P 256 396 198

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Sent to Mr. Randy Thompson
~~Environmental Dept.~~
Street and No. FL Crushed Stone Co.
P.O. Box 490300
P.O., State and ZIP Code Leesburg, FL 34749-0300

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Special Delivery Fee	
Restricted Delivery Fee	
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Postmark or Date
mailed: 9/25/90
Permit Amendments to
AC 27-118674
PSD-FL-091

PS Form 3800, June 1985

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Mr. Randy Thompson
Environ. Dept.
Florida Crushed Stone Company
P.O. BOx 490300
Leesburg, FL 34749-0300

4. Article Number
P 256 396 198

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PS Form 3811, Mar. 1988 ★ U.S.G.P.O. 1988-212-865 DOMESTIC RETURN RECEIPT

File Copy

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

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
NOTICE OF PERMIT AMENDMENT

Mr. Randy Thompson
Environmental Department
Florida Crushed Stone Company
Post Office Box 490300
Leesburg, Florida 34749-0300

September 25, 1990

Enclosed is an amendment for construction permits Nos. AC 27-118674 and PSD-FL-091 for Florida Crushed Stone Company to conduct performance tests on the cement kiln while using wastewater treatment sediment from Jacksonville's Northside Generating Station as a raw feed material to the dry process Portland cement plant at the existing facility located approximately 3.5 miles NW of Brooksville, Hernando County, Florida. This amendment is issued pursuant to Section 403, Florida Statutes.

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

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

James K. Pennington
for C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

Copy furnished to:
B. Thomas, SW District
J. Koogler, P.E., K&A
C. Shaver, NPS
J. Harper, EPA
K. Liles, HCC
Reading File
Bruce Mitchell } 9-25-90 RAR

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this NOTICE OF PERMIT AMENDMENT and all copies were mailed before the close of buisness on 9-25-90.

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.

Helen Tucker
Clerk

9-25-90
Date

Final Determination

The construction permit amendment request has been reviewed by the Department. Public Notice of the Department's Intent to Issue was published in The Tampa Tribune on August 31, 1990. The letter amendment and attachments were available for public inspection at the DER's Southwest District and Bureau of Air Regulation (Bureau) offices.

A comment package was received on the proposed action on September 12, 1990, from Dr. John Koogler, Koogler & Associates, on behalf of Florida Crushed Stone (FCS). The Department's responses to the comments will be addressed in the following:

1. The Department will not consider the request to allow FCS to utilize similar wastewater treatment sediment from other utilities until the pre- and post-tests for the JEA Northside Generating Station have been evaluated.

2. The Department is in agreement with the request to allow FCS to analyze a sample of the wastewater treatment sediment from each delivery vehicle for chlorinated organic compounds using test Method 608 (Organochlorine Pesticides and PCBs) and for polynuclear aromatic hydrocarbons using test Method 610 (Polynuclear Aromatic Hydrocarbons) in lieu of conducting emission measurements for dioxins, furans and polynuclear aromatic hydrocarbons. However, if these compounds are detected from lab analyses, a mass emissions test(s) will be required. Therefore, the following will be changed in No. 4 of the prermit amendment:

From:

Pollutant/Pollutant Category	Test Method
o PCDDs and PCDFs	EPA Method 23
o PAHs (polynuclear aromatic Hydrocarbons)	Modified Method 5

To:

Pollutant/Pollutant Category	**Test Method**
o PCDDs and PCDFs	**EPA Method 608 or** **EPA Method 23**
o PAHs (polynuclear aromatic Hydrocarbons)	**Test Method 610 or** **Modified Method 5**

3. The Department is in agreement with the request to allow the use of the Volatile Organic Sampling Train (VOST) method for making measurements for both benzene and volatile organic compounds. Therefore, the following will be changed in No. 4 of the permit amendment:

From:

Pollutant/Pollutant Category	Test Method
o Benzene	EPA Method 18
o Volatile Organic Compounds	EPA Method 25A

To:	Pollutant/Pollutant Category	Test Method
	o Benzene	VOST
	o Volatile Organic Compounds	VOST

4. The Department is in agreement with the request to allow the use of the EPA multi-metals train instead of EPA Reference Method 5 for measuring the emission rates of metals. Therefore, the following will be changed in No. 4 of the permit amendment:

From:	Pollutant/Pollutant Category	Test Method
	o Metals	EPA Method 5

To:	Pollutant/Pollutant Category	Test Method
	o Metals	EPA Multi-Metals Train

A letter was received from Ms. Jewell A. Harper, Chief of the Air Enforcement Branch, acknowledging receipt of the Notice of Intent to Issue a permit amendment. There were no substantive comments contained in the letter.

Attachments to be Incorporated:

7. Ms. Jewell A. Harper's letter received September 4, 1990.
8. Dr. John B. Koogler's letter received September 12, 1990.

The Bureau will incorporate the changes into the appropriate area of the letter amendment, as reflected in the final determination. It is recommended that the letter amendment be issued as drafted, with the above revisions and attachments incorporated. The letter amendment shall be attached to construciton permits Nos. AC 27-118674 and PSD-FL-091, and shall become a part of the permits.

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

September 24, 1990

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Randy Thompson
Environmental Department
Florida Crushed Stone Company
Post Office Box 490300
Leesburg, Florida 34749-0300

Dear Mr. Thompson:

Re: Amendment to Construction Permit No. AC 27-118674 and PSD Permit No. PSD-FL-091 to Conduct Performance Test(s) on the Cement Kiln While Processing Wastewater Treatment Sediment from JEA's Northside Generating Station.

The Department has reviewed the request that you provided on June 26, 1990. We have also considered the Department's legal authority to allow you to conduct the requested performance test(s). Paragraph 403.061(15), Florida Statutes (F.S.) authorizes the Department to consult with any person proposing to construct, install, or otherwise acquire a pollution control device or system concerning the efficacy of such device or system, or the pollution problem which may be related to the source, device, or system. Paragraph 403.061(16), F.S., authorizes the Department to encourage voluntary cooperation by persons in order to achieve the purposes of the state environmental control act. Paragraph 403.061(18), F.S., authorizes the Department to encourage and conduct studies, investigations, and research relating to the causes and control of pollution. Florida Administrative Code (F.A.C.) Rule 17-2.250(5) authorizes the Department to consider variations in industrial equipment and make allowances for excess emissions that provide practical regulatory controls consistent with the public interest.

In accordance with the provisions of Paragraphs 403.061(15), (16), and (18), F.S., and F.A.C. Rule 17-2.250(5), you are hereby authorized to performance test the cement kiln while processing wastewater treatment sediment from the Jacksonville Electric Authority's (JEA) Northside Generating Station up to a maximum of 1.4 percent of the total raw material feed rate on a dry weight basis (equivalent to 1.8 tons per hour). The existing cement kiln was permitted under construction permit No. AC 27-118674 and

PSD permit No. PSD-FL-091. Even though the claim is that there will be no actual pollutant emission increase, which will have to be verified, the source is not permitted to process wastewater treatment sediment in accordance with the referenced permits. The purpose of this activity is to obtain the data necessary to determine whether the cement kiln is capable of accommodating/processing wastewater treatment sediment from JEA's Northside Generating Station under the cement kiln's present physical configuration and what regulations the cement kiln will be subject to if it is to be permitted to process wastewater treatment sediment from JEA's Northside Generating Station.

The performance test(s) shall be subject to the following conditions:

1. The permittee shall notify, in writing, the Department's Southwest District and Bureau of Air Regulation (BAR) offices at least 15 days prior to commencement of the performance test(s). A written report shall be submitted to these offices within 45 days upon completion of the last test run.

2. Prior to or after conducting tests while processing wastewater treatment sediment from JEA's Northside Generating Station (Post-tests), performance tests (Pre-tests) shall be conducted while not processing wastewater treatment sediment for all of the identified pollutants and pollutant categories in order to establish background levels, unless performance tests have already been conducted and the results can be provided to the Department. These tests, "Pre-tests", shall be compared to the post-tests to determine if:

    a) PSD review is required, which includes a construction permit application package and appropriate processing fee; or,

    b) the current construction and PSD permits can be amended to allow the processing of wastewater treatment sediment from JEA's Northside Generating Station.

3. All post-test results shall be compared to "actual emissions" for PSD review purposes (see Region IV, U.S. EPA's letter dated April 4, 1990).

4. The contents of Dr. John B. Koogler's letter received June 26, 1990, are adopted by reference, with exceptions to paragraph 3 on page 3, of which the following pollutants/pollutant categories will also be tested for:

Pollutant/Pollutant Category	Test Method
o Metals (continued)	EPA Multi-Metals Train
Titanium	
Aluminum	
Magnesium	
Silver	
Cobalt	
Iron	
o PCDDs and PCDFs	Test Method 608 or EPA Method 23
o PAHs (polynuclear aromatic hydrocarbons)	Test Method 610 or Modified Method 5
o Benzene	VOST
o Mercury	EPA Method 101 or 101A
o Volatile Organic Compounds	VOST

5. An ultimate analysis of the particulate filter(s) shall be required. Also, an ultimate analysis of a representative sample(s) from the baghouse hopper shall be required.

6. This authorized performance test(s) shall not result in the release of objectionable odors pursuant to F.A.C. Rule 17-2.620(2).

7. Performance testing shall immediately cease upon the occurrence of a valid environmental complaint by a citizen or other party, or a nuisance or danger to public health or welfare. Performance testing shall not resume until appropriate measures to correct the problem have been implemented.

8. The performance test(s) shall be conducted under the direct supervision and responsible charge of a professional engineer registered in Florida.

9. This Department action is just to authorize the performance tests on the cement kiln while processing wastewater treatment sediment from JEA's Northside Generating Station. The processing of any wastewater treatment sediment after the last performance test run is completed will be deemed a violation of the current permits, AC 27-118674 and PSD-FL-091.

10. Complete documentation of any processing of wastewater treatment sediment from JEA's Northside Generating Station in the cement kiln shall be required (i.e., testing results; materials processed, by weight (both wet and dry); etc.).

11. The Department shall be notified in writing on the date of the last test run completion.

12. From the initial date of processing the wastewater treatment sediment from JEA's Northside Generating Station, which shall be documented in writing to the Department, the permittee shall be limited to 8 days to process the wastewater treatment sediment in the cement kiln. If additional time is needed, the permittee shall provide the Department with documentation of the progress accomplished to date and shall identify what is left to be done to complete the performance tests.

13. Based on conversation with Mr. Paul Reinermann, with the U.S. EPA, Region IV, the cement kiln will be subject to 40 CFR 61, Subpart E, National Emission Standard for Mercury, if wastewater treatment sediment is incinerated or dried in the source. Emissions to the atmosphere from sludge incineration plants, sludge drying plants, or a combination of these that process wastewater treatment plant sludges shall not exceed 3200 grams of mercury per 24-hour period.

14. Stack sampling for mercury shall be in accordance with 40 CFR 61.53.

15. A representative sludge sample shall be taken and analyzed from each delivery vehicle (i.e., rail tank car, etc.) prior to delivery. The sludge sampling shall be in accordance with 40 CFR 61.54. The sampling results shall be completed and available prior to processing and testing.

16. The contents of Mr. Daniel S. Davis' request document received May 21, 1990, are adopted by reference, with exceptions to Section 3.2, Sludge Analysis, of which the following pollutant(s) will also be required to be analyzed for:

    o Mercury
    o Aluminum
    o Silver
    o Magnesium
    o Titanium
    o Cobalt
    o Iron
    o Sulfur

17. The maximum sludge utilization rate shall not exceed 2.1 wet tons/hour (1.8 TPH dry), 50 wet tons per day, and shall not exceed a total of 400 wet tons for the performance testing period.

18. Attachments (See Attachment Section) are incorporated.

The Department has relied on the information referenced in the attachments and conversations with representatives of the FCSC, U.S. EPA-Region IV, and Department of Interior's National Park Service in authorizing this permit letter amendment to the construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091.

A copy of this letter and its attachments shall be attached to the construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091.

Sincerely,

Dale Twachtmann
Secretary

DT/plm

Attachments

c: B. Thomas, SW Dist.
J. Koogler, P.E., K&A
C. Shaver, NPS-Air
J. Harper, EPA
K. Liles, HCC

Attachment Section

1. Mr. Daniel S. Davis' submittal received May 21, 1990.
2. Dr. John B. Koogler's letter received June 26, 1990.
3. Mr. C. H. Fancy's letters dated June 27, 1990.
4. Table 147: Typical Fuel Oil Ash Analysis; AP-40, page 539; 2nd ed.; May, 1973.
5. 40 CFR 61 (July, 1989 version).
6. Intent to Issue Package dated August 22, 1990.
7. Ms. Jewell A. Harper's letter received September 4, 1990.
8. Dr. John B. Koogler's letter received September 12, 1990.

For Routing To Other Than The Addressee

To: Location:

To: Location:

To: Location:

From: Date:

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

TO: Dale Twachtmann

FROM: Steve Smallwood

DATE: September 24, 1990

SUBJ: Amendment to Construction Permits: AC 27-118674
PSD-FL-091
Cement Kiln
Florida Crushed Stone Company

Attached for your approval and signature is a letter prepared by the Bureau of Air Regulation that will amend the above referenced construction permits. The amendment will allow the company to conduct emissions tests while using a wastewater treatment sediment from Jacksonville's Northside Generating Station as a raw feed material to the dry process Portland cement plant. The existing facility is located approximately 3.5 miles NW of Brooksville, Hernando County, Florida.

The amendment is not controversial. I recommend your approval and signature.

SS/BM/plm

Attachment

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: 9-24-90

TO:

NAME: John Koogler
AGENCY:

TELEPHONE: 904/377-7158

OF PAGES (INCLUDE COVER SHEET): 7

FROM:

