	3,635,400	1,998.0	8,699,000	1,163,600
1976-77	4,706.7	25,602,000	2,879,900	7,706.3	40,456,000	4,599,900
1977-78	7,420.6	34,637	4,797,900	8,179.2	38,193	4,988,500
1978-79	6,682.0	31,020	3,845,200	7,687.3	35,672	4,639,100
1979-80	7,834.8	35,516	4,913,900	6,929.5	32,889	4,288,700
1980-81	5,461.8	25,625	3,183,400	6,872.6	31,980	3,980,300
1981-82	6,402.5	20,186	3,902,900	8,345.8	25,192	4,724,700

PLANT ENGINES - OPERATING STATISTICS

	GENERATOR ENGINE NO. 1 - DUAL FUEL			BLOWER ENGINE NO. 5 - DUAL FUEL			
1981-82	Hours Operation	Gallons Fuel Oil Used	KW Hours Genereated	Hours Operation	Cu. Ft. Gas Used 1000	Gallons Fuel Oil Used	Cu. Ft. Air Compressed 1000
July	8.0	169	1,701	668.6	3,961	3,909	885,500
Aug	5.1	107	890	623.2	3,711	3,598	824,600
Sep	2.3	42	315	682.1	4,160	4,155	920,800
Oct	None	None	None	739.7	4,948	4,312	998,600
Nov	"	"	"	682.0	3,630	4,333	952,100
Dec	"	"	"	731.0	3,010	6,403	944,800
Jan	"	"	"	132.8	817	1,114	171,300
Feb	3.5	73	310	53.2	438	363	70,600
Mar	5.5	116	885	None	None	None	None
Apr	4.5	95	315	6.1	40	53	8,200
May	4.0	84	225	None	None	None	None
June	4.7	97	275	435.4	2,960	4,875	601,000
Total	37.6	783	4,916	4,754.1	27,675	33,115	5,836,600
1980-81							
July	7.4	148	1,865	487.3	3,799	6,630	634,800
Aug	4.0	8	1,395	None	None	None	None
Sep	9.7	202	2,100	203.5	1,550	4,237	248,700
Oct	19.1	398	1,910	718.8	3,123	19,244	926,600
Nov	3.0	63	700	711.5	5,529	9,422	916,400
Dec	16.4	345	3,050	593.3	5,689	5,811	755,600
Jan	7.7	162	1,515	288.9	2,632	3,212	357,100
Feb	4.0	84	970	311.1	2,884	3,651	402,700
Mar	4.0	90	630	638.7	6,564	5,117	855,400
Apr	5.1	107	1,210	708.3	6,904	5,172	914,800
May	6.2	127	1,580	697.8	2,525	14,493	919,100
June	2.6	53	600	652.6	3,657	8,806	870,000
Total	89.2	1,787	17,525	6,011.8	44,856	85,795	7,801,400

1979-80							
July	12.4	248	1,280	618.8	5,909	3,263	833,700
Aug	6.6	131	1,820	742.8	7,498	3,380	1,002,800
Sep	15.0	242	2,070	707.4	7,023	4,022	952,800
Oct	5.0	100	1,480	689.6	6,994	3,080	927,100
Nov	4.4	85	1,190	703.5	6,960	3,027	948,300
Dec	15.6	310	3,820	742.5	7,182	3,865	982,100
Jan	12.2	240	3,085	625.6	6,261	2,593	821,500
Feb	11.8	235	3,020	577.1	6,291	2,531	776,100
Mar	8.4	169	1,705	487.1	4,180	1,716	606,100
Apr	20.5	423	3,640	692.6	6,952	3,599	904,000
May	7.0	147	1,950	742.9	6,386	7,221	990,600
June	4.0	84	1,145	627.0	5,143	6,757	820,200
Total	122.9	2,414	26,205	7,956.9	76,779	45,054	10,565,300

NINE YEAR COMPARATIVE SUMMARY

1973-74	75.4	1,535	219	4,318	21,300	97,713	5,684,400
1974-75	61.6	1,290	143	5,792	30,480	108,525	7,410,300
1975-76	50.2	890	4,410	6,728	47,153	78,411	8,930,900
1976-77	59.9	1,100	11,409	5,833	60,006	28,293	7,656,200
1977-78	87.9	1,744	25,224	3,706	32,814	17,627	4,653,300
1978-79	64.7	1,290	20,858	6,854	66,550	35,401	8,865,600
1979-80	122.9	2,414	26,205	7,957	76,779	45,054	10,565,300
1980-81	89.2	1,787	17,525	6,012	44,856	85,795	7,801,400
1981-82	37.6	783	4,916	4,754	27,675	33,115	5,836,600

TREATMENT PLANT NO. 2

Wastewater Treatment Plant No. 2 was constructed in the period April 1975 to June 1980, and was first placed in operation in June 1980. It was designed to operate in parallel with Plant No. 1, utilizing secondary activated sludge treatment to attain 90 percent removal of both B.O.D. and suspended solids. The design also includes sludge digestion and dewatering by centrifuges for the waste sludge pumped to Virginia Key from the North District 80 M.G.D. activated sludge plant. The performance of the plant for each of the two fiscal years covered is summarized on page 55, and is followed by the statistical tables on pages 57 to 65. The Basis of Design is given on pages 66 to 71. The flow diagram on page 72 shows the principal treatment functions of the plant.

As is true of all sewage treatment plants when first placed in operation, Plant No. 2 required numerous changes and adjustments to the physical plant and its operation before a smooth functioning system was established. The training of new personnel required exceptional diligence and patience by those in charge of the start-up program. Many of the new people had no previous plant operation experience. Despite the difficulties encountered, the plant was "on target" after seven months operation. Since February of 1981, both the B.O.D. and suspended solids of the effluent have been in the range of 7 to 14 p.p.m., resulting in monthly average removals above 90 percent. In the fiscal year ending June 30, 1982, the plant demonstrated a capability to treat an average daily flow of 82.3 million gallons. The Basis of Design capacity for this plant is 55 M.G.D.

The loading to sludge concentrators consists of raw and waste activated solids from the North District Plant, plus the sludges and recycle liquors from Plant No. 2. The North District waste is pumped to the plant through a 16 inch force main fourteen miles in length. This contribution for the fiscal 1981-82 averaged 2.23 M.G.D. of sludge having 3,378 p.p.m. total solids content.

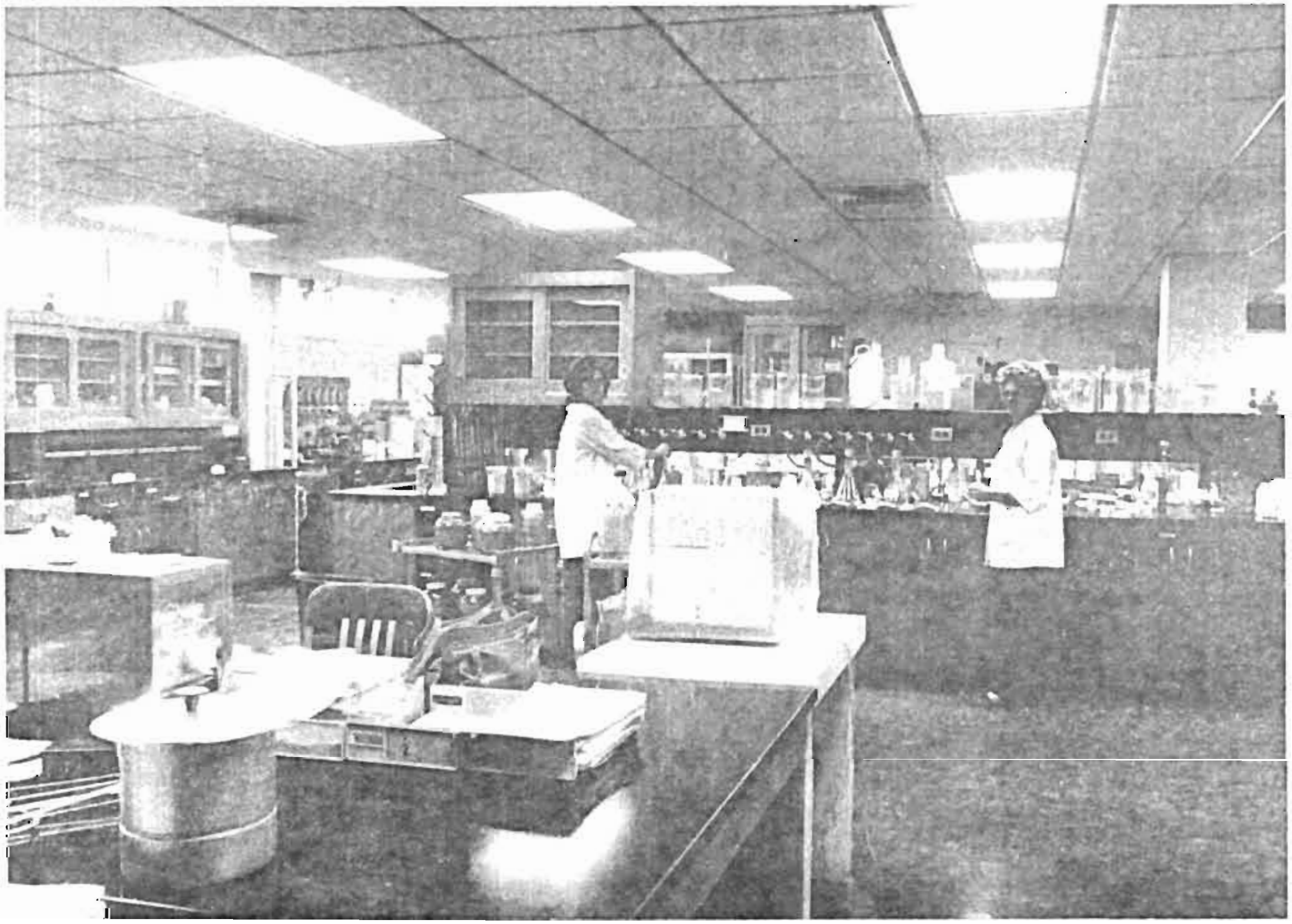
The selection and proper use of polymer coagulants to thicken these wastes presented a unique challenge to the operators in charge of the sludge concentrators and sludge digesters. The overflow from these tanks is pumped to the head of the plant. Excessive high solids in the overflow will result in poor performance of the downstream activated sludge process. By the use of the polymers, these sludges were thickened to 3.8 percent total solids when pumped to the sludge digesters. The quantities of the polymer used are shown in the table on page 64.

It is difficult to evaluate the performance of the sludge digesters during the start-up first year of this report due to the inherent problems associated with placing new equipment in operation. The total digestion system is comprised of sixteen tanks 105 feet in diameter with an effective depth of 26 feet. All have floating covers for collection and removal of the sewage gas. At initial start-up, these tanks were seeded with digested sludge from Plant No. 1. Gas scrubbers utilizing plant effluent reduce the H_2S in the gas to 40 grains per 100 cubic feet prior to use as fuel for engines. The average volatile percent of the raw sludge pumped to the digesters in fiscal 1981-82 was 75.5. This was reduced to 63.5 by digestion indicating a conversion of 33 percent of the solids to sewage gas. The operational data for the dewatering of the digested sludge by centrifuges is given in the Combined Plants Section, page 15.

The personnel required to operate Plant No. 2 are as follows: one Plant Superintendent, one Assistant Plant Superintendent, two Chemists, three Laboratory Technicians, six Treatment Plant Supervisors, twenty nine Plant Operators, three Clerk II's, four Automotive Equipment Operator III's, nine Automotive Equipment Operator II's and thirteen Laborers

COMPARATIVE SUMMARY DATA FOR TWO FISCAL YEARS
PLANT NO. 2

	1980-81	1981-82
Million Gallons Sewage Treated Daily	63	81
Raw Sewage Total Solids, p.p.m.	2,165	1,935
Raw Sewage Chlorides, p.p.m.	873	789
Raw Sewage Suspended Solids, p.p.m.	134	119
Raw Sewage B.O.D., p.p.m.	118	102
Suspended Solids Percent Removal	84	93
Final Effluent Suspended Solids, p.p.m.	22	9
Final Effluent B.O.D., p.p.m.	11	9
B.O.D. Percent Removal	91	91
Tons of Chlorine used in Plant - Year total	224	68
Mix Liquor Suspended Solids, p.p.m.	2,443	2,623
Sludge Volume Index, (SVI)	94	81
Final Tank Return Activated Sludge, (RAS), M.G.D.	27	25
Final Tank Return Activated Sludge, (RAS), p.p.m.	12,349	10,517
Percent Dry Solids of Raw Sludge to Digesters	3.8	3.9
Percent Volatile Solids, Raw Sludge to Digesters	74.7	75.5
Percent Dry Solids of Digested Sludge	1.6	2.3
Percent Volatile Solids of Digested Sludge	61.1	63.5
Dry Solids Added to Digestion System, Tons per year	22,015	29,855
Dry Solids Removed from Digestion System, Tons per year	7,310	17,353
Daily Sewage Gas Production, 1000 cu.ft.	833	760
Dry Solids North District, Tons per year	10,364	11,156



TREATMENT PLANT ANALYTICAL LABORATORY

RAW SEWAGE TREATED

	Flow in M.G.D.				
1981-82	Miami	Miami Beach	Total	pH	Total Alkalinity p.p.m.
July	51.83	20.49	72.32	7.0	207
Aug	62.86	22.95	85.81	7.2	202
Sep	62.31	25.09	87.40	7.1	204
Oct	56.40	23.81	80.21	7.1	208
Nov	55.39	26.41	81.80	7.0	211
Dec	53.27	22.56	75.83	7.1	213
Jan	50.69	20.97	71.66	7.1	212
Feb	52.03	21.93	73.96	7.1	211
Mar	54.20	23.26	77.46	7.3	224
Apr	65.73	22.18	87.91	6.9	204
May	66.11	22.01	88.12	7.0	202
June	69.59	23.85	93.44	7.1	205
Avg	58.37	21.92	81.33	7.1	209