NAME: Bruce Mitchell

AGENCY: DER - BAR

IF ANY PAGES ARE NOT CLEARLY RECEIVED, PLEASE CALL IMMEDIATELY. PHONE NO. 488-1344

SENDER'S NAME: Patty Adams

COMMENTS:

```
MESSAGE CONFIRM                         SEP-24-'90  MON  15:58

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                                TEL  NO:  904-922-6979
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Check Sheet

Company Name: Florida Crushed Stone, Wastewater Treatment Sludge amendment
Permit Number:
PSD Number:
County:
Permit Engineer:
Others involved:

related to
AC27-118674
PSD-FL-091
Amendment

Application:
- ☑ Initial ~~Application~~ request
- ☑ Incompleteness Letters
- ☑ Responses
- ☐ Final Application (if applicable)
- ☐ Waiver of Department Action
- ☐ Department Response
- ☐ Other

Intent:
- ☑ Intent to Issue
- ☑ Notice to Public
- ☐ Technical Evaluation
- ☐ BACT Determination
- ☑ Unsigned Permit
- ☐ Correspondence with:
  - ☑ EPA
  - ☐ Park Services
  - ☐ County
  - ☑ Other
- ☑ Proof of Publication
- ☐ Petitions - (Related to extensions, hearings, etc.)
- ☐ Other

Final Determination:
- ☑ Final Determination
- ☑ Signed Permit
- ☐ BACT Determination
- ☐ Other

Post Permit Correspondence:
- ☐ Extensions
- ☐ Amendments/Modifications
- ☐ Response from EPA
- ☐ Response from County
- ☐ Response from Park Services
- ☑ Other

FCS

FLORIDA CRUSHED STONE COMPANY

CEMENT / POWER / LIME PLANT

RECEIVED

OCT 23 1991

Division of Air
Resources Management

October 7, 1991

Mr. Bruce Mitchell
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2450

RE: JEA Sediment Use at FCS Cement Plant

Dear Mr. Mitchell:

Please be notified that the Florida Crushed Stone (FCS) Cement Plant, Brooksville, Florida wishes to withdraw our request for a performance test and for continuous utilization of wastewater treatment sediment from Jacksonville Electric Authority (JEA). The request by FCS to the Florida Department of Environmental Regulation to issue FCS the amendments as described above to the construction permit No. AC27-118674 (PSD-FL-091) is hereby withdrawn.

If there are any questions, please contact me at (904) 799-7881, ext. 205.

Sincerely,

Tom Mountain

Tom Mountain
Environmental Manager

cc: Larry Sellers, Esq., H&K
J. Koogler, Ph.D., P.E.
T. Cleveland, Esq., OHF&C
C. Hetrick, Her.Co.
K. Liles, Her. Co.
R. Thompson, GeoTech

TM/nc

BEST AVAILABLE COPY

TO: Bruce Mitchell
FDER
FAX #: 904-922-6979

FROM: Tom Mountain
Florida Crushed Stone
FAX #: 904-799-3508 PHONE #: 799-7881

DATE: 10/7/91
PAGES INCLUDING THIS PAGE: 2

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P 832 538 680

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Return Receipt Showing to Whom, Date, & Address of Delivery	
TOTAL Postage & Fees	$
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PS Form **3800**, June 1990

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- Complete items 3, and 4a & b.
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- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece next to the article number.

I also wish to receive the following services (for an extra fee):

1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:

Mr. Santo D'Amico
4287 Rachel Boulevard
Spring Hill, FL 34607

4a. Article Number
P 832 538 680

4b. Service Type
☐ Registered ☐ Insured
☒ Certified ☐ COD
☐ Express Mail ☐ Return Receipt for Merchandise

7. Date of Delivery 10/2/91

5. Signature (Addressee) D'Amico

6. Signature (Agent)

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

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

Florida Department of Environmental Regulation
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400
Lawton Chiles, Governor
Carol M. Browner, Secretary

September 30, 1991

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Santo D'Amico
4287 Rachel Boulevard
Spring Hill, Florida 34607

Dear Mr. D'Amico:

Re: Letter Opposing the Usage of JEA's Wastewater Treatment Sediment in Florida Crushed Stone Company's Cement Kiln

The Department has evaluated your letter received September 13, 1991, stating your opposition to the usage of JEA's wastewater treatment sediment in the above referenced source. The reason for your opposition is that you feel that the sediment contains flyash from the power boilers. This is not the case. The sediment does not contain flyash from the power boilers and the Department's action did not approve the use of any flyash from these sources. If you have any information contrary to this, please provide it to me. Enclosed is a copy of a partial report received by the Department on May 21, 1990, depicting the constituents of the sediment (Mr. Charles Hetrict, Hernando County Administrator has the complete report).

If we can be of further service, please call Mr. Bruce Mitchell at (904)488-1344 or write to me at the above address.

Sincerely,

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

CHF/BM/rbm

Attachments

cc: B. Thomas, SW District
T. Mountain, FCSC
J. Koogler, P.E., K&A
C. Hetrick, HCBCC

Attachments

RECEIVED

SEP 12 1991

Division of Air
Resources Management

4287 Rachel Boulevard
Spring Hill, FL 34607
September 10, 1991

Mr. Bruce Mitchell
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Mr. Mitchell,

This morning I read a story in the Hernando Times about conducting a test burn by Florida Stone. This is a process whereby sludge is converted into cement blocks. Quote; "the sludge comes from water used to clean equipment at the Jacksonville Electric Authority." unquote. This misstatement annoyed me and when read by others not familiar with flyash removal systems, may seem trivial.

I recently moved into Hernando County from New York and formerly worked in power plants. I am familiar with residue of fossil fuels and the conversion of the incombustibles of one form into another. The results of these tests done from 1958 to 1960 can be acquired from the E.P.A. or the D.E.A. in the New York area and you will find that the products achieved are very undesireable. The cement blocks have a low stress capability and cannot be used for structural purposes and the cinder stones for road fill purposes are undesireable because the toxic impurities found in ash will leach out into the ground water and into rivers.

I do not blame the electric company or the stone company for pushing this concept as it is a money winner but for me and other citizens it is another ecology loser for fish, animals and humans. Do not give approval for these tests now or in the future.

Respectfully yours,

Santo D'Amico

Santo D'Amico

cc: Hernando County Commissioners
Chief, Division of Environmental Affairs

2.0 DESCRIPTION AND CHARACTERISTICS OF SLUDGE

The sludge to be beneficially reused as a raw material supplement at Florida Crushed Stone is a sediment/precipitate generated in the wastewater treatment system at the Jacksonville Electric Authority (JEA) in Jacksonville, Florida. For the operational test, sludge from JEA's Northside Station will be used. After the operational test and after the required approvals/permit modifications are gained from the state, Florida Crushed Stone will consider long-term beneficial reuse of additional sludge from the Northside Station, similar sludges from other JEA stations, and similar sludges from other electric utilities.

At the Northside Station a variety of low volume wastewater streams make their way into the wastewater treatment system. Runoff from the washing of equipment, collected rainwater, and other miscellaneous sources are collected and commingled.

The wastewater collected at the Northside Station flows into a sedimentation basin where some solids settle out; the solids collected in this basin are called the surge basin sludge. Next, the effluent flows into a tank where lime is added to raise the pH of the solution and precipitate soluble metals. Any solids generated as a result of lime addition settle out in a second sedimentation basin; these solids are referred to as the treated sludge. Both the surge basin sludge and the treated sludge are proposed for reuse as a Portland cement raw material substitute

2.1 Elemental Analysis

Table 2-1 presents the analytical results from samples of the two Northside Station sludges. However, since the wastewater treatment system does not receive waste of completely uniform composition, the sludge compositions will vary somewhat from sample to sample. The surge basin sludge will contain from 90 to 95+ percent water. The treated sludge will contain 70

TABLE 2-1. COMPOSITION OF SLUDGES
BY WEIGHT PERCENT, DRY

ELEMENTAL ANALYSIS	SURGE BASIN	TREATED SLUDGE
ALUMINUM	0.44	0.44
ANTIMONY	0.02	0.00
ARSENIC	0.65	0.06
BARIUM	0.06	0.03
CADMIUM	0.01	0.00
CALCIUM	0.42	13.00
CHROMIUM	0.16	0.02
COBALT	0.03	0.01
COPPER	0.04	0.06
GOLD	0.01	0.00
IRON	17.00	7.50
LEAD	0.05	0.01
LITHIUM	0.00	0.00
MAGNESIUM	4.10	8.40
MANGANESE	0.04	0.11
MOLYBDENUM	1.60	0.05
NICKEL	2.00	0.52
PHOSPHORUS	0.00	0.00
PLATINUM	0.20	0.04
POTASSIUM	0.03	0.00
SELENIUM	0.03	0.01
SILICON	0.00	0.00
SILVER	0.00	0.00
SODIUM	0.99	0.73
STRONTIUM	0.01	0.03
TELLURIUM	0.11	0.01
THALLIUM	0.03	0.00
TITANIUM	0.07	0.01
VANADIUM	6.40	0.47
YTTRIUM	0.00	0.00
ZINC	0.04	0.04
CARBONATE	0.00	0.02
CHLORIDE	0.58	0.34
SULFATE	6.60	2.13
TOTAL	41.73	34.04

to 85 percent water. The samples were evaporated to dryness and were subsequently digested and analyzed for metals and major anions. The results shown in Table 2-1 are on a dry basis as a result.

Several samples of the surge basin sludge were collected and analyzed for selected group of metals in order to demonstrate that range of variability that may be anticipated for the sludges composition. These ranges are shown in Table 2-2.

As shown in Table 2-1, the sum of the metal and anion constituents is less than 100 percent. The analysis was performed for the elemental metals in the sludge and not the metal hydroxides (which is the likely chemical form of the metals). The presence of hydroxides should account for the missing mass.

The results in Table 2-1 do not include mercury. However, there is no obvious potential source of mercury for these sludges. None of the sources of the wastewater should contain any mercury.

2.2 Toxicity Testing

The sludges were determined to be nonhazardous in accordance with RCRA's EP toxicity and TCLP test criteria. In addition, the sludges are not RCRA listed hazardous wastes. All extractable metal levels are at least ten times below the toxic limit. The toxicity results are presented in Table 2-3. Extracted mercury levels were below the detectable limit for all sludges. This supports the conclusion that mercury should not be present in these sludges.

TABLE 2-2. EXAMPLE OF RANGE OF SLUDGE COMPOSITION FOR SELECTED METALS, WEIGHT PERCENT DRY

METAL	RANGE OF CONCENTRATIONS (WEIGHT PERCENT, DRY)
Ag - Silver	0.0001 - 0.002
As - Arsenic	0.005 - 0.07
Ba - Barium	0.02 - 0.06
Cd - Cadmium	0.0002 - 0.01
Co - Cobalt	0.02 - 0.04
Cr - Chromium	0.06 - 0.2
Cu - Copper	0.04 - 0.15
Mo - Molybdenum	0.09 - 1.6
Ni - Nickel	0.4 - 2.0
Pb - Lead	0.01 - 0.05
Se - Selenium	0.004 - 0.03
V - Vanadium	1.2 - 6.4

TABLE 2-3. EP TOX AND TCLP ANALYTICAL RESULTS

		EXTRACTS; (mg/L)						
		SURGE BASIN		TREATED SLUDGE		EP * BLANK	TCLP ** BLANK	TCLP+ BLANK
METAL	RCRA MAX.	EP	TCLP	EP	TCLP	FLUID	FLUID	FLUID
ARSENIC	5	0.024	0.028	0.0055	0.005	<0.002	0.006	<0.002
BARIUM	100	0.11	0.55	0.255	0.55	<0.009	0.61	0.71
BERYLLIUM		0.001	0.002	0.002	0.002	<0.001	<0.001	<0.001
CADMIUM	1	0.047	0.057	0.031	0.03	<0.003	<0.003	<0.003
CHROMIUM	5	0.024	0.034	0.035	0.035	<0.009	<0.009	<0.009
COBALT		0.52	0.52	0.25	0.26	<0.01	<0.01	<0.01
COPPER		0.04	0.08	0.105	0.09	<0.01	<0.01	<0.01
IRON		0.14	0.88	0.11	<0.03	<0.03	<0.03	<0.03
LEAD	5	<0.002	<0.05	0.003	<0.05	0.008	<0.05	<0.05
MERCURY	0.2	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
MOLYBDENUM		8	14	0.1	0.16	<0.05	<0.05	<0.05
NICKEL		26	26	14	15	<0.02	<0.02	<0.02
SELENIUM	1	<0.005	0.014	<0.005	<0.005	<0.005	<0.005	<0.005
SILVER	5	0.014	<0.009	0.021	0.021	<0.009	<0.009	<0.009
THALLIUM		<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09
VANADIUM		9.2	12	<0.02	<0.02	<0.02	<0.02	<0.02
ZINC		0.45	0.78	0.335	0.51	0.018	0.24	0.35

* EP EXTRACTION FLUID (0.5N ACETIC ACID)
** TCLP EXTRACTION FLUID (SODIUM ACETATE BUFFER)
\+ TCLP EXTRACTION FLUID (ACETIC ACID) - USED ONLY FOR TREATED SLUDGE

2.3 Organic Analysis

These sludges have been analyzed for total organics on several occasions. No organics were detected for most of these analysis. However, on one occasion 0.2 weight percent total organic carbon was detected. There is no obvious source for even this low level of organic content. It is likely that this sample was an anomaly and that for the most part the sludge is free of any organic constituents.

2.4 Physical Properties of the Sludge

The physical properties of the sludges are presented in Table 2-4. Laboratory and field tests show that the sludge will no naturally dewater below the moisture levels indicated. Although the sludges have relatively high viscosities, they have proven to be pumpable during full scale field tests.

TABLE 2-4. SLUDGE PHYSICAL PROPERTIES

Surge Basin Sludge:

Approximate Density - 9 lbs/gallon
Approximate Viscosity - 800 cps

Treated Sludge:

Approximate Density - 9 lbs/gallon
Approximate Viscosity - 3000 - 4000 cps

INTEROFFICE MEMORANDUM

Date: 11-Sep-1991 04:34pm GMT
From: Iris Littleton (TAL)
LITTLETON_I
Dept: Office General Counsel
Tel No: 904/488-9730

TO: DUANE REVELL (TPA) (REVELL,DUANE)

CC: Pat Manning (TAL) (MANNING_P)

Subject: New OGC Case Assignment

TO: Duane Revell

FROM: Iris - OGC - Tallahassee

Received 9/10/91 request for an Administrative Hearing from Hernando County against intent to issue permit AC27-118674 to Florida Crushed Stone Company.

cc: B. Mitchell
B Thomas, SW Dist.
J. Harper, EPA
C. Shaver, NPS
CHF/BA/PL

FCS
FLORIDA CRUSHED STONE COMPANY
CEMENT / POWER / LIME PLANT

RECEIVED
SEP 10 1991
Division of Air
Resources Management

September 3, 1991

Mr. Bruce Mitchel
DARM/BAR
Florida Department of Environental Regulation
Twin Towers Ofice Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RE: Intent to Issue Public Notice-JEA Sediment use at the FCS Cement Plant

Dear Mr. Mitchel:

Enclosed please find a copy of the returned notarized proof of legal notice for the DER's Intent to Issue regarding the above referenced subject.

If you have any questions, please call me immediately.

Sincerely,

Tom Mountain

Tom Mountain
Environmental Manager

TM/nc

cc: B. Mitchell
B. Thomas, SW Dist
J. Harper, EPA
C. Shaver, NPS
CHF/BA/PL

P.O. BOX 1508 / 10311 CEMENT PLANT ROAD / BROOKSVILLE, FL 34605-1508 / PHONE (904) 799-7881 / FAX (904) 796-6281

THE TAMPA TRIBUNE

Published Daily
Tampa, Hillsborough County, Florida

State of Florida
County of Hillsborough } ss.

Before the undersigned authority personally appeared R. Putney, who on oath says that he is Accounting Manager of The Tampa Tribune, a daily newspaper published at Tampa in Hillsborough County, Florida; that the attached copy of advertisement being a

LEGAL NOTICE PASCO,HERNANDO,CITRUS EDITIONS

in the matter of

INTENT TO ISSUE

was published in said newspaper in the issues of

August 29, 1991

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

Putney

Notary Public, State of Florida
My Commission Expires Sept. 3, 1994
Bonded Thru Troy Fain - Insurance Inc.

Sworn to and subscribed before me, this 29 *day*
of August *A.D. 19* 91

Scott D. Williams

(SEAL)

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

The Department of Environmental Regulation (Department) hereby gives notice of its intent to issue to Florida Crushed Stone Company (FCSC) an amendment to the construction permit, No. AC 27-118674 (PSD-FL-091), authorizing a performance test for pollutant emissions while utilizing the wastewater treatment sediment from Jacksonville Electric Authority's (JEA) generating stations in the facility's cement kiln, and an amendment to the construction permit, No. AC 27-118674 (PSD—FL—091C), authorizing continuous utilization of the material in the source, as detailed in the application package. The Department is issuing this intent to issue for the reasons stated below and in the proposed amendments.

The applicant, FCSC, Post Office Box 490300, Lessburg, Florida 34749-0300, submitted a request on August 9, 1991, via FAX, to the Department's Bureau of Air Regulation (BAR) for authorization to conduct additional pollutant emissions tests on the facility's cement kiln while utilizing wastewater treatment sediment form JEA's generating stations and to utilize the material on a continuous basis after evaluation of the test results. The performance tests for pollutant emissions will be conducted at baseline conditions and while utilizing wastewater treatment sediment from JEA's generating stations at a utilization/feed rate of 3.0% of the total raw material feed rate, on a dry weight basis, or 3.7 tons per hour, whichever is less. The cement kiln was permitted under the construction permit, No. AC 27-118674 (PSD-FL-091), and is not permitted to utilize the wastewater treatment sediment in accordance with the referenced permit.

The additional emissions tests are being proposed in order to gather more data regarding the emissions of particulate matter and mercury, both of which showed a possible increase in actual emissions in the previous performance tests (baseline versus wastewater treatment sediment feed conditions) conducted October 31 - November 2, 1990; also, the previous performance tests were conducted at one-half of the proposed performance test feed rate and the proposed continuous utilization/feed rate. Screening for a modification and Prevention of Significant Deterioration (PSD) shall be in accordance with Chapter 403, Florida Statutes (F.S.), Florida Administrative Code (F.A.C.) Chapters 17-2 and 17-4, and Title 40 Code of Federal Regulations (CFR, July, 1990 version).

If, after the performance test results are evaluated and the Department's BAR and involved parties (i.e., Department's Southwest District; U.S. EPA, National Park Service, Hernando County, etc.) and it is determined that actual pollutant emissions did not increase while utilizing the wastewater treatment sediment from JEA's generation stations pursuant to 40 CFR 60, Appendix C, then an amendment to the construction permit, No. AC 27-118674 (PSD-FL-091C), will be issued with certain specific Conditions authorizing continuous use of the material. However, if there is an actual emissions increase in pollutant emissions, FCSC will not be permitted to utilize the wastewater treatment sediment from JEA for any facility without further evaluation by the Department's BAR and involved parties.

The proposed project will occur at the applicant's facility located on U.S. Highway 98 NW. of Brooksville, Hernando County, Florida.

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

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

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the applications have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department.

Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

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

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

Department of Environmental Regulation, Southwest District Office, 4520 Oak Fair Boulevard, Tampa, Florida 33610-7347

Hernando County Board of County Commission, 20 North Main Street, Room 460, Brooksville, Florida 34601

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

BV1078 8/29/91

BEST AVAILABLE COPY

MEDIA HOT SHEET

Date: 9/4/91

Reporter: Dan DeWitt

At (Newspaper, T.V., Radio, etc.): St. Pete Times
1-800-333-7505
ext. 6116

From: Bruce Mitchell
Division: of Air Resources Management
Bureau/~~Sect~~.: of Air Regulation
Phone: 904-488-1344

Topic of Call: Florida Crushed Stone Company - trial burn of wastewater treatment sediment from JEA and the potential to utilize the material continuously pending the evaluation of the test results.

Questions asked:
1. Is the material hazardous waste?
2. Was I aware of the letter from Oertel & Hoffman recommending an adm. hearing? and, that the county commissioner's recommended that the county apply for one?
3. What about the mercury emissions?
④ What is the sediment and where does it come from?
⑤ Any sources permitted to process this material?
⑥ How is the area's air.
⑦ What are the control system(s) on the kiln.

Deadline:

Summary of Conversation (use remainder of sheet, and back, if necessary):

① The material is considered non-hazardous pursuant to 40 CFR 261 (federal guidelines).

② No I wasn't. It appears that the letter just stated, again, the Dept's intent from the recent pkg. mailed out to FCSC regarding the proposed trial burn and potential continuous utilization.

③ There was a slight change noted in mercury and particulate matter emissions such that the Dept. wants to see another data set before making any decision of allowing continuous utilization. I gave him the emissions results in lbs/hr & TPY and no-threat levels (24-hr).

④ The material is rain run-off from a property that has been collect in a basis, treated with alum/limestone to precipitate any salts formed, and is mostly water and inerts.

⑤ No air pollution source - this is the first that I am aware of; however, the SW Dist. has deemed the material safe for landfilling.

DER Employee Interviewed ____________

⑥ The county (Hernando) is deemed "attainment" in accordance with our regulations. However, the Dept. does give attention to the Class I area (Chassahowitzka National Wilderness Area).

⑦ The system is controlled with a baghouse, which is one of the better control system that can be used to controll particulate matt

In general, the purpose is to gain [illegible] [illegible] points to evaluate the source and proposed utilization of the material from FEA. The emissions will be evaluated pursuant to 40 CFR 60, Appendix C (statistical approach), to see if actual emissions did increase. If so, a modification would have to be evaluated pursuant to the rules, which includes the requirement of an application and processing fee. Otherwise, an amendment would be appropriate. Consequently, this project receives the same rule applicability determination for permitting purposes as does all other potential air emitting sources (past, present & future).

Also, a final decision regarding the emissions is to be made by the Dept's. BAR; SW Dist., Hernando Co., Nat'l. Park Service and the U.S. EPA, Region IV.

P 832 538 941

Certified Mail Receipt

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

UNITED STATES POSTAL SERVICE

Sent to	Randy Thompson
Street & No.	Fla. Crushed Stone
P.O., State & ZIP Code	Leesburg, Fl
Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, & Address of Delivery	
TOTAL Postage & Fees	$
Postmark or Date	8-27-91 AC 27-118674 BSD-FI-091 " " 091C

PS Form 3800, June 1990

● **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. Randy Thompson
Environmental Dept.
Fla. Crushed Stone Co.
P.O. Box 490300
Leesburg, Fl 34749-0300

4. Article Number
P 832 538 941

Type of Service:
☒ Registered
☒ Certified
☐ Express Mail
☐ Insured
☐ COD

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature – Addressee
X

6. Signature – Agent
X

7. Date of Delivery 8/30/91

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

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

File Copy

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400
Lawton Chiles, Governor
Carol M. Browner, Secretary

August 27, 1991

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Randy Thompson
Environmental Department
Florida Crushed Stone Company
Post Office Box 490300
Leesburg, Florida 34749-0300

Dear Mr. Thompson:

Re: Requests for Authorization to Conduct Pollutant Emissions Performance Tests While Utilizing the Wastewater Treatment Sediment from JEA's Generating Stations in Florida Crushed Stone Company's Cement Kiln and to Utilize the Material Continuously After Evaluation of the Test Results

Attached is one copy of the proposed performance test authorization amendment to construction permit, No. AC 27-118674 (PSD-FL-091), for Florida Crushed Stone Company (FCSC) to conduct additional pollutant emissions tests on the facility's cement kiln. The proposed performance tests for pollutant emissions will be conducted at baseline conditions and while utilizing the wastewater treatment sediment from Jacksonville Electric Authority's (JEA) generating stations at a utilization/feed rate of 3.0% of the total raw material feed rate, on a dry weight basis, or 3.7 tons per hour, whichever is less. The cement kiln was permitted under the construction permit, No. AC 27-118674 (PSD-FL-091), and is not permitted to process wastewater treatment sediment in accordance with the referenced permit.

The additional emissions tests are being proposed in order to gather more data regarding the emissions of particulate matter and mercury, both of which showed a possible increase in actual emissions in the previous performance tests (baseline versus wastewater treatment sediment feed conditions) conducted October 31 - November 2, 1990; also, the previous performance tests were conducted at approximately one-half of the proposed performance test feed rate and the proposed continuous utilization/feed rate. Screening for a modification and Prevention of Signification (PSD) will be in accordance with Chapter 403, Florida Statutes, Florida Administrative Code Chapters 17-2 and 17-4, and Title 40 Code of Federal Regulations (CFR; July, 1990 version).

Also, attached is one copy of the proposed amendment to the construction permit, No. AC 27-118674 (PSD-FL-091C), for FCSC to be permitted to utilize the wastewater treatment sediment from JEA's generating stations in the facility's cement kiln as a supplement to the clinker production. If, after the performance test results are evaluated by the Department's Bureau of Air Regulation and involved parties (i.e., Department's Southwest District, U.S. EPA, National Park Service, Hernando County, etc.) and it is determined that actual pollutant emissions did not increase while utilizing the wastewater treatment sediment from JEA's generating stations pursuant to 40 CFR 60, Appendix C, then the Department will issue the proposed amendment to the construction permit, No. AC 27-118674 (PSD-FL-091C), authorizing continuous use of the material in the source. However, if there is an actual emissions increase in pollutant emissions, FCSC will not be permitted to utilize the wastewater treatment sediment from JEA or any facility without further evaluation by the Department's Bureau of Air Regulation and involved parties.

If there are any questions, please call Mr. Bruce Mitchell at (904) 488-1344 or submit any written comments you wish to have considered concerning the Department's proposed action to me.

Sincerely,

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

CHF/BM/rbm

Attachments

c: B. Thomas, SW District
J. Koogler, Ph.D., P.E., K&A
C. Shaver, NPS
J. Harper, EPA
C. Hetrick, HCBCC
G. Smallridge, Esq., DER
T. Mountain, FCSC
L. Sellars, Esq., H&K picked-up by a runner: 8/27/91 a.m.

Reading File
Bruce Mitchell } 8/27/91 KT RAM

BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

In the Matter of
Application for Amendments by:

Florida Crushed Stone Company
P. O. Box 490300
Leesburg, Florida 34749-0300

DER File Nos. AC 27-118674
PSD-FL-091
PSD-FL-091C

INTENT TO ISSUE

The Department of Environmental Regulation (Department) hereby gives notice of its intent to issue to Florida Crushed Stone Company (FCSC) an amendment to the construction permit, No. AC 27-118674 (PSD-FL-091), authorizing a performance test for pollutant emissions while utilizing the wastewater treatment sediment from Jacksonville Electric Authority's (JEA) generating stations in the facility's cement kiln, and an amendment to the construction permit, No. AC 27-118674 (PSD-FL-091C), authorizing continuous utilization of the material in the source, as detailed in the application package specified above. The Department is issuing this Intent to Issue for the reasons stated below and in the attached proposed amendments.

The applicant, FCSC, submitted a request on August 9, 1991, via FAX, to the Department's Bureau of Air Regulation (BAR) for authorization to conduct additional pollutant emissions tests on the cement kiln while utilizing wastewater treatment sediment from JEA's generating stations and to utilize the material on a continuous basis after evaluation of the test results. The performance tests for pollutant emissions will be conducted at baseline conditions and while utilizing wastewater treatment sediment from JEA's generating stations at a utilization/feed rate of 3.0% of the total raw material feed rate, on a dry weight basis, or 3.7 tons per hour, whichever is less. The cement kiln was permitted under the construction permit, No. AC 27-118674 (PSD-FL-091), and is not permitted to process wastewater treatment sediment in accordance with the referenced permit.

The additional emissions tests are being proposed in order to gather more data regarding the emissions of particulate matter and mercury, both of which showed a possible increase in actual emissions in the previous performance tests (baseline versus wastewater treatment sediment feed conditions) conducted October 31 - November 2, 1990; also, the previous performance tests were conducted at approximately one-half of the proposed performance test feed rate and the proposed continuous utilization/feed rate. Screening for a modification and Prevention of Significant Deterioration (PSD) shall be in accordance with Chapter 403, Florida Statutes (F.S.), Florida Administrative Code (F.A.C.) Chapters 17-2 and 17-4, and Title 40 Code of Federal Regulations (CFR; July, 1990 version).

If, after the performance test results are evaluated by the Department's BAR and affected parties (i.e., Department's Southwest District, U.S. EPA, National Park Service, Hernando County, etc.) and it is determined that actual pollutant emissions did not increase while utilizing the wastewater treatment sediment from JEA's generating stations pursuant to 40 CFR 60, Appendix C, then an amendment to the construction permit, No. AC 27-118674 (PSD-FL-091C), will be issued with certain Specific Conditions authorizing continuous use of the material in the source. However, if there is an actual emissions increase in pollutant emissions, FCSC will not be permitted to utilize the wastewater treatment sediment from JEA or any facility without further evaluation by the Department's BAR and involved parties.

The proposed project will occur at the applicant's facility located on U.S. Highway 98 NW of Brooksville, Hernando County, Florida.

The Department has permitting jurisdiction under Chapter 403, F.S., F.A.C. Chapters 17-2 and 17-4, and 40 CFR (July, 1990 version). The project is not exempt from permitting procedures. The Department has determined that permit amendments are required for the proposed activity.

Pursuant to Section 403.815, F.S., and Rule 17-103.150, F.A.C., you (the applicant) are required to publish at your own expense the enclosed Notice of Intent to Issue. The notice shall be published one time only within 30 days, in the legal ad section of a newspaper of general circulation in the area affected. For the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. Where there is more than one newspaper of general circulation in the county, the newspaper used must be the one with significant circulation in the area that may be affected by the permit. If you are uncertain that a newspaper meets these requirements, please contact the Department at the address or telephone number listed below. The applicant shall provide proof of publication to the Department's Bureau of Air Regulation, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, (904)488-1344, within seven days of publication. Failure to publish the notice and provide proof of publication within the allotted time may result in the denial of the amendments.

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

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

The Petition shall contain the following information;

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;

(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

(d) A statement of the material facts disputed by Petitioner, if any;

(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;

(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and,

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

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

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

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

Copies furnished to:

B. Thomas, SW District
J. Koogler, Ph.D., P.E., K&A
J. Harper, EPA
C. Shaver, NPS
G. Smallridge, Esq., DER
C. Hetrick, HCBCC
T. Mountain, FCSC
L. Sellars, Esq., H&K

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this NOTICE OF INTENT TO ISSUE and all copies were mailed before the close of business on 8-27-91.

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

Clerk 8-27-91
Date

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

The Department of Environmental Regulation (Department) hereby gives notice of its intent to issue to Florida Crushed Stone Company (FCSC) an amendment to the construction permit, No. AC 27-118674 (PSD-FL-091), authorizing a performance test for pollutant emissions while utilizing the wastewater treatment sediment from Jacksonville Electric Authority's (JEA) generating stations in the facility's cement kiln, and an amendment to the construction permit, No. AC 27-118674 (PSD-FL-091C), authorizing continuous utilization of the material in the source, as detailed in the application package. The Department is issuing this Intent to Issue for the reasons stated below and in the proposed amendments.

The applicant, FCSC, Post Office Box 490300, Leesburg, Florida 34749-0300, submitted a request on August 9, 1991, via FAX, to the Department's Bureau of Air Regulation (BAR) for authorization to conduct additional pollutant emissions tests on the facility's cement kiln while utilizing wastewater treatment sediment from JEA's generating stations and to utilize the material on a continuous basis after evaluation of the test results. The performance tests for pollutant emissions will be conducted at baseline conditions and while utilizing wastewater treatment sediment from JEA's generating stations at a utilization/feed rate of 3.0% of the total raw material feed rate, on a dry weight basis, or 3.7 tons per hour, whichever is less. The cement kiln was permitted under the construction permit, No. AC 27-118674 (PSD-FL-091), and is not permitted to utilize the wastewater treatment sediment in accordance with the referenced permit.

The additional emissions tests are being proposed in order to gather more data regarding the emissions of particulate matter and mercury, both of which showed a possible increase in actual emissions in the previous performance tests (baseline versus wastewater treatment sediment feed conditions) conducted October 31 - November 2, 1990; also, the previous performance tests were conducted at one-half of the proposed performance test feed rate and the proposed continuous utilization/feed rate. Screening for a modification and Prevention of Significant Deterioration (PSD) shall be in accordance with Chapter 403, Florida Statutes (F.S.), Florida Administrative Code (F.A.C.) Chapters 17-2 and 17-4, and Title 40 Code of Federal Regulations (CFR; July, 1990 version).

If, after the performance test results are evaluated and the Department's BAR and involved parties (i.e., Department's Southwest District, U.S. EPA, National Park Service, Hernando County, etc.) and it is determined that actual pollutant emissions did not increase while utilizing the wastewater treatment sediment from JEA's generating stations pursuant to 40 CFR 60, Appendix C, then an amendment to the construction permit, No. AC 27-118674 (PSD-FL-

091C), will be issued with certain Specific Conditions authorizing continuous use of the material. However, if there is an actual emissions increase in pollutant emissions, FCSC will not be permitted to utilize the wastewater treatment sediment from JEA or any facility without further evaluation by the Department's BAR and involved parties.

The proposed project will occur at the applicant's facility located on U.S. Highway 98 NW of Brooksville, Hernando County, Florida.

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

The Petition shall contain the following information:

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;

(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

(d) A statement of the material facts disputed by Petitioner, if any;

(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;

(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and,

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

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the applications have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department.

Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

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

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

Department of Environmental Regulation
Southwest District Office
4520 Oak Fair Boulevard
Tampa, Florida 33610-7347

Hernando County Board of County Commission
20 North Main Street, Room 460
Brooksville, Florida 34601

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

Florida Department of Environmental Regulation
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400
Lawton Chiles, Governor
Carol M. Browner, Secretary

September xx, 1991

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Randy Thompson
Environmental Department
Florida Crushed Stone Company
Post Office Box 490300
Leesburg, Florida 34749-0300

Dear Mr. Thompson:

Re: Amendment to the Construction Permit, No. AC 27-118674 (PSD-FL-091), to Conduct Performance Tests for Pollutant Emissions on the Facility's Cement Kiln While Utilizing the Wastewater Treatment Sediment from JEA's Generating Stations

The Department has reviewed the request that you provided on August 9, 1991. We have also considered the Department's legal authority to allow Florida Crushed Stone Company (FCSC) to conduct the requested performance test(s). Paragraph 403.061(15), Florida Statutes (F.S.) authorizes the Department to consult with any person proposing to construct, install, or otherwise acquire a pollution control device or system concerning the efficacy of such device or system, or the pollution problem which may be related to the source, device, or system. Paragraph 403.061(16), F.S., authorizes the Department to encourage voluntary cooperation by persons in order to achieve the purposes of the state environmental control act. Paragraph 403.061(18), F.S., authorizes the Department to encourage and conduct studies, investigations, and research relating to the causes and control of pollution. Florida Administrative Code (F.A.C.) Rule 17-2.250(5) authorizes the Department to consider variation in industrial equipment and make allowances for excess emissions that provide practical regulatory controls consistent with the public interest.

In accordance with the provisions of Paragraphs 403.061(15), (16), and (18), F.S., and F.A.C. Rule 17-2.250(5), you are hereby authorized to conduct performance tests for pollutant emissions on FCSC's cement kiln while utilizing wastewater treatment sediment from Jacksonville Electric Authority's (JEA) Generating Stations at a utilization/feed rate of 3.0% of the total raw material feed rate, on a dry weight basis, or 3.7 tons per hour, whichever is less. The cement kiln was permitted under the construction permit, No. AC 27-118674 (PSD-FL-091), anf is not permitted to utilize the wastewater treatment sediment in accordance with the referenced permit.

The additional emissions tests are being proposed in order to gather more data regarding the emissions of particulate matter and mercury, both of which showed a possible increase in actual emissions in the previous performance tests (baseline versus wastewater treatment sediment feed conditions) conducted October 31 - November 2, 1990; also, the previous performance tests were conducted at one-half of the proposed performance test feed rate and the proposed continuous utilization/feed rate. Screening for a modification and Prevention of Significant Deterioration (PSD) shall be in accordance with Chapter 403, Florida Statutes (F.S.), Florida Administrative Code (F.A.C.) Chapters 17-2 and 17-4, and Title 40 Code of Federal Regulations (CFR; July, 1990 version). The performance test results will be evaluated pursuant to 40 CFR 60, Appendix C, by the Department's BAR and involved parties (i.e., Department's Southwest District, U.S. EPA, National Park Service, Hernando County, etc.) in order to determine if actual pollutant emissions increased while utilizing the wastewater treatment sediment from JEA's generating stations.

The performance tests shall be subject to the following conditions:

1. The permittee shall notify, in writing, the Department's Southwest District and Bureau of Air Regulation (BAR) offices at least 15 days prior to commencement of the performance tests. A written report shall be submitted to these offices within 45 days upon completion of the last test run.

2. Prior to or after conducting performance tests for pollutant emissions while utilizing the wastewater treatment sediment from JEA's generating stations (Post-tests), performance tests (Pre-tests/baseline) for pollutant emissions shall be conducted while operating under normal operating conditions with the presently permitted kiln feed materials. The pollutant emissions results of the "Pre-tests" shall be compared to the pollutant emissions results of the "Post-tests" to determine if:

    a) actual pollutant emissions increased pursuant to 40 CFR 60, Appendix C (July, 1990 version); and,

       is PSD (Prevention of Significant Deterioration) review required, which includes the submittal of a permit application and the appropriate processing fee, at a minimum; or,

b) the construction permit, No. AC 27-118674 (PSD-FL-091), can be amended to allow the utilization of the wastewater treatment sediment from JEA's generating stations on a continuous basis.

3. All "Post-test" emissions results shall be compared to "actual emissions" for PSD review purposes (see Region IV, U.S. EPA's letter dated April 4, 1990).

4. The contents of Dr. John B. Koogler's letter received August 9, 1991, are adopted by reference, with the following exceptions (each will be identified with the corresponding numbering in the letter and starting on page 3):

#2. The utilization/feed rate is to be either 3% of the total raw materials feed rate, on a dry weight basis, or 3.7 tons per hour, whichever is less.

#3. Documentation of any utilization of the wastewater treatment sediment from JEA's generating stations shall be required.

#4. A Department Type I audit is required and shall be coordinated with the Department.

#5. As stated in #3 above, documentation of the utilization rates (i.e., on a dry weight basis and actual feed basis) of the wastewater treatment sediment from JEA's generating stations shall be required.

#6. Emissions measurements shall also be required for the following pollutants and using the following test methods:

Pollutants/Pollutant Category	Test Method
o Particulate Matter	EPA Multi-Metals Train
o PCDDs (dioxins) and PCDFs (furans)	Test Method 608 or EPA Method 23
o PAHs (polycyclic aromatic hydrocarbons)	Test Method 610 or Modified Method 5
o Mercury	EPA Method 101
o Volatile Organic Compounds	EPA Method 25A

Note: The metals (particulate matter) to be tested for shall be the same as those required in the previous performance tests conducted in October 31 - November 2, 1990.

#7. The same as #6 above.

#9. The Department will take the responsibility of providing a cover letter to and mailing the performance test results to the reviewing parties (i.e., Department's Southwest District, U.S. EPA, National Park Service, Hernando County, etc.).

5. An ultimate analysis of the particulate filters(s) shall be required. Also, an ultimate analysis of a representative sample(s) from the baghouse hopper shall be required.

6. This authorized performance test(s) shall not result in the release of objectionable odors pursuant to F.A.C. Rule 17-2.620(2).

7. Performance testing shall immediately cease upon the occurrence of a valid environmental complaint by a citizen or other party, or a nuisance or danger to public health or welfare. Performance testing shall not resume until appropriate measures to correct the problem have been implemented.

8. The performance tests for pollutant emissions shall be conducted under the direct supervision and responsible charge of a professional engineer registered in Florida.

9. This Department action is just to authorize the performance tests for pollutant emissions on the facility's cement kiln while utilizing wastewater treatment sediment from JEA's generating stations. The utilization of any wastewater treatment sediment after the last performance test run is completed will be deemed a violation of the current construction permit, No. AC 27-118674 (PSD-FL-091).

10. Complete documentation of any utilization of the wastewater treatment sediment from JEA's generating stations in the cement kiln shall be required (i.e., testing results, materials utilized, by weight (both wet and dry); etc.).

11. The Department shall be notified in writing on the date of the last test run completion.

12. From the initial date of utilizing the wastewater treatment sediment from JEA's generating stations in the facility's cement kiln, which shall be documented in writing to the Department, the permittee shall be limited to a maximum of 14 days to conduct 7 days of performance tests on the source, which gives consideration to inclement weather and unforseen

interruption. If additional time is needed, the permittee shall provide the Department with documentation of the progress accomplished to date and shall identify what is left to be done to complete the performance tests.

13. Based on conversation with Mr. Paul Reinermann, with the U.S. EPA, Region IV, the facility's cement kiln will be subject to 40 CFR 61, Subpart E, National Emission Standard for Mercury, if wastewater treatment sediment is incinerated or dried in the source. Emissions to the atmosphere from sludge incineration plants, sludge drying plants, or a combination of these that process wastewater treatment plant sludges shall not exceed 3200 grams of mercury per 24-hour period.

14. Stack sampling for mercury shall be in accordance with 40 CFR 61.53.

15. The contents of Mr. Daniel S. Davis' request document received May 21, 1990, are adopted by reference, with exceptions to Section 3.2, Sludge Analysis, of which the following pollutants will also be required to be analyzed for:

    o Mercury
    o Aluminum
    o Silver
    o Magnesium
    o Titanium
    o Cobalt
    o Iron
    o Sulfur

16. An ultimate analysis of a sample from each of JEA's source's/facility's wastewater treatment sediment shall be submitted to the Department's Southwest District and Bureau of Air Regulation for demonstration of chemical constituent similarity and likeness to the wastewater treatment sediment used in previous performence tests and to the material to be used in this performance test. For mercury, the sediment sampling shall be in accordance with 40 CFR 61.54.

17. A representative sediment sample shall be taken and analyzed from each delivery vehicle (i.e., rail tank car, etc.) prior to delivery. For mercury, the sediment sampling shall be in accordance with 40 CFR 61.54. The sampling results shall be completed and available prior to processing and testing and retained for a two year period.

18. The maximum sediment utilization/feed rate to the facility's cement kiln shall not exceed 3.0% of the total raw material feed rate, on a dry weight basis, or 3.7 tons per hour, whichever is less.

19. Attachments (See Attachment Section) are incorporated.

The Department has relied on the information referenced in the attachments and conversations with representatives of the FCSC, U.S. EPA-Region IV, Department of Interior's National Park Service, and Hernando County in authorizing this permit amendment, No. AC 27-118674 (PSD-FL-091).

Sincerely,

Carol M. Browner
Secretary

CB/BM/rbm

Attachments

c: B. Thomas, SWD
J. Koogler, Ph.D., P.E., K&A
C. Shaver, NPS-Air
J. Harper, EPA
C. Hetrick, HCBCC
T. Mountain, FCSC
G. Smallridge, Esq., DER
L. Sellars, Esq., H&K

Attachment Section

1. Dr. John B. Koogler's letter with enclosures received August 9, 1991, via FAX.
2. Dr. John B. Koogler's letter with enclosures received August 12, 1991 (hard copy).
3. 40 CFR (July, 1990 version).
4. Ms. Jewell A. Harper's letter dated April 4, 1990.
5. Ms. Jewell A. Harper's letter dated August 20, 1990.
6. Mr. Daniel S. Davis's letter received May 21, 1990.
7. Intent to Issue package dated August 27, 1991.

Attachment 1

Available Upon Request

Attachment 2

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

RECEIVED
AUG 12 1991
Division of Air
Resources Management

KA 307-90-05

August 9, 1991

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

Subject: Florida Crushed Stone Company
Hernando County, Florida
Use of Wastewater Sediment as a Raw Material Sediment

Dear Mr. Fancy:

We appreciated the opportunity to meet with you and Bruce Mitchell on July 30, 1991, to discuss matters related to use of a non-hazardous wastewater sediment as a raw feed supplement during the production of Portland cement at the Florida Crushed Stone Company plant in Hernando County, Florida. At the present time, Florida Crushed Stone (FCS) is proposing to use only wastewater sediment generated by the Jacksonville Electric Authority (JEA) at their electric power generating stations in Jacksonville, Florida. The maximum feed rate of the wastewater sediment will be three percent of the total kiln feed, or 3.7 tons per hour, whichever is less.

The sediment to be beneficially used as a raw material supplement is a sediment generated in the wastewater treatment systems at the JEA electric power generating stations in Jacksonville, Florida. The sources of wastewater include run-off from equipment washing, collected rainfall and other miscellaneous sources. The comingled waters flow into a settling basin where the larger particles settle. The outflow from the first basin enters a second settling basin where lime is added to raise the pH and enhance the sedimentation of the remaining solids. The sediment from both settling basins will be combined and used as the raw material supplement.

The total quantity of wastewater sediment from the JEA facilities is estimated not to exceed 18,000 tons. As stated, this wastewater sediment will be fed to the cement kiln as a supplement to normal kiln feed materials at a maximum rate of three percent of the total kiln feed or approximately 3.7 tons per hour. At this feed rate, approximately 5,000 hours of kiln operating time will be required to consume all of the wastewater sediment. FCS is requesting that 16 months be allowed for the consumption of all of the sediment. This will take into consideration delays that might arise due to kiln operating considerations and/or wastewater sediment handling and shipment.

If a wastewater sediment feed rate of 3.7 tons per hour cannot be achieved during the test period, it is our understanding that the Department will amend the construction permit to allow a maximum sediment feed rate of 110 percent of that achieved during the test period. This is normal Department policy when the maximum permitted (or proposed) processing rate is not achieved during a compliance test.

Information submitted to the Department under cover of our letter dated March 11, 1991 (Attachment 1) shows the maximum concentrations of various metals possible in the wastewater sediment without the impact of emissions exceeding acceptable ambient standards. These calculations were based on a wastewater sediment feed rate of five percent of the total kiln feed rate or 6.2 tons per hour and the assumption that 10 percent of the metals in the wastewater sediment would be discharged to the atmosphere. FCS is requesting a maximum wastewater sediment feed rate of three percent of the total kiln feed rate or 3.7 tons per hour. Additionally, other documentation submitted to the Department (von Seebach, M. and J. B. Thompkins., "Metal Emissions are Predictable." Rock Products, April 1991, pp. 31-35) shows that the fractions of metals released to the atmosphere during Portland cement production is less than 0.5 percent of the metals input to the system (with the possible exception of mercury and thallium). Therefore, even if there is a considerable variation in the concentration of metals in the JEA wastewater sediment, FCS has provided assurance that acceptable ambient standards will not be exceeded.

For purposes of the permit amendment under consideration, FCS is proposing the following limits on metals and certain other constituents in the JEA wastewater sediment based on the above referenced air quality modeling and more restrictive practical considerations. These limits are listed below:

Constituent	Maximum Concentration
Total Organic Chlorine	0.2 percent
Total Oil and Grease	2 percent
Arsenic	1250 mg/kg
Antimony	2000 mg/kg
Barium	1000 mg/kg
Cadmium	1000 mg/kg
Chromium +6	100 mg/kg
Lead	4900 mg/kg

Mercury	10 mg/kg
Silver	2000 mg/kg
Thallium	1600 mg/kg

The above limits are somewhat higher than the maximum concentrations reported by Radian in a background document previously provided to the Department, giving FCS a reasonable margin in which to operate. On the other hand, the suggested concentrations are well below concentrations that would result in unacceptable ambient concentrations using very conservative assumptions.

It is my understanding, based on our discussions of July 30, 1991, that the amendment to the FCS cement plant permit will be handled as a one-step process. The Intent that will be issued by the Department will include a requirement for testing to document the plant operating conditions and emission rates. If the testing demonstrates that there is no increase in the emissions of any regulated air pollutant, it is our understanding that the Department will amend the construction permit for the cement plant to allow the use of wastewater sediment as a raw material substitute, assuming there are no valid objections. Following the amendment to the construction permit, FCS will be required to have the cement plant operating permit amended through the FDER District Office in Tampa.

Regarding the tests that will be conducted to document the cement plant operations and emissions from the cement plant during the use of the wastewater sediment, the following points were agreed upon:

1. A baseline test will be conducted with the CPL plant operating under normal operating conditions with the presently permitted kiln feed materials.

2. The wastewater sediments tests will be conducted with the sediment providing up to three percent of the total kiln feed rate. The sediment feed rate will be approximately 3.7 tons per hour.

3. The time required for conducting the wastewater sediment tests will be approximately one week. Florida Crushed Stone requests that the Department allow 14 days for the tests in the event of inclement weather.

4. The Department may conduct a Type I Audit during the test period.

5. During both the baseline and the wastewater sediment tests, the operations of the CPL plant will be documented including:

    a. The kiln feed rate, the coal feed rate and the clinker production rate of the cement plant.

   b. The coal feed rate and power output for the power plant.

   c. The calciner feed rate, the coal feed rate and the lime production rate for the lime plant.

   d. The inlet temperature to the baghouse, the pressure drop across the baghouse, and the baghouse fan speed and fan current.

   e. An analysis of the normal kiln feed material and an analysis of the wastewater sediment.

6. The emission measurements that will be made during the baseline period include:

   a. Particulate matter using EPA Method 5

   b. Mercury using EPA Method 101

7. During the wastewater sediment tests, the following emission measurements will be made:

   a. Particulate matter using EPA Method 5

   b. Mercury using EPA Method 101

8. The procedure used for determining if there is an increase in emissions during the wastewater sediment test when compared with the baseline conditions is that set forth in Appendix C of 40CFR60. This method was developed by EPA to:

   > "... determine whether a physical or operational change to an existing facility results in an increase in the emission rate to the atmosphere."

9. The Department will provide Koogler & Associates with a list of agencies that are to receive copies of the test data. Koogler & Associates will express mail copies of the test reports to all agencies designated by the Department. The Department will follow with a letter to the agencies requesting that the data be reviewed as expeditiously as possible. Koogler & Associates will expedite the analysis of samples and the preparation of test reports. Commitments have been made by laboratories that will be involved to provide sample turnaround within 48 hours of receipt.

10. The Department will complete their review of the data submitted by Florida Crushed Stone as expeditiously as possible but within 30 days of receipt. If the Department's review concludes there is no increase in emissions during the

use of wastewater sediment, the Department will amend the construction permit for the cement plant to allow the use of wastewater sediment with no additional notice being required.

The results of the baseline and wastewater sediment tests conducted in 1990 were discussed (Attachment 2). It was concluded that there were no increases in emissions of regulated air pollutants with the possible exception of particulate matter and mercury. An analysis of the particulate matter emission tests during the baseline period and during the wastewater sediment tests conducted in the Fall of 1990 demonstrated that there was no increase in particulate matter emissions when wastewater sediment was used based on the methodology present in 40CFR60, Appendix C. A copy of this analysis is included as Attachment 3. To provide additional information related to particulate matter emissions under the two operating conditions and to further demonstrate that the use of wastewater sediment does not affect particulate matter emissions, FCS has agreed to conduct additional particulate matter emission measurements during the baseline and wastewater sediment tests discussed herein.

In information submitted to the Department in June 1991, a detailed discussion of the apparent anomaly associated with mercury emissions measured under the two sets of operating conditions in the Fall of 1990 was presented. A copy of this analysis, documenting that the mercury emissions measured during the wastewater sediment tests in the Fall of 1990 were over 200 percent of the total mercury input to the CPL plant, is attached (Attachment 4). In order to develop additional data related to mercury emissions from the CPL and resolve questions raised as a result of the two previous tests, FCS will conduct additional emission measurements for mercury as outlined herein.

An impact analysis previously submitted to the Department demonstrated that the impacts of all organic (and inorganic) constituents of the CPL stack gas were well below NTLs (Attachment 5).

If I have misinterpreted any of the matters that we discussed during our meeting, please contact me immediately. We appreciated the opportunity to meet with you and your interest in this matter.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:wa
Enc.

c: Mr. Bruce Mitchell, FDER
Mr. Tom Mountain, FCS
Mr. Larry Sellars, Holland & Knight

ATTACHMENT 1

KOOGLER & ASSOCIATES

SUMMARY OF AIR QUALITY MODELING RESULTS AND CALCULATIONS OF WWS METALS LIMITS

Metal	Acceptable Ambient Level (ug/m3)	Baseline Emissions(1) (lb/hr)	Baseline Maximum Annual Impact(2) (ug/m3)		Additional Emissions Allowed(3) (lb/hr)		Possible Metal Concentration in WWS(4) (ug/g)	
			C	CPL	C	CPL	C	CPL
As	2.3x10^{-3}	0.004	5.8x10^{-6}	2.5x10^{-6}	1.57	3.69	1,260	(7)
Sb	0.3	NM(10)	-	-	-	-	164,600(8)	(7)
Ba	50	0.02	2.9x10^{-5}	-	(11)	-	(11)	(7)
Be	4.1x10^{-3}	NM	-	-	-	-	1,260(9)	(7)
Cd	5.5x10^{-3}	0.005	7.3x10^{-6}	-	3.77	-	3,014	(7)
Cr^{+6}	8.3x10^{-4}	0.02(6)	2.9x10^{-5}		0.55	-	439(6)	(7)
Pb	0.09	0.13	1.9x10^{-4}	-	61.61	-	49,285	(7)
Hg	0.3	0.04	5.8x10^{-5}	-	205.8	-	164,600	(7)
Ag	3	0.009	1.3x10^{-5}	-	2058	-	>1,000,000	(7)
Th	0.3	NM	-	-	-	-	164,600(8)	(7)

(1) Measured emission rate during Baseline Test with Cement, Power and Lime Plants operating.

(2) Annual average ambient concentration resulting from measured Baseline emission rate. Under Condition "C" (Cement Plant only), ambient concentrations were calculated with Cement Plant stack gas flows. Under Condition "CPL" (Cement, Power and Lime Plants), ambient concentrations were calculated with CPL stack gas flow. Assumed 100% annual operating factor for both conditions.

(3) Emissions in addition to Baseline emissions that can be tolerated without exceeding AAL.

(4) Concentration of metal in wastewater sediment that will result in "additional emissions" defined in Footnote (3), assuming WWS feed rate of 5 percent of kiln feed (12,500 lb/hr) and assuming 10 percent of the metals in the WWS are discharged from the stack.

(5) C = Cement Plant only operating; CPL = Cement, Power and Lime Plants operating.

(6) Assuming all chromium measured during Baseline Test was hexavalent; chromium as stack gas was actually trivalent. The 439 ug/g concentration in WWS is as Cr+6.

(7) Allowable metal concentration in WWS when CPL Plants operate can be 2.34 times higher than that allowed when Cement Plant only operates.

(8) Assumed to have same permissible concentrations as mercury because of similar AAL.

(9) Assumed to have same permissible concentrations as arsenic because of similar AAL.

(10) NM-Not measured during Baseline or WWS tests.

(11) Additional emissions can be greater than the total proposed WWS feed rate, metal concentration could be greater than 100 percent.

Example Calculation

Measured Arsenic emission rate during the WWS test

= 0.004 lb/hr

Annual Arsenic concentration in ambient air

= [0.004 lb/hr (measured)] /[79.4 lb/hr (modeled)]

x 0.1157 $\mu g/m^3$ (modeled impact)

= 5.8×10^{-6} $\mu g/m^3$

Acceptable Ambient Level (AAL)

= 2.3×10^{-3} $\mu g/m^3$

Increase in ambient level without exceeding AAL

= $(2.3 \times 10^{-3}) - (5.8 \times 10^{-6})$

= 2.294×10^{-3} $\mu g/m^3$

Emission rate resulting in ambient impact of 2.294×10^{-3} $\mu g/m^3$

= [(2.294×10^{-3})/0.1157 (modeled impact)]

x 79.4 lb/hr

= 1.57 lb/hr

Arsenic concentration in WWS, at a feed rate of 12,500* lb/hr, resulting in 1.57 lb/hr arsenic.

= $1.57/(12500 \times 10^{-6})$

= 126.0 $\mu g/g$

Acceptable arsenic concentration in WWS if 10 percent of arsenic is released to the atmosphere.

= 12.6 $\mu g/g/(1-0.9)$

= 1260 $\mu g/g$

*Maximum feed rate of 7425 lb/hr now proposed by FCS.

ATTACHMENT 2

SUMMARY OF EMISSIONS AND STACK GAS PARAMETERS
DURING BASELINE AND WWS* TESTS

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

TEST	BASELINE	WWS
Date	9/18-20/90	10/31-11/2/90
PM, mass (lb/hr)	56.80	67.95
conc (gr/dscf)	0.0104	0.0131
02 (%)	10.4	10.2
Volatile organics (lb/hr)**	0.177	0.010
PCDD/DF (lb/hr)	0.114×10^{-6}	0.096×10^{-6}
<u>Selected Metals (lb/hr - Blank Corrected)</u>		
As	<0.004	0.002
Ba	0.005	0.054
Cd	<0.005	<0.005
Cr	0.010	0.024
Co	0.005	<0.022
Cu	0.003	<0.010
Fe	0.992	1.597
Pb	0.130	0.124
Hg	0.034	0.380
Mo	0.018	<0.002
Ni	<0.018	<0.006
Se	<0.004	<0.012
Ag	<0.001	<0.015
Ti	<0.001	0.645
V	<0.018	0.022
<u>Stack Gas</u>		
Flow (dscfm)	637,713	603,670
Temp (°F)	385	390
Moisture (%)	7.2	7.1

* WWS - Wastewater sediment as a kiln feed supplement.

** See following supplemental table for specific organic compounds.

SUMMARY OF ORGANIC COMPOUND EMISSIONS DURING BASELINE AND WWS TESTS

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

TEST	BASELINE	WWS
Date	9/18-20/90	10/31-11/2/90
<u>Volatile Organic Compounds</u>		
Acetone	0.0247	0.0003
Benzene	0.1005	0.0049
Toluene	0.0136	0.0006
Tetrachloroethylene	<0.0025	ND
Chlorobenzene	0.0074	0.0002
Ethylbenzene	<0.0026	<0.0001
Xylene	0.0078	0.0004
Chloromethane	<0.0095	0.0020
Bromomethane	<0.0027	0.0003
Carbon disulfide	<0.0029	0.0002
Styrene	<0.0024	0.0006
Other Traces	-	0.0001
TOTAL VOCs	<0.1766	0.0097

ATTACHMENT 3

COMPARISON OF PARTICULATE MATTER EMISSION RATES DURING BASELINE AND WWS TESTS

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

SEPTEMBER - NOVEMBER 1990

Baseline Test

RUN	Particulate Matter Emission Rate (Lb/Hr)
1	62.21
2	59.15
3	49.05
$\bar{X}_1$	56.80
s_1	6.89
n_1	3

WWS Test

RUN	Particulate Matter Emission Rate (Lb/Hr)
1	65.77
2	77.11
3	60.96
$\bar{X}_2$	67.95
s_2	8.29
n_2	3

Where: $\overline{X}$ = Average emission rate
s = Standard deviation
n = Number of observations

$$t \text{ measured} = \frac{|X_1 - X_2|}{\sigma t\ (1/n_1 + 1/n_2)^2}$$

Where:

$$\sigma t = \left[\frac{(n_1 - 1)\ (s_1)^2 + (n_2 - 1)\ (s_2)^2}{n_1 + n_2 - 2}\right]^{0.5}$$

$$= \left[\frac{(2)\ (6.89)^2 + 2(8.29)^2}{4}\right]^{0.5}$$

$$= 7.62$$

$$t \text{ measured} = |56.80 - 67.95|/(7.62)(1/3 + 1/3)^2$$

$$= 1.79$$

t critical = 2.13 at 95% C.L.

t measured < t critical; therefore, reject the hypothesis that the two particulate matter emission rates are different (at the 95% C.L.)

APPENDIX C—DETERMINATION OF EMISSION RATE CHANGE

1. *Introduction.*

1.1 The following method shall be used to determine whether a physical or operational change to an existing facility resulted in an increase in the emission rate to the atmosphere. The method used is the Student's *t* test, commonly used to make inferences from small samples.

2. *Data.*

2.1 Each emission test shall consist of *n* runs (usually three) which produce *n* emission rates. Thus two sets of emission rates are generated, one before and one after the change, the two sets being of equal size.

2.2 When using manual emission tests, except as provided in § 60.8(b) of this part, the reference methods of Appendix A to this part shall be used in accordance with the procedures specified in the applicable subpart both before and after the change to obtain the data.

2.3 When using continuous monitors, the facility shall be operated as if a manual emission test were being performed. Valid data using the averaging time which would be required if a manual emission test were being conducted shall be used.

3. *Procedure.*

3.1 Subscripts a and b denote prechange and postchange respectively.

3.2 Calculate the arithmetic mean emission rate, E, for each set of data using Equation 1.

$$E=\frac{\sum_{i=1}^{n}}{n} E_i=\frac{E_1+E_2\ldots+E_n}{n} \qquad (1)$$

Where:

E_i=Emission rate for the *i* th run.

n=number of runs.

3.3 Calculate the sample variance, S^2, for each set of data using Equation 2.

$$S^2=\frac{\sum_{i=1}^{n}(E_i-E)^2}{n-1}=\frac{\sum_{i=1}^{n}E_i^2-\left(\sum_{i=1}^{n}E_i\right)^2\Big/n}{n-1} \qquad (2)$$

3.4 Calculate the pooled estimate, S_p, using Equation 3.

$$S_p=\left[\frac{(n_a-1)\,S_a^2+(n_b-1)\,S_b^2}{n_a+n_b-2}\right]^{1/2} \qquad (3)$$

3.5 Calculate the test statistic, *t*, using Equation 4.

$$t=\frac{E_b-E_a}{S_p\left[\frac{1}{n_a}+\frac{1}{n_b}\right]^{1/2}} \qquad (4)$$

4. *Results.*

4.1 If $E_b>E_a$ and $t>t'$, where t' is the critical value of *t* obtained from Table 1, then with 95% confidence the difference between E_b and E_a is significant, and an increase in emission rate to the atmosphere has occurred.

TABLE 1

Degrees of freedom (n_a+n_b-2)	t' (95 percent confidence level)
2	2.920
3	2.353
4	2.132
5	2.015
6	1.943
7	1.895
8	1.860

For greater than 8 degrees of freedom, see any standard statistical handbook or text.

5.1 Assume the two performance tests produced the following set of data:

Test a	Test b
Run 1: 100	115
Run 2: 95	120
Run 3: 110	125

5.2 Using Equation 1—

E_a=100+95+110/3=102

E_b=115+120+125/3=120

5.3 Using Equation 2—

S_a^2=(100−102)^2+(95−102)^2+(110−102)^2/ 3−1=58.5

S_b^2=(115−120)^2+(120−120)^2+(125−120)^2/ 3−1=25

5.4 Using Equation 3—

S_p=[(3−1)(58.5)+(3+1)(25)/3+3−2] ½=6.46

5.5 Using Equation 4—

$$t=\frac{120-102}{6.46\left[\frac{1}{3}+\frac{1}{3}\right]^{1/2}}=3.412$$

5.6 Since $(n^1+n^2-2)=4$, $t'=2.132$ (from Table 1). Thus since $t>t'$ the difference in the values of E_a and E_b is significant, and there has been an increase in emission rate to the atmosphere.

6. *Continuous Monitoring Data.*

6.1 Hourly averages from continuous monitoring devices, where available, should be used as data points and the above procedure followed.

ATTACHMENT 4

ANALYSIS OF MERCURY EMISSIONS DURING BASELINE AND WWS TESTS

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

SEPTEMBER-NOVEMBER 1990

Material balances were carried out with respect to mercury to assist in the interpretation of the analytical and process data gathered during emission measurements conducted on September 18-19, 1990 and October 31-November 2, 1990. To carry out the material balances, the following data were considered:

- Rates of all raw materials, fuels and discharge streams; and
- Mercury concentrations in the raw materials, fuels and discharge streams.

As flow measurements and concentration measurements were not conducted for all streams of interest, several conservative assumptions were necessary to perform the calculations. The assumptions included:

1. All mercury in the coal was volatilized and discharged through the stack.
2. All mercury in the kiln feed material was volatilized and discharged through the stack. (This assumption implies that no mercury would be found in the outgoing clinker or in the baghouse dust.)

Mercury from Coal

Power plant coal feed rate = 1200 tpd = 50 tph (plant operating records)

Cement plant coal utilization rate = 8.5 tph (plant operating records)

The coal mercury concentrations were not measured during the test. Furthermore, the coal supplier was unable to locate any data. For this reason, an alternate source of data was required.

Florida Crushed Stone has purchased coal from the same source since the power, cement and lime plants began operation. According to information provided by the coal supplier, the coal is Pennsylvanian bituminous from Kentucky. According to information published in the open literature (Reference 1), the mercury concentrations of 34 bituminous coals from Kentucky ranged from 0.02 ppm to 1.3 ppm; the average mercury concentration of the coal samples being 0.20 ppm. The ash content, heating value, sulfur content, and elemental compositions of the ash of the coal utilized at Florida Crushed Stone was compared with the compositions of the coals listed in the U.S.G.S. Survey (Reference 1, Attachment 2). The maximum mercury concentration encountered for coals of similar composition was 0.20 ppm. For this reason, the mercury

concentration of the fuel used at Florida Crushed Stone was estimated to be 0.20 ppm. Using this estimate, the mercury incoming with the coal is given by:

Hg in coal = (58.5 tons coal/hour) x (2000 lb/ton)
x (0.20 x 10-6 parts Hg/part coal)
= 0.023 lb Hg/hour

Mercury from the Raw Materials Used in the Cement Plant

Baseline Test Conditions

Kiln Feed Rate = 132 tph

Mercury content of Kiln Feed = 0.4 ug/g or 0.4 ppm

Mercury incoming with kiln raw materials is:

(132 tons/hour) x (2000 lb/ton)
x (0.4 x 10-6 parts Hg/part feed)
= 0.106 Hg/hr

WWS Test Conditions

Kiln Feed Rate = 128 tph

Mercury content of kiln feed (including WWS) = 0.5 ug/g or 0.5 ppm

Mercury incoming with the kiln raw materials (which includes the wastewater sediment) is:

(128 tons/hour) x (2000 lb/ton)
x (0.5 x 10-6 parts Hg/part feed)
= 0.128 Hg/hr

It should be noted that of the 0.128 lb/hr of mercury incoming with the kiln feed, only 0.001 lb Hg/hr (1.75 tph x 2000 lb/hr x 0.4 x 10-06 parts Hg/part feed) was attributable to the wastewater sediment.

Mercury from Limestone used in Power Plant and Lime Plant

The lime plant limestone feed rate was calculated form the lime production rate of the lime plant. The prorating factor was assumed to be proportional to the molecular weights of calcium carbonate and calcium oxide, respectively (100 lb CaCO3/56 lb CaO).

Thus, the feed rate of the limestone is:

(11 tph) x (100/56) = 19.6 tph

The mercury content of the limestone is not known. However, the kiln feed is approximately 83 percent limestone. As a conservative estimate, it was assumed that the mercury concentration of the limestone is the same as the mercury concentration of the kiln feed.

Thus, the mercury incoming with the limestone is:

(19.6 tph) x (2000 lb/ton) x (0.4 x 10-6 parts Hg/part feed)
= 0.016 lb Hg/hr

Total Mercury Incoming with Feed Streams and Fuel

Baseline Test Conditions

The total incoming mass of mercury with the kiln feed and coal is:

0.106 lb/hr + 0.023 lb/hr + 0.016 = 0.145 Hg/hr

WWS Test Conditions

The total mercury incoming with the kiln feed and coal is:

= 0.128 lb/hr + 0.023 lb/hr + 0.016 = 0.167 Hg/hr

These calculations show that the mass rate of mercury to the process during the wastewater sediment test was only about 15 percent higher than the mass rate of mercury to the process during the baseline test. Furthermore, this slight increase in mercury in the system was not the result of the WWS but was the result of minor variations in the mercury content of the other raw materials and differences in raw material feed rates. The attached Table 5 from the WWS test report shows there is less mercury in the WWS (0.4 ppm) than in the kiln feed (0.5 ppm).

Material Balances

The ratio of the outgoing mass of mercury (assuming all will be found in the stack gas) to the incoming mass of mercury can be expressed as:

% Recovery = (Mercury in Stack) x 100 / (Mercury in Feed Streams)

Baseline Test Conditions

The measured mercury emission rate in the stack was 0.034 lb/hr.

% Recovery = (0.034 lb/hr) x 100 (0.145 lb/hr) = 23.4%

WWS Test Conditions

The measured mercury emission rate of the stack was 0.383 lb/hr

% Recovery = (0.383 lb/hr) x 100 / (0.167 lb/hr) = 229%

Conclusions

The apparent increase in the measured mercury emissions during the wastewater sediment test cannot be attributed to the use of the wastewater sediment. Furthermore, the magnitude of the increase cannot be explained by the changes in the total mercury fed to the cement plant through the raw materials. It is possible that the apparent increase in mercury emissions is the result of analytical difficulties.

The mercury emissions measured during the baseline tests appear reasonable as it is reasonable to assume that some of the mercury in the system will remain in the clinker and baghouse dust (See Attachment 2). Conversely, the emissions reported during the wastewater sediment tests are suspect as they represent more than twice the mercury input to the cement kiln system.

References

1. V.E. Swanson, J.H. Medlin, J.R. Hatch, S.L. Coleman, G.H. Wood, Jr., S.D. Woodruff and R.T. Hildebrand, (1976) "Collection, chemical analysis and evaluation of coal samples in 1975", United States Department of the Interior Geological Survey, Open-file report 76-468, p 188-203.

ATTACHMENT 5

KOOGLER & ASSOCIATES

IMPACT OF TRACE CONSTITUENTS ON AIR QUALITY

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

	Emission Rate(1) (lb/hr)		Impact of Emission and No Threat Levels(2) (micrograms per cubic meter)					
			8-hr		24-hr		Annual	
Constituent	Baseline	WWS	Impact	NTL	Impact	NTL	Impact	NTL
As	<0.004	-	<0.01	2	<0.001	0.48	<0.00001	0.00023
Ba	-	0.054	<0.01	5	0.001	1.2	0.00009	50
Cd	<0.005	<0.005	<0.01	0.5	<0.001	0.12	<0.00001	0.00056
Cr	-	0.024	<0.01	5	<0.001	1.2	0.00004	1000
Co	-	0.022	<0.01	0.5	<0.001	0.12	-	-
Cu	-	<0.010	<0.01	1.0	<0.001	0.24	-	-
Fe	-	1.597	0.07	50	0.026	12	-	-
Pb	0.130	-	0.01	1.5	0.002	0.36	0.00022	0.09
Hg	-	0.149(3)	0.01	1.0	0.002	0.24	-	-
Mo	0.018	-	<0.01	50	<0.001	12	-	-
Ni	<0.018	-	<0.01	0.5	<0.001	0.12	<0.00003	0.00420
Se	-	0.012	<0.01	2	<0.001	0.48	-	-
Ag	-	0.015	<0.01	0.1	<0.001	0.024	0.00003	3
Ti	-	0.645	0.03	100	0.011	24	-	-
V	-	0.022	<0.01	0.5	<0.001	0.12	0.00004	20
2,3,7,8 TCDD	$0.114x10^{-6}$	-	-	-	-	-	$1.9x10^{-10}$	$2.2x10^{-8}$
Acetone	0.025	-	<0.01	35600	<0.001	8544	-	-
Benzene	0.101	-	<0.01	30	0.002	7.2	0.00017	0.12
Toluene	0.014	-	<0.01	3750	<0.001	900	0.00002	300
TCE	<0.003	-	<0.01	3350	<0.001	804	-	-
Chlorobenzene	0.007	-	<0.01	460	<0.001	110	-	-
Ethylbenzene	0.003	-	<0.01	4350	<0.001	1044	-	-
Xylene	0.008	-	<0.01	4350	<0.001	1044	-	-
Chloromethane	0.010	-	<0.01	-	<0.001	-	-	-
Bromomethane	<0.003	-	<0.01	200	<0.001	48	<0.00001	0.006
Carbon disulfide	<0.003	-	<0.01	120	<0.001	29	<0.00001	0.01
Styrene	0.002	-	<0.01	2150	<0.001	516	-	-

(1) Listed emission rate is the highest rate measured during Baseline and WWS tests with cement, power and lime plants operating.

(2) No Threat Levels - Policy based ambient guidelines established by FDER.

(3) Emission rate measured during baseline plus maximum amount of mercury that could be controlled by the wastewater sediment (see page 2c of 12).

Attachment 3

Available Upon Request

Attachment 4

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

APR 4 1990
4APT-AEB

RECEIVED
APR 09 1990
DER - BAQM

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

RE: Florida Crushed Stone (PSD-FL-091)

Dear Mr. Fancy:

This is to acknowledge receipt of your letter dated March 15, 1990, transmitting a request by Florida Crushed Stone to amend their prevention of significant deterioration (PSD) permit to allow the burning of tire derived fuel (TDF) in their cement kiln. The current permit for the source limits the fuel of the kiln to coal only. As discussed between Mr. Bruce Mitchell of your staff and Mr. Gregg Worley of my staff on March 30, 1990, we have the following comments.

Under the scenario presented by the source, the switch to the use of TDF in the kiln would not constitute a major modification for the purposes of PSD provided that the increase in pollutants due to the fuel switch did not exceed significant emissions increase levels. It is important to note that the change in emissions must be evaluated from "old actual" to "new allowable" emissions. The old actual emissions must be based on the previous two years of operating data unless some other period is deemed to be more representative of normal operating conditions. The new allowable emissions will be those emissions which are reflected in the amended permit. Also, it was noted that the list of pollutants to be tested did not include benzene. Since benzene is a pollutant regulated under the Clean Air Act for which a significant emissions rate has not been established, any increase of emissions of benzene would subject the source to PSD.

Thank you for the opportunity to review and comment on this package. If you have any further questions or comments, please do not hesitate to contact Mr. Gregg Worley of my staff at 404/347-2864.

Sincerely yours,

Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides and Toxics
Management Division

Attachment 5

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

AUG 20 1990

4APT-AE

RECEIVED
AUG 24 1990
DER - BAQM

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

RE: Florida Crushed Stone (PSD-FL-091)

Dear Mr. Fancy:

This is to acknowledge receipt of your letter dated June 27, 1990, concerning the above referenced source's request to process wastewater treatment sediment in their existing cement kiln. As discussed between Mr. Bruce Mitchell of your staff and Mr. Gregg Worley of my staff on July 26, 1990, we have the following comments to offer.

As presented in my letter to you dated April 4, 1990, concerning a proposed switch in fuel at the above referenced facility, the change in the method of operation of the kiln would not be a "major" modification for the purposes of Prevention of Significant Deterioration (PSD) unless the switch resulted in a "significant" increase in emissions. It was noted that emissions would be tested both prior to and after the fuel switch in order to correctly determine emissions increases.

Similarly, the addition of the capability to process wastewater treatment sediments would not constitute a "major" modification unless there was a significant increase in pollutants. Based on the lack of emission factors for this material, your plan of testing pollutant emissions before and after the modification should be sufficient to determine applicability of new source review. Also, a determination should be made as to whether this project is related to the earlier fuel switch and whether the increases in emissions from both modifications should be considered together in determining applicability.

The cement kiln will be subject to 40 C.F.R. Part 61, Subpart E which regulates stationary sources that incinerate or dry wastewater treatment sludge (sediment). This regulation will apply regardless of the mercury content of the sediment. Approval for processing the sediment by the Florida DER is necessary under 40 C.F.R. § 61.08.

Thank you for the opportunity to review and comment on this package. If you have any questions on these comments, please contact Mr. Gregg Worley of my staff at (404) 347-2904.

Sincerely yours,

Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides, and Toxics
Management Division

cc'd:
BA/CHF
B. Thomas, SW Dist. } 8-24-90 Rm

Attachment 6

RADIAN
CORPORATION

8501 Mo-Pac Blvd.
P.O. Box 201088
Austin, TX 78720-1088
(512)454-4797

REQUEST FOR REGULATORY APPROVAL:

OPERATIONAL TEST TO DEMONSTRATE BENEFICIAL REUSE OF A NONHAZARDOUS WASTEWATER TREATMENT SLUDGE AT FLORIDA CRUSHED STONE COMPANY'S BROOKSVILLE PLANT

EIVED
MAY 21 1990
DER - BAQM

Prepared for:

The Bureau of Air Quality Management
Florida Department of Environmental Regulation
Tallahassee, Florida

Prepared by:

Radian Corporation, Austin, Texas
on behalf of
Florida Crushed Stone Company, Brooksville, Florida

18 May 1990

TABLE OF CONTENTS

1.0 INTRODUCTION

The purpose of this document is to formally request the state of Florida's approval for an operational test for the beneficial reuse of approximately 400 short tons (wet basis) of electric utility sludge as a raw material supplement at the Florida Crushed Stone Company's Brooksville plant. The operational test is designed to gather all information necessary to demonstrate that the beneficial reuse of utility sludge has no adverse affect on cement quality or process operations, and to assess the feasibility of developing a long-term utilization program at the Brooksville plant.

The utilization of this sludge as a raw material supplement for the production of Portland Cement has already been tested by Radian Corporation at a cement plant in South Carolina (Gifford-Hill cement company in Harleyville). Stack emissions data was collected during this test and showed that the use of the sludge results in no adverse environmental impacts. As a result, no stack emissions will collected during the operations test.

The remaining sections of this document provide: 1) a description and characterization of the sludge; 2) a description of the proposed beneficial reuse concept; and 3) an assessment of the environmental impact that may result from sludge utilization at the Brooksville plant.

2.0 DESCRIPTION AND CHARACTERISTICS OF SLUDGE

The sludge to be beneficially reused as a raw material supplement at Florida Crushed Stone is a sediment/precipitate generated in the wastewater treatment system at the Jacksonville Electric Authority (JEA) in Jacksonville, Florida. For the operational test, sludge from JEA's Northside Station will be used. After the operational test and after the required approvals/permit modifications are gained from the state, Florida Crushed Stone will consider long-term beneficial reuse of additional sludge from the Northside Station, similar sludges from other JEA stations, and similar sludges from other electric utilities.

At the Northside Station a variety of low volume wastewater streams make their way into the wastewater treatment system. Runoff from the washing of equipment, collected rainwater, and other miscellaneous sources are collected and commingled.

The wastewater collected at the Northside Station flows into a sedimentation basin where some solids settle out; the solids collected in this basin are called the surge basin sludge. Next, the effluent flows into a tank where lime is added to raise the pH of the solution and precipitate soluble metals. Any solids generated as a result of lime addition settle out in a second sedimentation basin; these solids are referred to as the treated sludge. Both the surge basin sludge and the treated sludge are proposed for reuse as a Portland cement raw material substitute

2.1 Elemental Analysis

Table 2-1 presents the analytical results from samples of the two Northside Station sludges. However, since the wastewater treatment system does not receive waste of completely uniform composition, the sludge compositions will vary somewhat from sample to sample. The surge basin sludge will contain from 90 to 95+ percent water. The treated sludge will contain 70

TABLE 2-1. COMPOSITION OF SLUDGES BY WEIGHT PERCENT, DRY

ELEMENTAL ANALYSIS	SURGE BASIN	TREATED SLUDGE
ALUMINUM	0.44	0.44
ANTIMONY	0.02	0.00
ARSENIC	0.65	0.06
BARIUM	0.06	0.03
CADMIUM	0.01	0.00
CALCIUM	0.42	13.00
CHROMIUM	0.16	0.02
COBALT	0.03	0.01
COPPER	0.04	0.06
GOLD	0.01	0.00
IRON	17.00	7.50
LEAD	0.05	0.01
LITHIUM	0.00	0.00
MAGNESIUM	4.10	8.40
MANGANESE	0.04	0.11
MOLYBDENUM	1.60	0.05
NICKEL	2.00	0.52
PHOSPHORUS	0.00	0.00
PLATINUM	0.20	0.04
POTASSIUM	0.03	0.00
SELENIUM	0.03	0.01
SILICON	0.00	0.00
SILVER	0.00	0.00
SODIUM	0.99	0.73
STRONTIUM	0.01	0.03
TELLURIUM	0.11	0.01
THALLIUM	0.03	0.00
TITANIUM	0.07	0.01
VANADIUM	6.40	0.47
YTTRIUM	0.00	0.00
ZINC	0.04	0.04
CARBONATE	0.00	0.02
CHLORIDE	0.58	0.34
SULFATE	6.60	2.13
TOTAL	41.73	34.04

to 85 percent water. The samples were evaporated to dryness and were subsequently digested and analyzed for metals and major anions. The results shown in Table 2-1 are on a dry basis as a result.

Several samples of the surge basin sludge were collected and analyzed for selected group of metals in order to demonstrate that range of variability that may be anticipated for the sludges composition. These ranges are shown in Table 2-2.

As shown in Table 2-1, the sum of the metal and anion constituents is less than 100 percent. The analysis was performed for the elemental metals in the sludge and not the metal hydroxides (which is the likely chemical form of the metals). The presence of hydroxides should account for the missing mass.

The results in Table 2-1 do not include mercury. However, there is no obvious potential source of mercury for these sludges. None of the sources of the wastewater should contain any mercury.

2.2 Toxicity Testing

The sludges were determined to be nonhazardous in accordance with RCRA's EP toxicity and TCLP test criteria. In addition, the sludges are not RCRA listed hazardous wastes. All extractable metal levels are at least ten times below the toxic limit. The toxicity results are presented in Table 2-3. Extracted mercury levels were below the detectable limit for all sludges. This supports the conclusion that mercury should not be present in these sludges.

TABLE 2-2. EXAMPLE OF RANGE OF SLUDGE COMPOSITION FOR SELECTED METALS, WEIGHT PERCENT DRY

METAL	RANGE OF CONCENTRATIONS (WEIGHT PERCENT, DRY)
Ag - Silver	0.0001 - 0.002
As - Arsenic	0.005 - 0.07
Ba - Barium	0.02 - 0.06
Cd - Cadmium	0.0002 - 0.01
Co - Cobalt	0.02 - 0.04
Cr - Chromium	0.06 - 0.2
Cu - Copper	0.04 - 0.15
Mo - Molybdenum	0.09 - 1.6
Ni - Nickel	0.4 - 2.0
Pb - Lead	0.01 - 0.05
Se - Selenium	0.004 - 0.03
V - Vanadium	1.2 - 6.4

TABLE 2-3. EP TOX AND TCLP ANALYTICAL RESULTS

		EXTRACTS: (mg/L)						
		SURGE BASIN		TREATED SLUDGE		EP * BLANK FLUID	TCLP ** BLANK FLUID	TCLP+ BLANK FLUID
METAL	RCRA MAX.	EP	TCLP	EP	TCLP			
ARSENIC	5	0.024	0.028	0.0055	0.005	<0.002	0.006	<0.002
BARIUM	100	0.11	0.55	0.255	0.55	<0.009	0.61	0.71
BERYLLIUM		0.001	0.002	0.002	0.002	<0.001	<0.001	<0.001
CADMIUM	1	0.047	0.057	0.031	0.03	<0.003	<0.003	<0.003
CHROMIUM	5	0.024	0.034	0.035	0.035	<0.009	<0.009	<0.009
COBALT		0.52	0.52	0.25	0.26	<0.01	<0.01	<0.01
COPPER		0.04	0.08	0.105	0.09	<0.01	<0.01	<0.01
IRON		0.14	0.88	0.11	<0.03	<0.03	<0.03	<0.03
LEAD	5	<0.002	<0.05	0.003	<0.05	0.008	<0.05	<0.05
MERCURY	0.2	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
MOLYBDENUM		8	14	0.1	0.16	<0.05	<0.05	<0.05
NICKEL		26	26	14	15	<0.02	<0.02	<0.02
SELENIUM	1	<0.005	0.014	<0.005	<0.005	<0.005	<0.005	<0.005
SILVER	5	0.014	<0.009	0.021	0.021	<0.009	<0.009	<0.009
THALLIUM		<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09
VANADIUM		9.2	12	<0.02	<0.02	<0.02	<0.02	<0.02
ZINC		0.45	0.78	0.335	0.51	0.018	0.24	0.35

* EP EXTRACTION FLUID (0.5N ACETIC ACID)
** TCLP EXTRACTION FLUID (SODIUM ACETATE BUFFER)
+ TCLP EXTRACTION FLUID (ACETIC ACID) - USED ONLY FOR TREATED SLUDGE

2.3 Organic Analysis

These sludges have been analyzed for total organics on several occasions. No organics were detected for most of these analysis. However, on one occasion 0.2 weight percent total organic carbon was detected. There is no obvious source for even this low level of organic content. It is likely that this sample was an anomaly and that for the most part the sludge is free of any organic constituents.

2.4 Physical Properties of the Sludge

The physical properties of the sludges are presented in Table 2-4. Laboratory and field tests show that the sludge will no naturally dewater below the moisture levels indicated. Although the sludges have relatively high viscosities, they have proven to be pumpable during full scale field tests.

TABLE 2-4. SLUDGE PHYSICAL PROPERTIES

Surge Basin Sludge:

Approximate Density = 9 lbs/gallon
Approximate Viscosity = 800 cps

Treated Sludge:

Approximate Density = 9 lbs/gallon
Approximate Viscosity = 3000 - 4000 cps

3.0 DESCRIPTION OF PROPOSED PROJECT

3.1 Sludge Excavation

Four hundred short tons (wet basis) of Northside Station sludge will be used during this operational test. The sludge will be excavated and loaded into rail tankers. Any excess water that is removed during excavation will be allowed to decant in the rail tanker for a minimum of 24 hours. The decant water will be removed from the rail tanker prior to rail shipment and will be returned to JEA's water treatment system.

3.2 Sludge Analysis

The sludge will be delivered to Florida Crushed Stone's Brooksville plant in rail tank cars (approximately 20,000 gallons capacity each). Prior to shipment, a sample will be drawn from each car and sent by courier to a qualified analytical laboratory for sample digestion and ICAPES analysis for the following metals:

- Arsenic,
- Barium,
- Cadmium,
- Cobalt,
- Copper,
- Lead,
- Molybdenum,
- Nickel,
- Selenium,
- Silver and
- Vanadium.

In addition, each sample will be analyzed for total organic content and moisture content. The rail car will be approved for shipment if the sampling results indicate that the composition of the material is not significantly different than expected. The sampling results will be sent to Florida Crushed Stone before the rail car reaches the plant.

In addition to the sampling and analysis, each rail car will be weighed in route to Brooksville to determine the total quantity of sludge shipped with that load.

3.3 Sludge Handling

For the operational test the sludge will be pumped from the rail cars into a vacuum truck. From the vacuum truck the sludge will be pumped directly into the plants raw mill where it will be mixed and ground with the remaining raw materials and subsequently fed into the preheater and rotary kiln where clinker will be produced. No on-site storage vessels for the sludge will be required for the test.

Sludge will be used as a raw material supplement at a rate of approximately 50 tons/day. It will be mixed with approximately 3500 tons/day of raw materials.

4.0 ENVIRONMENTAL IMPACTS

No adverse environmental impacts are expected as a result of the proposed operational test at the Brooksville plant. Stack metals emissions data was collected during a similar test program conducted at a cement plant in South Carolina. The results of this test are shown in Table 4-1. The metals emissions data represents the sum of particulate and vapor phase metals emissions. As shown in this test, stack emissions were not effected by the use of the sludge.

The South Carolina test results were based on the following sludge utilization rate:

Sludge Feed Rate = 1.8 wet tons/hour, (44 tons/day)
Sludge Moisture Content = 94.4 %
Kiln Raw Material Feed Rate = 143 tons/hour
Sludge Substitution Rate = 0.0007 tons sludge solids/ton raw materials

The Brooksville test will be based on the following sludge utilization rate:

Sludge Feed Rate = 2.1 wet tons/hour, (50 tons/day)
Sludge Moisture Content = 94 % (estimate)
Kiln Raw Material Feed Rate = 145 tons/hour
Sludge Substitution Rate = 0.00$\underset{\overset{\wedge}{0}}{}$9 tons sludge solids/ton raw materials

The Brooksville operational test will be run at a slightly higher substitution rate than the South Carolina test. However, the rate is still very low, and no impact on stack emissions is expected.

The sludge is not a source of fugitive organic or particulate emissions, and it is used at such a low rate that it will not effect combustion related emissions (CO, NOx), or emission of sulfur dioxide.

Table 4-1. Comparison of Stack Metals Emissions With and Without Sludge Addition

Baseline Stack Test:

	Stack Flow (dscfm)	Sample Vol (dscf)	Metals Analysis (micrograms)											
			Ag	As	Ba	Cd	Co	Cr	Cu	Mo	Ni	Pb	Se	V
Test 1	176,117	49.5016	<8	<2	<40	3.1	<20	60	38	<40	171	3	<41.5	1.5
Test 2	172,765	50.7696	<8	<2	<40	6	<20	48	31	<40	30	20.8	<41.5	18
Test 3	168,028	48.0155	<8	<2	<40	2.8	<20	60	34	<40	33	6.3	<41.5	18
Ave. Mass Flow (lbs/hr)			--	--	--	0.002	--	0.026	0.016	--	0.036	0.005	--	0.006

With Sludge Utilization :

	Stack Flow (dscfm)	Sample Vol (dscf)	Metals Analysis (micrograms)											
			Ag	As	Ba	Cd	Co	Cr	Cu	Mo	Ni	Pb	Se	V
Test 1	170,685	48.7232	2	<1.5	<10	5	<5	8	16	<10	<4	2.5	9.1	4
Test 2	168,967	50.7946	<2	2.1	<10	5.8	<5	7	13	<10	41	1.6	28	6
Test 3	176,563	52.0513	6	<1.5	<10	1.3	<5	8	<2	<10	<4	<1.5	1.5	4
Ave. Mass Flow (lbs/hr)			0.001	0.000	--	0.002	--	0.003	0.004	--	0.006	0.001	0.006	0.002

Florida Department of Environmental Regulation
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400
Lawton Chiles, Governor
Carol M. Browner, Secretary

October xx, 1991

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Randy Thompson
Environmental Department
Florida Crushed Stone Company
Post Office Box 490300
Leesburg, Florida 34749-0300

Dear Mr. Thompson:

Re: Amendment to the Construction Permit, No. AC 27-118674 (PSD-FL-091C), to be Permitted to Utilize the Wastewater Treatment Sediment from JEA's Generating Stations

The Department has reviewed the request for a construction permit amendment that you provided in a letter with attachments received on August 9, 1991, via FAX. The request was for the facility's cement kiln to be permitted to utilize the wastewater treatment sediment from Jacksonville Electric Authority's (JEA) generating stations for a limited time frame (i.e., 16 months) only after the pollutant emissions results of the performance tests have been reviewed by the Department's Bureau of Air Regulation and involved parties (i.e., Department's Southwest District, U.S. EPA, National Park Service, Hernando County, etc.) and there were "no actual emissions" increase of any pollutant pursuant to 40 CFR 60, Appendix C (July, 1990 version).

Based on an evaluation of the pollutant emissions test results, there was not an actual emissions increase of any pollutant.. Therefore, the request to utilize wastewater treatment sediment from JEA's generating stations is acceptable and the following Specific Conditions and Attachments are changed and/or added:

<u>Specific Conditions</u>:

o The cement kiln's utilization rate of wastewater treatment sediment from JEA's generating stations shall not exceed 3.0% of the total permitted raw material feed rate, on a dry weight basis, or 3.7 tons per hour, whichever is less.

- The facility may utilize the wastewater treatment sediment from JEA's generating stations for a period not to exceed 12 months.

- The maximum quantity of the wastewater treatment sediment from JEA's generating stations that may be utilized in the facility's cement kiln is 18,000 tons.

- The facility's cement kiln shall not utilize any wastewater treatment sediment from JEA's generating stations having concentrations equal to or greater than the following:

Constituent	Maximum Concentration
Total Organic Chlorine	0.2 percent
Total Oil and Grease	2.0 percent
Arsenic	1250 mg/kg
Antimony	2000 mg/kg
Barium	1000 mg/kg
Cadmium	1000 mg/kg
Chromium +6	100 mg/kg
Lead	4900 mg/kg
Mercury	10 mg/kg
Silver	2000 mg/kg
Thallium	1600 mg/kg

Note: Dr. John B. Koogler's letter with attachments dated August 9, 1991, is incorporated by reference.

- The quantity of all of the wastewater treatment sediment from JEA's generating stations utilized in the facility's cement kiln shall be documented and kept on record/file for a minimum of two years.

- The quantity of all deliveries of the wastewater treatment sediment from JEA's generating stations and the facility identified from which the material was shipped shall be documented and kept on record/file for a minimum of two years.

- Objectionable odors shall not be allowed off the facility's property in accordance with Florida Administrative Code Rule 17-2.620(2).

- Based on conversation with the U.S. EPA, Region IV, the facility's cement kiln is subject to all applicable standards of 40 CFR 61, Subpart E, National Emission Standard for Mercury, because the wastewater treatment sediment is incinerated or dried in the source.

- o Emissions to the atmosphere from sludge incineration plants, sludge drying plants, or a combination of these that process wastewater treatment plant sludges shall not exceed 3200 grams of mercury per 24-hour period in accordance with 40 CFR 61.52.

- o Stack sampling for mercury shall be in accordance with 40 CFR 61.53.

- o Sludge/sediment sampling for mercury shall be in accordance with 40 CFR 61.54.

- o Monitoring of mercury emissions and operations shall be in accordance with 40 CFR 61.55.

- o All references to the Title 40 Code of Federal Regulations shall be of the July, 1990 version.

- o For sludge/sediment analyses, Mr. Daniel S. Davis' document received May 21, 1990, is adopted by reference, with exceptions to Section 3.2, Sludge Analysis, of which the following pollutants will also be required to be analyzed for:

o Mercury
o Aluminum
o Silver
o Magnesium
o Titanium
o Cobalt
o Iron
o Sulfur

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

1. Dr. John B. Koogler's letter with enclosures received August 9, 1991, via FAX.
2. Dr. John B. Koogler's letter with enclosures received August 12, 1991 (hard copy).
3. 40 CFR (July, 1990 version).
4. Ms. Jewell A. Harper's letter dated April 4, 1990.
5. Ms. Jewell A. Harper's letter dated August 20, 1990.
6. Mr. Daniel S. Davis's letter received May 21, 1990.
7. Intent to Issue package dated August 27, 1991.
8. Public Notice of the Intent to Issue received September xx, 1991.
9. Mrs. Carol M. Browner's letter (amendment) dated September xx, 1991.
10. Dr. John B. Koogler's letter with enclosures (performance test results of pollutant emissions) received September xx, 1991.
11. Mr. C. H. Fancy's letter transmitting the performance test results of the pollutant emissions to the involved parties dated September xx, 1991.
12. The Department's Final Determination and Amendment dated October xx, 1991.

This letter must be attached to the construction permit, No. AC 27-118674 (PSD-FL-091C), and shall become a part of the permit.

Sincerely,

Carol M. Browner
Secretary

CB/SS/rbm

Attachments

cc: B. Thomas, SW District
G. Smallridge, Esq., DER
J. Koogler, Ph.D., P.E., K&A
C. Shaver, NPS
J. Harper, EPA
C. Hetrick, HCBCC
L. Sellars, Esq., H&K

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400
Lawton Chiles, Governor
Carol M. Browner, Secretary

August 19, 1991

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Charles Hetrick
County Administrator
Hernando County Board of County Commissioners
Hernando County Government Center
Administration Building
20 North Main Street, Room 461
Brooksville, Florida 34601

Dear Mr. Hetrick:

Re: Letters (2) Regarding Florida Crushed Stone's Usage of Tire Derived Fuels and JEA's Wastewater Treatment Sludge

The Department's Bureau of Air Regulation (BAR) has reviewed your letters received January 18, 1991 (tire derived fuel), and February 26, 1991 (JEA's wastewater treatment sludge), which were both signed by Dr. J. P. Subramani, with Oertel Hoffman Fernandez and Cole, P.A. Florida Crushed Stone Company (FCSC) has prepared a response to the comments that pertained to them and they are enclosed.

Besides the comments in the letter of January 18, 1991, you requested a copy of the Modesto Energy Company's Final Emissions Report, dated April 25, 1988. The company no longer considers the report confidential and a copy has been enclosed.

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

Sincerely,

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

CF/BM/rbm

Enclosures

cc: B. Thomas, SW District
C. Forthman, Esq., DER
C. Shaver, NPS
T. Mountain, FCS
L. Sellers, Esq., H&K
J. Koogler, Ph.D., P.E.
J. Harper, EPA
G. Smallridge, Esq., DER
J. Subramani, Ph.D., P.E., OHF&C

Enclosures

January 18, 1991 Letter
and Response

February 26, 1991 Letter
and Response

Final Emissions Report
Modesto Energy Company
April 25, 1988

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ■ FAX 377-7158

KA 307-90-05

August 9, 1991

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

Subject: Florida Crushed Stone Company
Hernando County, Florida
Use of Wastewater Sediment as a Raw Material Sediment

Dear Mr. Fancy:

We appreciated the opportunity to meet with you and Bruce Mitchell on July 30, 1991, to discuss matters related to use of a non-hazardous wastewater sediment as a raw feed supplement during the production of Portland cement at the Florida Crushed Stone Company plant in Hernando County, Florida. At the present time, Florida Crushed Stone (FCS) is proposing to use only wastewater sediment generated by the Jacksonville Electric Authority (JEA) at their electric power generating stations in Jacksonville, Florida. The maximum feed rate of the wastewater sediment will be three percent of the total kiln feed, or 3.7 tons per hour, whichever is less.

The sediment to be beneficially used as a raw material supplement is a sediment generated in the wastewater treatment systems at the JEA electric power generating stations in Jacksonville, Florida. The sources of wastewater include run-off from equipment washing, collected rainfall and other miscellaneous sources. The comingled waters flow into a settling basin where the larger particles settle. The outflow from the first basin enters a second settling basin where lime is added to raise the pH and enhance the sedimentation of the remaining solids. The sediment from both settling basins will be combined and used as the raw material supplement.

The total quantity of wastewater sediment from the JEA facilities is estimated not to exceed 18,000 tons. As stated, this wastewater sediment will be fed to the cement kiln as a supplement to normal kiln feed materials at a maximum rate of three percent of the total kiln feed or approximately 3.7 tons per hour. At this feed rate, approximately 5,000 hours of kiln operating time will be required to consume all of the wastewater sediment. FCS is requesting that 16 months be allowed for the consumption of all of the sediment. This will take into consideration delays that might arise due to kiln operating considerations and/or wastewater sediment handling and shipment.

If a wastewater sediment feed rate of 3.7 tons per hour cannot be achieved during the test period, it is our understanding that the Department will amend the construction permit to allow a maximum sediment feed rate of 110 percent of that achieved during the test period. This is normal Department policy when the maximum permitted (or proposed) processing rate is not achieved during a compliance test.

Information submitted to the Department under cover of our letter dated March 11, 1991 (Attachment 1) shows the maximum concentrations of various metals possible in the wastewater sediment without the impact of emissions exceeding acceptable ambient standards. These calculations were based on a wastewater sediment feed rate of five percent of the total kiln feed rate or 6.2 tons per hour and the assumption that 10 percent of the metals in the wastewater sediment would be discharged to the atmosphere. FCS is requesting a maximum wastewater sediment feed rate of three percent of the total kiln feed rate or 3.7 tons per hour. Additionally, other documentation submitted to the Department (von Seebach, M. and J. B. Thompkins., "Metal Emissions are Predictable." Rock Products, April 1991, pp. 31-35) shows that the fractions of metals released to the atmosphere during Portland cement production is less than 0.5 percent of the metals input to the system (with the possible exception of mercury and thallium). Therefore, even if there is a considerable variation in the concentration of metals in the JEA wastewater sediment, FCS has provided assurance that acceptable ambient standards will not be exceeded.

For purposes of the permit amendment under consideration, FCS is proposing the following limits on metals and certain other constituents in the JEA wastewater sediment based on the above referenced air quality modeling and more restrictive practical considerations. These limits are listed below:

Constituent	Maximum Concentration
Total Organic Chlorine	0.2 percent
Total Oil and Grease	2 percent
Arsenic	1250 mg/kg
Antimony	2000 mg/kg
Barium	1000 mg/kg
Cadmium	1000 mg/kg
Chromium +6	100 mg/kg
Lead	4900 mg/kg

Mercury	10 mg/kg
Silver	2000 mg/kg
Thallium	1600 mg/kg

The above limits are somewhat higher than the maximum concentrations reported by Radian in a background document previously provided to the Department, giving FCS a reasonable margin in which to operate. On the other hand, the suggested concentrations are well below concentrations that would result in unacceptable ambient concentrations using very conservative assumptions.

It is my understanding, based on our discussions of July 30, 1991, that the amendment to the FCS cement plant permit will be handled as a one-step process. The Intent that will be issued by the Department will include a requirement for testing to document the plant operating conditions and emission rates. If the testing demonstrates that there is no increase in the emissions of any regulated air pollutant, it is our understanding that the Department will amend the construction permit for the cement plant to allow the use of wastewater sediment as a raw material substitute, assuming there are no valid objections. Following the amendment to the construction permit, FCS will be required to have the cement plant operating permit amended through the FDER District Office in Tampa.

Regarding the tests that will be conducted to document the cement plant operations and emissions from the cement plant during the use of the wastewater sediment, the following points were agreed upon:

1. A baseline test will be conducted with the CPL plant operating under normal operating conditions with the presently permitted kiln feed materials.