1980-81					
July					
Aug					
Sep					
Oct	34.44	21.42	55.86	7.1	219
Nov	28.43	24.15	52.58	7.2	217
Dec	40.68	22.15	62.83	7.1	229
Jan	34.46	22.15	56.61	7.3	229
Feb	41.09	23.04	64.13	7.2	230
Mar	35.36	21.92	57.28	7.2	223
Apr	53.12	20.21	73.33	7.1	227
May	56.23	20.27	76.50	7.4	219
June	49.85	18.91	68.76	7.1	209
Avg	41.51	21.58	62.94	7.2	222

SEWAGE CHLORINATION

	Pounds		
1981-82	Post at Outfall	Other	Total Treatment Plant
July	12,400	None	12,400
Aug	12,400	"	12,400
Sep	12,000	"	12,000
Oct	12,400	"	12,400
Nov	None	"	None
Dec	26,040	899	26,939
Jan	12,648	1,147	13,795
Feb	17,612	1,092	18,704
Mar	13,795	1,116	14,911
Apr	None	None	None
May	"	"	"
June	12,000	"	12,000
Total	131,295	4,254	135,549
Avg	14,588	355	15,061

1980-81	Post at Outfall	Other	Total Treatment Plant
July			
Aug			
Sep			
Oct	10,788	27,001	37,789
Nov	11,910	32,640	44,550
Dec	13,981	33,728	47,337
Jan	13,609	55,707	69,316
Feb	18,788	130,956	149,744
Mar	12,059	31,551	43,710
Apr	11,790	7,650	19,440
May	12,400	8,370	20,770
June	11,190	4,980	16,170
Total	116,515	332,583	448,826
Avg	12,946	36,954	49,870

	p.p.m. TOTAL SOLIDS	p.p.m. CHLORIDES		Potable Water
1981-82	Raw Sewage	Raw Sewage	Final Effluent	Used at Plant 1000 Gals
July	2,194	900	951	299
Aug	1,860	684	730	962
Sep	1,287	656	690	1,530
Oct	1,973	787	811	1,642
Nov	2,596	1,048	1,127	1,631
Dec	2,115	875	890	1,292
Jan	1,842	721	716	1,366
Feb	1,812	776	777	1,452
Mar	2,087	829	847	2,951
Apr	2,005	780	796	1,557
May	1,891	777	781	3,262
June	1,557	630	647	3,113
Total				21,058
Avg	1,935	789	814	1,755
1980-81				
July				1,883
Aug				1,959
Sep				2,546
Oct	2,202	891	906	4,157
Nov	2,499	958	973	2,420
Dec	2,103	845	879	2,107
Jan	2,163	868	861	1,985
Feb	2,036	837	834	2,220
Mar	2,166	854	841	1,616
Apr	2,026	791	780	1,700
May	2,372	996	1,002	3,043
June	1,919	819	262	2,719
Total				28,355
Avg	2,165	873	815	2,360

	BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS			
1981-82	Raw Sewage p.p.m.	Final Effluent p.p.m.	Population Equivalent 1000	Percent Removed	Raw Sewage p.p.m.	Final Effluent p.p.m.	Population Equivalent 1000	Percent Removed
July	100	8	355	92	128	11	386	92
Aug	92	8	387	91	112	10	401	91
Sep	77	8	330	90	104	9	379	91
Oct	80	7	315	91	111	8	371	93
Nov	97	9	389	91	117	8	399	93
Dec	103	10	383	90	124	10	392	92
Jan	118	10	415	92	127	9	380	93
Feb	132	11	479	92	127	9	392	93
Mar	126	13	480	90	131	11	423	92
Apr	112	13	483	89	124	11	455	91
May	112	8	484	93	119	7	437	94
June	77	6	353	92	106	5	413	95
Total			4,853				4,828	
Avg	102	9	404	91	119	9	402	93
1980-81								
July	105	15	218	86	160	21	278	87
Aug	81	27	155	67	122	38	198	69
Sep	94	13	183	86	127	29	210	77
Oct	89	9	247	90	111	31	262	72
Nov	111	8	298	93	110	23	251	79
Dec	112	8	357	93	138	26	374	81
Jan	169	16	469	91	141	36	333	74
Feb	112	8	352	93	145	12	388	92
Mar	111	6	312	95	133	13	328	90
Apr	212	10	762	95	180	13	550	93
May	117	8	437	93	123	14	391	89
June	100	7	337	93	116	10	332	91
Total			4,127				3,895	
Avg	118	11	344	91	134	22	325	84

OXYGEN ACTIVATED SLUDGE

	Mix Liquor - Oxygenation Tanks			Final Settling Tanks Return Activated Sludge			
1981-82	Suspended Solids p.p.m.	Sludge Volume Index	D.O. p.p.m.	Suspended Solids p.p.m.	M.G.D. Avg	Percent of Raw Sewage Flow	Detention Time Hours
July	3,380	97	4.5	11,550	30	42	4.1
Aug	2,230	68	4.7	9,595	24	28	3.4
Sep	2,216	72	6.0	9,605	23	26	3.4
Oct	2,687	82	5.6	10,655	24	30	3.7
Nov	2,568	75	4.9	10,571	24	30	3.6
Dec	2,876	86	6.0	11,706	23	30	3.9
Jan	2,385	84	9.0	10,510	25	35	4.1
Feb	2,828	92	3.9	9,874	25	34	4.0
Mar	2,808	77	2.7	10,938	25	33	3.8
Apr	2,598	76	4.5	10,897	25	28	3.3
May	2,688	80	6.2	10,820	25	28	3.3
June	2,208	85	6.5	9,478	25	27	3.1
Total	31,472	974	64.5	126,199	298	371	43.7
Avg	2,623	81	5.4	10,577	25	31	3.6
1980-81							
July							
Aug							
Sep							
Oct	1,302	75	3.4	13,100	27	48	5.3
Nov	1,406	78	4.6	13,900	26	49	5.6
Dec	1,046	128	4.1	9,000	33	53	4.7
Jan	2,803	155	4.5	11,300	30	53	4.5
Feb	1,928	70	4.8	13,100	28	44	4.8
Mar	4,255	112	4.8	12,326	32	56	5.1
Apr	2,797	78	3.1	12,487	25	34	4.0
May	3,256	70	4.6	13,559	23	30	3.8
June	3,194	76	6.2	12,379	22	32	4.3
Total	21,987	842	40.1	111,142	255	399	42.6
Avg	2,443	94	4.5	12,349	27	44	4.7

SLUDGE SOLIDS PUMPED TO DIGESTION TANKS

1981-82	Total Gallons 1000	Average Dry Solids Percent	Average Volatile Solids Percent	Total Pounds Dry Solids 1000
July	20,020	3.7	72.4	6,151
Aug	17,245	3.8	68.0	5,343
Sep	15,645	3.9	73.3	5,141
Oct	18,368	3.4	81.6	5,171
Nov	17,829	3.7	73.8	5,279
Dec	16,408	3.9	79.0	4,665
Jan	16,926	3.9	80.8	5,382
Feb	14,302	3.4	79.0	4,130
Mar	13,997	4.3	77.7	5,038
Apr	12,216	4.3	72.2	4,203
May	12,896	4.2	75.2	4,383
June	15,045	3.8	73.7	4,824
Total	190,897			59,710
Avg	15,908	3.9	75.5	4,976
Per day	523			164
1980-81				
July				
Aug				
Sep				
Oct	15,962	3.9	72.9	3,160
Nov	14,310	3.7	73.7	4,401
Dec	14,244	3.6	75.1	4,332
Jan	15,128	3.4	75.3	4,086
Feb	16,089	3.8	73.6	4,714
Mar	18,795	3.4	73.8	5,326
Apr	16,620	3.5	76.7	4,805
May	18,879	4.7	79.6	6,428
June	18,162	4.3	71.9	6,779
Total	148,189			44,030
Avg	16,465	3.8	74.7	4,892
Per day	543			161

DIGESTED SLUDGE

1981-82	Liquid Sludge 1000 gals	Percent Dry Solids	Percent Volatile Solids	Dry Solids to Centrifuges 1000 Lbs.
July	15,515	2.3	63.6	2,976
Aug	13,319	2.4	62.5	2,666
Sep	12,230	2.0	62.7	2,040
Oct	11,313	2.3	62.4	2,170
Nov	9,592	2.4	62.2	1,920
Dec	17,777	2.3	62.2	3,410
Jan	15,544	2.2	65.8	2,852
Feb	19,533	2.2	65.1	3,584
Mar	16,284	2.1	64.2	2,852
Apr	17,386	2.4	64.2	3,480
May	13,216	2.7	63.5	2,976
June	16,787	2.7	63.2	3,780
Total	178,496			34,706
Avg	14,875	2.3	63.5	2,892
Per day	489			95

1980-81	Liquid Sludge 1000 gals	Percent Dry Solids	Percent Volatile Solids	Dry Solids to Centrifuges 1000 Lbs.
July				
Aug				
Sep				
Oct				
Nov				
Dec				
Jan	17,346	1.2	47.2	1,736
Feb	17,906	1.5	57.6	2,240
Mar	25,801	1.7	62.5	3,658
Apr	27,338	1.0	55.3	2,280
May	16,824	1.9	67.2	2,666
June	8,435	2.9	64.9	2,040
Total	113,650			14,620
Avg	18,942	1.6	61.1	2,437
Per day	627			81

Solids from October, November and December 1980 were used to seed digesters.

SOURCE OF SLUDGE PROCESSED IN CONCENTRATORS

1981-82	North District Sludge Flow M.G.	North District Sludge Concentration Mg/L	North District Sludge Dry Solids Tons	Central District Sludge Flow M.G.	Central District Sludge Concentration Mg/L	Central District Sludge Dry Solids Tons
July	81.98	2,636	902	55.67	11,567	2,731
Aug	80.92	2,587	873	41.32	9,595	1,634
Sep	77.36	2,636	864	36.53	9,625	1,452
Oct	80.15	2,562	855	42.07	10,336	1,901
Nov	68.60	3,878	1,100	39.87	10,566	1,755
Dec	66.46	3,270	913	47.22	11,681	2,298
Jan	70.60	3,125	921	42.55	10,421	1,824
Feb	56.43	3,636	854	37.73	10,205	1,598
Mar	57.77	4,140	992	39.44	10,938	1,793
Apr	56.42	3,892	921	32.34	10,895	1,476
May	60.13	4,042	1,007	37.94	10,807	1,715
June	57.39	4,005	956	38.39	9,478	1,513
Total	814.71	40,532	11,158	491.07	126,114	21,690
Avg	67.89	3,378	930	40.92	10,509	1,808

POLYMER USE AT CONCENTRATORS

1981-82	Total Dry Solids Tons	Total Polymer used Dry Lbs.	Lbs. of Polymer per ton of solids added	Total Polymer cost	Polymer cost per ton of solids added
July	3,633	9,870	2.7	$ 32,081	$ 8.83
Aug	2,507	10,279	4.1	33,407	13.32
Sep	2,316	8,916	3.8	29,085	12.56
Oct	2,756	8,865	3.2	28,857	10.47
Nov	2,855	8,583	2.7	27,893	9.77
Dec	3,211	8,829	3.2	27,243	8.48
Jan	2,745	8,810	3.2	25,814	9.40
Feb	2,452	7,958	3.2	23,316	8.51
Mar	2,785	12,997	4.7	17,497	6.28
Apr	2,397	7,822	3.3	18,544	7.74
May	2,722	13,521	5.0	24,356	8.95
June	2,469	13,774	5.6	32,555	13.18
Total	32,849	120,224		$320,647	$117.49
Avg	2,737	10,019	3.7	$ 26,721	$ 9.79

SEWAGE GAS PRODUCED

1981-82	Total Gas Produced 1000 cu.ft.	Gas per Million Gallons of Sewage Treated 1000 cu.ft.	Hydrogen Sulfide in Sewage Gas Grains per 100 cu.ft. Raw	Scrubbed
July	27,398	4.8		
Aug	24,465	3.7		
Sep	26,433	4.4		
Oct	19,998	4.0	180	45
Nov	29,022	5.7	185	50
Dec	26,393	5.5	190	60
Jan	24,927	5.1	190	55
Feb	18,281	5.6	145	50
Mar	22,438	5.2	117	29
Apr	19,668	4.4	135	27
May	19,130	3.8	110	35
June	19,323	3.9	120	30
Total	277,476		1,372	381
Avg	23,123	4.7	152	42

Gas production figures are estimates in some cases due to metering problems.

MIAMI-DADE WATER AND SEWER AUTHORITY

ADDITIONS TO

CENTRAL DISTRICT WASTEWATER TREATMENT PLANT

BASIS OF DESIGN

A. ADDITIONAL 55 MGD WASTEWATER TREATMENT FACILITY
(In Parallel with Existing Plant on Virginia Key)

Type of Treatment: Secondary treatment activated sludge using high purity oxygen to attain 90 percent removal of BOD_5 and S.S.