2. The wastewater sediments tests will be conducted with the sediment providing up to three percent of the total kiln feed rate. The sediment feed rate will be approximately 3.7 tons per hour.
3. The time required for conducting the wastewater sediment tests will be approximately one week. Florida Crushed Stone requests that the Department allow 14 days for the tests in the event of inclement weather.
4. The Department may conduct a Type I Audit during the test period.
5. During both the baseline and the wastewater sediment tests, the operations of the CPL plant will be documented including:
    a. The kiln feed rate, the coal feed rate and the clinker production rate of the cement plant.

   b. The coal feed rate and power output for the power plant.

   c. The calciner feed rate, the coal feed rate and the lime production rate for the lime plant.

   d. The inlet temperature to the baghouse, the pressure drop across the baghouse, and the baghouse fan speed and fan current.

   e. An analysis of the normal kiln feed material and an analysis of the wastewater sediment.

6. The emission measurements that will be made during the baseline period include:

   a. Particulate matter using EPA Method 5

   b. Mercury using EPA Method 101

7. During the wastewater sediment tests, the following emission measurements will be made:

   a. Particulate matter using EPA Method 5

   b. Mercury using EPA Method 101

8. The procedure used for determining if there is an increase in emissions during the wastewater sediment test when compared with the baseline conditions is that set forth in Appendix C of 40CFR60. This method was developed by EPA to:

   > "... determine whether a physical or operational change to an existing facility results in an increase in the emission rate to the atmosphere."

9. The Department will provide Koogler & Associates with a list of agencies that are to receive copies of the test data. Koogler & Associates will express mail copies of the test reports to all agencies designated by the Department. The Department will follow with a letter to the agencies requesting that the data be reviewed as expeditiously as possible. Koogler & Associates will expedite the analysis of samples and the preparation of test reports. Commitments have been made by laboratories that will be involved to provide sample turnaround within 48 hours of receipt.

10. The Department will complete their review of the data submitted by Florida Crushed Stone as expeditiously as possible but within 30 days of receipt. If the Department's review concludes there is no increase in emissions during the

use of wastewater sediment, the Department will amend the construction permit for the cement plant to allow the use of wastewater sediment with no additional notice being required.

The results of the baseline and wastewater sediment tests conducted in 1990 were discussed (Attachment 2). It was concluded that there were no increases in emissions of regulated air pollutants with the possible exception of particulate matter and mercury. An analysis of the particulate matter emission tests during the baseline period and during the wastewater sediment tests conducted in the Fall of 1990 demonstrated that there was no increase in particulate matter emissions when wastewater sediment was used based on the methodology present in 40CFR60, Appendix C. A copy of this analysis is included as Attachment 3. To provide additional information related to particulate matter emissions under the two operating conditions and to further demonstrate that the use of wastewater sediment does not affect particulate matter emissions, FCS has agreed to conduct additional particulate matter emission measurements during the baseline and wastewater sediment tests discussed herein.

In information submitted to the Department in June 1991, a detailed discussion of the apparent anomaly associated with mercury emissions measured under the two sets of operating conditions in the Fall of 1990 was presented. A copy of this analysis, documenting that the mercury emissions measured during the wastewater sediment tests in the Fall of 1990 were over 200 percent of the total mercury input to the CPL plant, is attached (Attachment 4). In order to develop additional data related to mercury emissions from the CPL and resolve questions raised as a result of the two previous tests, FCS will conduct additional emission measurements for mercury as outlined herein.

An impact analysis previously submitted to the Department demonstrated that the impacts of all organic (and inorganic) constituents of the CPL stack gas were well below NTLs (Attachment 5).

If I have misinterpreted any of the matters that we discussed during our meeting, please contact me immediately. We appreciated the opportunity to meet with you and your interest in this matter.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:wa
Enc.

c: Mr. Bruce Mitchell, FDER
Mr. Tom Mountain, FCS
Mr. Larry Sellars, Holland & Knight
B. Thomas, SW Dist.
J. Harper, EPA
C. Shaver, NPS
C. Hetrick, HCBCC
CHF/BA

ATTACHMENT 1

SUMMARY OF AIR QUALITY MODELING RESULTS
AND CALCULATIONS OF WWS METALS LIMITS

Metal	Acceptable Ambient Level (ug/m3)	Baseline Emissions(1) (lb/hr)	Baseline Maximum Annual Impact(2) (ug/m3)		Additional Emissions Allowed(3) (lb/hr)		Possible Metal Concentration in WWS(4) (ug/g)	
			C	CPL	C	CPL	C	CPL
As	$2.3x10^{-3}$	0.004	$5.8x10^{-6}$	$2.5x10^{-6}$	1.57	3.69	1,260	(7)
Sb	0.3	NM(10)	-	-	-	-	164,600(8)	(7)
Ba	50	0.02	$2.9x10^{-5}$	-	(11)	-	(11)	(7)
Be	$4.1x10^{-3}$	NM	-	-	-	-	1,260(9)	(7)
Cd	$5.5x10^{-3}$	0.005	$7.3x10^{-6}$	-	3.77	-	3,014	(7)
Cr^{+6}	$8.3x10^{-4}$	0.02(6)	$2.9x10^{-5}$		0.55	-	439(6)	(7)
Pb	0.09	0.13	$1.9x10^{-4}$	-	61.61	-	49,285	(7)
Hg	0.3	0.04	$5.8x10^{-5}$	-	205.8	-	164,600	(7)
Ag	3	0.009	$1.3x10^{-5}$	-	2058	-	>1,000,000	(7)
Th	0.3	NM	-	-	-	-	164,600(8)	(7)

(1) Measured emission rate during Baseline Test with Cement, Power and Lime Plants operating.

(2) Annual average ambient concentration resulting from measured Baseline emission rate. Under Condition "C" (Cement Plant only), ambient concentrations were calculated with Cement Plant stack gas flows. Under Condition "CPL" (Cement, Power and Lime Plants), ambient concentrations were calculated with CPL stack gas flow. Assumed 100% annual operating factor for both conditions.

(3) Emissions in addition to Baseline emissions that can be tolerated without exceeding AAL.

(4) Concentration of metal in wastewater sediment that will result in "additional emissions" defined in Footnote (3), assuming WWS feed rate of 5 percent of kiln feed (12,500 lb/hr) and assuming 10 percent of the metals in the WWS are discharged from the stack.

(5) C = Cement Plant only operating; CPL = Cement, Power and Lime Plants operating.

(6) Assuming all chromium measured during Baseline Test was hexavalent; chromium as stack gas was actually trivalent. The 439 ug/g concentration in WWS is as Cr+6.

(7) Allowable metal concentration in WWS when CPL Plants operate can be 2.34 times higher than that allowed when Cement Plant only operates.

(8) Assumed to have same permissible concentrations as mercury because of similar AAL.

(9) Assumed to have same permissible concentrations as arsenic because of similar AAL.

(10) NM-Not measured during Baseline or WWS tests.

(11) Additional emissions can be greater than the total proposed WWS feed rate, metal concentration could be greater than 100 percent.

Example Calculation

Measured Arsenic emission rate during the WWS test

= 0.004 lb/hr

Annual Arsenic concentration in ambient air

= [0.004 lb/hr (measured)] /[79.4 lb/hr (modeled)]

x 0.1157 $\mu g/m^3$ (modeled impact)

= 5.8×10^{-6} $\mu g/m^3$

Acceptable Ambient Level (AAL)

= 2.3×10^{-3} $\mu g/m^3$

Increase in ambient level without exceeding AAL

= $(2.3 \times 10^{-3}) - (5.8 \times 10^{-6})$

= 2.294×10^{-3} $\mu g/m^3$

Emission rate resulting in ambient impact of 2.294×10^{-3} $\mu g/m^3$

= [(2.294×10^{-3})/0.1157 (modeled impact)]

x 79.4 lb/hr

= 1.57 lb/hr

Arsenic concentration in WWS, at a feed rate of 12,500* lb/hr, resulting in 1.57 lb/hr arsenic.

= $1.57/(12500 \times 10^{-6})$

= 126.0 $\mu g/g$

Acceptable arsenic concentration in WWS if 10 percent of arsenic is released to the atmosphere.

= 12.6 $\mu g/g/(1-0.9)$

= 1260 $\mu g/g$

*Maximum feed rate of 7425 lb/hr now proposed by FCS.

ATTACHMENT 2

SUMMARY OF EMISSIONS AND STACK GAS PARAMETERS DURING BASELINE AND WWS* TESTS

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

TEST	BASELINE	WWS
Date	9/18-20/90	10/31-11/2/90
PM, mass (lb/hr)	56.80	67.95
conc (gr/dscf)	0.0104	0.0131
O2 (%)	10.4	10.2
Volatile organics (lb/hr)**	0.177	0.010
PCDD/DF (lb/hr)	0.114×10^{-6}	0.096×10^{-6}
Selected Metals (lb/hr - Blank Corrected)		
As	<0.004	0.002
Ba	0.005	0.054
Cd	<0.005	<0.005
Cr	0.010	0.024
Co	0.005	<0.022
Cu	0.003	<0.010
Fe	0.992	1.597
Pb	0.130	0.124
Hg	0.034	0.380
Mo	0.018	<0.002
Ni	<0.018	<0.006
Se	<0.004	<0.012
Ag	<0.001	<0.015
Ti	<0.001	0.645
V	<0.018	0.022
Stack Gas		
Flow (dscfm)	637,713	603,670
Temp (°F)	385	390
Moisture (%)	7.2	7.1

---

* WWS - Wastewater sediment as a kiln feed supplement.

** See following supplemental table for specific organic compounds.

SUMMARY OF ORGANIC COMPOUND EMISSIONS
DURING BASELINE AND WWS TESTS

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

TEST	BASELINE	WWS
Date	9/18-20/90	10/31-11/2/90
Volatile Organic Compounds		
Acetone	0.0247	0.0003
Benzene	0.1005	0.0049
Toluene	0.0136	0.0006
Tetrachloroethylene	<0.0025	ND
Chlorobenzene	0.0074	0.0002
Ethylbenzene	<0.0026	<0.0001
Xylene	0.0078	0.0004
Chloromethane	<0.0095	0.0020
Bromomethane	<0.0027	0.0003
Carbon disulfide	<0.0029	0.0002
Styrene	<0.0024	0.0006
Other Traces	-	0.0001
TOTAL VOCs	<0.1766	0.0097

ATTACHMENT 3

COMPARISON OF PARTICULATE MATTER EMISSION RATES DURING BASELINE AND WWS TESTS

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

SEPTEMBER - NOVEMBER 1990

Baseline Test

RUN	Particulate Matter Emission Rate (Lb/Hr)
1	62.21
2	59.15
3	49.05
$\bar{X}_1$	56.80
s_1	6.89
n_1	3

WWS Test

RUN	Particulate Matter Emission Rate (Lb/Hr)
1	65.77
2	77.11
3	60.96
$\bar{X}_2$	67.95
s_2	8.29
n_2	3

Where: $\bar{X}$ = Average emission rate
s = Standard deviation
n = Number of observations

$$t \text{ measured} = \frac{|X_1 - X_2|}{\sigma t\ (1/n_1 + 1/n_2)^2}$$

Where:

$$\sigma t = \left[\frac{(n_1 - 1)\ (s_1)^2 + (n_2 - 1)\ (s_2)^2}{n_1 + n_2 - 2}\right]^{0.5}$$

$$= \left[\frac{(2)\ (6.89)^2 + 2(8.29)^2}{4}\right]^{0.5}$$

$$= 7.62$$

$$t \text{ measured} = |56.80 - 67.95|/(7.62)(1/3 + 1/3)^2$$

$$= 1.79$$

t critical = 2.13 at 95% C.L.

t measured < t critical; therefore, reject the hypothesis that the two particulate matter emission rates are different (at the 95% C.L.)

APPENDIX C—DETERMINATION OF EMISSION RATE CHANGE

1. *Introduction.*

1.1 The following method shall be used to determine whether a physical or operational change to an existing facility resulted in an increase in the emission rate to the atmosphere. The method used is the Student's *t* test, commonly used to make inferences from small samples.

2. *Data.*

2.1 Each emission test shall consist of *n* runs (usually three) which produce *n* emission rates. Thus two sets of emission rates are generated, one before and one after the change, the two sets being of equal size.

2.2 When using manual emission tests, except as provided in § 60.8(b) of this part, the reference methods of Appendix A to this part shall be used in accordance with the procedures specified in the applicable subpart both before and after the change to obtain the data.

2.3 When using continuous monitors, the facility shall be operated as if a manual emission test were being performed. Valid data using the averaging time which would be required if a manual emission test were being conducted shall be used.

3. *Procedure.*

3.1 Subscripts a and b denote prechange and postchange respectively.

3.2 Calculate the arithmetic mean emission rate, E, for each set of data using Equation 1.

$$E=\sum_{\frac{i=1}{n}}^{n} E_i=\frac{E_1+E_2\ldots+E_n}{n} \qquad (1)$$

Where:

E_i=Emission rate for the *i* th run.
n=number of runs.

3.3 Calculate the sample variance, S^2, for each set of data using Equation 2.

$$S^2=\frac{\sum_{i=1}^{n}(E_i-E)^2}{n-1}=\frac{\sum_{i=1}^{n}E_i^2-\left(\sum_{i=1}^{n}E_i\right)^2\Big/n}{n-1} \qquad (2)$$

3.4 Calculate the pooled estimate, S_p. using Equation 3.

$$S_p=\left[\frac{(n_a-1)\,S_a^2+(n_b-1)\,S_b^2}{n_a+n_b-2}\right]^{1/2} \qquad (3)$$

3.5 Calculate the test statistic, *t*, using Equation 4.

$$t=\frac{E_b-E_a}{S_p\left[\frac{1}{n_a}+\frac{1}{n_b}\right]^{1/2}} \qquad (4)$$

4. *Results.*

4.1 If $E_b>E_a$ and $t>t'$, where t' is the critical value of *t* obtained from Table 1, then with 95% confidence the difference between E_b and E_a is significant, and an increase in emission rate to the atmosphere has occurred.

TABLE 1

Degrees of freedom (n_a+n_b-2)	t' (95 percent confidence level)
2	2.920
3	2.353
4	2.132
5	2.015
6	1.943
7	1.895
8	1.860

For greater than 8 degrees of freedom, see any standard statistical handbook or text.

5.1 Assume the two performance tests produced the following set of data:

Test a	Test b
Run 1. 100	115
Run 2. 95	120
Run 3. 110	125

5.2 Using Equation 1—

E_a=100+95+110/3=102
E_b=115+120+125/3=120

5.3 Using Equation 2—

S_a^2=(100−102)²+(95−102)²+(110−102)²/3−1=58.5
S_b^2=(115−120)²+(120−120)²+(125−120)²/3−1=25

5.4 Using Equation 3—

S_p=[(3−1)(58.5)+(3+1)(25)/3+3−2] ½=6.46

5.5 Using Equation 4—

$$t=\frac{120-102}{6.46\left[\frac{1}{3}+\frac{1}{3}\right]^{1/2}}=3.412$$

5.6 Since $(n^1+n^2-2)=4$, $t'=2.132$ (from Table 1). Thus since $t>t'$ the difference in the values of E_a and E_b is significant, and there has been an increase in emission rate to the atmosphere.

6. *Continuous Monitoring Data.*

6.1 Hourly averages from continuous monitoring devices, where available, should be used as data points and the above procedure followed.

ATTACHMENT 4

ANALYSIS OF MERCURY EMISSIONS
DURING BASELINE AND WWS TESTS

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

SEPTEMBER-NOVEMBER 1990

Material balances were carried out with respect to mercury to assist in the interpretation of the analytical and process data gathered during emission measurements conducted on September 18-19, 1990 and October 31-November 2, 1990. To carry out the material balances, the following data were considered:

- o Rates of all raw materials, fuels and discharge streams; and
- o Mercury concentrations in the raw materials, fuels and discharge streams.

As flow measurements and concentration measurements were not conducted for all streams of interest, several conservative assumptions were necessary to perform the calculations. The assumptions included:

1. All mercury in the coal was volatilized and discharged through the stack.
2. All mercury in the kiln feed material was volatilized and discharged through the stack. (This assumption implies that no mercury would be found in the outgoing clinker or in the baghouse dust.)

Mercury from Coal

Power plant coal feed rate = 1200 tpd = 50 tph (plant operating records)

Cement plant coal utilization rate = 8.5 tph (plant operating records)

The coal mercury concentrations were not measured during the test. Furthermore, the coal supplier was unable to locate any data. For this reason, an alternate source of data was required.

Florida Crushed Stone has purchased coal from the same source since the power, cement and lime plants began operation. According to information provided by the coal supplier, the coal is Pennsylvanian bituminous from Kentucky. According to information published in the open literature (Reference 1), the mercury concentrations of 34 bituminous coals from Kentucky ranged from 0.02 ppm to 1.3 ppm; the average mercury concentration of the coal samples being 0.20 ppm. The ash content, heating value, sulfur content, and elemental compositions of the ash of the coal utilized at Florida Crushed Stone was compared with the compositions of the coals listed in the U.S.G.S. Survey (Reference 1, Attachment 2). The maximum mercury concentration encountered for coals of similar composition was 0.20 ppm. For this reason, the mercury

concentration of the fuel used at Florida Crushed Stone was estimated to be 0.20 ppm. Using this estimate, the mercury incoming with the coal is given by:

Hg in coal = (58.5 tons coal/hour) x (2000 lb/ton)
x (0.20 x 10-6 parts Hg/part coal)
= 0.023 lb Hg/hour

Mercury from the Raw Materials Used in the Cement Plant

Baseline Test Conditions

Kiln Feed Rate = 132 tph

Mercury content of Kiln Feed = 0.4 ug/g or 0.4 ppm

Mercury incoming with kiln raw materials is:

(132 tons/hour) x (2000 lb/ton)
x (0.4 x 10-6 parts Hg/part feed)
= 0.106 Hg/hr

WWS Test Conditions

Kiln Feed Rate = 128 tph

Mercury content of kiln feed (including WWS) = 0.5 ug/g or 0.5 ppm

Mercury incoming with the kiln raw materials (which includes the wastewater sediment) is:

(128 tons/hour) x (2000 lb/ton)
x (0.5 x 10-6 parts Hg/part feed)
= 0.128 Hg/hr

It should be noted that of the 0.128 lb/hr of mercury incoming with the kiln feed, only 0.001 lb Hg/hr (1.75 tph x 2000 lb/hr x 0.4 x 10-06 parts Hg/part feed) was attributable to the wastewater sediment.

Mercury from Limestone used in Power Plant and Lime Plant

The lime plant limestone feed rate was calculated form the lime production rate of the lime plant. The prorating factor was assumed to be proportional to the molecular weights of calcium carbonate and calcium oxide, respectively (100 lb CaC03/56 lb CaO).

Thus, the feed rate of the limestone is:

(11 tph) x (100/56) = 19.6 tph

The mercury content of the limestone is not known. However, the kiln feed is approximately 83 percent limestone. As a conservative estimate, it was assumed that the mercury concentration of the limestone is the same as the mercury concentration of the kiln feed.

Thus, the mercury incoming with the limestone is:

(19.6 tph) x (2000 lb/ton) x (0.4 x 10-6 parts Hg/part feed)
= 0.016 lb Hg/hr

Total Mercury Incoming with Feed Streams and Fuel

Baseline Test Conditions

The total incoming mass of mercury with the kiln feed and coal is:

0.106 lb/hr + 0.023 lb/hr + 0.016 = 0.145 Hg/hr

WWS Test Conditions

The total mercury incoming with the kiln feed and coal is:

= 0.128 lb/hr + 0.023 lb/hr + 0.016 = 0.167 Hg/hr

These calculations show that the mass rate of mercury to the process during the wastewater sediment test was only about 15 percent higher than the mass rate of mercury to the process during the baseline test. Furthermore, this slight increase in mercury in the system was not the result of the WWS but was the result of minor variations in the mercury content of the other raw materials and differences in raw material feed rates. The attached Table 5 from the WWS test report shows there is less mercury in the WWS (0.4 ppm) than in the kiln feed (0.5 ppm).

Material Balances

The ratio of the outgoing mass of mercury (assuming all will be found in the stack gas) to the incoming mass of mercury can be expressed as:

% Recovery = (Mercury in Stack) x 100 / (Mercury in Feed Streams)

Baseline Test Conditions

The measured mercury emission rate in the stack was 0.034 lb/hr.

% Recovery = (0.034 lb/hr) x 100 (0.145 lb/hr) = 23.4%

WWS Test Conditions

The measured mercury emission rate of the stack was 0.383 lb/hr

% Recovery = (0.383 lb/hr) x 100 / (0.167 lb/hr) = 229%

Conclusions

The apparent increase in the measured mercury emissions during the wastewater sediment test cannot be attributed to the use of the wastewater sediment. Furthermore, the magnitude of the increase cannot be explained by the changes in the total mercury fed to the cement plant through the raw materials. It is possible that the apparent increase in mercury emissions is the result of analytical difficulties.

The mercury emissions measured during the baseline tests appear reasonable as it is reasonable to assume that some of the mercury in the system will remain in the clinker and baghouse dust (See Attachment 2). Conversely, the emissions reported during the wastewater sediment tests are suspect as they represent more than twice the mercury input to the cement kiln system.

References

1. V.E. Swanson, J.H. Medlin, J.R. Hatch, S.L. Coleman, G.H. Wood, Jr., S.D. Woodruff and R.T. Hildebrand, (1976) "Collection, chemical analysis and evaluation of coal samples in 1975", United States Department of the Interior Geological Survey, Open-file report 76-468, p 188-203.

ATTACHMENT 5

IMPACT OF TRACE CONSTITUENTS ON AIR QUALITY

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

	Emission Rate(1) (lb/hr)		Impact of Emission and No Threat Levels(2) (micrograms per cubic meter)					
			8-hr		24-hr		Annual	
Constituent	Baseline	WWS	Impact	NTL	Impact	NTL	Impact	NTL
As	<0.004	-	<0.01	2	<0.001	0.48	<0.00001	0.00023
Ba	-	0.054	<0.01	5	0.001	1.2	0.00009	50
Cd	<0.005	<0.005	<0.01	0.5	<0.001	0.12	<0.00001	0.00056
Cr	-	0.024	<0.01	5	<0.001	1.2	0.00004	1000
Co	-	0.022	<0.01	0.5	<0.001	0.12	-	-
Cu	-	<0.010	<0.01	1.0	<0.001	0.24	-	-
Fe	-	1.597	0.07	50	0.026	12	-	-
Pb	0.130	-	0.01	1.5	0.002	0.36	0.00022	0.09
Hg	-	0.149(3)	0.01	1.0	0.002	0.24	-	-
Mo	0.018	-	<0.01	50	<0.001	12	-	-
Ni	<0.018	-	<0.01	0.5	<0.001	0.12	<0.00003	0.00420
Se	-	0.012	<0.01	2	<0.001	0.48	-	-
Ag	-	0.015	<0.01	0.1	<0.001	0.024	0.00003	3
Ti	-	0.645	0.03	100	0.011	24	-	-
V	-	0.022	<0.01	0.5	<0.001	0.12	0.00004	20
2,3,7,8 TCDD	$0.114x10^{-6}$	-	-	-	-	-	$1.9x10^{-10}$	$2.2x10^{-8}$
Acetone	0.025	-	<0.01	35600	<0.001	8544	-	-
Benzene	0.101	-	<0.01	30	0.002	7.2	0.00017	0.12
Toluene	0.014	-	<0.01	3750	<0.001	900	0.00002	300
TCE	<0.003	-	<0.01	3350	<0.001	804	-	-
Chlorobenzene	0.007	-	<0.01	460	<0.001	110	-	-
Ethylbenzene	0.003	-	<0.01	4350	<0.001	1044	-	-
Xylene	0.008	-	<0.01	4350	<0.001	1044	-	-
Chloromethane	0.010	-	<0.01	-	<0.001	-	-	-
Bromomethane	<0.003	-	<0.01	200	<0.001	48	<0.00001	0.006
Carbon disulfide	<0.003	-	<0.01	120	<0.001	29	<0.00001	0.01
Styrene	0.002	-	<0.01	2150	<0.001	516	-	-

(1) Listed emission rate is the highest rate measured during Baseline and WWS tests with cement, power and lime plants operating.

(2) No Threat Levels - Policy based ambient guidelines established by FDER.

(3) Emission rate measured during baseline plus maximum amount of mercury that could be controlled by the wastewater sediment (see page 2c of 12).

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

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Division of Air
Resources Management

FAX TRANSMITTAL FORM

TO: Bruce Mitchell
FDER

FROM: John Koogler
K&A

PROJECT: 307-90-05

SENT BY: Anne
DATE: 8/9/91
FAX PHONE: 904-377-7158

The text being transmitted consists of 22 pages PLUS this one.

REMARKS: Originals Fedex'd for Monday delivery

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RECEIVED
AUG 09 1991
Division of Air
Resources Management

August 8, 1991

Mr. Clair Fancy
Bureau of Air Quality Management
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dear Mr. Fancy:

This firm represents Hernando County on all Department of Environmental Regulation permit and related matters regarding Florida Mining and Materials and Florida Crushed Stone Company activities in that county. On several occasions representatives of this firm have either met with you or discussed over the phone Hernando County's keen interest in monitoring FMM and FCS files at DER's offices in Tallahassee and Tampa. In order to insure that we are aware of all activity regarding these DER files, we frequently visit and inspect your central files in the Bureau of Air Quality Management to determine if any new documents have been entered into these files. We felt comfortable that by following this procedure, we could respond in a timely fashion to any activity regarding these files. Our comfort was based on assurances that all matters regarding these files are promptly entered into the central Bureau of Air Quality Management files. Based on a recent occurrence, however, we are concerned that all materials regarding these files are not promptly being filed. If this continues, Hernando County's substantial interests may be seriously and adversely affected.

Specifically I am referring to a letter which was received by DER on March 15, 1991, including lengthy attachments, but was not placed in the central bureau files until July 30, 1991. This letter concerned the burning of waste materials (sludge) in a cement kiln belonging to Florida Crushed Stone Company. We understand that this letter and materials were in the possession of one of your staff members for the past four and one half months.

Despite our most diligent efforts to monitor these files and collect all information concerning new activity before DER in these files in order to protect Hernando County's substantial interests, they will not prove fruitful if pertinent information does not reach the proper bureau file promptly or we are not otherwise informed that DER has received such information. Thus, we are concerned that we may miss important deadlines instrumental to Hernando County despite our efforts.

On behalf of Hernando County we would certainly appreciate your assistance to insure that all information regarding these files is first placed in the central file before being assigned, or that we are informed that the information has been received.

Thank you for your interest and assistance.

Sincerely,

Tom Tomasello

Thomas G. Tomasello

TGT/dg/1579

xc: Ms. Katherine Liles
Hernando County

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KA 307-90-05

August 6, 1991

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

Subject: Florida Crushed Stone Company
Hernando County, Florida
Wastewater Sediment as a Raw Material Feed
Response to Concerns Raised by Hernando County

Dear Mr. Fancy:

During a meeting in your office on July 30, 1991, the Florida Crushed Stone Company (FCS) offered to provide the Department information to assist in responding to concerns raised by Hernando County regarding the use of wastewater sediment as a raw material substitute during the production of Portland cement. As discussed during our meeting, the only wastewater sediment being considered by FCS at this time is a non-hazardous material generated by the Jacksonville Electric Authority (JEA) in Jacksonville, Florida. The concerns raised by the county were set forth in correspondence to you dated February 26, 1991. In the following paragraphs, I have paraphrased the concerns of the county and have provided a response based on the use of wastewater sediment from JEA.

1. Origin of the wastewater sediment.

RESPONSE: The sediment to be beneficially reused as a raw material supplement during the production of Portland cement is a sediment/precipitate generated in the wastewater treatment systems at JEA electric power generating stations in Jacksonville, Florida. During the tests conducted in October-November 1990, the sediment was from the JEA Northside Generating Station.

The sources of wastewater from the generating stations include run-off from equipment washing, collected rainfall and other miscellaneous sources. The comingled waters flow into a settling basin where the larger particles settle. The outflow from the first basin enters a second settling basin where lime is added to raise the pH and enhance the sedimentation of the remaining solids. The sediment from both of the settling basins will be combined and used as the raw material substitute for the production of Portland cement.

2. Variability in the concentration of metals in wastewater sediment.

<u>RESPONSE</u>: The question raised by Hernando County was based upon the range of metals concentrations listed in a report prepared by Radian and submitted to the Department as background material and the concentrations of metals measured in the wastewater sediment during the test conducted at FCS in October-November 1990. The analytical data submitted by Radian indicates that the concentrations of some of the metals in the sediment could be several times greater than the concentrations measured during the test period.

Information submitted to the Department under cover of our letter dated March 11, 1991, (Attachment 1) shows the maximum concentrations of various metals possible in the wastewater treatment sediment without exceeding acceptable ambient standards. These calculations show acceptable concentrations ranging from 430 Mg/g for hexavalent chromium to 1260 Mg/g for beryllium and arsenic to approximately 50,000 Mg/g for lead and even higher for other metals. These calculations were based on the assumption that 10 percent of the metals in the wastewater sediment would be released to the atmosphere. Other documentation submitted to the Department (von Seebach, M. and J. B. Tompkins., " Metal Emissions are Predictable." <u>Rock Products</u>, April 1991, pp. 31-35) shows that the fraction of metals released to the atmosphere from Portland cement plants is less than 0.5 percent of metals input to the plant (with the possible exception of mercury and thallium). Therefore, even if there is a considerable variation in the concentrations of metals in the wastewater sediment, FCS has provided assurance that acceptable ambient standards will not be exceeded.

In materials submitted to the Department in early June, FCS proposed limits on metals and certain other constituents in wastewater sediment based on air quality modeling and more restrictive practical considerations. These limits are listed below:

Constituent	Maximum Concentration
Total Organic Chlorine	0.2 percent
Total Oil and Grease	2 percent
Arsenic	1250 mg/kg
Antimony	2000 mg/kg

Barium	1000 mg/kg
Cadmium	1000 mg/kg
Chromium +6	100 mg/kg
Lead	4900 mg/kg
Mercury	10 mg/kg
Silver	2000 mg/kg
Thallium	1600 mg/kg

The above limits for metals and other constituents in JEA wastewater sediment are somewhat higher than the maximum concentrations reported by Radian, giving FCS a reasonable margin in which to operate. Yet the concentrations are below those that would result in unacceptable ambient concentrations using very conservative assumptions.

3. Comments related to dioxin/furan emissions.

   RESPONSE: FCS corrected the toxic equivalency factors used to calculate an equivalent 2,3,7,8-TCDD emission rate and reported this information to the Department under separate cover. The revised data (Attachment 2) show that dioxin/furan emissions during the baseline period were higher than emissions measured during the wastewater sediment test. Additionally, data submitted to the Department (Attachment 3) show that the impact of dioxin/furan emissions under worst case conditions was over 100 times less than the acceptable ambient level established by the Department's No Threat Levels.

4. Comments regarding municipal waste combustor New Source Performance Standards.

   RESPONSE: As defined in 40CFR60.51a, a municipal waste combustor is:

   > "... any device that combusts solid, liquid or gasified MSW (municipal solid wastes) ...."

   In the same section, municipal solid waste is defined as:

   > "... household, commercial/retail, and/or institutional waste. ... household, commercial/retail, and institutional waste do not include ... industrial process or manufacturing wastes ...."

It is apparent from the definitions included in the New Source Performance Standards for Municipal Waste Combustors (40CFR60, Subpart Ea) that the FCS facility, even when utilizing wastewater treatment sediment as a feed supplement, does not fall into this category. Hence, emission limits established for municipal waste combustors do not apply to the FCS Portland cement plant.

5. Comments regarding mercury emissions.

<u>RESPONSE</u>: The emission measurements conducted by FCS in October-November 1990 were inconclusive regarding mercury emissions. Information submitted to the Department (Attachment 4) explained the problems associated with the measurements. To develop further data on mercury emissions, both under baseline conditions and with wastewater sediment being used as a raw material supplement, additional tests have been proposed. The results of these tests will be made available to all concerned parties.

I trust that the information provided herein will satisfactorily respond to the questions raised by Hernando County. I would also like to point out that Mr. Tom Mountain of FCS and I met with Mr. Charles Hetrick, County Administrator for Hernando County, on July 29, 1990, to discuss the concerns of the county relative to the use of wastewater sediment and tire derived fuel.

If additional information is required, please do not hesitate to contact me.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:wa
Enc.

c: Mr. Tom Mountain
Mr. Larry Sellars

ATTACHMENT 1

KOOGLER & ASSOCIATES

SUMMARY OF AIR QUALITY MODELING RESULTS
AND CALCULATIONS OF WWS METALS LIMITS

Metal	Acceptable Ambient Level (ug/m3)	Baseline Emissions(1) (lb/hr)	Baseline Maximum Annual Impact(2) (ug/m3)		Additional Emissions Allowed(3) (lb/hr)		Possible Metal Concentration in WWS(4) (ug/g)	
			C	CPL	C	CPL	C	CPL
As	2.3x10^{-3}	0.004	5.8x10^{-6}	2.5x10^{-6}	1.57	3.69	1,260	(7)
Sb	0.3	NM(10)	-	-	-	-	164,600(8)	(7)
Ba	50	0.02	2.9x10^{-5}	-	(11)	-	(11)	(7)
Be	4.1x10^{-3}	NM	-	-	-	-	1,260(9)	(7)
Cd	5.5x10^{-3}	0.005	7.3x10^{-6}	-	3.77	-	3,014	(7)
Cr^{+6}	8.3x10^{-4}	0.02(6)	2.9x10^{-5}		0.55	-	439(6)	(7)
Pb	0.09	0.13	1.9x10^{-4}	-	61.61	-	49,285	(7)
Hg	0.3	0.04	5.8x10^{-5}	-	205.8	-	164,600	(7)
Ag	3	0.009	1.3x10^{-5}	-	2058	-	>1,000,000	(7)
Th	0.3	NM	-	-	-	-	164,600(8)	(7)

(1) Measured emission rate during Baseline Test with Cement, Power and Lime Plants operating.

(2) Annual average ambient concentration resulting from measured Baseline emission rate. Under Condition "C" (Cement Plant only), ambient concentrations were calculated with Cement Plant stack gas flows. Under Condition "CPL" (Cement, Power and Lime Plants), ambient concentrations were calculated with CPL stack gas flow. Assumed 100% annual operating factor for both conditions.

(3) Emissions in addition to Baseline emissions that can be tolerated without exceeding AAL.

(4) Concentration of metal in wastewater sediment that will result in "additional emissions" defined in Footnote (3), assuming WWS feed rate of 5 percent of kiln feed (12,500 lb/hr) and assuming 10 percent of the metals in the WWS are discharged from the stack.

(5) C = Cement Plant only operating; CPL = Cement, Power and Lime Plants operating.

(6) Assuming all chromium measured during Baseline Test was hexavalent; chromium as stack gas was actually trivalent. The 439 ug/g concentration in WWS is as Cr+6.

(7) Allowable metal concentration in WWS when CPL Plants operate can be 2.34 times higher than that allowed when Cement Plant only operates.

(8) Assumed to have same permissible concentrations as mercury because of similar AAL.

(9) Assumed to have same permissible concentrations as arsenic because of similar AAL.

(10) NM-Not measured during Baseline or WWS tests.

(11) Additional emissions can be greater than the total proposed WWS feed rate, metal concentration could be greater than 100 percent.

Example Calculation

Measured Arsenic emission rate during the WWS test

= 0.004 lb/hr

Annual Arsenic concentration in ambient air

= [0.004 lb/hr (measured)] /[79.4 lb/hr (modeled)]

x 0.1157 $\mu g/m^3$ (modeled impact)

= 5.8 x 10^{-6} $\mu g/m^3$

Acceptable Ambient Level (AAL)

= 2.3 x 10^{-3} $\mu g/m^3$

Increase in ambient level without exceeding AAL

= (2.3 x 10^{-3}) - (5.8 x 10^{-6})

= 2.294 x 10^{-3} $\mu g/m^3$

Emission rate resulting in ambient impact of 2.294 x 10^{-3} $\mu g/m^3$

= [(2.294 x 10^{-3})/0.1157 (modeled impact)]

x 79.4 lb/hr

= 1.57 lb/hr

Arsenic concentration in WWS, at a feed rate of 12,500* lb/hr, resulting in 1.57 lb/hr arsenic.

= 1.57/(12500 x 10^{-6})

= 126.0 $\mu g/g$

Acceptable arsenic concentration in WWS if 10 percent of arsenic is released to the atmosphere.

= 12.6 $\mu g/g/(1-0.9)$

= 1260 $\mu g/g$

*Maximum feed rate of 7425 lb/hr now proposed by FCS.

ATTACHMENT 2

KOOGLER & ASSOCIATES

SUMMARY OF EMISSIONS AND STACK GAS PARAMETERS DURING BASELINE AND WWS* TESTS

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

TEST	BASELINE	WWS
Date	9/18-20/90	10/31-11/2/90
PM, mass (lb/hr)	56.80	67.95
conc (gr/dscf)	0.0104	0.0131
O2 (%)	10.4	10.2
Volatile organics (lb/hr)**	0.177	0.010
PCDD/DF (lb/hr)	0.114×10^{-6}	0.096×10^{-6}
<u>Selected Metals (lb/hr - Blank Corrected)</u>		
As	<0.004	0.002
Ba	0.005	0.054
Cd	<0.005	<0.005
Cr	0.010	0.024
Co	0.005	<0.022
Cu	0.003	<0.010
Fe	0.992	1.597
Pb	0.130	0.124
Hg	0.034	0.380
Mo	0.018	<0.002
Ni	<0.018	<0.006
Se	<0.004	<0.012
Ag	<0.001	<0.015
Ti	<0.001	0.645
V	<0.018	0.022
<u>Stack Gas</u>		
Flow (dscfm)	637,713	603,670
Temp (°F)	385	390
Moisture (%)	7.2	7.1

* WWS - Wastewater sediment as a kiln feed supplement.

** See following supplemental table for specific organic compounds.

SUMMARY OF ORGANIC COMPOUND EMISSIONS DURING BASELINE AND WWS TESTS

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

TEST	BASELINE	WWS
Date	9/18-20/90	10/31-11/2/90
Volatile Organic Compounds		
Acetone	0.0247	0.0003
Benzene	0.1005	0.0049
Toluene	0.0136	0.0006
Tetrachloroethylene	<0.0025	ND
Chlorobenzene	0.0074	0.0002
Ethylbenzene	<0.0026	<0.0001
Xylene	0.0078	0.0004
Chloromethane	<0.0095	0.0020
Bromomethane	<0.0027	0.0003
Carbon disulfide	<0.0029	0.0002
Styrene	<0.0024	0.0006
Other Traces	-	0.0001
TOTAL VOCs	<0.1766	0.0097

ATTACHMENT 3

IMPACT OF TRACE CONSTITUENTS ON AIR QUALITY

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

	Emission Rate(1) (lb/hr)		Impact of Emission and No Threat Levels(2) (micrograms per cubic meter)					
			8-hr		24-hr		Annual	
Constituent	Baseline	WWS	Impact	NTL	Impact	NTL	Impact	NTL
As	<0.004	-	<0.01	2	<0.001	0.48	<0.00001	0.00023
Ba	-	0.054	<0.01	5	0.001	1.2	0.00009	50
Cd	<0.005	<0.005	<0.01	0.5	<0.001	0.12	<0.00001	0.00056
Cr	-	0.024	<0.01	5	<0.001	1.2	0.00004	1000
Co	-	0.022	<0.01	0.5	<0.001	0.12	-	-
Cu	-	<0.010	<0.01	1.0	<0.001	0.24	-	-
Fe	-	1.597	0.07	50	0.026	12	-	-
Pb	0.130	-	0.01	1.5	0.002	0.36	0.00022	0.09
Hg	-	0.149(3)	0.01	1.0	0.002	0.24	-	-
Mo	0.018	-	<0.01	50	<0.001	12	-	-
Ni	<0.018	-	<0.01	0.5	<0.001	0.12	<0.00003	0.00420
Se	-	0.012	<0.01	2	<0.001	0.48	-	-
Ag	-	0.015	<0.01	0.1	<0.001	0.024	0.00003	3
Ti	-	0.645	0.03	100	0.011	24	-	-
V	-	0.022	<0.01	0.5	<0.001	0.12	0.00004	20
2,3,7,8 TCDD	$0.114x10^{-6}$	-	-	-	-	-	$1.9x10^{-10}$	$2.2x10^{-8}$
Acetone	0.025	-	<0.01	35600	<0.001	8544	-	-
Benzene	0.101	-	<0.01	30	0.002	7.2	0.00017	0.12
Toluene	0.014	-	<0.01	3750	<0.001	900	0.00002	300
TCE	<0.003	-	<0.01	3350	<0.001	804	-	-
Chlorobenzene	0.007	-	<0.01	460	<0.001	110	-	-
Ethylbenzene	0.003	-	<0.01	4350	<0.001	1044	-	-
Xylene	0.008	-	<0.01	4350	<0.001	1044	-	-
Chloromethane	0.010	-	<0.01	-	<0.001	-	-	-
Bromomethane	<0.003	-	<0.01	200	<0.001	48	<0.00001	0.006
Carbon disulfide	<0.003	-	<0.01	120	<0.001	29	<0.00001	0.01
Styrene	0.002	-	<0.01	2150	<0.001	516	-	-

(1) Listed emission rate is the highest rate measured during Baseline and WWS tests with cement, power and lime plants operating.

(2) No Threat Levels - Policy based ambient guidelines established by FDER.

(3) Emission rate measured during baseline plus maximum amount of mercury that could be controlled by the wastewater sediment (see page 2c of 12).

ATTACHMENT 4

KOOGLER & ASSOCIATES

ANALYSIS OF MERCURY EMISSIONS DURING BASELINE AND WWS TESTS

FLORIDA CRUSHED STONE COMPANY HERNANDO COUNTY, FLORIDA

SEPTEMBER-NOVEMBER 1990

Material balances were carried out with respect to mercury to assist in the interpretation of the analytical and process data gathered during emission measurements conducted on September 18-19, 1990 and October 31-November 2, 1990. To carry out the material balances, the following data were considered:

- o Rates of all raw materials, fuels and discharge streams; and
- o Mercury concentrations in the raw materials, fuels and discharge streams.

As flow measurements and concentration measurements were not conducted for all streams of interest, several conservative assumptions were necessary to perform the calculations. The assumptions included:

1. All mercury in the coal was volatilized and discharged through the stack.
2. All mercury in the kiln feed material was volatilized and discharged through the stack. (This assumption implies that no mercury would be found in the outgoing clinker or in the baghouse dust.)

Mercury from Coal

Power plant coal feed rate = 1200 tpd = 50 tph (plant operating records)

Cement plant coal utilization rate = 8.5 tph (plant operating records)

The coal mercury concentrations were not measured during the test. Furthermore, the coal supplier was unable to locate any data. For this reason, an alternate source of data was required.

Florida Crushed Stone has purchased coal from the same source since the power, cement and lime plants began operation. According to information provided by the coal supplier, the coal is Pennsylvanian bituminous from Kentucky. According to information published in the open literature (Reference 1), the mercury concentrations of 34 bituminous coals from Kentucky ranged from 0.02 ppm to 1.3 ppm; the average mercury concentration of the coal samples being 0.20 ppm. The ash content, heating value, sulfur content, and elemental compositions of the ash of the coal utilized at Florida Crushed Stone was compared with the compositions of the coals listed in the U.S.G.S. Survey (Reference 1, Attachment 2). The maximum mercury concentration encountered for coals of similar composition was 0.20 ppm. For this reason, the mercury

concentration of the fuel used at Florida Crushed Stone was estimated to be 0.20 ppm. Using this estimate, the mercury incoming with the coal is given by:

Hg in coal = (58.5 tons coal/hour) x (2000 lb/ton)
x (0.20 x 10-6 parts Hg/part coal)
= 0.023 lb Hg/hour

Mercury from the Raw Materials Used in the Cement Plant

Baseline Test Conditions

Kiln Feed Rate = 132 tph

Mercury content of Kiln Feed = 0.4 ug/g or 0.4 ppm

Mercury incoming with kiln raw materials is:

(132 tons/hour) x (2000 lb/ton)
x (0.4 x 10-6 parts Hg/part feed)
= 0.106 Hg/hr

WWS Test Conditions

Kiln Feed Rate = 128 tph

Mercury content of kiln feed (including WWS) = 0.5 ug/g or 0.5 ppm

Mercury incoming with the kiln raw materials (which includes the wastewater sediment) is:

(128 tons/hour) x (2000 lb/ton)
x (0.5 x 10-6 parts Hg/part feed)
= 0.128 Hg/hr

It should be noted that of the 0.128 lb/hr of mercury incoming with the kiln feed, only 0.001 lb Hg/hr (1.75 tph x 2000 lb/hr x 0.4 x 10-06 parts Hg/part feed) was attributable to the wastewater sediment.

Mercury from Limestone used in Power Plant and Lime Plant

The lime plant limestone feed rate was calculated form the lime production rate of the lime plant. The prorating factor was assumed to be proportional to the molecular weights of calcium carbonate and calcium oxide, respectively (100 lb CaC03/56 lb CaO).

Thus, the feed rate of the limestone is:

(11 tph) x (100/56) = 19.6 tph

The mercury content of the limestone is not known. However, the kiln feed is approximately 83 percent limestone. As a conservative estimate, it was assumed that the mercury concentration of the limestone is the same as the mercury concentration of the kiln feed.

Thus, the mercury incoming with the limestone is:

(19.6 tph) x (2000 lb/ton) x (0.4 x 10-6 parts Hg/part feed)
= 0.016 lb Hg/hr

Total Mercury Incoming with Feed Streams and Fuel

Baseline Test Conditions

The total incoming mass of mercury with the kiln feed and coal is:

0.106 lb/hr + 0.023 lb/hr + 0.016 = 0.145 Hg/hr

WWS Test Conditions

The total mercury incoming with the kiln feed and coal is:

= 0.128 lb/hr + 0.023 lb/hr + 0.016 = 0.167 Hg/hr

These calculations show that the mass rate of mercury to the process during the wastewater sediment test was only about 15 percent higher than the mass rate of mercury to the process during the baseline test. Furthermore, this slight increase in mercury in the system was not the result of the WWS but was the result of minor variations in the mercury content of the other raw materials and differences in raw material feed rates. The attached Table 5 from the WWS test report shows there is less mercury in the WWS (0.4 ppm) than in the kiln feed (0.5 ppm).

Material Balances

The ratio of the outgoing mass of mercury (assuming all will be found in the stack gas) to the incoming mass of mercury can be expressed as:

% Recovery = (Mercury in Stack) x 100 / (Mercury in Feed Streams)

Baseline Test Conditions

The measured mercury emission rate in the stack was 0.034 lb/hr.

% Recovery = (0.034 lb/hr) x 100 (0.145 lb/hr) = 23.4%

WWS Test Conditions

The measured mercury emission rate of the stack was 0.383 lb/hr

% Recovery = (0.383 lb/hr) x 100 / (0.167 lb/hr) = 229%

Conclusions

The apparent increase in the measured mercury emissions during the wastewater sediment test cannot be attributed to the use of the wastewater sediment. Furthermore, the magnitude of the increase cannot be explained by the changes in the total mercury fed to the cement plant through the raw materials. It is possible that the apparent increase in mercury emissions is the result of analytical difficulties.

The mercury emissions measured during the baseline tests appear reasonable as it is reasonable to assume that some of the mercury in the system will remain in the clinker and baghouse dust (See Attachment 2). Conversely, the emissions reported during the wastewater sediment tests are suspect as they represent more than twice the mercury input to the cement kiln system.

References

1. V.E. Swanson, J.H. Medlin, J.R. Hatch, S.L. Coleman, G.H. Wood, Jr., S.D. Woodruff and R.T. Hildebrand, (1976) "Collection, chemical analysis and evaluation of coal samples in 1975", United States Department of the Interior Geological Survey, Open-file report 76-468, p 188-203.

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August 2, 1991

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

Subject: Florida Crushed Stone Company
Hernando County, Florida
Use of Tire Derived Fuel
Response to Concerns Raised by Hernando County

Dear Mr. Fancy:

As discussed during our meeting in your office on July 30, 1991, Florida Crushed Stone is providing the following information to assist the Department in responding to concerns raised by Hernando County regarding the use of tire derived fuel by the Florida Crushed Stone Company. The concerns of the county were set forth in correspondence to you dated January 18 and July 8, 1991. In the following paragraphs, I have paraphrased the concerns raised by the county and have provided our response.

1. **Expected increases in emission rates of particulate matter, metals and organic compounds compared with the results of emission measurements conducted by Florida Crushed Stone.**

   RESPONSE: In most applications submitted to the Department requesting construction permits or amendments or modifications to existing permits, specific information related to the facility or process involved is not available. In lieu of site specific information, it is common practice to present information that was developed from engineering calculations or at other facilities operating under conditions as similar as possible to those proposed in the application.

   In the Intent issued by the Department on April 30, 1990, to grant Florida Crushed Stone approval to conduct tests using tire derived fuel, results of other tire derived fuel tests were included. Some of these reports were from the Department's files and some may have been provided by Florida Crushed Stone. Some of these reports may have indicated emission rate increases of various constituents when tire derived fuel was burned. It should be pointed out that the information was provided in the Intent to make available as much information as possible to all concerned.

When the emission measurements were conducted at Florida Crushed Stone in September 1990 while tire derived fuel was being used, the results demonstrated that with the specific facility operated by Florida Crushed Stone and with tires fed under conditions adopted by Florida Crushed Stone, there would be no increases in the emissions of any regulated air pollutant. This is a function of the Florida Crushed Stone facility and the tire derived fuel firing procedure adopted by Florida Crushed Stone. The results of tests at other facilities having dissimilarities both in the physical plants as well as in tire derived fuel firing procedures are not relevant to conditions at Florida Crushed Stone.

2. **Comments related to dioxin/furan emissions.**

RESPONSE: Florida Crushed Stone corrected the toxic equivalency factors used to calculate an equivalent 2,3,7,8 TCDD emission rate and reported this information to the Department under separate cover. The revised data (a summary of which is attached) show TCDD/DF emissions during the baseline period were higher than emissions during the tire derived fuel test. Additional data submitted to the Department (a copy which is attached) show that the impact of TCDD/DF emissions under worst case conditions was over 100 times less than the acceptable impact established by the Department's No Threat Levels.

3. **Nitrogen oxides test data.**

RESPONSE: During the baseline and tire derived fuel tests conducted September 1990, nitrogen oxides emission measurements were made using EPA Method 7. The results that were received from the laboratory were flawed and no conclusion could be reached. Nitrogen oxides emission measurements using EPA Method 7E will be conducted at the time of the next tire derived fuel test and results will be reported to the Department.

4. **Products of incomplete combustion and the impacts of these other emissions.**

RESPONSE: During the tests conducted in September 1990, samples were collected and analyzed for 34 volatile organic compounds and over 90 semi-volatile organic compounds. These compounds would have included any organic compound present in the fuels and any significant products of incomplete combustion in the stack gas during both the baseline and tire derived fuel tests. There were no significant semi-volatile organic compounds found in the stack gas above detectable levels including no benzo(b)fluoranthene; a semi-volatile organic compound found during emission measurements at the Modesto Energy Facility in California.

Regarding the impacts of all emissions, these were addressed in documentation submitted to the Department (a copy of which is attached hereto). The impact analyses presented to the Department demonstrated that the expected concentrations of all constituents emitted in significant quantity were many times below No Threat Levels established by the Department.

5. **Sulfur dioxide emission rates.**

RESPONSE: The county commented that sulfur dioxide emission rates measured during the tire derived fuel firing in September 1990 were lower than sulfur dioxide emissions measured during the baseline conditions even though the sulfur input to the kiln increased as a result of using tire derived fuel. Considering the cement plant alone, the potential sulfur dioxide emissions when firing 100 percent coal is approximately 300 pounds per hour (based on 10 tons per hour of coal with a 0.75 percent sulfur content). When tire derived fuel constitutes 15 percent of the total heat input to the kiln, the potential sulfur dioxide emissions will be approximately 315 pounds per hour (based on a sulfur content of tire derived fuel of 1.2 percent).

Emission measurements made when only the cement plant was operating have shown sulfur dioxide emissions in the range of 2-5 pounds per hour; even though potential emissions were approximately 300 pounds per hour. This demonstrates there is a tremendous sulfur dioxide absorption capacity in the cement kiln, the pre-heater and the raw materials dryer. The fact that the test results showed less sulfur dioxide during the tire derived fuel tests (551 pounds per hour) than during the baseline tests (595 pounds per hour) should not be construed to mean there is less sulfur dioxide emitted when tire derived fuel is burned, but should be interpreted as a demonstration that there is no change in emissions.

6. **Request for the Modesto Energy Company emission report.**

RESPONSE: Regardless of the confidentiality of this report, it should be pointed out that neither the Department nor Florida Crushed Stone relied on information presented in the report when evaluating Florida Crushed Stone's request to use tire derived fuel. As the report was not used in the decision making process, the report should not be considered a factor in this matter.

I trust that the information provided herein will satisfactorily respond to the questions raised by Hernando County. I would also like to point out that Mr. Tom Mountain of Florida Crushed Stone and I met with Mr. Charles Hetrick, County Administrator, Hernando County, on Monday, July 29, 1990, to discuss the concerns of the county.

If additional information is required, please do not hesitate to contact me.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:wa
Enc.

c: Mr. Thomas Mountain, FCS
Mr. Larry Sellars, Holland & Knight

SUMMARY OF EMISSIONS AND STACK GAS PARAMETERS DURING BASELINE AND TDF TESTS

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

TEST	BASELINE	TDF
Date	9/18-20/90	9/20-24/90
PM, mass (lb/hr)	56.80	52.21
conc (gr/dscf)	0.0104	0.0103
O_2 (%)	10.4	11.7
CO_2 (%)	9.3	9.9
CO (ppm)	323	197
SO_2, mass (lb/hr)	595	551
conc (ppm)	94.1	93.5
Organics (lb/hr)*	5.187	1.420
Volatile organics	(0.177)	(0.520)
(Semi-volatile organics)	(5.01)	(0.90)
PCDD/DF (lb/hr)	0.114×10^{-6}	0.008×10^{-6}
<u>Metals (lb/hr - Blank Corrected)</u>		
Al	0.030	0.948
As	<0.004	<0.004
Ba	0.005	0.004
Cd	<0.005	<0.005
Cr	0.010	0.004
Co	0.005	<0.002
Cu	0.003	<0.001
Fe	0.992	0.892
Pb	0.130	0.036
Mg	0.036	0.081
Hg	0.025	0.006
Mo	0.018	0.018
Ni	<0.018	<0.018
Se	<0.004	<0.004
Ag	<0.001	<0.001
Ti	<0.001	0.017
Va	<0.018	<0.018
Zn	3.094	1.643

IMPACT OF TRACE CONSTITUENTS ON AIR QUALITY

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

	Emission Rate(1) (lb/hr)		Impact of Emission and No Threat Levels(2) (micrograms per cubic meter)					
			8-hr		24-hr		Annual	
Constituent	Baseline	TDF	Impact	NTL	Impact	NTL	Impact	NTL
Al	-	0.948	0.04	100	0.016	24	-	-
As	<0.004	-	<0.01	2	<0.001	0.48	<0.00001	0.00023
Ba	0.005	-	<0.01	5	<0.001	1.2	0.00001	50
Cd	<0.005	-	<0.01	0.5	<0.001	0.12	<0.00001	0.00056
Cr	0.010	-	<0.01	5	<0.001	1.2	0.00002	1000
Co	0.005	-	<0.01	0.5	<0.001	0.12	-	-
Cu	0.003	-	<0.01	1.0	<0.001	0.24	-	-
Fe	0.992	-	0.04	50	0.016	12	-	-
Pb	0.130	-	0.01	1.5	0.002	0.36	0.00022	0.09
Mg	-	0.081	<0.01	100	<0.001	24	-	-
Hg	0.025	-	<0.01	1.0	<0.001	0.24	-	-
Mo	0.018	-	<0.01	50	<0.001	12	-	-
Ni	<0.018	-	<0.01	0.5	<0.001	0.12	<0.00003	0.00420
Se	<0.004	-	<0.01	2	<0.001	0.48	-	-
Ag	<0.001	-	<0.01	0.1	<0.001	0.024	<0.00001	3
Ti	-	0.017	<0.01	100	<0.001	24	-	-
Va	<0.018	-	<0.01	0.5	<0.001	0.12	<0.00003	20
Zn	3.094	-	0.14	50	0.051	12	-	-
2,3,7,8 TCDD	0.114x10^{-6}	-	-	-	-	-	1.9x10^{-10}	2.2x10^{-8}
Acetone	0.025	-	<0.01	35600	<0.001	8544	-	-
Benzene	-	0.171	0.01	30	0.003	7.2	0.00028	0.12
Toluene	-	0.246	0.01	3750	0.004	900	0.00041	300
TCE	<0.003	-	<0.01	3350	<0.001	804	-	-
Chlorobenzene	-	0.009	<0.01	460	<0.001	110	-	-
Ethylbenzene	-	0.004	<0.01	4350	<0.001	1044	-	-
Xylene	-	0.015	<0.01	4350	<0.001	1044	-	-
Chloromethane	-	0.043	<0.01	-	0.001	-	-	-
Bromomethane	<0.003	-	<0.01	200	<0.001	48	<0.00001	0.006
Carbon disulfide	<0.003	-	<0.01	120	<0.001	29	<0.00001	0.01
Styrene	-	<0.005	<0.01	2150	<0.001	516	-	-

(1) Listed emission rate is the highest rate measured during Baseline and TDF tests with cement, power and lime plants operating.

(2) No Threat Levels - Policy based ambient guidelines established by FDER.

BEST AVAILABLE COPY

7-30-91 meeting @ FCS's representatives

Bruce Mitchell	FDER/DARM/BAR	(904) 488-1344
John Koogler	K&Assoc/FCS	904/377-5822
Larry Sellers	Holland & Knight	904/425-5671
James Kamas	Radian	(512) 454-4797
Tom Mountain	Florida Crushed Stone	(904) 799-7881

James W. Kamas
Senior Program Manager
Research & Engineering Operations

RADIAN
CORPORATION

(512) 454-4797

P.O. Box 201088 • 8501 Mo-Pac Blvd. • Austin, TX 78720-1088

7-31-91

Tom Mountain @ FCS

2% of raw feed to kiln

11,000 - 12,000 tons

<= 12 - 16 mths =>

via Marsha

SUMMARY OF PLANT OPERATING CONDITIONS AND EMISSION DATA FOR BASELINE AND WWS(1) TEST PERIODS

FLORIDA CRUSHED STONE COMPANY
CPL PLANT
BROOKSVILLE, FLORIDA

	Baseline	WWS Test
Date	Sept. 18-24, 1990	Oct. 31-Nov 2, 1990
Plant Conditions		
Cement Plant		
Kiln Feed Rate (tph)	132	128
WWS Feed Rate (tph)	0	1.75
Clinker Production (tph)	80	76
Coal Firing Rate (tph)	8.5	8.5
Power/Lime Plants		
Elect. Power Generator (MW)	110	110
Lime Production (tph)	11	11
Stack Gas Flow/Characteristics		
Flow Rate (dscfm)	637713	603670
Temperature (°F)	385	390
Moisture (%)	7.2	7.2
Oxygen (%)	10.4	10.1
Emission Data		
Particulate Matter (lb/hr)	(62.2/59.2/49.0) = 56.8	(65.8/77.1/61.0) = 67.9
Volatile Organic Compounds		
Total (lb/hr)	0.15	0.010
Benzene (lb/hr)	0.08	0.005
TCDD/TCDF(2)	0.000000114	0.000000096
Metals (lb/hr)		
Arsenic	<0.004	0.005
Barium	0.02	0.065
Cadmium	<0.005	0.003
Chromium (Total)	0.02	0.030
Lead	0.13	0.127
Mercury	0.04	0.383
Silver	<0.009	<0.016

---

(1) WWS - Wastewater sediment test

(2) TCDD/TCDF - Total dioxins and furans reported as 2378-TCDD based on toxicity equivalency from EPA, 1990.

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

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Air Regulation

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KA 307-90-05

June 5, 1991

VIA FEDERAL EXPRESS

Mr. C. H. Fancy
Florida Department of
Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Subject: Air Construction Permit Application
Florida Crushed Stone Company
Hernando County, Florida

Dear Mr. Fancy:

Enclosed are six (6) copies of the application for an air construction permit for a modification for wastewater sediment at the Florida Crushed Stone Company in Hernando County, Florida. Also enclosed is our check No. 4884 in the amount of $200.00, the permit application fee.

If you have any questions concerning the enclosed applications, please do not hesitate to give me a call.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:mab

cc: Tom Mountain, Florida Crushed Stone Company

BEST AVAILABLE COPY

FEDERAL EXPRESS

[redacted]

QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL
PACKAGE
TRACKING NUMBER 9159526235

9159526235

RECIPIENT'S COPY

[redacted]

Date 6/15/91

1 From (Your Name) Please Print: Janis Koogler
Your Phone Number (Very Important): ( )
Company: KOOGLER & ASSOC
Department/Floor No.:
Street Address: 4014 NW 13TH ST
City: GAINSVILLE
State: FL
ZIP Required: 3 2 6 0 9

2 To (Recipient's Name) Please Print: Mr. C.H. Fancy
Recipient's Phone Number (Very Important): ( )
Company: FDER – Air Bureau
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip® Codes.): 2600 Blair Stone Rd
City: Tallahassee
State: FL
ZIP Required: 32399

YOUR INTERNAL BILLING REFERENCE INFORMATION (First 24 characters will appear on invoice.): [illegible]

H IF HOLD FOR PICK-UP, Print FEDEX Address Here
Street Address
City
State
ZIP Required

3 PAYMENT 1 ☒ Bill Sender 2 ☐ Bill Recipient's FedEx Acct. No. 3 ☐ Bill 3rd Party FedEx Acct. No. 4 ☐ Bill Credit Card
5 ☐ Cash/Check

[redacted]

4 SERVICES (Check only one box)

Priority Overnight Service (Delivery by next business morning†)
- 11 ☐ YOUR PACKAGING
- 16 ☐ FEDEX LETTER *
- 12 ☒ FEDEX PAK *
- 13 ☐ FEDEX BOX
- 14 ☐ FEDEX TUBE

Standard Overnight Service (Delivery by next business afternoon†)
- 51 ☐
- 56 ☐ FEDEX LETTER *
- 52 ☐ FEDEX PAK *
- 53 ☐ FEDEX BOX
- 54 ☐ FEDEX TUBE

Economy Two-Day Service (formerly Standard Air) (Delivery by second business day†)
- 30 ☐ ECONOMY TWO-DAY SVC.

Heavyweight Service (for Extra Large or any package over 150 lbs.)
- 70 ☐ HEAVYWEIGHT **
- 80 ☐ DEFERRED HEAVYWEIGHT **

† Delivery commitment may be later in some areas.
* Declared Value Limit $100.
** Call for delivery schedule.

DELIVERY AND SPECIAL HANDLING (Check services required)
- 1 ☐ HOLD FOR PICK-UP (Fill in Box H)
- 2 ☒ DELIVER WEEKDAY
- 3 DELIVER SATURDAY (Extra charge) (Not available to all locations) ☐
- 4 ☐ DANGEROUS GOODS (Extra charge)
- 5 ☐
- 6 ☐ DRY ICE ____ Lbs.
- 7 ☐ OTHER SPECIAL SERVICE
- 8 ☐
- 9 ☐ SATURDAY PICK-UP (Extra charge)
- 10 ☐
- 11 ☐ DESCRIPTION
- 12 ☐ HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES | WEIGHT In Pounds Only | YOUR DECLARED VALUE
Total | Total | Total

DIM SHIPMENT (Chargeable Weight) ☐ ____ lbs.

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1 ☐ Regular Stop 3 ☐ Drop Box
2 ☐ On-Call Stop 4 ☐ B.S.C. 5 ☐ Station

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Emp. No. Date
☐ Cash Received
☐ Return Shipment
☐ Third Party ☐ Chg. To Del. ☐ Chg. To Hold
Street Address
City State Zip
Received By
X
Date/Time Received FedEx Employee Number

5 Release Signature:
Date/Time

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 8/90
PART #119501 FXEM 8/90
FORMAT #041

041

KOOGLER & ASSOCIATES
PH 377-5822
4014 NW 13TH STREET
GAINESVILLE, FL 32609

4884

63-2/630
BRANCH 320

June 5, 19 91

PAY TO THE ORDER OF Florida Department of Environmental Regulation $ 200.00

Two hundred -- 00/100 DOLLARS

HARLAND 1989

FIRST UNION
First Union National Bank of Florida
Gainesville, Florida 32601
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FOR Air Construction Permit Fee

Marion A. Boyer

[redacted]

6-6-91

F&A sending application
back w/letter requesting
correct fee -
Per Gil Sweeney

PA

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

APPLICATION TO ~~OPERATE~~/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Cement Plant [ ] New[1] [x] Existing[1]

APPLICATION TYPE: [ ] Construction [ ] Operation [X] Modification for wastewater sediment

COMPANY NAME: Florida Crushed Stone Company COUNTY: Hernando

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) Cement plant

SOURCE LOCATION: Street 10311 Cement Plant Road City Brooksville

UTM: East (17) 360.008 km North 3162.392 km

Latitude 28 ° 34 ' 57 "N Longitude 82 ° 25 ' 53 "W

APPLICANT NAME AND TITLE: Thomas W. Mountain, Administrative Assistant

APPLICANT ADDRESS: P.O. Box 1508, Brooksville, FL 34605-1508

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Florida Crushed Stone Company

I certify that the statements made in this application for a construction 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 contrc facilities in such a manner as to comply with the provision of Chapter 403, Florid Statutes, and all the rules and regulations of the department and revisions thereof. also understand that a permit, if granted by the department, will be non-transferab and I will promptly notify the department upon sale or legal transfer of the permitte establishment.

*Attach letter of authorization

Signed: Thomas W. Mountain

Thomas W. Mountain, Administrative Assistant
Name and Title (Please Type)

Date: 6/5/91 Telephone No. (904) 799-7881

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 hav been ~~designed~~/examined by me and found to be in conformity with modern engineerin principles applicable to the treatment and disposal of pollutants characterized in th permit application. There is reasonable assurance, in my professional judgment, tha

---

[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.

JOHN B. KOOGLER
No. 12925

Signed

John B. Koogler, Ph.D., P.E.
Name (Please Type)

Koogler & Associates, Environmental Services
Company Name (Please Type)

4014 N.W. 13th Street, Gainesville, FL 32609
Mailing Address (Please Type)

Florida Registration No. 12925 Date: 6/5/91 Telephone No. (904) 377-5822

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.

See pages 2a - 2h of 12.

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

Start of Construction June 1991 Completion of Construction July 1991

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.)

NA - existing baghouse will control emissions.

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

AC27-61016 issued 11/10/83; expired 1986

AC27-118674 issued 8/26/86; expired 3/31/91

AO27-183508 issued 5/24/91; expires 5/20/96

IIA. GENERAL PROJECT INFORMATION

An existing dry-process portland cement plant with a kiln feed rate of 123.75 tons per hour and a clinker production rate of 75.0 tons per hour will beneficially reuse non-hazardous waste water sediments to supplement a portion of the normal materials fed to the kiln. It is proposed that the total feed rate of the non-hazardous wastewater sediments shall not exceed five percent of the total kiln feed rate or 6.20 tons per hour, whichever is less. The cement kiln is permitted for a heat input of 248 million BTU per hour. This heat input requirement will not change as a result of using the wastewater sediment.

The hot gases exhausted from the cement kiln pass through a pre-heater where heat is recovered and transferred to the kiln feed material. The kiln gases then pass through a baghouse for particulate matter control before being discharged to the atmosphere. The baghouse also controls particulate matter emissions from the power plant and lime plants and from a limestone dryer. The dust collected in the baghouse will continue to be incorporated in the kiln feed as is the current practice. As a result, the baghouse dust becomes part of the clinker, and eventually, part of the finished product.

Aside from using up to five percent (by weight) of a non-hazardous wastewater treatment sediment as a replacement for an equal amount of kiln feed material, there will be no changes in kiln operating conditions, kiln feed rates, clinker production rates or the air pollution control system. The wastewater sediment will be blended with other kiln feed materials in the raw mill during feed preparation. The kiln feed, including the wastewater sediment, will be fed to the pre-heater and into the kiln as is the present practice. The size distribution of the kiln feed is not expected to change with the addition of the wastewater sediment; hence, the particulate matter loading to the baghouse is not expected to change.

To support the request for using wastewater sediment as a kiln feed supplement, Florida Crushed Stone applied to the Department for an amendment to the existing air construction permit (AC27-118674 and PSD-FL-091) to conduct tests while incorporating wastewater sediment in the kiln feed. The request was granted by the Department by letter amendment dated September 24, 1990.

Baseline tests were conducted at the Florida Crushed Stone plant during the period of September 18-20, 1990, and tests using wastewater sediment to supplement approximately 1.5 percent of the kiln feed was conducted during the period of October 31-November 2, 1990. The tests included emission measurements for particulate matter, 18 metals, volatile organic compounds, dioxins and furans, stack gas flow and temperature, and an analysis of several of the feed streams to the cement plant. Reports of these tests have been submitted to the Department and results are summarized in Attachment 1 to this application.

The baseline and wastewater sediment tests demonstrated that there is no significant change in the emission rates of any regulated pollutant as a result of using wastewater sediment to supplement kiln feed. Both the baseline and wastewater sediment tests and the attached paper documenting the partitioning of metals in cement kilns (Attachment 2) demonstrate that the majority of the metals in feed materials and fuels to cement kilns remain in the cement clinker. The apparently higher emission rates of particulate matter and mercury are discussed in the following paragraphs.

A statistical analysis of particulate matter emissions during the baseline and wastewater sediment tests is included as Attachment 3. This analysis demonstrates that at the 95 percent confidence level the particulate matter emissions during the two sets of tests do not differ.

An analysis of mercury emission is included as Attachment 4. Information in this attachment demonstrates that mercury emissions during the wastewater sediment tests could have increased, at the most, 15 percent over baseline conditions. The information further demonstrates that this increase in emissions would have been due a higher mercury concentration in the kiln fed material during the wastewater sediments tests exclusive of the mercury contribution from the wastewater sediment itself. Data demonstrate that the mercury concentration in the wastewater sediment was less than in the kiln feed material and that the wastewater sediment could have accounted for only 0.001 pounds per hour of mercury.

Florida Crushed Stone recognizes that the use of a wastewater sediment will subject the plant to the National Emission Standard for mercury (40CFR61, Subpart E) as it applies to plants that "... incinerate or dry wastewater treatment plant sludge." Communication with EPA Region IV has yielded the opinion that the emission limit for mercury set forth in 40CFR61, Subpart E, for the processing of wastewater treatment sediment (3200 grams of mercury per 24-hour period) will apply only to mercury present in the wastewater sediment and not to mercury present in the coal fired to the power plant, cement plant and lime plant nor to mercury in the feed materials or other raw materials used in the cement plant, power plant or lime plant.

To comply with the requirement of 40CFR61, Subpart E, as interpreted by EPA, Florida Crushed Stone proposes to use the sediment sampling method described in 40CFR61.54. This method requires the sediment to be sampled in accordance with EPA Test Method 105 and analyzed for mercury. The mercury emissions from the sediment are then determined by multiplying the mercury concentration in the sediment by the dry sediment feed rate and by an appropriate conversion factor. A copy of 40CFR61, Subpart E, is included as Attachment 5 to this application.

To assure compliance with the mercury emission limits of 40CFR61, Subpart E, Florida Crushed Stone will limit the dry wastewater sediment feed rate to five percent of the kiln feed rate with a maximum wastewater sediment feed rate not to exceed 6.20 tons per hour and will limit the mercury content of the wastewater sediment on a dry basis to 10 micrograms per gram or less. These conditions will limit the mercury input to the CPL plant from the wastewater sediment to approximately 1350 grams per day. Assuming 100 percent of the mercury in the wastewater sediment is released to the atmosphere, the emission rate will be only 42 percent of that allowed by 40CFR61, Subpart E.

Sulfur dioxide and semi-volatile organic compound emissions were not measured during the wastewater sediment tests as established in the pre-test protocol approved by FDER. It was reasoned that the wastewater sediment would not affect the emissions of these categories of compounds as no reduced sulfur compounds or semi-volatile organic compounds where present in the wastewater sediments. Tests for organic compounds in the wastewater sediment, the baghouse dust, and the kiln feed material showed no detectable quantities of EPA Methods 8080 and 8100 organic compounds nor any of detectable quantities of PCBs (see complete test report). Emission measurements for organic compounds and dioxins and furans during the wastewater sediment tests showed lower emission rates of both categories of compounds than were measured during the baseline test period.

To demonstrate that emissions from the CPL plant, under baseline and WWS conditions, will not result in ambient concentrations that exceed FDER established No Threat Levels (NTL), air quality modeling has been conducted. The emission rates used in the modeling were the highest emission rates measured for metals or specific organic compounds during the baseline and wastewater sediment tests. In the case of mercury, the emission rate used was that measured during the baseline test plus that contributed by the maximum anticipated mercury level in the wastewater sediment (1350 grams per day). The emission rates resulted from the operation of the cement, power and lime plants and represent total emissions; not just the incremental emissions due to the use of wastewater sediment in the cement plant. The modeling was conducted at a stack gas temperature and flow rate representative of cement plant only operations rather than at the higher temperature and flow rate representative of CPL plants operating.