Year of Design: 1985

Quantity of Sewage: Average daily flow in mgd 55

Maximum rate for design of flumes, ducts, grit chambers, mgd 146

Sewage Characteristics:		Avg.	Max.	Min.
BOD_5 Raw Sewage	ppm	190	290	50
BOD_5 Recycled Sludge Waste	ppm	30	30	30
BOD_5 Total (Entering Process)	ppm	220	320	80
Soluble BOD_5 (41% estimated)	ppm	90	130	35
T.S.S.	ppm	195	390	60
V.S.S.	ppm	175	300	55
C.O.D.	ppm	500	670	225
H_2S - Raw	ppm	10.0	15.0	7.0
H_2S - After Aerated Grit Chamber	ppm	6.5	10	4.5
pH	---	7.0	7.7	6.3
Temperature	^oF	85	86	78
Grease	ppm	32	34	31
Chlorides	ppm	1,150	1,660	440

Aerated Grit Channels:

Number of channels (one is standby)	2
Width, ft.	22.67
Water depth at 55 mgd, ft.	13.0
Length, ft.	64.0
Detention at 55 mgd through one channel, minutes	3.7
Air supply, each channel, cfm	320
Air supply, maximum cfm/linear ft.	5
(supplied from blowers in existing plant)	

Main Flow Meters:

Combination magnetic and venturi meters	
In Miami force main, recorder cap., mgd	100
In Miami Beach force main, recorder cap., mgd	60
Parshall Flumes (in each grit channel exit)	80
Recorder capacity, each flume, mgd	

Oxygen Aeration Tanks:

Number of tanks (including one standby)	4
Number of stages per tank	6
Width of each stage, ft.	39.17
Length of each stage, ft.	78.33
Average side water depth, ft.	10
Freeboard depth below fixed cover, ft.	2
Wastewater volume per tank, cu. ft.	184,000
Wastewater volume per tank, mg	1.4
Average Hydraulic flow	
Degritted wastewater, mgd	55
Inplant sidestreams, mgd	3
(Overflows from digesters, sludge concentration tanks)	
Return activated sludge (50% of plant influent), mgd	27
Total mixed liquor flow, mgd	85
Detention time at 85 mgd, hr.	1.2
Organic load, lb. BOD_5/day	108,000
F/M, lb. BOD_5 load/lb. MLVSS	0.7
(Food to biomass ratio)	
Volumetric load, lb. BOD_5 load/1000 cf tank	180
Sludge yield, lb./lb.	1
(Lb. of suspended solids formed in biomass per lb. of BOD_5 load)	
BOD_5 removal @ 90%, lb./day	99,000
Maximum oxygen required:	
Lb. O_2/lb. BOD_5 removed	1.4
Lb. O_2 per day	139,000

Cryogenic Oxygen Plant

Number of units (one is standby)	2
Capacity, each ton/day	70

Final Settling Tanks

No. of tanks, including one standby	10
Average water depth, ft.	11.0
No. of channels per tank	3
Width of each channel, ft.	18.0
Length of each channel, ft.	275.0
Volume each tank, cu. ft.	163,350
Volume 9 tanks, mg.	11
Surface area, 9 tanks, sq. ft.	134,000
Effluent weir length per tank, linear ft.	835
Tank loading at average daily flow	
Upflow velocity at (57.5 mgd), ft./hr.	2.4
Surface overflow rate, gpd/sq. ft.	430
Solids loading, SS lb./day/sq. ft.	34
Effluent weir load, gpd/linear ft.	7,650
Upflow detention time, hours	3.8
Number of final sludge pumps (two are standby)	20
Range of capacity, each pump, mgd	0.9 to 3.2
Return sludge pumping capacity, % plant inflow	15 to 80
Scum is collected and returned to aeration tanks inlet	

B. SLUDGE TREATMENT FACILITY FOR WASTE SLUDGE FROM ADDITIONAL 55 MGD PLANT AND NORTH DISTRICT TREATMENT PLANT

Pre-digestion Waste Sludge Concentration Tanks

Waste sludge from 80 mgd North District Plant	
Average daily sludge flow, mgd	2.3
Suspended solids, lb./day	149,000
Waste sludge from Additional 55 mgd plant	
Average daily sludge flow, mgd	0.6
Suspended solids, lb./day	105,000
Total sludge wasted into Concentration Tanks	
Average daily sludge flow, mgd	2.9
Suspended solids, lb./day	254,000
Number of tanks provided (gravity settling type)	
Serving Additional 55 mgd plant	2
Serving 80 mgd North District Plant	2
Total number of tanks (one is standby)	4
Tank dimensions	
Inside diameter, ft.	55
Side water depth, ft.	13
Surface area, sq. ft.	2,375
Volume, cu. ft.	31,000
Tank loading (3 units at average daily flow)	
Upflow velocity, ft./hr.	1.7
Surface overflow rate, gpd/sq. ft.	320
Solids loading, SS lb./day/sq. ft.	36
Upflow detention time, hours	4.5
Concentrated waste sludge production	
Solids capture, percent	90

Average sludge underflow (4% solids), mgd	0.7
Suspended solids, SS lb/day	229,000
Concentrated sludge pumps	
Number for North District sludge	3
Number for Additional 55 mgd Plant sludge	3
Total number (one is standby)	6
Capacity, each, gpm	200
Total capacity, gpm	1,000
Rate of pumping sludge to digesters	
Pumping 24 hr. on average day, gpm	480
Pumping 12 hr. on average day, gpm	960
Pumping 24 hr. on maximum day, gpm	800
Pumping 24 hr. on minimum day, gpm	300
Scum is collected and pumped into the digesters	

Overflow Return Pumps
(Discharge into secondary aeration tanks)

Average concentration tanks overflow, mgd	2.2
Digester and preheat conc. overflow, mgd	0.8
Average daily overflow, mgd	3
Maximum concentration tanks overflow, mgd	3.4
Max. sludge treatment & dewatering sidestreams, mgd	1.6
Maximum overflow return, mgd	5
Pumps provided	
Number for North District	3
Number for Additional 55 mgd Plant	3
Total pumps (one is standby)	6
Capacity, each, gpm	1,000
Total Capacity, gpm	5,000

Anaerobic Sludge Digestion Tanks
(High rate - two stage - heated primary stage - floating covers)

Number of tanks provided	
Serving North District Plant	8
Serving Additional 55 mgd Plant	8
Total number (one is standby)	16
Tank dimensions, each unit	
Inside diameter, ft.	105
Maximum side water depth, ft.	25.9
Bottom cone depth, ft.	3
Volume, excluding cone, cu. ft.	224,000
Volume, excluding cone, cu. mg.	1.67
Digester loading, average daily concentrated waste sludge inflow	
Average sludge inflow (4% solids), mgd	0.7
Total suspended solids, lb./day	229,000
Volatile suspended solids, lb/day	155,000
Post heat decant and centrifuge centrate	
Average daily flow (1% solids), mgd	0.4
Total suspended solids, lb./day	35,000
Volatile suspended solids, lb./day	19,000

Total loading into digesters	
Average daily inflow, mgd	1.1
Total suspended solids, lb./day	264,000
Volatile suspended solids, lb./day	174,000
Hydraulic detention in 11 primary digesters, days	17.2
Hydraulic detention in 4 secondary digesters, days	6.2
Hydraulic detention in 15 digesters, total days	23
Digested sludge produced (Assume 55% of volatile solids are removed by digestion process)	
Suspended solids, lb./day	152,000
Sludge liquid (3% solids), mgd	0.6

C. SLUDGE DEWATERING FACILITY FOR SLUDGE ORIGINATING FROM NORTH DISTRICT PLANT AND BOTH CENTRAL DISTRICT PLANTS

Quantity of Digested Sludge

(At average raw sewage influent of 195 mgd, total through the three treatment plants)

Sludge originating from 80 mgd North District Plant and Additional 55 mgd Plant (from 16 new digesters)	
Suspended solids, lb./day	152,000
Sludge volume (3% solids), mgd	0.6
Sludge from 60 mgd upgraded existing plant (4 existing digesters)	
Suspended solids, lb./day	43,000
Sludge volume (3% solids), mgd	0.2
Total digested sludge pumped to dewatering	
Suspended solids, lb./day	195,000
Sludge volume (3% solids), mgd	0.8

Sludge Centrifuges

Number of units (two are standby)	6
Rate of inflow, each unit, gpm	75
Sludge cake production, annual average	
Suspended solids (@ 85% capture), lb./day	116,000
Sludge cake (25% solids), ton/hr.	10
Sludge cake (25% solids), ton/year	85,000
Sludge cake (20% solids), ton/hr.	12
Sludge cake (20% solids), ton/year	106,000
Suspended solids (@ 90% capture), lb./day	122,000
Sludge cake (20% solids), ton/hr.	13
Sludge cake (20% solids), ton/year	111,000
Peak sludge cake production	
Suspended solids (@ 90% capture), lb./day	198,000
Sludge cake (20% solids), ton/hr.	21

D. DIGESTER GAS

Gas from 16 new digesters receiving waste sludge from 80 mgd North District Plant and Additional 55 mgd Plant

Volume Produced

Annual daily average production	
Cu. ft. per lb. waste sludge VSS load into digesters	10
Million cu. ft. per day	1.7
Maximum day, million cu. ft. per day	2.4
Minimum day, million cu. ft. per day	0.7

Gas Storage Tanks

Spherical tanks, number	2
Diameter, ft.	80
Volume, each, cu. ft.	268,000
Storage capacity @ 35 psig, percent of daily production	100

Gas Utilization

Combustible (methane) content, percent	65
Potential gross energy content, BTU per cu. ft. of gas	620
Potential gross energy utilization rate, million BTU/day	1,050
Potential gross energy utilization rate, million BTU/minute	0.73
Potential gross energy utilization rate thousand HP	17
Potential gross energy utilization rate megawatts	13
Electric generator capacity	
Gas engine drive output @ 26% efficiency, HP	4,500
Electric generator output @ 90% efficiency megawatts	3

E. CHLORINATION
(For odor control and disinfaction)

Number of chlorine feeders (one is standby)	3
Capacity per feeder, lb./day	8,000
Maximum feed rate, lb./day	16,000
Maximum feed rate (into 110 mgd), ppm	18

F. EFFLUENT PUMPING STATION
(Serves both the existing 60 mgd treatment plant
and the additional 55 mgd plant)

Type of Pumping Units

Vertical axial flow wet pit pumps, each with 500 HP electric motor connected through an electromagnetic adjustable speed drive.

Initial Installation
(Pump building includes space for three additional pumping units)

Number of pumping units (one is standby)	8
Capacity, each, mgd	50
Total ultimate capacity, future, mgd	350

groundwaters, and surface waters need to be monitored only if sludge nutrients are applied at rates exceeding the uptake capacity of crops or soils.

18.3 Sludge as an Energy Source

Whether produced from direct burning of sludge or from the combustion of sludge-derived fuels such as digester gas or pyrolysis gas, the end product is energy. Heat can be made to perform a variety of useful functions.

18.3.1 Perspective

The precipitous rise in energy prices during the 1970s has generated intense interest in the conservation and recovery of this precious commodity. For example, the United States Energy Research and Development Administration (now the Department of Energy) has proposed one-seventh of the United States energy requirements be produced by bioconversion processes (for example anaerobic digestion) by the year 2020 (4). Clearly, however, this awesome quantity of energy will not be generated from municipal wastewater sludge; there is simply insufficient sludge. Very large external organic sources (for example, manure from feed lots or municipal refuse) and external processing systems (energy farms) will be required to effect such production. As with utilization of sludge on land, the impact of energy recovery from municipal sludges will be largely local, that is, it will be felt most strongly at the treatment plant and in its immediate vicinity. Here, the effects can be significant.

As Figure 6-32 indicates, the energy value of methane generated from the anaerobic digestion process exceeds the energy requirements of the digestion process. The excess can be used to supply the energy needs of other plant processes. In some instances, the gas generated is sufficient to supply the energy needs of the entire wastewater treatment plant, with excess gas available for sale. Notable examples are the British Southern and Mogden plants and the County Sanitation Districts of Los Angeles County Joint Disposal Plant (5). Heat recovery is possible even if digestion is not used, for example, heat recovery from coincineration of sludge and municipal refuse is expected to provide all the energy needs of the Central Contra Costa Sanitary District (CCCSD) plant in Concord, California (6).

In January 1978, the State of California Public Utilities Commission (PUC) passed a resolution directing all state utilities to augment cogeneration projects by setting up new rate schedules covering interruptible electric service; by creating new specific rates to encourage cogeneration, including revisions to standby rates; and by developing guidelines covering the price and conditions for the purchase of energy and capacity from cogeneration facilities owned by others (7). The term cogeneration in this context means the production of power by utilization of waste heat; it also covers power produced through the burning of alternative fuels, such as municipal waste. The resolution significantly changes the economics of power generation at California wastewater treatment plants and encourages the use of in-plant energy recovery.

On June 27, 1979, the Federal Energy Regulatory Commission issued proposed regulations providing for the qualification of small power production and cogeneration facilities under Section 201 of the Public Utility Regulatory Policies Act of 1978 (8). The proposed regulations are set up to assure opportunities for small power producers (<80 MW) to sell electricity to electric utilities when such electricity is generated through the use of renewable energy sources (such as sludge) or recovered process heat.

These regulatory actions are an indicator of future trends in the United States as the country seeks to increase its non-fossil fuel energy production. The designer should be aware of their impacts on future planning for using sludge as an energy source.

The recovery of energy in the form of fuels and heat from municipal sludges will be discussed in detail in the following sections.

18.3.2 Recovery of Energy From Sludge

Figure 18-1 shows on one diagram processes which release energy from sludge; devices which convert the released energy to useful forms; useful energy forms; and suggested applications of recovered energy, either at the wastewater treatment plant or off-site. Special consideration must be made when designing processes to recover energy from wastewater sludge. Some of these considerations are discussed below.