The results of the modeling and a comparison of impacts with NTLs are summarized in Attachment 6. The results of this analysis show impacts are hundreds to millions times lower than applicable NTLs.

The following conditions, originally proposed in a letter dated March 11, 1991, from Koogler & Associates to Mr. C. H. Fancy, are proposed for the utilization of wastewater sediment. Slight changes have been made in the originally proposed conditions to assure consistency with other information in this application and the maximum mercury level in the wastewater sediment has been reduced to 10 milligrams per kilogram as discussed in previous paragraphs.

1. Material Classification

   All materials accepted for reuse as a raw material supplement by Florida Crushed Stone will be classified as RCRA nonhazardous (i.e., neither characteristically hazardous nor listed as hazardous by RCRA), and Florida nonhazardous.

2. Acceptance Criteria

   Samples will be collected from each new material and analyzed to determine the composition of material generated at the source. Only materials having a composition that conforms to the conditions of the amended permit will be shipped to Florida Crushed Stone for reuse.

3. Handling and Storage Requirements

   Florida Crushed Stone proposes to accept both rail and truck shipments of materials for beneficial reuse. The materials will be stored along with the other raw material at the plant in raw material storage areas. Some material will be stored in the limestone storage area and will be fed to the raw mill with the limestone. Other materials will be stored in separate piles.

Nearly all of the substitute materials used at Florida Crushed Stone will be moist (typically 30-80+ percent moisture) and therefore will not be a source of fugitive dust emissions. As added insurance, however, all of the substitute materials will be subject to the fugitive dust control practices now in-place at the plant. These practices include covered storage for most raw materials and wetting of open piles, as needed, to control fugitive dust generation from the storage areas.

Any water runoff from the stored materials will be contained in the existing CPL plant water management system. As only nonhazardous substitute materials will be used, runoff from the materials will not pose a threat to water quality.

All raw materials (including the materials proposed for reuse under this amendment) will be transferred from the raw material storage area into several raw material feed silos using a reclaimer. Material from each of the feed silos will be metered onto a common feed conveyor and subsequently into the raw mill for mixing and grinding. The feed rate from each of the feed silos will be adjusted to produce a final mix of raw materials with the appropriate cement chemistry.

4. Material Characteristics and Feed Rates

Only materials with a leachable metals content below the hazardous level according to the TCLP extraction procedure will be used by Florida Crushed Stone. In addition, the composition of materials used by Florida Crushed Stone will comply with the following restrictions:

Constituent	Maximum Concentration
Total Organic Chlorine	0.2 percent
Total Oil and Grease	2 percent
Arsenic	1250 mg/kg (5000 mg/kg)*
Antimony	2000 mg/kg
Barium	1000 mg/kg
Cadmium	1000 mg/kg
Chromium +6	100 mg/kg
Lead	4900 mg/kg
Mercury	10 mg/kg
Silver	2000 mg/kg
Thallium	1600 mg/kg

The metals concentration limits for the substitute materials were formulated using the air quality analysis that was included in correspondence to FDER dated March 11, 1991. The levels were set to assure that guidelines established under the Florida air toxics policy will not be exceeded. In general, the limits have been set to provide an adequate margin of safety so as to insure negligible impact.

Total feed rate of materials shall not exceed five percent of the total raw material feed to the cement kiln or 6.20 tons per hour, whichever is less.

* Florida Crushed Stone proposes to accept materials with arsenic concentrations up to 5,000 mg/kg, but will restrict materials with arsenic concentrations between 1,250 and 5,000 mg/kg to no more than one percent of the total raw material feed to the process or 1.25 tons per hour, whichever is less.

5. Testing and Record Keeping Practices

Before a substitute material from a new source is used at Florida Crushed Stone, samples will be collected and analyzed to determine the materials composition. Materials from a new source will not be shipped to Florida Crushed Stone unless the composition is consistent with the conditions of this permit amendment. Florida

Crushed Stone will also notify the Florida Department of Environmental Regulation of the proposed use of each material at least 30 days before shipments are received. The notification will include a description of the material, its source and material analysis.

Each truck load or rail car load of material received by Florida Crushed Stone will be sampled. Samples will be segregated by source. One composite sample will be generated and analyzed for each five hundred tons or fraction thereof received from each source.

Florida Crushed Stone will maintain a file on each material received for use. The file will include information on the source, chemical analysis, shipments received, and material usage information.

E. Requested permitted equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52 ; if power plant, hrs/yr ____ ; if seasonal, describe: Present permit allows 8760 hours per year operations.

F. If this is a new source or major modification, answer the following questions. (Yes or No) NA - minor modification to existing major facility.

1. Is this source in a non-attainment area for a particular pollutant? ____
    a. If yes, has "offset" been applied? ____
    b. If yes, has "Lowest Achievable Emission Rate" been applied? ____
    c. If yes, list non-attainment pollutants. ____
2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. ____
3. Does the State "Prevention of Significant Deterioriation" (PSD) requirement apply to this source? If yes, see Sections VI and VII. ____
4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? ____
5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source? ____

H. Do "Reasonably Available Control Technology" (RACT) requirements apply to this source? NO

- a. If yes, for what pollutants? NA
- 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		
See Page 4A of	12.			

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

1. Total Process Input Rate (lbs/hr): 247,500

2. Product Weight (lbs/hr): 150,000

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(3)		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/~~yr~~ hr.	T/yr	
Part. Matter	37.1(1)	162	(2)	37.1	46,066	175,511	
SO_2	74.3(1)	325	(2)	74.3	305	1,162	
NOx	359.0(1)	1572	(2)	359.0	359	1,572	

[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).

(1) Cement kiln only; emissions are as presently permitted.
(2) Allowed by permits AC27-118674 and AC27-61016.
(3) From original permit applications.

SECTION IIIA

Raw Materials Used

Material	Contaminant	Utilization Rate	Flow Diagram
Rotary Dryer (C-12)			
Limestone Fines	Dust	194,225-205,400 lbs/hr*	C03
Clay	Dust	18,600- 19,800 lbs/hr*	C03
Wastewater Sediment	Dust	12,375 lbs/hr**	C03
Raw Mill (E-03)			
Limestone Fines	Dust	194,225-205,400 lbs/hr*	E01
Clay	Dust	18,600- 19,800 lbs/hr*	E01
Lime Rock	Dust	5,000 lbs/hr	E01
Fly Ash	Dust	17,300 lbs/hr	E01
Wastewater Sediment	Dust	12,375 lbs/hr**	E01
Kiln (K-02)			
Same as raw mill			
Coal (see fuel use)			K01
Cooler (K-07)			
Clinker	Dust	150,000 lbs/hr	K02 Discharge

SECTION IIIB

The material input rate and output rate are the same for all operations except for the kiln. For the kiln 247,500 lbs/hr of material are input (See IIIA) and 150,000 lbs/hr of clinker is produced.

* Feed rates will vary depending upon WWS feed rate.
** Maximum feed rate.

NOTE: Total raw mill and kiln feed rates will not exceed presently permitted rate of 123.75 tons/hr (247,500 lbs/hr).

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)
Baghouse	PM	99+	>1.0	See Test Data

Existing baghouse with 3192 teflon coated glass fiber bags in 28 compartments.

Each bag is 12 in. diameter and 37 ft. long providing about 362,000 sq. ft. of filter area.

Bags are cleaned by reverse air flow with cleaning cycle controlled by pressure drop.

Air-to-cloth ratio is 2.9 to 1 with CPL plants operating and 1.6 when the cement plant operates alone.

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Coal	18,500	20,600 lbs/hr	248.0
Coal (1)	2,800	3,090 lbs/hr	210.8 (1)
Tire derived fuel (TDF)	2,400	2,657 lbs/hr	37.2
(1) When TDF is used to supplement coal.			

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

Fuel Analysis: Coal / TDF

Percent Sulfur: 0.75 / 1.3 Percent Ash: 10 / 4

Density: - lbs/gal Typical Percent Nitrogen: 1.4 / 0.2

Heat Capacity: 12,400 / 14,000 BTU/lb - BTU/gal

Other Fuel Contaminants (which may cause air pollution): Trace metals - See attached test summary

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

Annual Average NA Maximum

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

Baghouse dust is incorporated in kiln feed material.

(Stack gas flow for cement plant only.)

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

Stack Height: 320 ft. Stack Diameter: 18.65 ft.

Gas Flow Rate: 575,660 ACFH 385,000 DSCFH Gas Exit Temperature: 290 °F.

Water Vapor Content: 5.0 % Velocity: 35.1 FPS

SECTION IV: INCINERATOR INFORMATION

NOT APPLICABLE

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		Temperature (°F)
			Type	BTU/hr	
Primary Chamber					
Secondary Chamber					

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

Gas Flow Rate: ______ ACFH ______ DSCFH* 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: ____________________

____

____

____

____

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

____

____

____

____

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)]

   UNCHANGED FROM ORIGINAL PERMIT APPLICATION; SEE SECTION IIIA.

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. UNCHANGED FROM ORIGINAL PERMIT APPLICATION.

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

   UNCHANGED FROM ORIGINAL PERMIT APPLICATION.

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.)

   UNCHANGED FROM ORIGINAL PERMIT APPLICATION; SEE SECTION IIID.

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).

   UNCHANGED FROM ORIGINAL PERMIT APPLICATION.

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.

   AS SUBMITTED WITH ORIGINAL APPLICATION.

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).

   AS SUBMITTED WITH ORIGINAL APPLICATION.

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.

   AS SUBMITTED WITH ORIGINAL APPLICATION.

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

NOT APPLICABLE

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

NOT APPLICABLE

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.

ATTACHMENT 1

SUMMARY OF EMISSIONS AND STACK GAS PARAMETERS DURING BASELINE AND WWS* TESTS

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

TEST	BASELINE	WWS
Date	9/18-20/90	10/31-11/2/90
PM, mass (lb/hr)	56.80	67.95
conc (gr/dscf)	0.0104	0.0131
O2 (%)	10.4	10.2
Volatile organics (lb/hr)**	0.177	0.010
PCDD/DF (lb/hr)	0.114×10^{-6}	0.096×10^{-6}
Selected Metals (lb/hr - Blank Corrected)		
As	<0.004	0.002
Ba	0.005	0.054
Cd	<0.005	<0.005
Cr	0.010	0.024
Co	0.005	<0.022
Cu	0.003	<0.010
Fe	0.992	1.597
Pb	0.130	0.124
Hg	0.034	0.380
Mo	0.018	<0.002
Ni	<0.018	<0.006
Se	<0.004	<0.012
Ag	<0.001	<0.015
Ti	<0.001	0.645
V	<0.018	0.022
Stack Gas		
Flow (dscfm)	637,713	603,670
Temp (°F)	385	390
Moisture (%)	7.2	7.1

* WWS - Wastewater sediment as a kiln feed supplement.

** See following supplemental table for specific organic compounds.

SUMMARY OF ORGANIC COMPOUND EMISSIONS DURING BASELINE AND WWS TESTS

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

TEST	BASELINE	WWS
Date	9/18-20/90	10/31-11/2/90
Volatile Organic Compounds		
Acetone	0.0247	0.0003
Benzene	0.1005	0.0049
Toluene	0.0136	0.0006
Tetrachloroethylene	<0.0025	ND
Chlorobenzene	0.0074	0.0002
Ethylbenzene	<0.0026	<0.0001
Xylene	0.0078	0.0004
Chloromethane	<0.0095	0.0020
Bromomethane	<0.0027	0.0003
Carbon disulfide	<0.0029	0.0002
Styrene	<0.0024	0.0006
Other Traces	-	0.0001
TOTAL VOCs	<0.1766	0.0097

ATTACHMENT 2

This paper is primarily related to burning waste derived fuels in kilns; however, the discussion of metals partitioning will apply to the metals contained in the non-hazardous wastewater sediments proposed for use by Florida Crushed Stone. It is emphasized that Florida Crushed Stone will not burn waste derived fuels nor will the wastewater sediments be of a hazardous nature.

METAL EMISSIONS ARE PREDICTABLE

by Michael von Seebach & J. Bruce Tompkins

Accurate predictions of metal emissions may be made in kilns burning conventional and hazardous waste fuels

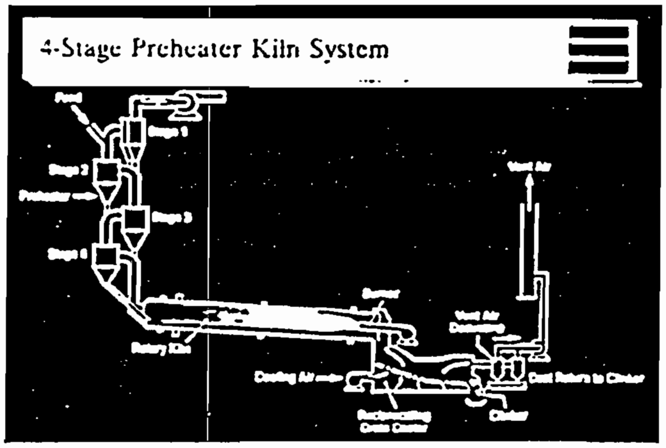

FIGURE 1

CEMENT companies applying for new permits, or permit modifications, to replace fossil fuel with hazardous waste fuel in a cement kiln typically are faced with two concerns voiced by local residents and environmental agencies. These groups want to know the potential for emission of hazardous organic compounds and for the emission of metals. This article will address both concerns.

As the cement industry remains under pressure from imports, manufacturing cost improvements are a necessity. Replacing fossil fuel with substitutes offers one method for potential cost savings.

In order to determine the behavior of the additional metals brought into the system with these replacement fuels, investigations were performed by Southwestern Portland Cement Co. (Southdown) at Houston, Texas, to study where the metals go.

For these studies, the metals input into the kiln system were varied by at least one order of magnitude. Study results clearly revealed which portion of the metals were tied up in clinker and dusts, and which portions were emitted.

Extensive investigations also were made on six preheater and precalciner kilns to determine the behavior of metals. The studies were performed on kilns burning both conventional and hazardous waste fuels.

SEVERAL tests have been performed to demonstrate the destruction and removal efficiency (DRE) of cement kilns with respect to organic compounds.[1] Most of these tests utilized a variety of different hazardous organic compounds input to the burning zone of long wet kilns, while feeding hazardous waste as replacement fuel.

A more demanding test series involved feeding organic hazardous compounds into the burning zone of a preheater kiln as part of the liquid hazardous waste fuel (HWF) supplement. In a second series, organic hazardous compounds were introduced to the kiln inlet of the same preheater kiln in conjunction with automobile tires being used as replacement fuel. A flow sheet of the kiln system in which the tests were performed is shown in Fig. 1.

The preheater kiln system tested has a clinker capacity of 2,350 short tons per day. Its prime fuel is pulverized coal. Due to the waste stream expected to be used as replacement fuel, carbon tetrachloride and trichlorobenzene were used as the principle organic hazardous constituents (POHCs) for DRE testing. These POHCs are difficult to combust and destroy because of their thermal stability. The POHCs were metered to the kiln system while their concentrations in the stack gases were measured. Results of these tests are shown in Table 1.

During test conditions 1 and 2, both POHCs were added to the liquid HWF. This way, the POHCs had to travel through the sintering and calcining zone of the rotary kiln, and through the entire preheater to survive. The results shown in Table 1 were in agreement with previous test data, indicating destruction and removal efficiencies of carbon tetrachloride exceeding 99.99%.

During the most severe test condition (3), the POHCs were introduced with automobile tires at the inlet of the rotary kiln. The tire feed device utilizes a specially designed feed chute with a double air lock, which allows the tires to slide down the feed shelf into the rotary kiln. The test results given in Table

Destruction and Removal Efficiencies
For POHCs of a 4-Stage Preheater Kiln System

Principle Organic Hazardous Constituent DRE in %		
Tests of 9/15 - 9/22	Carbontetrachloride	Trichlorobenzene
Condition 1:	POHCs Added with Liquid HWF	
Run 1	99.9996	99.9960
Run 2	99.9996	99.9957
Run 3	99.9996	99.9960
Condition 2:	POHCs Added with Liquid HWF	
Run 1	99.9996	99.9961
Run 2	99.9996	99.9959
Condition 3:	POHCs Added with Tires	
Run 1	99.9996	99.9961
Run 2	99.9996	99.9961
Run 3	99.9996	99.9961

TABLE 1

Balancing of Arsenic Preheater
Precalciner Kiln System

clinker

	Analyzed	Calculated	
	PPM	mg kg CL	PPM
Raw Materials	8.400	12.689	8.400
Fuels	1.000	0.132	
Preheater Exit		3.379	17.767
Stack Loss	0.012	0.005	
Dust from Baghouse	16.000	3.374	17.743
Preheater Feed	18.064	16.064	9.445
Loss Through Bypass	10.000	0.000	
Kiln Feed	0.000	19.150	14.197
Clinker	14.300		12.816
Total Input	12.821		
Total Output	13.900		

TABLE 2

(mg/kg clinker

1 again show, as expected, that the DREs were as high as experienced under test conditions 1 and 2.

For carbon tetrachloride, the DRE was measured to be greater than 99.999%, and for trichlorobenzene, DREs greater than 99.996% were measured. These DREs were a result of the detection limits of the constituents in stack gases, rather than the result of actual findings of undestroyed POHCs. In essence, no POHCs were actually detected in the stack gases.

These results clearly support the claim that the emission of organics from cement kilns burning HWF as a replacement for part of the fossil fuel is not a valid concern.

SPRUNG, et al[2,3,4] have extensively investigated the reactions of trace amounts of metals in cement kiln systems. In the course of these investigations, both internal and external circulation of the trace metals were measured. Measurements were made on suspension preheater and traveling grate preheater kiln systems. The results of the measurements revealed that most trace metals in the kiln behave in a manner similar to the main elements (i.e., Ca, Si, Al, Fe, and Mg). As such, most of the trace metals are bound in the clinker and dust discharged from the kiln.

Since most of the dust is returned to the kiln feed, external circulations of the main and trace elements develop. This is typical for cement kiln systems. More than 99.9% of the total main and trace element inputs are bound in the solids of the kiln system.[2,3]

It is generally accepted that alkali evaporation from the hot zones of the rotary kiln is increased as the halogen content, specifically the chlorine content, of the preheater feed is increased. Increased volatilization should therefore also occur for most metals in the presence of chlorine. Even for chromium, increased volitalization and partitioning in an incinerator were reported after the chlorine content was increased.[5]

In an effort to verify the retention and partitioning of metals in cement kilns, detailed systems analyses were performed. The systems analyzed were three precalciner kiln systems, two conventional preheater kiln systems (one of which was tested with two chlorine input levels) and one long wet kiln. The systems analyses were performed by sampling all incoming and outgoing mass flows on an hourly basis for a period of at least eight hours. The hourly samples were combined in a composite sample. The composite samples then were analyzed for all metals.

During the sampling periods, particulate emissions from the stacks also were measured, and the particulate catches were analyzed. Based upon the analytical results and estimated flow quantities, total input and output of metals were balanced. Since cement kilns typically operate in steady state conditions, such balances are reasonably accurate (i.e., better than ± 5% to 10%). As experienced in previous investigations, when attempting to balance mathematically the total input and output of one trace element in cement kilns[4], the accuracy of the balance is determined by the accuracy of the digestion and analysis of the elements rather than by the system stability.

A typical balance of arsenic (one of the trace metals) is given in Table 2. Table 2 represents the individual results as analyzed and calculated for a four-stage preheater/precalciner kiln system. Listed are the incoming and outgoing mass flows of the system, the analytical results, and the calculated values in units of mg arsenic/kg clinker. The total input into the kiln system from raw material and fuel is 12.821 mg arsenic/kg clinker. The bulk of the arsenic input results from the raw material.

The total output with clinker and through the stack is 13.912 mg arsenic/kg clinker. This is 8.5% higher than the input. A computer program is used to adjust input and output accordingly. The measured emissions were, however, not subjected to adjustment. It should be noted that the precalciner kiln system, for which the arsenic balance is given, is not equipped with a bypass. Also, all of the dust collected in the kiln baghouse is returned to the preheater feed.

The arsenic balances, as shown in Table 2, for a preheater/precalciner kiln, were compared for all kiln systems investigated. The comparison focused on the total input and output and on the portion of arsenic bound in the solids (i.e., clinker and dust). Included in this comparison were two conventional preheater kiln systems that were using liquid HWF to replace some of the fossil fuel.

It was found that the percentage of arsenic bound or retained in

Metals Retention in Percent of Input

Metal	Input - Lbs/Hr	Retention %
Cr	0.5642 To 10.1974	99.8553 ± 0.3990
Pb	1.5761 To 42.2842	99.8531 ± 0.2008
Ba	33.1177 To 75.9640	99.8781 ± 0.2509
Cd	0.0864 To 0.3945	≥99.5550 ± 0.4418
As	0.0151 To 6.5910	≥99.8868 ± 0.2916
Be	0.0003 To 0.7172	≥99.8681 ± 1.3278
Se	0.0072 To 1.3410	≥95.4002 ± 1.7779
Ag	0.0439 To 0.4975	±99.8420 ± 0.1839
Ni	1.9490 To 5.0261	≥99.9574 ± 0.0108
Sb	0.3532 To 0.6640	≥99.7690 ± 0.0785
Zn	9.1751 To 35.8034	99.7869 ± 0.2598
V	4.9594 To 31.3130	≥99.9922 ± 0.0007

TABLE 3

(Retention in Solids

Metals Retention for Cadmium and Lead With Increased Cl-Input

Metal	Retention at 100 Lbs of Cl-/Hr	Retention at 180 Lbs Cl-/Hr
Cd	99.55	99.87
Pb	99.85	99.98

TABLE 4

the solids was similar to all systems: 99.88%, with a standard deviation of s = ± .29%. This result permits consideration of the retention of arsenic in the solids of all kiln systems as a physical characteristic of the arsenic. The origin of the arsenic has no influence on this physical characteristic. The retention of arsenic in the solids is a function of the physical and chemical behavior of the arsenic input into the kiln systems.

SIMILAR comparisons were made for other metals, and the results of these comparisons are shown in Table 3. This table gives the input range of each metal in the various kiln systems burning fossil, and in two cases, liquid HWF fuel. The table also indicates the retention of these metals in the solids of the kiln systems (i.e., the percentage of the metal locked up in the solids). Excluded from Table 3 are the highly volatile metals, thallium and mercury, which will be dealt with later. All other trace metals fit well into the scheme found for arsenic.

Even with the wide input range over approximately one order of magnitude, the retention of a specific metal in the solids of a kiln system is similar for all kiln systems. The retention of each metal, or the portion of the total input of that metal, which is retained and locked up in the solids seems to be a characteristic of each metal. Again, for the metals to be retained, it is not relevant where the metals originate from: a metal input with raw material behaves in the same way as a metal input with fuel or with HWF. This finding is of specific importance when considering the burning of solid HWF using the Cadence technology.[7]

It is to be expected that this characteristic portion of the metal retained in the solids may be correlated with the volatility of the metal. However, it is not obvious from the results presented in Table 3. Chromium, which is not highly volatile, shows a retention in the solids of 99.855%, while 99.853% of the more volatile lead input is retained in the solids.

The lowest retention in this group of metals was observed for cadmium. With inputs ranging from 0.08 to .39 lb/hr, 99.555% of the cadmium was retained in the clinker and dust. This result is in line with the known high volatility of cadmium in the temperature ranges of a kiln system.

The retention of metals in the solids of a kiln system was measured specifically with different chlorine input levels on a four-stage preheater system. The kiln was not equipped with a bypass. The results of lead and cadmium retention, with outputs of 1.8 lb/min and 3 lb/min of chlorine, respectively, is shown in Table 4. The table shows that the average retention of those selected metals is, within reasonable accuracy, independent of the chlorine input. Increased chlorine input does not decrease the amount of lead and cadmium bound in the clinker and dust. This result may be valid only within the relatively narrow range of chlorine input levels, but measurements at higher chlorine inputs are not possible.

Additional chlorine could not be removed from the kiln system through a bypass. The results, given in Table 4, still support the conclusion that the retention of lead and cadmium in the solids of the kiln system is not decreased with increasing chlorine input, as long as the chlorine levels do not exceed practical operating levels. This finding is important, since it allows the utilization of chlorinated waste streams as a replacement for fossil fuel as long as the chlorine tolerance levels of the kiln system are not exceeded.

In addition to metals retention in the solids of cement kiln systems, basic facts about metals emissions also must be known for sound metals management.

THE metals retention in the kiln systems was derived from balancing the metals input and output; the emissions were, however, measured separately. For emissions measurements, the particulate catches (using the Environmental Protection Association's Method 5) were analyzed. Metals emissions also were measured directly (using EPA's Draft Multi-Metals Train). Generally, both methods give similar results, which demonstrates that none of the metals discussed are emitted as free metals or vapors. The metals are condensed and have reacted at least partly with the feed stock particulates which pass through the baghouse as particulate emissions.

This finding is in agreement with the results reported by Sprung et al.[3] The preheater off gasses are used to dry the raw material or they are quenched prior to entering the baghouse. The operating temperature range of the air pollution control device does not permit gas temperatures high enough to allow metals to exist in vaporized form.

As in the case of metals retention in solids, the metals emissions of all tested kiln systems were compared for each metal. The comparison was made on the basis of total metals input. The minute amount of the specific metal emitted was determined as a percentage of the total metals input. It should be noted that the metals emissions frequently are below the detection limit. In these cases, the detection limit was used as the metals emission, representing the most conservative approach to present emissions data.

The summary for all metals emissions as a percentage of the total metals input is given in Table 5. This table shows the mean values of the emissions from the six kiln systems. As pointed out earlier, some of the kiln systems have totally closed dust-return loops, and only two of the systems tested were burning HWF as a replacement for a portion of the fossil fuel.

As can be expected, no differences in the metals emissions between the kiln systems burning HWF and coal, and those burning coal only, were identified. This confirms the theory that the origin and point of introduction of metals in the kiln system is irrelevant for the retention and emissions of the metals.

The results given in Table 5 indicate that the emissions, in percent of the total metals input, are different for certain groups of metals. While only .004% to .048% of the total metals input is emitted as particulates of metals (like vanadium, arsenic, and nickel), up to .44% of the total cadmium input is emitted as particulates. These results are consistent with those reported for cadmium emissions of a cyclone-type preheater kiln system by Kirchner.[4]

It may, therefore, be concluded that the figures given in Table 5 for the metals emissions in percent of the total metals input are reasonably accurate and representative.

In an effort to group the metals in order of their partitioning, Figure 2 was developed. This figure illustrates metals emissions (in a logarithmic scale) for various metals as a percentage of the total metals input. The metals are arranged in decreasing order with respect to emissions. Fig. 2 reinforces the theory that cadmium is the most critical metal, followed by selenium, antimony, zinc, lead, and silver.

BOTH Table 5 and Fig. 2 indicate that cadmium, selenium, antimony, zinc, lead, and silver are the metals that demand the kiln operator's attention regardless of whether HWF is supplementing fossil fuel or not. However, cadmium and lead are generally higher in waste-derived fuel than in fossil fuel. It is, therefore, necessary to forecast the emissions of these metals prior to actually burning HWF in a kiln to ensure that these emissions pose no risk to human health nor to the environment.

In Fig. 2 and Tables 4 and 5, thallium and mercury were not addressed. These metals are considerably more volatile than the others; they were included in the systems analyses and emissions measurements. Most of the balances of the inputs and outputs of these two metals performed on the six kiln systems, close well. This indicates that the mass flows and emissions were measured accurately.

However, a significant data scatter exists from kiln system to kiln system. The scatter of the mercury data is larger than that of the thallium data. This is shown in Table 6, which is a summary of the retention and emissions data for mercury and thallium. The thallium retention in the solids of the kiln systems averages 90% with a standard deviation of ± 10.7%. Accordingly, 10% to 20% of the total thallium input is emitted. The data scatter increased primarily due to a long wet kiln, which is included in the data base. The figures for mercury show an even greater scatter: 61% of the total mercury input is retained in the solids with a standard deviation of ± 32%.

The measured mercury emis-

Metals Emissions in Percent of Input

Metal	Input • Lbs/Hr	Emission %
Cr	0.5642 To 10.1974	0.128
Pb	1.5761 To 42.2842	0.167
Ba	33.1177 To 75.9640	0.030
Cd	0.0864 To 0.3945	0.440
As	0.0151 To 6.5910	0.022
Be	0.0003 To 0.7172	0.114
Se	0.0072 To 1.3410	0.298
Ag	0.0439 To 0.4975	0.163
Ni	1.9490 To 5.0261	0.048
Sb	0.3532 To 0.6640	0.266
Zn	9.1751 To 35.8034	0.220
V	4.9594 To 31.3130	0.004

TABLE 5

Metals Emissions

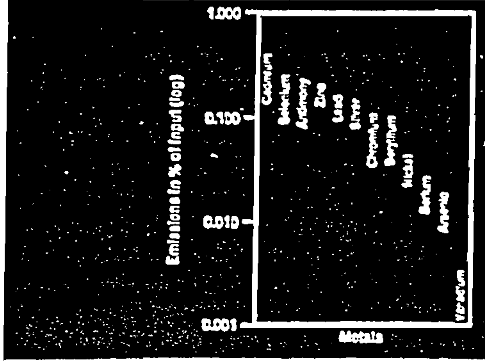

FIGURE 2

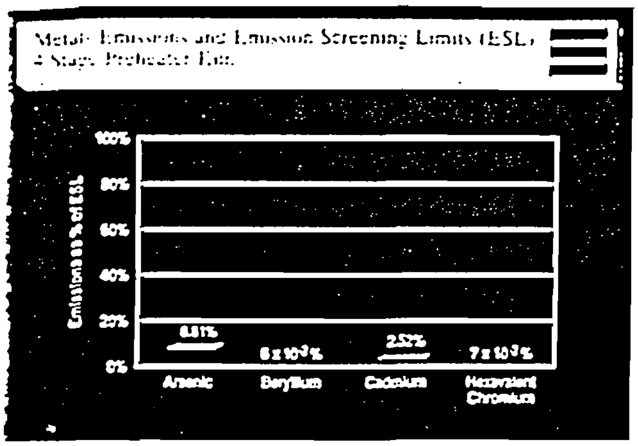

FIGURE 3

Retention and Emissions of Volatile Metals

Metals	Input Lbs/Hr	Retention %	Emission %
Hg	0.0047 - 0.0938	≥ 61.3 ± 32.5	10% - 90%
Tl	0.0180 - 0.7357	90.1219 ± 10.7113	10% - 20%

TABLE 6

sions vary between 10% and 90% of the total mercury input. As previously discussed, the emissions were assumed to be at the detection limit when the stack testing indicated emissions below the detection limit of thallium and mercury. There is insufficient information to explain the scatter of the thallium and even more so the mercury data. Therefore, until more information is available, the most conservative assumptions must be made.

BASED upon the results reported under 3 and 4, it appears valid to predict metals emissions from cement kilns based upon the total metals input into the kiln and the average emissions figures given in Table 5 and Fig. 2. It should be pointed out that these forecasts may be applied to kiln systems of different capacities, as long as the total metals input is not significantly different than the ranges given in Tables 4 and 5. This limitation effectively will limit the extrapolation that may have to be applied.

The forecasting calculations as described above have been used to predict emissions of arsenic, beryllium, and cadmium for a four-stage preheater kiln system with a capacity of 2,000 short tpd. To put the metals emissions predicted into perspective, they were compared with the extremely conservative Emissions Screening Limits (ESL) as published by the EPA,[9] taking the specific plant data into account.

The result of this comparison is given in Fig. 3. This figure gives the predicted metals emissions as a percent of the emissions screening limits. The calculation also was performed for chromium. Through site-specific testing, it was demonstrated that the content of hexavalent chromium is approximately 2% of the total chromium content.

Fig. 3 indicates that all of the metals investigated show emission rates significantly less than 10% of the conservative ESL as published by EPA. The input of the other metals was so low that only comparative calculations were performed, but they are not shown in Fig. 3. Unfortunately, it is too early to compare these emissions forecasts with tests that are presently underway. However, the emissions forecasts compare well with emissions measured in previous stack tests. It may, therefore, be assumed that the methodology described provides reasonably accurate results for metals emissions forecasting. ■

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ATTACHMENT 3

COMPARISON OF PARTICULATE MATTER EMISSION RATES DURING BASELINE AND WWS TESTS

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

SEPTEMBER - NOVEMBER 1990

Baseline Test

RUN	Particulate Matter Emission Rate (Lb/Hr)
1	62.21
2	59.15
3	49.05
$\overline{X}_1$	56.80
s_1	6.89
n_1	3

WWS Test

RUN	Particulate Matter Emission Rate (Lb/Hr)
1	65.77
2	77.11
3	60.96
$\overline{X}_2$	67.95
s_2	8.29
n_2	3

Where: $\bar{X}$ = Average emission rate
s = Standard deviation
n = Number of observations

$$t \text{ measured} = \frac{|X_1 - X_2|}{\sigma t\ (1/n_1 + 1/n_2)^2}$$

Where:

$$\sigma t = \left[\frac{(n_1 - 1)\ (s_1)^2 + (n_2 - 1)\ (s_2)^2}{n_1 + n_2 - 2}\right]^{0.5}$$

$$= \left[\frac{(2)\ (6.89)^2 + 2(8.29)^2}{4}\right]^{0.5}$$

$$= 7.62$$

$$t \text{ measured} = |56.80 - 67.95|/(7.62)(1/3 + 1/3)^2$$

$$= 1.79$$

t critical = 2.13 at 95% C.L.

t measured < t critical; therefore, reject the hypothesis that the two particulate matter emission rates are different (at the 95% C.L.)

parameters that are selectively measured by the CERMS (e.g., velocity pressure), use two analogous values: one that represents zero to 20 percent of the high-level value (a value that is between 1.25 and 2 times the average potential value) for that parameter, and one that represents 50 to 100 percent of the high-level value. Introduce, or activate internally, the reference signals to the CERMS (these need not be certified). Record the CERMS response to each, and subtract this value from the respective reference value (see example data sheet in Figure 6-1).

5. *RA Test Procedure*