18.3.2.1 Treatment of Digester Gas

The treatment required depends on the digester gas' anticipated use. Treatment is minimal if the gas is burned in a boiler or in a high temperature internal combustion engine. Conversely, if it is sold for utilities as a natural gas substitute it must be upgraded to natural gas quality. This involves treatment to remove particulates, H_2S, CO_2, and water. As a general rule, gas treatment should be avoided to as great a degree as possible. It is preferable to set up recovery systems that can be operated with untreated digester gas.

Particulates are carried over with the gas as it leaves the digester. They may be removed in large sedimentation traps and cyclonic separators.

H_2S is most commonly removed by iron-sponge scrubbers. The "sponge" consists of wood shavings impregnated with iron oxide. H_2S reacts with iron oxide to form nonvolatile ferric sulfide. The sponge can be regenerated with air. Sponge capacity is

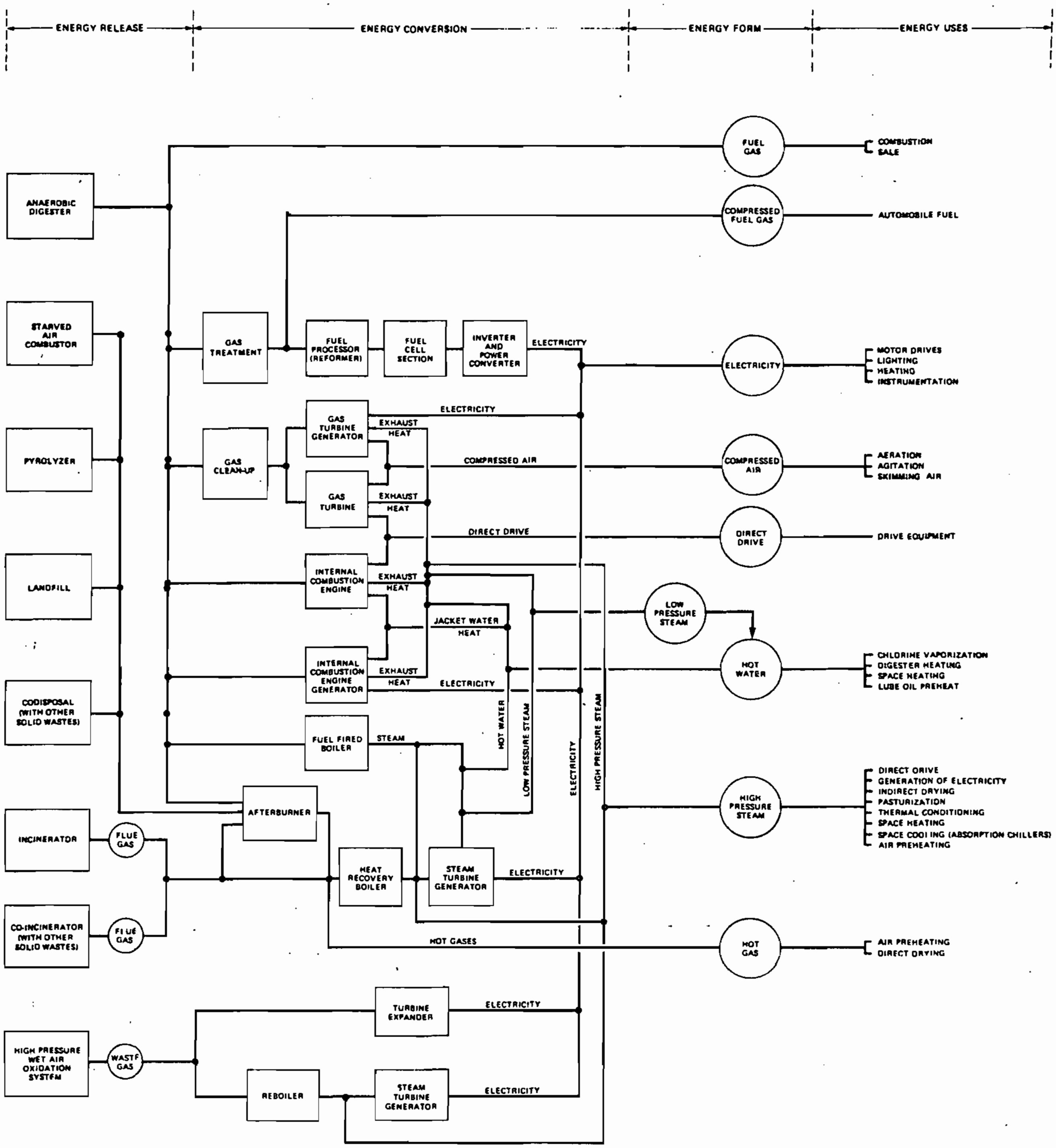


FIGURE 18-1

THE RELEASE, CONVERSION, FORMS AND USES OF ENERGY FROM SLUDGE

about 0.6 pounds of sulfur per pound of iron oxide (0.6 kg/kg). Problems have been experienced with fouling of the iron-sponge by oils and greases entrained in the digester gas. Iron-sponge scrubbers are commercially available. Other H_2S scrubbing processes are less commonly used and are proprietary.

CO_2 removal processes can be divided into three broad categories; absorption (both physical and chemical), adsorption, and cryogenic processing. Many CO_2 removal processes also remove H_2S. The only process which has received much use in wastewater treatment plants is absorption in water; this process has been tested at Modesto, California, and Los Angeles County, California. In 1976, total costs for a water scrubbing unit of 1,000,000 cubic feet per day (28,300 m^3/d) capacity were estimated at $2.50 per million Btu ($2.37/GJ) of energy (9). Some methane is also absorbed during the scrubbing process; costs were based on energy leaving the scrubber as opposed to energy in the untreated gas. Of this, $0.15 per million Btu ($0.14/GJ) was attributed to the cost of iron-sponge H_2S removal, which must necessarily precede the water scrubber. It was estimated that this unit would produce 2 MGD (87 l/s) of spent scrubbing water. Costs for treating the spent scrubbing water were included in the estimate. These units are commercially available.

Gas leaves the digestion system at approximately 95°F (35°C) and is saturated with water vapor. During transport the gas is cooled. Condensate formed must be removed to protect downstream equipment. Water traps should be installed at low spots in the gas pipe and at frequent intervals. If moisture must be reduced substantially, adsorption drying or glycol dehydration can be used.

18.3.2.2 Gas-Burning Equipment

Corrosion Factors

One of the major problems associated with recovering heat from digester gas is corrosion caused by SO_2 and SO_3, the combustion products of H_2S. If the exhaust gas temperature is allowed to drop below its dewpoint, the condensate which forms is acidic as the result of absorbing SO_2 and SO_3. The acidic condensate is corrosive to metallic elements of the exhaust-carrying system. There are two alternatives to alleviate the problem. The first is scrubbing of H_2S from the gas before combustion. The second is maintaining the exhaust gas at temperatures considerably greater than its dewpoint, to prevent condensation. This generally requires that the water temperature of any boiler or engine using unscrubbed gas be at least 212°F (100°C). Also, stack gas temperatures should not be allowed to drop below 350° to 400°F (177° to 204°C). Use of unscrubbed digester gas is preferred. Equipment fueled by unscrubbed digester gas should not be used in intermittent service, since condensation will occur each time the unit is shut down.

Shutdowns should be minimized. Similarly, the equipment should be designed so that even when operated at its lowest loadings, exhaust gas temperatures are sufficiently high to prevent condensation.

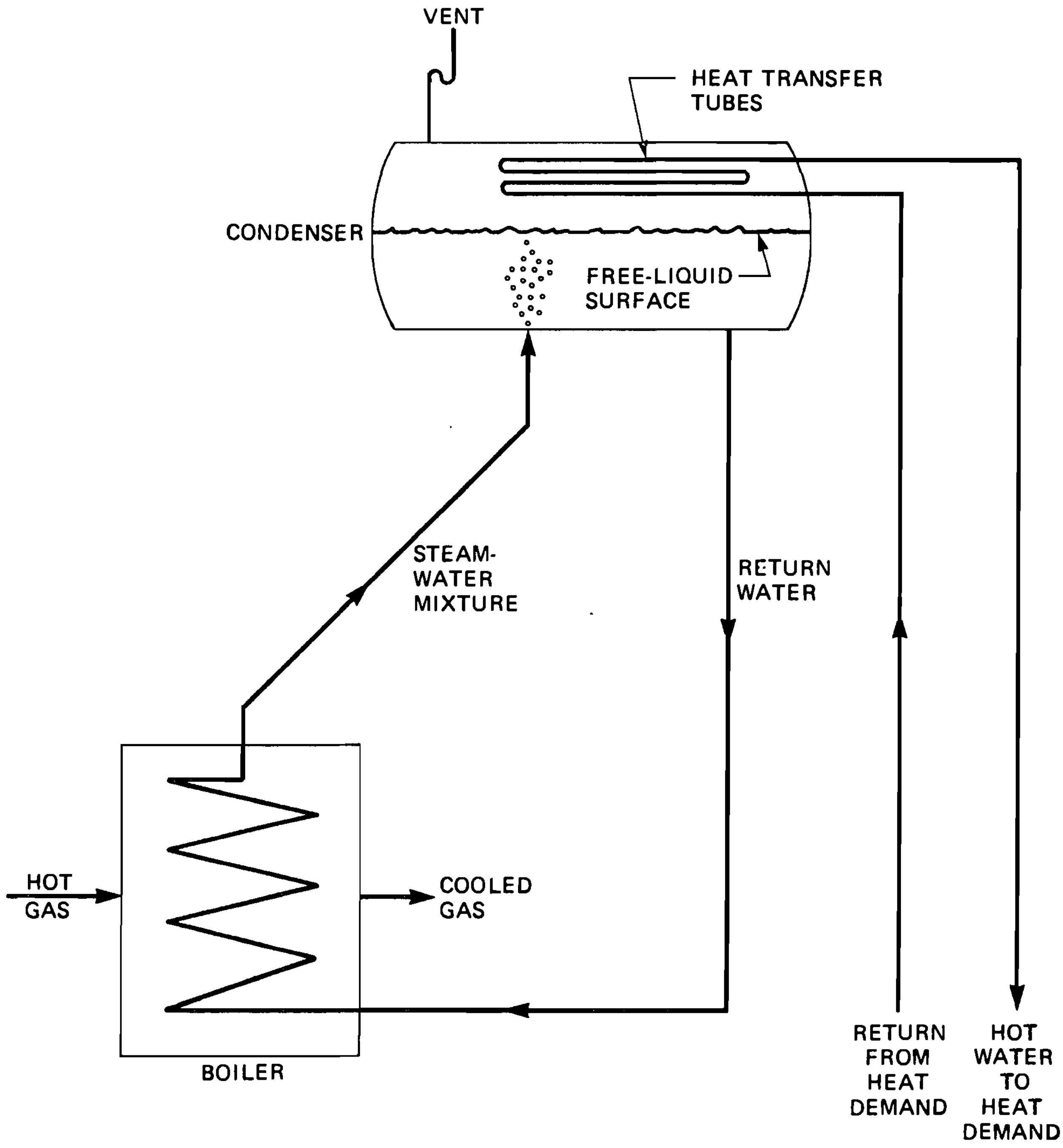


FIGURE 18-2

SCHEMATIC OF COMBINED BOILER/CONDENSER SYSTEM FOR HOT WATER PRODUCTION

Boilers

Scotch-type tube boilers and cast iron sectionalized boilers have both worked well with untreated digester gas as long as the water or steam temperatures are maintained above 212°F (100°C). Figure 18-2 illustrates an effective method for hot water production using boilers. The heat source (the boiler) and heat demands are not directly tied together, but separated by a condenser. The condenser is mounted directly above the boiler. The specific gravity of the steam/water mixture produced in the boiler tubes is less than that of the water returning to the boiler. The mixture is displaced upward into the condenser, gives up its heat, then flows by gravity back to the boiler. A natural circulation pattern is thus set up.

If heat supply exceeds heat demand, the excess heat is released by venting steam from the condensers. Temperature control is automatic, being set by the vent pressure. Advantages of this system are simplicity, elimination of costs associated with pumping, automatic temperature control, and independent operation of the boiler from other heat sources and heat demands. Independent operation is particularly important; it allows the boiler to operate at its own best conditions, without being affected by the operations of other components of the system.

Prime Movers

Digester gas can be used to fuel reciprocating engines and gas turbines. Prime movers convert part of the fuel's energy to work, rejecting the remainder as waste heat. Thermal efficiency can be dramatically improved if portions of the rejected heat can be recovered and used for process or building heating. Waste heat recovery is more efficient if prime movers are run hot, since heat rejected at higher temperatures can be put to a greater variety of uses than heat rejected at low temperature. Also, exhaust systems last longer because SO_2-SO_3 corrosion is reduced.

Reciprocating Engines. Engines may be cooled using either a forced circulation system in which water is pumped through the engine, or a natural draft system. The equipment configuration for natural circulation cooling is similar to that described for boiler natural circulation systems except the engine replaces the boiler in the flow diagram (see Figure 18-2). The advantages of natural circulation cooling are the same as those discussed for natural circulation boiling. Cooling system pressures are limited to about 10 psig (69 kN/m^2); if operated at higher pressures cooling water could leak past the cylinder liner seals and into the cylinder. The maximum cooling water temperature is thus about 240°F (116°C), corresponding to the temperature of saturated steam at 10 psig (69 kN/m^2). Engines using natural circulation cooling are relatively small, typically developing less than 1,500 horsepower (1,120 kW). Flow rates developed by natural circulation cooling may be insufficient to cool larger engines. Flow rates may be increased by installing a booster pump in the circulating loop near the entrance to the engine jacket. There are reciprocating engines on the market designed to operate at temperatures in the 160° to 180°F (71° to 82°C) range. However, they are not recommended for services with unscrubbed digester gas because of potential problems with SO_2-SO_3 corrosion. Heat recovered from the engine jacket is typically used to sustain the digestion process and for space heating.

Reciprocating engines commonly employed in wastewater treatment plants fall into two categories; dual-fuel (compression ignited) and spark ignited engines. Dual-fuel engines use a blend of diesel fuel and digester gas; the fraction of diesel fuel can be varied from a minimum of 4 percent all the way to 100 percent of the mixture. Dual-fuel engines are typically used if there is insufficient digester gas to satisfy power demands. Dual-fuel engines have been specified for new plants where digester gas production is expected to lag behind power demands for several years.

Spark-ignited engines are generally used when there is sufficient digester gas to satisfy power demands. Spark-ignited engines can operate on several different types of fuel (for example, digester gas and natural gas). Special carburetors are provided to blend digester gas with an air-diluted backup fuel (for example, natural gas) during infrequent periods when not enough digester gas is available to satisfy power requirements. Spark-ignited engines are less complex then dual-fuel engines, are available in smaller sizes, and are less costly to operate since expensive diesel fuel is not required.

Naturally aspirated feed systems are preferred to turbocharged systems for spark-ignited engines. Turbocharged systems require that gas be delivered at high pressure, which means the gas must be first compressed, then delivered through a fuel metering system with restricted openings. Gas impurities (oils, greases, and water) are condensed when the gas is compressed and cooled; these impurities often clog the fuel metering system. Naturally aspirated systems operate at low pressures (<0.5 psig [3.4 kN/m^2]). With careful design of the gas transport systems, compression of the feed gas is not required. Low pressure fuel metering systems also have relatively large openings compared to metering systems used with turbocharged units. For these reasons, naturally-aspirated fuel systems are therefore less susceptible to clogging than systems with turbocharged units.

Engines represent a large capital investment and should be conservatively designed to protect that investment. For four-stroke engines it is recommended that brake mean effective pressure (BMEP) not exceed 80 to 85 psig (550 to 590 kN/m^2) to minimize strain on the equipment. Engine speeds in the 700 to 1,000 rpm are preferred as are average piston speeds in the range of 1,200-1,500 feet per minute (370 to 460 m/min). Heavy-duty industrial engines should be specified, not automotive engines.

Gas Turbines. Gas turbines have had relatively limited use to date. Where used, there have been fouling problems which are inherent with compressing a dirty gas through fuel metering systems with small clearances. However, new developments in the turbine field and the fact that less NO_x is produced by turbines than by reciprocating engines has led to a second look at turbines, particularly in nonattainment air quality areas. A new system that uses a relatively low (4/1) pressure ratio turbine with recuperation has the potential to solve many of the problems which plagued earlier installations (10). The normally low efficiency of the low pressure ratio turbine is boosted by preheating the compressed air with heat recovered from the exhaust gas. Ignition for this turbine can be staged to minimize NO_x generation. Emissions control is particularly important in non-attainment areas where new stationary sources must use Best Available Control Technology (BACT). BACT for reciprocating engines is considered to be catalytic denitrification, while BACT for low pressure ratio turbines can be staged ignition.

18.3.2.3 Generators

Generators may be synchronous or induction types. Synchronous generators are by far the most common. However, in smaller sizes (below 5 or 10 MW) induction units are generally less expensive than synchronous units. They are also easier to maintain since they require no governor or synchronizing equipment. Induction generators have the disadvantage of being unable to operate unless parallelled with synchronous generation, either utility or in-plant. Thus an induction generator by itself cannot be used to provide emergency power.

18.3.3 Examples of Energy Recovery

The following two examples demonstrate calculations for two of the most commonly encountered energy recovery practices. Other examples and case histories can be found in References 11 and 12.

18.3.3.1 Energy Recovery from Digester Gas

Gas from an anaerobic digestion system is to be utilized to help supply plant energy needs in a 30 MGD (1.3 m^3/s) activated sludge plant. Digester gas will be used to fuel a spark-ignited internal combustion engine equipped with natural circulation cooling. The engine will drive an electrical generator. The electricity generated will be used to power various plant motor drives. Heat recovered from the engine cooling jacket and from the exhaust silencer will be used for space and process heating. It is hoped that sufficient heat will be recovered to supply at least digester heat requirements; any excess heat recovered will be used for "other" process heating. It is anticipated that heat recovered from the engine jacket (usually low temperature heat) will be used to make hot water for digester heating, while heat recovered from the exhaust silencer (high temperature heat) will be used to generate steam. Figure 18-3 is the system flowsheet.

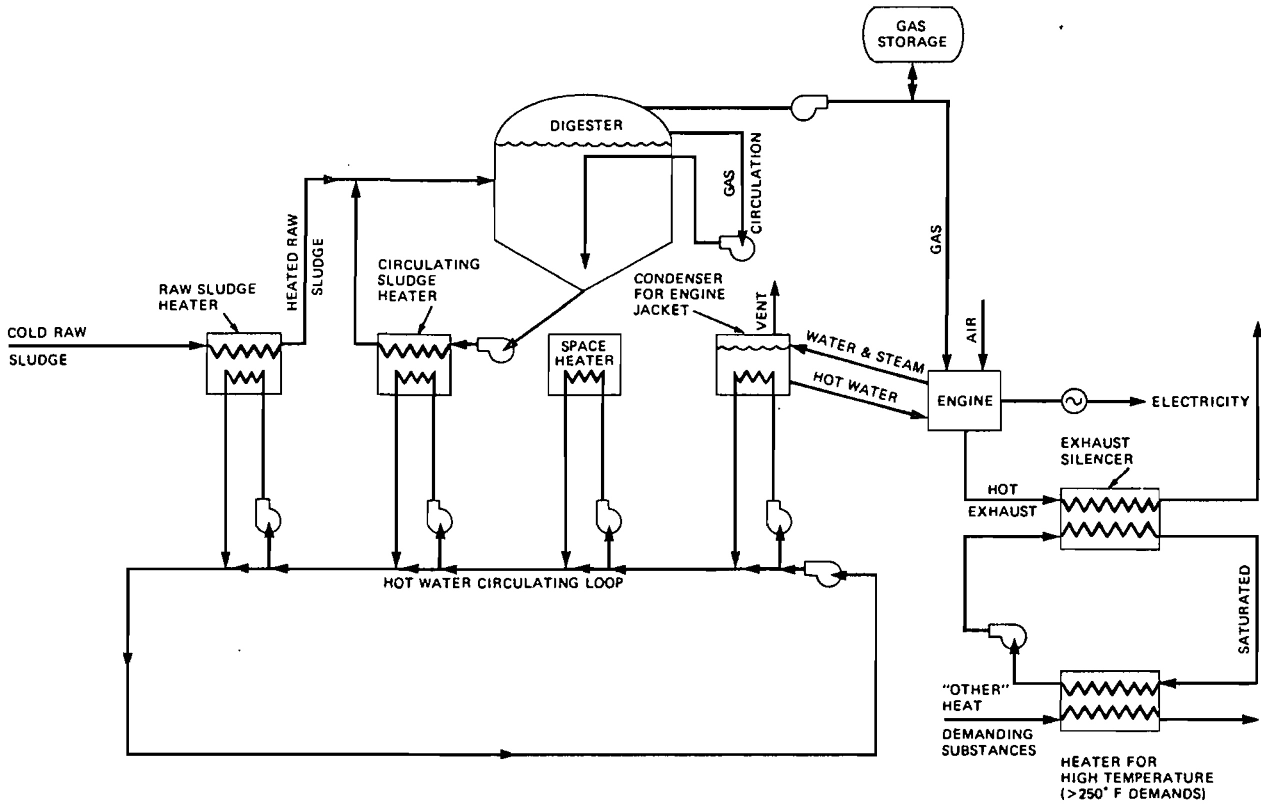


FIGURE 18-3

PROCESS SCHEMATIC FOR EXAMPLE OF ENERGY RECOVERY FROM DIGESTER GAS

The following data is estimated for the sludges and digester gas:

- Digester feed = 50,000 pounds per day (22,700 kg/d), dry weight basis. The feed solids are 75 percent volatile. The sludge is 4 percent solids by weight.

- Fifty percent of the volatile solids (VS) are destroyed during digestion.

- Raw sludge temperature is 60°F (16°C).

- Fifteen standard cubic feet (0.42 m^3) of digester gas are generated for every pound (0.454 kg) of VS destroyed.

- The gas composition is 66 percent CH_4, 28.3 percent CO_2, and 5.7 percent water (by volume). Other gases (H_2, H_2S, N_2) are present but not in sufficient quantities to affect the heat balance.

- 619 Btu (648 kJ) of heat are produced for every standard cubic foot (28.3 liters) of digester gas combusted.

The plant has the following energy requirements, which could be supplied in part or in whole by energy recovery from digester gas:

- 1,000 kW of electricity.
- Energy for raw sludge and digester heating (to be computed).
- 15 x 10^6 Btu per day (15.8 x GJ/d) for miscellaneous heating.

The following calculations are required:

- Determine the energy value of the digester gas.
- Determine if energy that can be recovered from the combusted gas is sufficient to satisfy the energy requirements listed above.
- Provide an energy flow diagram.
- Determine overall heat recovery efficiency.

To make comprehension of this example easier, the energy flow diagram is presented first (see Figure 18-4). The calculation is divided into four sections, as illustrated by the numbered "boxes" on the diagram. The magnitudes of the energy streamd shown on Figure 18-4 are developed in the following calculations:

<u>Determine the Energy Value of the Digester Gas (Box 1)</u>

1. Digester gas flow rate

$$= \left(\frac{50{,}000 \text{ lb solids}}{\text{day}}\right)\left(\frac{0.75 \text{ lb VS}}{\text{lb solids}}\right)\left(\frac{0.5 \text{ lb VS destroyed}}{\text{lb VS fed}}\right)$$

$$\times \left(\frac{15 \text{ scf}}{\text{lb VS destroyed}}\right) = 281{,}250 \text{ scfd } (8{,}157 \text{ m}^3\text{/d})$$

2. Energy value of the gas

$$= (281{,}250 \text{ scfd})\ (619 \text{ Btu/scf})$$

$$= 174 \times 10^6 \text{ Btu per day } (183.5 \text{ GJ/d})$$

Strictly speaking, the energy value of the digester gas should include not only the heat of combustion but the heat contents (enthalpy) of the reactants (air, fuel gas) calculated with respect to a selected base temperature. However, the heat contents of the reactants are very small compared to the heat of combustion and may be neglected with very little loss of accuracy and with a substantial reduction in amount of calculations necessary.

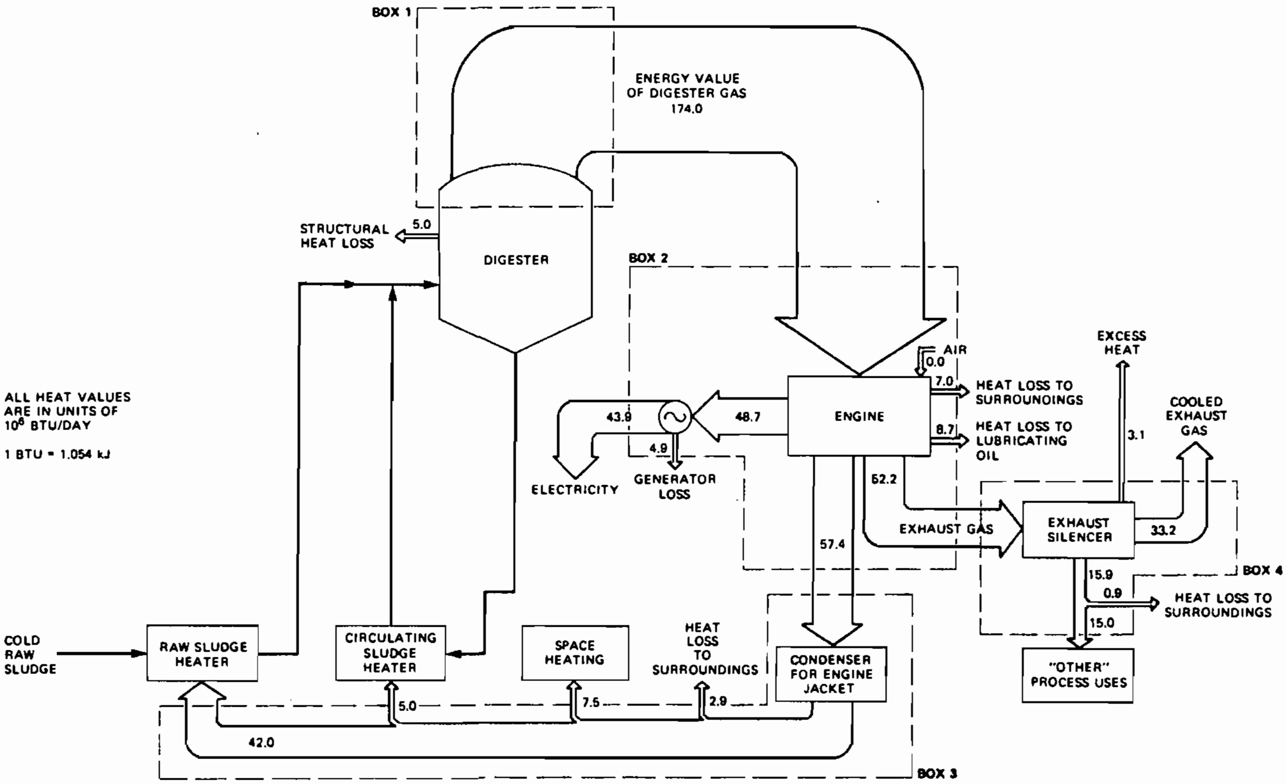


FIGURE 18-4

ENERGY FLOWSHEET FOR EXAMPLE OF ENERGY RECOVERY FROM DIGESTER GAS

Make a Heat Balance Around the Engine/Generator (Box 2)

1. Assume 28 percent of the energy value of the fuel gas is converted to work.

   Work produced

   $= 0.28\ (174 \times 10^6\ \text{Btu/day})$

   $= 48.7 \times 10^6$ Btu per day (51.3 GJ/d)

   Assume 90 percent of the work produced can be converted to electricity.

Electricity

$= 0.90\ (48.7 \times 10^6\ \text{Btu/day}) = 43.9 \times 10^6\ \text{Btu/day}\ (46.2\ \text{GJ/d})$

This is equivalent to 535 kW. Since average plant electrical demand is 1,000 kW, auxiliary power must be purchased.

2. Assume 33 percent of the energy value of the fuel gas is recovered in the engine jacket water.

   Energy recovered in the jacket water

   $= 0.33\ (174 \times 10^6\ \text{Btu/day})$

   $= 57.4 \times 10^6$ Btu per day (60.5 GJ/d)

3. Assume the radiant heat loss from the engine is 4 percent of the energy value of the fuel gas.

   Radiation loss

   $= 0.04\ (174 \times 10^6\ \text{Btu/day}) = 7.0 \times 10^6$ Btu per day (7.4 GJ/d)

4. Assume 5 percent of the energy value of the fuel gas is transferred to lubricating oil.

   Heat loss to oil

   $= 0.05\ (174 \times 10^6\ \text{Btu/day}) = 8.7 \times 10^6$ Btu per day (9.2 GJ/d)

5. Heat in the exhaust gas is the difference between the energy value of the fuel gas and the heat losses determined in items 1 through 5.

   Heat in the exhaust gas

   $= (174.0 - 48.7 - 57.4 - 7.0 - 8.7) \times 10^6$

   $= 52.2 \times 10^6$ Btu per day (55.0 GJ/d)

<u>Determine Whether Sufficient Heat can be Recovered From the Jacket Cooling Water to Satisfy Digester Heating Requirements (Box 3)</u>

1. Energy required to heat raw sludge

   $$= \left(\frac{50{,}000\ \text{lb solids/day}}{0.04\ \text{lb solids/lb sludge}}\right)\left(\frac{1.0\ \text{Btu}}{\text{lb sludge/°F}}\right)\ (95 - 60\text{°F})$$

   $= 42.0 \times 10^6$ Btu per day (44.3 GJ/d)

2. Determine energy required for circulating sludge heating. The purpose of the circulating sludge heater is to make up for any heat lost through the digester structure. Heat

loss calculations similar to these shown in Chapter 6, Section 6.2.6.2, indicates that for the digester of this example, losses are on the order of 5.0 x 10^6 Btu per day (5.3 GJ/d).

3. Determine heat loss in the hot water circulating loop. There is very little heat loss because this is a closed system (see Figure 18-3). The only losses will be through the insulation. It is roughly assumed that heat loss is 5 percent of the heat leaving the engine jacket.

   Heat loss

   $= 0.05\ (57.4 \times 10^6) = 2.9 \times 10^6$ Btu per day (3.0 GJ/d)

4. Total heat required for the digestion system

   $= (42.0 + 5.0 + 2.9) \times 10^6 = 49.9 \times 10^6$ Btu/day (52.6 GJ/d)

5. Heat available in the cooling water minus total heat required for the digestion system

   $= (57.4 - 49.9) \times 10^6 = 7.5 \times 10^6$ Btu/day (7.9 GJ/d)

   To keep the internal combution engine adequately cooled, this heat must be rejected in some manner. The heat may be rejected by venting steam from the condenser. In this case, however, the designer has chosen to use the extra heat for building heat, thereby utilizing rather than wasting it.

Determine if Sufficient Heat can be Recovered from the Hot Combustion Gases Leaving the Engine to Satisfy "Other" Process Requirements (Box 4)

From previous calculations, the heat available in the hot combustion gas is 52.2 x 10^6 Btu per day (55.0 GJ/d). Not all of this heat can be recovered for use. Practical limits exist to the degree to which the hot gas can be cooled. For example, the hot gases must be substantially warmer than the material being heated to carry out heat transfer in an exchanger of reasonable size and cost. In this example, however, the lower temperature limit is set at 350°F to preclude corrosion that might occur by condensation of water vapor on the inside of the exhaust stack walls. The designer must therefore determine if sufficient heat can be obtained to satisfy "other" process uses when the hot combustion gases are cooled to 350°F (117°C) in the exhaust silencer. Since the heat content of the hot combustion gases is known (52.2 x 10^6 Btu per day [55.0 GJ/d]), heat available can readily be calculated once the heat content of the gas at 350°F (117°C) has been determined. This is calculated as follows:

1. First calculate the volume of exhaust gas. Gas production can be predicted from stoichiometry:

$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O \qquad (18\text{-}1)$$

a. CO_2 present = CO_2 in digester gas plus CO_2 formed by combustion of methane.

1. From previous calculations, digester gas production is 281,250 standard cubic feet per day (8,157 m^3/d).

2. Unburned digester gas contains 28.3 percent CO_2 by volume.

   CO_2 associated with digester gas

   = 0.283 (281,250 scfd) = 79,593 scfd (2,252 m^3/d)

3. From Equation 18-1, one cubic foot of CO_2 is formed for every cubic foot of methane burned. Digester gas contains 66 percent methane by volume.

   CO_2 formed by combustion of methane

   = 0.66 (281,250 scfd) = 185,625 scfd (5,253 m^3/d)

4. Total CO_2 volume

   = 79,593 + 185,625 = 262,218 scfd (7,505 m^3/d)

b. CH_4 present: none, all converted to CO_2.

c. O_2 present: assume that air supplied exceeds theoretical requirements by 10 percent. Oxygen associated with this excess is not consumed. From Equation 18-1, theoretical oxygen requirements are two cubic feet of oxygen for every cubic foot of methane burned.

   Oxygen in excess of theoretical requirements

$$= (2)(0.10) \left(\frac{0.66 \text{ ft}^3 \text{ CH}_4}{\text{ft}^3 \text{ digester gas}} \right) (281,520 \text{ scfd})$$

   = 37,125 scfd (1,050 m^3/d)

d. N_2 present: N_2 associated with the air passes through the system unchanged in quantity.

N_2 flow

$$= 281{,}250 \text{ scfd} \left(\frac{0.66 \text{ ft}^3 \text{ CH}_4}{\text{ft}^3 \text{ digester gas}}\right)$$

$$\times \left(\frac{[1.10 \times 2] \text{ ft}^3 \text{ O}_2 \text{ delivered}}{\text{ft}^3 \text{ CH}_4}\right) \left(\frac{0.79 \text{ ft}^3 \text{ N}_2}{0.21 \text{ ft}^3 \text{ O}_2}\right)$$

$= 1{,}536{,}265$ scfd (43,476 m^3/d)

e. H_2O present = H_2O in digester gas plus that created by combustion of methane.

   1. Digester gas contains 5.7 percent H_2O by volume.

      H_2O in digester gas

      = 0.057 (281,250 scfd) = 16,031 scfd (453 m^3/d)

   2. From Equation 18-1, two cubic feet of H_2O are formed for every cubic foot of methane burned.

      H_2O formed

$$= 281{,}250 \text{ scfd} \left(\frac{0.66 \text{ ft}^3 \text{ CH}_4}{\text{ft}^3 \text{ digester gas}}\right) \left(\frac{2 \text{ ft}^3 \text{ H}_2\text{0}}{\text{ft}^3 \text{ CH}_4}\right)$$

      = 371,250 scfd (10,506 m^3/d)

   3. Total water = 16,031 + 371,250 = 387,281 scfd (10,960 m^3/d)

f. Total gas flow = 262,218 + 37,125 + 1,536,265 + 387,281 = 2,222,889 scfd (62,907 m^3/d)

2. Next calculate the heat content of the exhaust gas at 350°F (117°C). The heat content of the exhaust gas is the sum of the heat contents of its individual components. The heat content of any component at 350°F is the sum of the sensible and latent heats required to raise the component from an arbitrarily selected base temperature to 350°F (177°C). Mean heat capacity data for several gases is shown on Figure 18-5. The base temperature for Figure 18-5 is 77°F (25°C). The mean heat capacity of a gas over the range 77°F to 350°F is the value found at 350°F.

   a. Heat content of CO_2

$$= \left(\frac{9.5 \text{ Btu}}{\text{lb mole/°F}}\right) \left(\frac{\text{lb mole}}{359 \text{ scf}}\right) (350° - 77°\text{F}) \, (262{,}218 \text{ scfd})$$

      = 1.9×10^6 Btu per day (2.0 GJ/d)

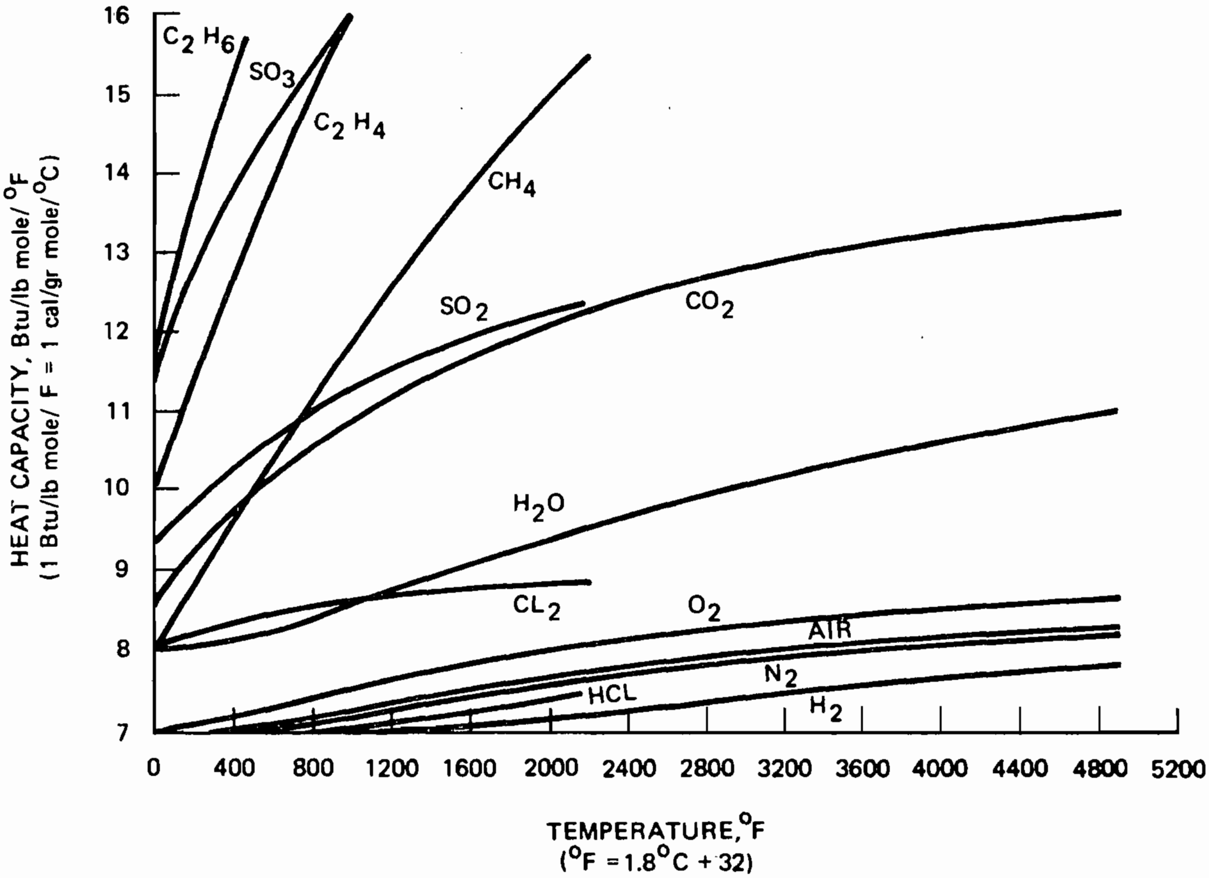


FIGURE 18-5

MEAN MOLAL HEAT CAPACITIES OF GASES AT CONSTANT PRESSURE (13) (MEAN VALUES FROM 77° to T°F)

b. Heat content of O_2

$$= \frac{7.2 \text{ Btu}}{\text{lb mole/°F}} \left(\frac{\text{lb mole}}{359 \text{ scf}}\right) (350°-77°\text{F}) (37{,}125 \text{ scfd})$$

$= 0.2 \times 10^6$ Btu per day (0.2 GJ/day)

c. Heat content of N_2

$$= \frac{6.8 \text{ Btu}}{\text{lb mole/°F}} \left(\frac{\text{lb mole}}{359 \text{ scf}}\right) (350°-77°\text{F}) (1{,}536{,}265 \text{ scfd})$$

$= 7.9 \times 10^6$ Btu/day (8.4 GJ/d)

d. Heat content of water. In this calculation, water is pictured as heated in a liquid state to the dew point, evaporated, and heated as a vapor to final temperature. Other approaches can also be used; these are described in thermochemistry textbooks.

1. Water comprises $\left(\frac{387,281 \text{ scfd } H_2O}{2,222,889 \text{ scfd total}}\right)$ 100

= 17.4 percent by volume of the exhaust gas. The dew point for gas containing 17.4 percent water by volume is 135°F (58°C).

2. Heat to raise liquid water to the dew point

$$=\left(\frac{387,281 \text{ scfd}}{359 \text{ scf/lb mole}}\right)\left(\frac{18 \text{ Btu}}{\text{lb mole/°F}}\right) (135-77°F)$$

$= 1.1 \times 10^6$ Btu per day (1.2 GJ/d)

3. Heat to vaporize water at the dew point

$$=\left(\frac{387,281 \text{ scfd}}{359 \text{ scf/lb mole}}\right)\left(\frac{18,720 \text{ Btu}}{\text{lb mole}}\right)$$

$= 20.2 \times 10^6$ Btu per day (1.19 GJ/d)

4. Heat to raise water vapor from the dew point to 350°F

$$=\left(\frac{8.2 \text{ Btu}}{\text{lb mole/°F}}\right)\left(\frac{387,281 \text{ scfd}}{359 \text{ scf/lb mole}}\right)(350°-135°F)$$

$= 1.9 \times 10^6$ Btu per day (2.0 GJ/d)

5. Total heat content of water = (1.1 + 20.2 + 1.9) $\times 10^6 = 23.2 \times 10^6$ Btu per day (24.5 GJ/d).

e. Heat content of exhaust gas at 350°F (117°C)

$= (1.9 + 0.2 + 7.9 + 23.2) \times 10^6 = 33.2 \times 10^6$ Btu per day (35.0 GJ/d)

3. Energy available to satisfy "other" requirements

$= (52.2 - 33.2) \times 10^6 = 19.0 \times 10^6$ Btu per day (20.0 GJ/d).

4. Determine heat loss in steam/condensate circulating loop. There will be very little heat loss because this is a closed system (see Figure 18-3). Assume losses are roughly 5 percent of the heat transferred from the exhaust silencer.

Heat loss

$= 0.05\ (19.0 \times 10^6$ Btu/day$) = 0.9 \times 10^6$ Btu per day (1.0 GJ/d)

5. Heat available for "other" process demands

$= (19.0 - 0.9) \times 10^6 = 18.1 \times 10^6$ Btu per day (19.1 GJ/d)

The available heat is sufficient to satisfy the demands.

Determine Efficiency of the Energy Recovery System

There are several methods for evaluating the efficiency of the energy recovery system. One approach is to compute the useful heat and work recovered as a percentage of the energy input.

1. Useful heat and work:

   a. Electrical energy = 43.9×10^6 Btu per day (46.2 GJ/d).

   b. Raw sludge heating = 42.0×10^6 Btu per day (44.2 GJ/d).

   c. Circulating sludge heating = 5.0×10^6 Btu per day (5.3 GJ/d).

   d. "Other" process heating = 15.0×10^6 Btu per day (15.8 GJ/d).

   e. Space heating = 7.5×10^6 Btu per day (7.9 GJ/d).

2. Energy input from digester gas = 174×10^6 Btu/day (183.4 GJ/d).

3. Computed efficiency $= \left(\frac{43.9 + 42.0 + 5.0 + 15.0 + 7.5}{174.0}\right) 100$

   = 65 percent

This activated sludge plant is not able to supply all its energy needs using digester gas (insufficient electrical energy). Generally, digester gas is sufficient to satisfy the energy requirements of most primary treatment plants but not activated sludge plants, since aeration blowers generally have high electrical demands.

18.3.3.2 Recovery of Energy from Incinerator Flue Gas

A wastewater treatment plant of 125 MGD (5.48 m^3/s) capacity uses incineration to process 190,000 pounds per day (82,260 kg/d) of combined primary and waste-activated sludges. Heat is recovered from the flue gases as electricity and steam in a steam turbine power cycle, using a waste heat boiler. The designer's objective is to maximize work production (electricity and direct power).

Steam is not used for space or process heating. A flow sheet of the process is shown on Figure 18-6. The following additional information is provided:

- The flue gas heat content is 606 x 10^6 Btu per day (639 GJ/d), based on an assumed gas composition and gas temperature, using methods described in the example of Section 18.3.3.1. Similarly, the heat content of the stack gas is 250 x 10^6 Btu per day (263 GJ/d). Heat losses from the boiler structure are 18 x 10^6 Btu per day (19 GJ/d).

- The boiler produces superheated steam at 615 psia (4,261 kN/m^2) and 825°F (441°C), which is then fed to a steam turbine, called the "main turbine."

- Steam is withdrawn from the turbine at three points. First, 50,000 pounds per day (22,700 kg/d) are withdrawn at 165 psia (1,143 kN/m^2) and applied to drives for pumps and compressors. This is called "process" steam. Second, a quantity (to be computed) is withdrawn and used for preheating of the boiler feedwater. This is called "preheat" steam. The remaining steam, which is "primary" steam, is exhausted at 1 psia (6.9 kN/m^2). The efficiency of the turbine (actual to theoretical work output) is assumed to be 76 percent.

- Exhausted "process" steam from the pump and compressor drives is condensed at 1 psia (6.9 kN/m^2), combined with the "primary" condensate, and sent to the feedwater heater. "Primary" and "process" condensates are assumed to be saturated water at the exhaust pressure (1 psia [6.9 kN/m^2]).

- "Preheat" steam is mixed with "primary" and "process" condensates in the feedwater heater to produce a saturated feedwater at 300°F (149°C).

- The feedwater is pressurized to 615 psia (4,261 kN/m^2), and returned to the boiler.

The following information is desired:

- Steam and condensate flow rates.

- Electric power generated.

- Pump and compressor work produced by the "process" steam.

- Energy recovery efficiency.

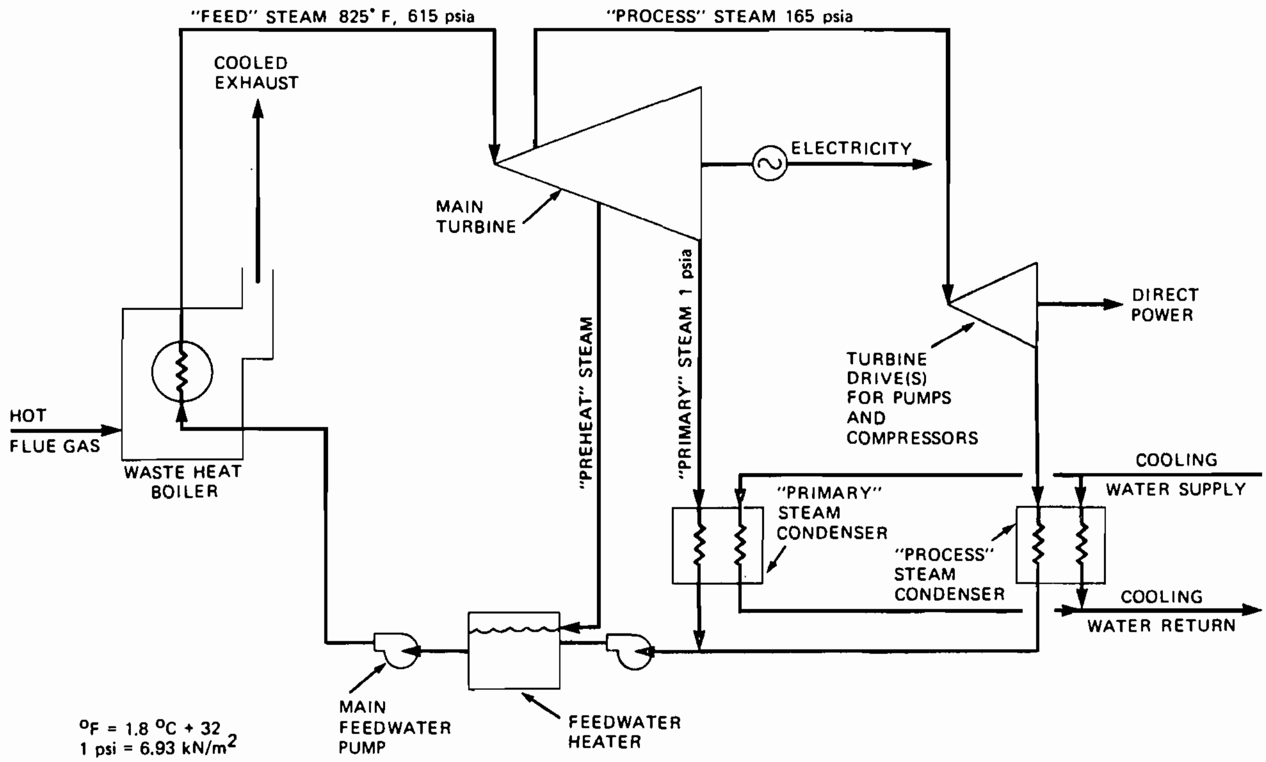


FIGURE 18-6

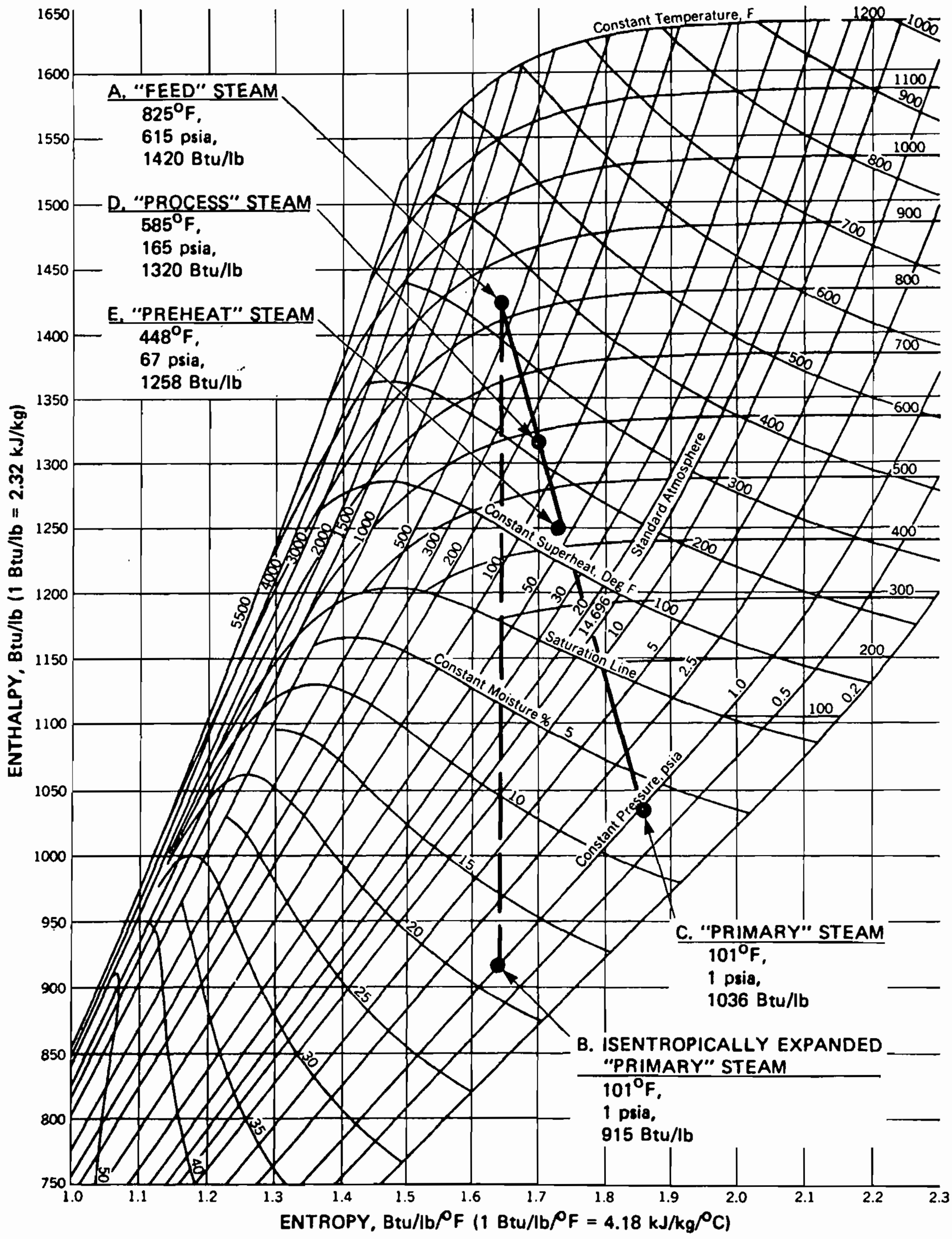
FLOWSHEET FOR EXAMPLE OF ENERGY RECOVERY FROM INCINERATOR FLUE GAS

Analyze the Operation of the Main Turbine

Turbine operations can be analyzed using a Mollier diagram. A Mollier diagram is a plot of enthalpy versus entropy for specific two-phase systems which display lines for constant pressure, temperature, percent moisture, and superheat, among others. Figure 18-7 is a Mollier diagram for the steam-water system. Note that the terms "enthalpy" and "heat content" are equivalent and will be used interchangeably in the following discussion.

The "state line" concept is used for turbine analysis. The state line describes the steam condition at every point within the turbine. The line can be drawn once any two points describing steam conditions in the turbine are established. For this example, the turbine feed steam and the "primary" steam exhaust conditions will be determined, then plotted on the Mollier diagram of Figure 18-7.

1. The turbine feed steam condition (615 psia [4,261 kN/m^2]), 825°F [441°C]) is plotted as point A on the Mollier Diagram (see Figure 18-7). Figure 18-7 is not detailed, so that data points and state lines can be clearly seen. More detailed diagrams are available (14,15).



MOLLIER CHART COURTESY OF BABCOCK AND WILCOX

FIGURE 18-7

STEAM CONDITIONS FOR EXAMPLE OF RECOVERY OF ENERGY FROM INCINERATOR OF FLUE GAS

2. Determine the "primary" steam exhaust condition. If the turbine were 100 percent efficient, the steam would expand isentropically, that is, the entropy of the steam at any point in the turbine would be identical to the entropy of the feed steam and the state line would be vertical (dashed line in the Mollier Diagram). The "primary" exhaust steam condition would be located at the intersection of the vertical state line and the exhaust pressure (1 psia [6.9 kN/m^2]), at point B. Enthalpy of the steam at point B is 915 Btu per pound (2.13 MJ/kg).

However, turbines are not 100 percent efficient since isentropic expansion is never attained. The energy which can be extracted from the steam in practical applications is only a percentage of that which can be extracted by isentropic expansion. This is expressed by Equation 18-2.

$$\text{Turbine efficiency} = \left(\frac{H_1 - H_{2p}}{H_1 - H_{2i}} \right) 100 \qquad (18\text{-}2)$$

Where:

H_1 = enthalpy of inlet steam, Btu/lb.

H_{2p} = enthalpy of steam exhausted from a practical turbine, Btu/lb.

H_{2i} = enthalpy of steam exhausted from an ideal turbine, Btu/lb.

The efficiency described by Equation 18-2 is the actual work output relative to theoretical output--it is less than 100 percent because of irreversibility in the expansion of gases in the turbine. Mechanical losses in the turbine and generator are not included.

For the practical turbine, enthalpy of the exhausted steam (H_{2p}) can be computed from Equation 18-2. For the turbine of the example (76 percent efficient).

$$H_{2p} = \left(1{,}420 - \frac{76}{100} \right) (1{,}420 - 915) \qquad (18\text{-}2)$$

= 1,036 Btu per pound (2,405 kJ/kg)

The "primary" exhaust steam condition for the practical turbine is located at point C, the intersection of the exhaust pressure (1 psia [6.9 kN/m^2]) and enthalpy value 1,036 Btu per pound (2,405 kJ/kg). The state line for the practical turbine is then drawn between points A and C.

3. The "process" steam condition must lie on the state line. It is located at the intersection of the state line and the "process" steam operating pressure (165 psia [1,145 kN/m^2]), at point D.

4. As with the "process" steam, the "preheat" steam condition can be determined once its pressure is known. Pressure can be determined by the following reasoning:

   a. "Preheat" steam pressure is essentially equal to the pressure in the feedwater heater (pressure drop through the lines connecting the turbine and feedwater heater is assumed negligible).

   b. The feedwater heater is a direct contact device. Sufficient "preheat" steam is mixed with "primary" and "process" condensates to form a two-phase system at 300°F (149°C). Thus the feedwater heater system is a saturated system.

   c. The feedwater heater pressure, therefore is the pressure of saturated steam at 300°F (149°C), which is 67 psia (464 kN/m^2).

The "preheat" steam condition is located at the intersection of the state line and the 67 psia (464 kN/m^2) constant pressure line (point E). Enthalpy of the "preheat" steam is 1,258 Btu per pound (2,921 kJ/kg).

<u>Determine Steam and Condensate Flows</u>

1. Circulating steam rate is computed by a heat balance around the boiler.

   a. Enthalpy of the water entering the boiler is assumed equal to that leaving the feedwater heater; that is, pumping affects the enthalpy value negligibly. This is a justifiable assumption for the pumping of liquids. From steam tables (14,15), the enthalpy of saturated water at 300°F (149°C) is 270 Btu per pound (627 kJ/kg).

   b. By previous calculations, enthalpy of superheated steam leaving the boiler is 1,420 Btu per pound (3,297 kJ/kg).

   c. From the problem statement, heat absorbed in the boiler

      $= 338 \times 10^6$ Btu per day (356 GJ/d).

   d. Therefore steam circulating rate

      $$= \frac{338 \times 10^6 \text{ Btu/day}}{(1{,}420 - 270) \text{ Btu/lb}}$$

      = 293,900 pounds per day (133,400 kg/d).

2. "Process," "primary," and "preheat" steam rates are determined by mass and heat balances around the feedwater heater. Let X and Y be the flow rates for "primary" and "preheat" steam, respectively. Equation 18-3 is the mass balance around the feedwater heater.

$$293,900 = X + Y + 50,000 \qquad (18\text{-}3)$$

Equation 18-4 is the heat balance for the feedwater heater.

$$293,900\ (270) = 70\ X + 1258\ Y + 70\ (50,000) \qquad (18\text{-}4)$$

Enthalpies of the "process" and "primary" condensates (70 Btu per pound or 162 kJ/kg) are for saturated water at 1 psia (6.93 kN/m^2). Solving Equations 18-3 and 18-4 simultaneously, "primary" and "preheat" steam rates are 194,626 pounds per day (88,350 kg/d) and 49,274 pounds per day (22,370 kg/d), respectively.

At this point, construction of an energy flowsheet should be initiated (see Figure 18-8). This allows the designer to see all pertinent data on one sheet and gives a feeling for the magnitude of the various energy flows.

Determine Electrical Energy Generated

Work produced is the sum of the total enthalpy changes across the turbogenerator:

1. Work from "process" steam

   = 50,000 lb/day (1,420 - 1,320 Btu/lb)

   = 4.90×10^6 Btu per day (5.16 GJ/d)

2. Work from "preheat" steam

   = 49,274 lb/day (1,420 - 1,258 Btu/lb)

   = 7.98×10^6 Btu per day (8.41 GJ/d)

3. Work from "primary" steam

   = 194,620 lb/day (1,420 - 1,036 Btu/lb)

   = 74.73×10^6 Btu per day (78.77 GJ/d)

4. Total work produced

   = $(4.90 + 7.98 + 74.73) \times 10^6$

   = 87×10^6 Btu per day (92.3 GJ/d)

5. Assume mechanical efficiency of the turbine/generator combination is 95 percent.

Net electricity produced

= 83.2 x 10^6 Btu per day (87.7 GJ/d)

This is equivalent to 1,015 kW of electricity.

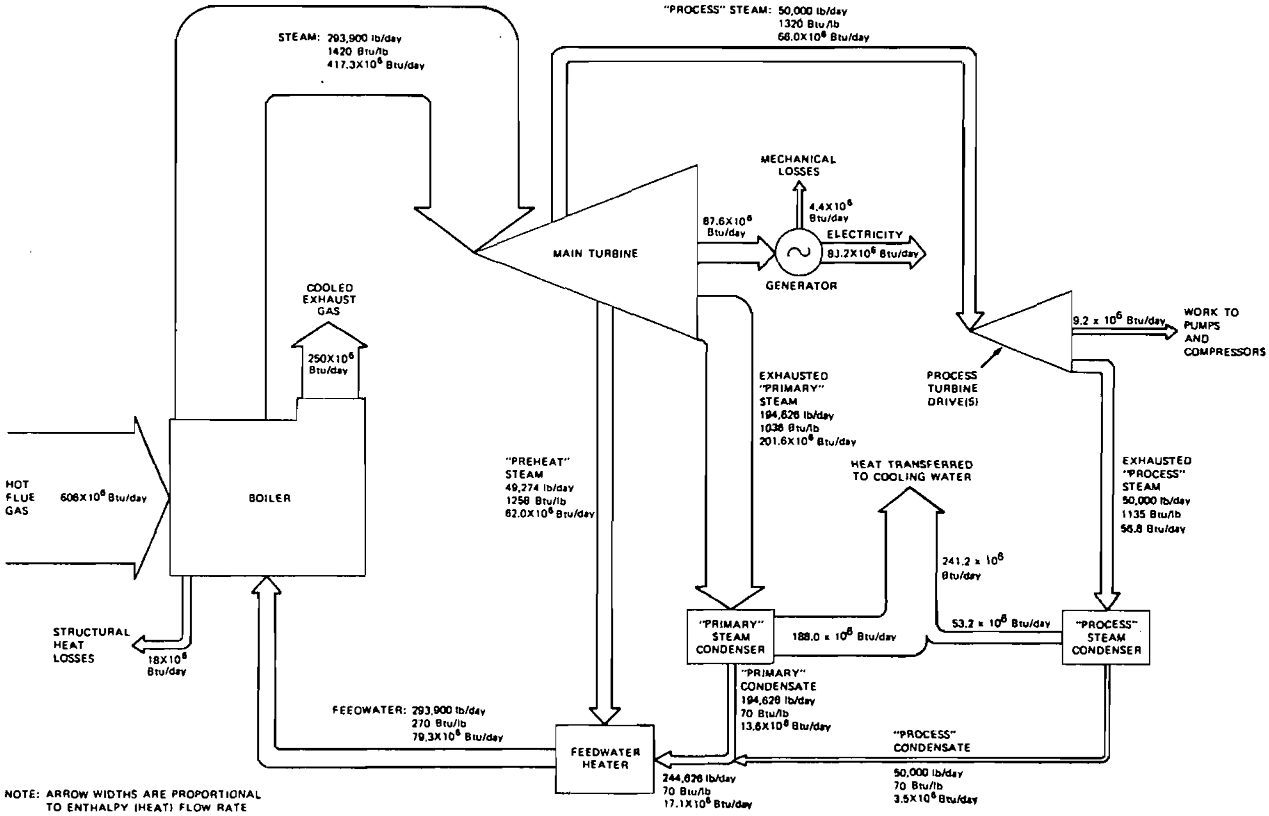


FIGURE 18-8

ENERGY FLOWSHEET FOR EXAMPLE OF ENERGY RECOVERY FROM INCINERATOR FLUE GAS

Determine Work Produced in the "Process" Steam Cycle

Enthalpy of the "process" steam is 1,320 Btu per pound (3,065 kJ/kg). Enthalpy of the exhausted steam can be determined using the same technique employed for analysis of the main turbine. Isentropic expansion of process steam (initially at point D, Figure 18-5) to 1 psia (6.9 kN/m^2) produces an exhaust gas of enthalpy 950 Btu per pound (2,206 kJ/kg). Assume process turbines are 50 percent efficient.

1. Enthalpy of exhausted steam

$$= 1{,}320 - \frac{50}{100}\ (1{,}320 - 950)$$

$$= 1{,}135 \text{ Btu per pound } (2{,}635 \text{ kJ/kg})$$

2. Work produced

$= (50{,}000 \text{ lb/day}) (1{,}320 - 1{,}135 \text{ Btu/lb})$

$= 9.2 \times 10^6$ Btu per day (9.7 GJ/d)

3. Assuming mechanical losses of 5 percent, work delivered

$= (9.2 \times 10^6$ Btu per day$) (0.95) = 8.8 \times 10^6$ Btu per day (9.3 GJ/d)

This is equivalent to 107 kW.

Determine Energy Recovery Efficiency

Assume heat removed in the condensers is not used beneficially, but discharged to the atmosphere via cooling towers.

1. Energy recovery, based on heat transferred to steam

$$= \left(\frac{(83.2 \times 10^6 + 8.8 \times 10^6)}{338 \times 10^6}\right) 100 = 27.2 \text{ percent}$$

2. Energy recovery, based on heat in the incinerator flue gas

$$= \left(\frac{(83.2 \times 10^6 + 8.8 \times 10^6)}{606 \times 10^6}\right) 100 = 15.2 \text{ percent}$$

Compare the recovery of this example (15 percent) against the recovery of energy from digester gas (65 percent), as illustrated by the example in Section 18.3.3.1. Greater efficiency was obtained by the internal combustion system because:

1. No heat was lost prior to the work producing step. In contrast, fully 41 percent of the heat available in the incinerator flue gas was rejected in the waste heat recovery boiler before any useful work could be extracted (see Figure 18-8).

2. With the internal combustion system, waste heat from the work producing step was used benefically (for digester and space heating). In contrast, waste heat from the steam condensers was not used benefically but rejected to the environment. It is difficult to use this heat since it is available at only a very low temperature (102°F [39°C]).

These two examples demonstrate the general rule that energy recovery schemes whose sole effect is the production of work are not likely to be efficient.

It should not be inferred from the examples that energy recovery from flue gases must necessarily be inefficient. In this example, the objective of the designer in recoverying heat from incinerator flue gas was to maximize work. Had he chosen to exhaust steam from either of the turbines at higher pressures and used it for heating purposes or had he used "process" steam solely for heating, some work would have been sacrificed but thermal efficiency could have been substantially improved. The point to be made here is that the designer should examine a wide range of options when analyzing energy recovery operations.

18.3.4 Other Factors Affecting Heat Recovery

The previous calculations point out some of the factors a designer must consider in conducting a heat recovery analysis. They are by no means the only factors; much more detail must be added. For example:

- The full range of conditions expected at the plant must be evaluated, not just average conditions. Energy supply and energy demand schedules must be established. Heat recovery equipment must be sized to handle peak demands. Storage requirements for primary and backup fuels must be determined.

- A source of backup energy must be available in the event that plant energy recovery systems experience partial or total failure.

- The physical and chemical nature of flue gases generated must be considered (for example, temperature, corrosiveness, particulate concentration, and moisture content).

- The equipment must be designed to withstand the conditions to which it will be subjected. Appropriate materials of construction must be used.

- Any solid, liquid or gaseous residual from the heat recovery operation must be collected and disposed of in a safe and environmentally sound manner.

- Chemical and physical treatments for makeup and circulating water or steam must be established.

- Manpower to operate the heat recovery system must be determined. Specialists may be required for certain equipment, for example, stationary engineers for high pressure boilers and engine specialists for internal combustion engines.

- Control strategies must be decided upon, and instrumentation to carry them out must be provided.