5.1 Sampling Strategy for RM's Tests, Correlation of RM and CERMS Data, Number of RM's Tests, and Calculations. These are the same as PS 2, Sections 7.1, 7.2, 7.3, and 7.5, respectively. Summarize the results on a data sheet. An example is shown in Figure 6-2. The RA test may be conducted during the CD test period.

5.2 Reference Methods (RM's). Unless otherwise specified in the applicable subpart of the regulations, the RM for the pollutant gas is the Appendix A method that is cited for compliance test purposes, or its approved alternatives. Methods 2, 2A, 2B, 2C, or 2D, as applicable are the RM's for the determination of volumetric flow rate.

6. *Bibliography*

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Performance Specification 7—Specifications and Test Procedures for Hydrogen Sulfide Continuous Emission Monitoring Systems in Stationary Sources

[Added by 55 FR 40175, October 2, 1990]

1. Applicability and Principle

1.1. *Applicability.* 1.1.1 This specification is to be used for evaluating the acceptability of hydrogen sulfide (H_2S) continuous emission monitoring systems (CEMS's) at the time of or soon after installation and whenever specified in an applicable subpart of the regulations.

1.1.2 This specification is not designed to evaluate the installed CEMS performance over an extended period of time nor does it identify specific calibration techniques and other auxiliary procedures to assess CEMS performance. The source owner or operator, however, is responsible to calibrate, maintain, and operate the CEMS. To evaluate CEMS performance, the Administrator may require, under Section 114 of the Act, the source owner or operator to conduct CEMS performance evaluations at other times besides the initial test. *See* §60.13(c).

1.1.3. The definitions, installation specifications, test procedures, data reduction procedures for determining calibration drifts (CD) and relative accuracy (RA), and reporting of Performance Specification 2(PS 2), Sections 2, 3, 5, 6, 8, and 9 apply to this specification.

1.2 Principle. Reference method (RM), CD, and RA tests are conducted to determine that the CEMS conforms to the specification.

2. Performance and Equipment Specifications

2.1 *Instrument zero and span.* This specification is the same as Section 4.1 of PS 2.

2.2 *Calibration drift.* The CEMS calibration must not drift or deviate from the reference value of the calibration gas or reference source by more than 5 percent of the established span value for 6 out of 7 test days (e.g., the established span value is 300 ppm for subpart J fuel gas combustion devices).

2.3. *Relative accuracy.* The RA of the CEMS shall be no greater than 20 percent of the mean value of the RM test data in terms of the units of the emission standard or 10 percent of the applicable standard, whichever is greater.

3. Relative Accuracy Test Procedure

3.1 Sampling Strategy for RM Tests, Correlation of RM and CEMS Data Number of RM Tests, and Calculations. These are the same as that in PS 2, §7.1, 7.2, 7.3, and 7.5, respectively.

3.2 Reference Methods. Unless otherwise specified in an applicable subpart of the regulation, Method 11 is the RM for this PS.

4. Bibliography

1. U.S. Environmental Protection Agency. Standards of Performance for New Stationary Sources; Appendix B; Performance Specifications 2 and 3 for SO_2, NO_x, CO_2, and O_2 Continuous Emission Monitoring Systems; Final Rule. 48 CFR 23608, Washington, DC U.S. Government Printing Office. May 25, 1983.

2. U.S. Government Printing Office. Gaseous Continuous Emission Monitoring Systems—Performance Specification Guidelines for SO_2, NO_x, CO_2, O_2, and TRS. U.S. Environmental Protection Agency. Washington, D.C. EPA-450/3-82-026. October 1982. 26p.

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4. Ferguson, B.B., R.E. Lester (Harmon Engineering and Testing), and W.J. Mitchell. Field Evaluation of Carbon Monoxide and Hydrogen Sulfide Continuous Emission Monitors at an Oil Refinery. Prepared for the U.S. Environmental Protection Agency. Research Triangle Park, N.C. Publication No. EPA-600/4-82-054. August 1982. 100p.

APPENDIX C—DETERMINATION OF EMISSION RATE CHANGE

1. *Introduction.*

1.1 The following method shall be used to determine whether a physical or operational change to an existing facility resulted in an increase in the emission rate to the atmosphere. The method used is the Student's *t* test, commonly used to make inferences from small samples.

2. *Data.*

2.1 Each emission test shall consist of *n* runs (usually three) which produce *n* emission rates. Thus two sets of emission rates are generated, one before and one after the change, the two sets being of equal size.

2.2 When using manual emission tests, except as provided in § 60.8(b) of this part, the reference methods of Appendix A to this part shall be used in accordance with the procedures specified in the applicable subpart both before and after the change to obtain the data.

2.3 When using continuous monitors, the facility shall be operated as if a manual emission test were being performed. Valid data using the averaging time which would be required if a manual emission test were being conducted shall be used.

3. *Procedure.*

3.1 Subscripts a and b denote prechange and postchange respectively.

3.2 Calculate the arithmetic mean emission rate, E, for each set of data using Equation 1.

$$E=\frac{\sum_{i=1}^{n} E_i}{n}=\frac{E_1+E_2\ldots+E_n}{n} \qquad (1)$$

Where:

E_i=Emission rate for the *i* th run.

n=number of runs.

3.3 Calculate the sample variance, S^2, for each set of data using Equation 2.

$$S^2=\frac{\sum_{i=1}^{n}(E_i-E)^2}{n-1}=\frac{\sum_{i=1}^{n}E_i^2-\left(\sum_{i=1}^{n}E_i\right)^2\Big/n}{n-1} \qquad (2)$$

3.4 Calculate the pooled estimate, S_p, using Equation 3.

$$S_p=\left[\frac{(n_a-1)\,S_a^2+(n_b-1)\,S_b^2}{n_a+n_b-2}\right]^{1/2} \qquad (3)$$

3.5 Calculate the test statistic, *t*, using Equation 4.

$$t=\frac{E_b-E_a}{S_p\left[\frac{1}{n_a}+\frac{1}{n_b}\right]^{1/2}} \qquad (4)$$

4. *Results.*

4.1 If $E_b>E_a$ and $t>t'$, where t' is the critical value of t obtained from Table 1, then with 95% confidence the difference between E_b and E_a is significant, and an increase in emission rate to the atmosphere has occurred.

TABLE 1

Degrees of freedom (n_a+n_b-2)	t' (95 percent confidence level)
2	2.920
3	2.353
4	2.132
5	2.015
6	1.943
7	1.895
8	1.860

For greater than 8 degrees of freedom, see any standard statistical handbook or text.

5.1 Assume the two performance tests produced the following set of data:

Test a	Test b
Run 1. 100	115
Run 2. 95	120
Run 3. 110	125

5.2 Using Equation 1—

$$E_a=100+95+110/3=102$$
$$E_b=115+120+125/3=120$$

5.3 Using Equation 2—

$$S_a^2=(100-102)^2+(95-102)^2+(110-102)^2/3-1=58.5$$
$$S_b^2=(115-120)^2+(120-120)^2+(125-120)^2/3-1=25$$

5.4 Using Equation 3—

$$S_p=[(3-1)(58.5)+(3+1)(25)/3+3-2]^{1/2}=6.46$$

5.5 Using Equation 4—

$$t=\frac{120-102}{6.46\left[\frac{1}{3}+\frac{1}{3}\right]^{1/2}}=3.412$$

5.6 Since $(n^1+n^2-2)=4$, $t'=2.132$ (from Table 1). Thus since $t>t'$ the difference in the values of E_a and E_b is significant, and there has been an increase in emission rate to the atmosphere.

6. *Continuous Monitoring Data.*

6.1 Hourly averages from continuous monitoring devices, where available, should be used as data points and the above procedure followed.

APPENDIX D—REQUIRED EMISSION INVENTORY INFORMATION

(a) Completed NEDS point source form(s) for the entire plant containing the designated facility, including information on the applicable criteria pollutants. If data concerning the plant are already in NEDS, only that information must be submitted which is necessary to update the existing NEDS record for that plant. Plant and point identification codes for NEDS records shall correspond to those previously assigned in NEDS; for plants not in NEDS, these codes shall be obtained from the appropriate Regional Office.

(b) Accompanying the basic NEDS information shall be the following information on each designated facility:

(1) The state and county identification codes, as well as the complete plant and point identification codes of the designated facility in NEDS. (The codes are needed to match these data with the NEDS data.)

(2) A description of the designated facility including, where appropriate:

(i) Process name.

(ii) Description and quantity of each product (maximum per hour and average per year).

(iii) Description and quantity of raw materials handled for each product (maximum per hour and average per year).

(iv) Types of fuels burned, quantities and characteristics (maximum and average quantities per hour, average per year).

(v) Description and quantity of solid wastes generated (per year) and method of disposal.

(3) A description of the air pollution control equipment in use or proposed to control the designated pollutant, including:

(i) Verbal description of equipment.

(ii) Optimum control efficiency, in percent. This shall be a combined efficiency when more than one device operates in series. The method of control efficiency determination shall be indicated (e.g., design efficiency, measured efficiency, estimated efficiency).

(iii) Annual average control efficiency, in percent, taking into account control equipment down time. This shall be a combined efficiency when more than one device operates in series.

(4) An estimate of the designated pollutant emissions from the designated facility (maximum per hour and average per year). The method of emission determination shall also be specified (e.g., stack test, material balance, emission factor).

APPENDIX E—[RESERVED]

APPENDIX F—QUALITY ASSURANCE PROCEDURES

PROCEDURE 1. QUALITY ASSURANCE REQUIREMENTS FOR GAS CONTINUOUS EMISSION MONITORING SYSTEMS USED FOR COMPLIANCE DETERMINATION

1. Applicability and Principle

1.1 Applicability. Procedure 1 is used to evaluate the effectiveness of quality control (QC) and quality assurance (QA) procedures and the quality of data produced by any continuous emission monitoring system (CEMS) that is used for determining compliance with the emission standards on a continuous basis as specified in the applicable regulation. The CEMS may include pollutant (e.g., SO_2 and NO_x) and diluent (e.g., O_2 or CO_2) monitors.

This procedure specifies the minimum QA requirements necessary for the control and assessment of the quality of CEMS data submitted to the Environmental Protection Agency (EPA). Source owners and operators responsible for one or more CEMS's used for compliance monitoring must meet these minimum requirements and are encouraged to develop and implement a more extensive QA program or to continue such programs where they already exist.

Data collected as a result of QA and QC measures required in this procedure are to be submitted to the Agency. These data are to be used by both the Agency and the CEMS operator in assessing the effectiveness of the CEMS QC and QA procedures in the maintenance of acceptable CEMS operation and valid emission data.

Appendix F, Procedure 1 is applicable December 4, 1987. The first CEMS accuracy assessment shall be a relative accuracy test audit (RATA) (see section 5) and shall be completed by March 4, 1988 or the date of the initial performance test required by the applicable regulation, whichever is later.

1.2 Principle. The QA procedures consist of two distinct and equally important functions. One function is the assessment of the quality of the CEMS data by estimating accuracy. The other function is the control and improvement of the quality of the CEMS data by implementing QC policies and corrective actions. These two functions form a control loop: When the assessment function indicates that the data quality is inadequate, the control effort must be increased until the data quality is acceptable. In order to provide uniformity in the assessment and reporting of data quality, this procedure explicitly specifies the assessment methods for response drift and accuracy. The methods are based on procedures included in the applicable performance specifications (PS's) in Appendix B of 40 CFR Part 60. Procedure 1 also requires the analysis of the EPA audit samples concurrent with certain reference method (RM) analy-

ATTACHMENT 4

ANALYSIS OF MERCURY EMISSIONS
DURING BASELINE AND WWS TESTS

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

SEPTEMBER-NOVEMBER 1990

Material balances were carried out with respect to mercury to assist in the interpretation of the analytical and process data gathered during emission measurements conducted on September 18-19, 1990 and October 31-November 2, 1990. To carry out the material balances, the following data were considered:

- Rates of all raw materials, fuels and discharge streams; and
- Mercury concentrations in the raw materials, fuels and discharge streams.

As flow measurements and concentration measurements were not conducted for all streams of interest, several conservative assumptions were necessary to perform the calculations. The assumptions included:

1. All mercury in the coal was volatilized and discharged through the stack.
2. All mercury in the kiln feed material was volatilized and discharged through the stack. (This assumption implies that no mercury would be found in the outgoing clinker or in the baghouse dust.)

Mercury from Coal

Power plant coal feed rate = 1200 tpd = 50 tph (plant operating records)

Cement plant coal utilization rate = 8.5 tph (plant operating records)

The coal mercury concentrations were not measured during the test. Furthermore, the coal supplier was unable to locate any data. For this reason, an alternate source of data was required.

Florida Crushed Stone has purchased coal from the same source since the power, cement and lime plants began operation. According to information provided by the coal supplier, the coal is Pennsylvanian bituminous from Kentucky. According to information published in the open literature (Reference 1), the mercury concentrations of 34 bituminous coals from Kentucky ranged from 0.02 ppm to 1.3 ppm; the average mercury concentration of the coal samples being 0.20 ppm. The ash content, heating value, sulfur content, and elemental compositions of the ash of the coal utilized at Florida Crushed Stone was compared with the compositions of the coals listed in the U.S.G.S. Survey (Reference 1, Attachment 2). The maximum mercury concentration encountered for coals of similar composition was 0.20 ppm. For this reason, the mercury

concentration of the fuel used at Florida Crushed Stone was estimated to be 0.20 ppm. Using this estimate, the mercury incoming with the coal is given by:

Hg in coal = (58.5 tons coal/hour) x (2000 lb/ton)
x (0.20 x 10-6 parts Hg/part coal)
= 0.023 lb Hg/hour

Mercury from the Raw Materials Used in the Cement Plant

Baseline Test Conditions

Kiln Feed Rate = 132 tph

Mercury content of Kiln Feed = 0.4 ug/g or 0.4 ppm

Mercury incoming with kiln raw materials is:

(132 tons/hour) x (2000 lb/ton)
x (0.4 x 10-6 parts Hg/part feed)
= 0.106 Hg/hr

WWS Test Conditions

Kiln Feed Rate = 128 tph

Mercury content of kiln feed (including WWS) = 0.5 ug/g or 0.5 ppm

Mercury incoming with the kiln raw materials (which includes the wastewater sediment) is:

(128 tons/hour) x (2000 lb/ton)
x (0.5 x 10-6 parts Hg/part feed)
= 0.128 Hg/hr

It should be noted that of the 0.128 lb/hr of mercury incoming with the kiln feed, only 0.001 lb Hg/hr (1.75 tph x 2000 lb/hr x 0.4 x 10-06 parts Hg/part feed) was attributable to the wastewater sediment.

Mercury from Limestone used in Power Plant and Lime Plant

The lime plant limestone feed rate was calculated form the lime production rate of the lime plant. The prorating factor was assumed to be proportional to the molecular weights of calcium carbonate and calcium oxide, respectively (100 lb CaCO3/56 lb CaO).

Thus, the feed rate of the limestone is:

(11 tph) x (100/56) = 19.6 tph

The mercury content of the limestone is not known. However, the kiln feed is approximately 83 percent limestone. As a conservative estimate, it was assumed that the mercury concentration of the limestone is the same as the mercury concentration of the kiln feed.

Thus, the mercury incoming with the limestone is:

(19.6 tph) x (2000 lb/ton) x (0.4 x 10-6 parts Hg/part feed)
= 0.016 lb Hg/hr

Total Mercury Incoming with Feed Streams and Fuel

Baseline Test Conditions

The total incoming mass of mercury with the kiln feed and coal is:

0.106 lb/hr + 0.023 lb/hr + 0.016 = 0.145 Hg/hr

WWS Test Conditions

The total mercury incoming with the kiln feed and coal is:

= 0.128 lb/hr + 0.023 lb/hr + 0.016 = 0.167 Hg/hr

These calculations show that the mass rate of mercury to the process during the wastewater sediment test was only about 15 percent higher than the mass rate of mercury to the process during the baseline test. Furthermore, this slight increase in mercury in the system was not the result of the WWS but was the result of minor variations in the mercury content of the other raw materials and differences in raw material feed rates. The attached Table 5 from the WWS test report shows there is less mercury in the WWS (0.4 ppm) than in the kiln feed (0.5 ppm).

Material Balances

The ratio of the outgoing mass of mercury (assuming all will be found in the stack gas) to the incoming mass of mercury can be expressed as:

% Recovery = (Mercury in Stack) x 100 / (Mercury in Feed Streams)

Baseline Test Conditions

The measured mercury emission rate in the stack was 0.034 lb/hr.

% Recovery = (0.034 lb/hr) x 100 (0.145 lb/hr) = 23.4%

WWS Test Conditions

The measured mercury emission rate of the stack was 0.383 lb/hr

% Recovery = (0.383 lb/hr) x 100 / (0.167 lb/hr) = 229%

Conclusions

The apparent increase in the measured mercury emissions during the wastewater sediment test cannot be attributed to the use of the wastewater sediment. Furthermore, the magnitude of the increase cannot be explained by the changes in the total mercury fed to the cement plant through the raw materials. It is possible that the apparent increase in mercury emissions is the result of analytical difficulties.

The mercury emissions measured during the baseline tests appear reasonable as it is reasonable to assume that some of the mercury in the system will remain in the clinker and baghouse dust (See Attachment 2). Conversely, the emissions reported during the wastewater sediment tests are suspect as they represent more than twice the mercury input to the cement kiln system.

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SU-041

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Collection, chemical analysis, and evaluation of coal samples in 1975

By

Vernon E. Swanson, Jack H. Medlin, Joseph R. Hatch, S. Lynn Coleman,
Gordon H. Wood, Jr., Scott D. Woodruff, and Ricky T. Hildebrand

Open-file report 76-468
1976

This report is preliminary and has not been edited or reviewed for conformity with U.S. Geological Survey standards and nomenclature.

TABLE 5
SUMMARY OF METALS ANALYSES

CENTRAL POWER & LIME, INC.
CEMENT/POWER/LIME PLANTS
OCTOBER 31-NOVEMBER 2, 1990

Metal	WWT Sediment(1) (ug/g)(4)	Kiln Feed(2) (ug/g)	Baghouse Dust(3) (ug/g)
Aluminum	29,900	7,900	10,900
Arsenic	4.8	3.2	5.4
Barium	172	53	88
Cadmium	11	3.0	3.0
Chromium	188	29	36
Cobalt	82	2.2	3.6
Copper	395	26	28
Iron	59,100	11,400	7,770
Lead	103	51	80
Magnesium	37,800	2,270	2,850
Mercury	0.4	0.5	2.1
Molybdenum	100	9.1	12
Nickel	2,790	12	11
Selenium	1.0	0.7	1.5
Silver	<13	<13	<13
Titanium	70	65	153
Vanadium	4,280	40	62
Zinc	313	13	22

(1) Wastewater treatment sediment.
(2) Kiln feed including the WWT sediment.
(3) Baghouse dust during the time when WWT sediment was included in the kiln feed.
(4) ug/g = parts per million (wt. basis)

ATTACHMENT 5

§ 61.44 Stack sampling.

(a) Sources subject to §61.42(b) shall be continuously sampled, during release of combustion products from the tank, according to Method 104 of Appendix B to this part. Method 103 of Appendix B to this part is approved by the Administrator as an alternative method for sources subject to §61.42(b).

[61.44(a) revised by 50 FR 46290, November 7, 1985]

(b) All samples shall be analyzed, and beryllium emissions shall be determined within 30 days after samples are taken and before any subsequent rocket motor firing or propellant disposal at the given site. All determinations shall be reported to the Administrator by a registered letter dispatched before the close of the next business day following such determinations.

(c) Records of emission test results and other data needed to determine total emissions shall be retained at the source and made available, for inspection by the Administrator, for a minimum of 2 years.

(d) The Administrator shall be notified at least 30 days prior to an emission test, so that he may at his option observe the test.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

Subpart E—National Emission Standard for Mercury

§ 61.50 Applicability.

The provisions of this subpart are applicable to those stationary sources which process mercury ore to recover mercury, use mercury chlor-alkali cells to produce chlorine gas and alkali metal hydroxide, and incinerate or dry wastewater treatment plant sludge.

§ 61.51 Definitions.

Terms used in this subpart are defined in the act, in Subpart A of this part, or in this section as follows:

(a) "Mercury" means the element mercury, excluding any associated elements, and includes mercury in particulates, vapors, aerosols, and compounds.

(b) "Mercury ore" means a mineral mined specifically for its mercury content.

(c) "Mercury ore processing facility" means a facility processing mercury ore to obtain mercury.

(d) "Condenser stack gases" mean the gaseous effluent evolved from the stack of processes utilizing heat to extract mercury metal from mercury ore.

(e) "Mercury chlor-alkali cell" means a device which is basically composed of an electrolyzer section and a denuder (decomposer) section and utilizes mercury to produce chlorine gas, hydrogen gas, and alkali metal hydroxide.

(f) "Mercury chlor-alkali electrolyzer" means an electrolytic device which is part of a mercury chlor-alkali cell and utilizes a flowing mercury cathode to produce chlorine gas and alkali metal amalgam.

(g) "Denuder" means a horizontal or vertical container which is part of a mercury chlor-alkali cell and in which water and alkali metal amalgam are converted to alkali metal hydroxide, mercury, and hydrogen gas in a short-circuited, electrolytic reaction.

(h) "Hydrogen gas stream" means a hydrogen stream formed in the chlor-alkali cell denuder.

(i) "End box" means a container(s) located on one or both ends of a mercury chlor-alkali electrolyzer which serves as a connection between the electrolyzer and denuder for rich and stripped amalgam.

(j) "End box ventilation system" means a ventilation system which collects mercury emissions from the end-boxes, the mercury pump sumps, and their water collection systems.

(k) "Cell room" means a structure(s) housing one or more mercury electrolytic chlor-alkali cells.

(l) "Sludge" means sludge produced by a treatment plant that processes municipal or industrial waste waters.

(m) "Sludge dryer" means a device used to reduce the moisture content of sludge by heating to temperatures above 65°C (ca. 150°F) directly with combustion gases.

§ 61.52 Emission standard.

(a) Emissions to the atmosphere from mercury ore processing facilities and mercury cell chlor-alkali plants shall not exceed 2300 grams of mercury per 24-hour period.

(b) Emissions to the atmosphere from sludge incineration plants, sludge drying plants, or a combination of these that process wastewater treatment plant sludges shall not exceed 3200 grams of mercury per 24-hour period.

§ 61.53 Stack sampling.

(a) Mercury ore processing facility.

(1) Unless a waiver of emission testing

is obtained under §61.31, each owner or operator processing mercury ore shall test emissions from the source according to Method 101 of Appendix B to this part. The emission test shall be performed—

[61.53(a)(1) introductory text revised by 50 FR 46290, November 7, 1985]

(i) Within 90 days of the effective date in the case of an existing source or a new source which has an initial start-up date preceding the effective date; or

(ii) Within 90 days of startup in the case of a new source which did not have an initial startup date preceding the effective date.

(2) The Administrator shall be notified at least 30 days prior to an emission test, so that he may at his option observe the test.

(3) Samples shall be taken over such a period or periods as are necessary to accurately determine the maximum emissions which will occur in a 24-hour period. No changes in the operation shall be made, which would potentially increase emissions above that determined by the most recent source test, until the new emission level has been estimated by calculation and the results reported to the Administrator.

(4) All samples shall be analyzed and mercury emissions shall be determined within 30 days after the stack test. Each determination shall be reported to the Administrator by a registered letter dispatched within 15 calendar days following the date such determination is completed.

[61.53(a)(4) amended by 52 FR 8726, March 19, 1987]

(5) Records of emission test results and other data needed to determine total emissions shall be retained at the source and made available, for inspection by the Administrator, for a minimum of 2 years.

(b) Mercury chlor-alkali plant — hydrogen and end-box ventilation gas streams.

(1) Unless a waiver of emission testing is obtained under §61.13, each owner or operator employing mercury chlor-alkali cell(s) shall test emissions from hydrogen streams according to Method 102 and from end-box ventilation gas streams according to Method 101 of Appendix B to this part. The emission test shall be performed—

[61.53(b)(1) introductory text amended by 50 FR 46290, November 7, 1985]

(i) Within 90 days of the effective date in the case of an existing source or a new source which has an initial startup date preceding the effective date; or

(ii) Within 90 days of startup in the case of a new source which did not have an initial startup date preceding the effective date.

(2) The Administrator shall be notified at least 30 days prior to an emission test, so that he may at his option observe the test.

(3) Samples shall be taken over such a period or periods as are necessary to accurately determine the maximum emissions which will occur in a 24-hour period. No changes in the operation shall be made, which would potentially increase emissions above that determined by the most recent source test, until the new emission has been estimated by calculation and the results reported to the Administrator.

(4) All samples shall be analyzed and mercury emissions shall be determined within 30 days after the stack test. Each determination shall be reported to the Administrator by a registered letter dispatched within 15 calendar days following the date such determination is completed.

[61.53(b)(4) amended by 52 FR 8726, March 19, 1987]

(5) Records of emission test results and other data needed to determine total emissions shall be retained at the source and made available, for inspection by the Administrator, for a minimum of 2 years.

(c) Mercury chlor-alkali plants—cell room ventilation system.

(1) Stationary sources using mercury chlor-alkali cells may test cell room emissions in accordance with paragraph (c)(2) of this section or demonstrate compliance with paragraph (c)(4) of this section and assume ventilation emissions of 1,300 gms/day of mercury.

(2) Unless a waiver of emission testing is obtained under §61.13, each owner or operator shall pass all cell room air in force gas streams through stacks suitable for testing and shall test emissions from the source according to Method 101 in Appendix B to this part. The emission test shall be performed—

[61.53(c)(2) introductory text revised by 50 FR 46290, November 7, 1985]

(i) Within 90 days of the effective date in the case of an existing source or a new source which has an initial startup date preceding the effective date; or

(ii) Within 90 days of startup in the case of a new source which did not have an initial startup date preceding the effective date.

(3) The Administrator shall be notified at least 30 days prior to an emission test, so that he may at his option observe the test.

(4) An owner or operator may carry out approved design, maintenance, and housekeeping practices. A list of approved practices is provided in Appendix A of "Review of National Emission Standards for Mercury," EPA-450/3-84-014a, December 1984. Copies are available from EPA's Central Docket Section, Docket item number A-84-41, III-B-1.

[61.53(c)(4) amended by 52 FR 8726, March 19, 1987]

(d) Sludge incineration and drying plants.

(1) Unless a waiver of emission testing is obtained under § 61.13, each owner or operator of a source subject to the standard in § 61.52(b) shall test emissions from that source. Such tests shall be conducted in accordance with the procedures set forth either in paragraph (d) of this section or in § 61.54.

(2) Method 101A in Appendix B to this part shall be used to test emissions as follows:

(i) The test shall be performed within 90 days of the effective date of these regulations in the case of an existing source or a new source which has an initial startup date preceding the effective date.

(ii) The test shall be performed within 90 days of startup in the case of a new source which did not have an initial startup date preceding the effective date.

(3) The Administrator shall be notified at least 30 days prior to an emission test, so that he may at his option observe the test.

(4) Samples shall be taken over such a period or periods as are necessary to determine accurately the maximum

emissions which will occur in a 24-hour period. No changes shall be made in the operation which would potentially increase emissions above the level determined by the most recent stack test, until the new emission level has been estimated by calculation and the results reported to the Administrator.

(5) All samples shall be analyzed, and mercury emissions shall be determined within 30 days after the stack test. Each determination shall be reported to the Administrator by a registered letter dispatched within 15 calendar days following the date such determination is completed.

[61.53(d)(5) amended by 52 FR 8726, March 19, 1987]

(6) Records of emission test results and other data needed to determine total emissions shall be retained at the source and shall be made available, for inspection by the Administrator, for a minimum of 2 years.

§ 61.54 Sludge sampling.

(a) As an alternative means for demonstrating compliance with § 61.52(b), an owner or operator may use Method 105 of Appendix B and the procedures specified in this section.

(1) A sludge test shall be conducted within 90 days of the effective date of these regulations in the case of an existing source or a new source which has an initial startup date preceding the effective date; or

(2) A sludge test shall be conducted within 90 days of startup in the case of a new source which did not have an initial startup date preceding the effective date.

(b) The Administrator shall be notified at least 30 days prior to a sludge sampling test, so that he may at his option observe the test.

(c) Sludge shall be sampled according to paragraph (c)(1) of this section, sludge charging rate for the plant shall be determined according to paragraph (c)(2) of this section, and the sludge analysis shall be performed according to paragraph (c)(3) of this section.

(1) The sludge shall be sampled according to Method 105 — Determination of Mercury Wastewater Treatment Plant Sewage Sludges. A total of three composite samples shall be obtained within an operating period of 24 hours. When the 24 hour operating period is not continuous, the total sampling period shall not exceed 72 hours after the first grab sample is obtained. Samples shall not be exposed to any condition that may result in mercury contamination or loss.

[61.54(c)(1) revised by 49 FR 35769, September 12, 1984]

(2) The maximum 24-hour period sludge incineration or drying rate shall be determined by use of a flow rate measurement device that can measure the mass rate of sludge charged to the incinerator or dryer with an accuracy of ±5 percent over its operating range. Other methods of measuring sludge mass charging rates may be used if they have received prior approval by the Administrator.

(3) The sampling, handling, preparation, and analysis of sludge samples shall be accomplished according to Method 105 in Appendix B of this part.

[61.54(c)(3) amended by 49 FR 35769, September 12, 1984]

(d) The mercury emissions shall be determined by use of the following equation.

$$E_{Hg}=\frac{MQ\ F_{sm(avg)}}{1000}$$

where:

E_{Hg}=Mercury emissions, g/day.

M=Mercury concentration of sludge on a dry solids basis, μg/g.

Q=Sludge changing rate, kg/day.

F_{sm}=Weight fraction of solids in the collected sludge after mixing.

1000=Conversion factor, kg μg/g^2.

[61.54(d) corrected by 53 FR 36972, September 23, 1988]

(e) No changes in the operation of a plant shall be made after a sludge test has been conducted which would potentially increase emissions above the level determined by the most recent sludge test, until the new emission level has been estimated by calculation and the results reported to the Administrator.

(f) All sludge samples shall be analyzed for mercury content within 30 days after the sludge sample is collected. Each determination shall be reported to the Administrator by a registered letter dispatched within 15 calendar days following the date such determination is completed.

[61.54(f) amended by 52 FR 8726, March 19, 1987]

(g) Records of sludge sampling, charging rate determination and other data needed to determine mercury content of wastewater treatment plant sludges shall be retained at the source and made available, for inspection by the Administrator, for a minimum of 2 years.

§ 61.55 Monitoring of emissions and operations.

[61.55 revised by 52 FR 8726, March 19, 1987]

(a) Wastewater treatment plant sludge incineration and drying plants. All the sources for which mercury emissions exceed 1,600 g per 24-hour period, demonstrated either by stack sampling according to § 61.53 or sludge sampling according to § 61.54, shall monitor mercury emissions at intervals of at least once per year by use of Method 105 of Appendix B or the procedures specified in § 61.53 (d) (2) and (4). The results of monitoring shall be reported and retained according to § 61.53(d) (5) and (6) or § 61.54 (f) and (g).

(b) Mercury cell chlor-alkali plants—hydrogen and end-box ventilation gas streams.

(1) The owner or operator of each mercury cell chlor-alkali plant shall, within 1 year of the date of publication of these amendments or within 1 year of startup for a plant with initial startup after the date of publication, perform a mercury emission test that demonstrates compliance with the emission limits in § 61.52, on the hydrogen stream by Reference Method 102 and on the end-box stream by Reference Method 101 for the purpose of establishing limits for parameters to be monitored.

(2) During tests specified in paragraph (b)(1) of this section, the following control device parameters shall be monitored, except as provided in paragraph (c) of this section, and recorded manually or automatically at least once every 15 minutes:

(i) The exit gas temperature from uncontrolled streams;

(ii) The outlet temperature of the gas stream for the final (i.e., the farthest downstream) cooling system when no control devices other than coolers and demisters are used;

(iii) The outlet temperature of the gas stream from the final cooling system when the cooling system is followed by a molecular sieve or carbon adsorber;

(iv) Outlet concentration of available chlorine, pH, liquid flow rate, and inlet gas temperature of chlorinated brine scrubbers and hypochlorite scrubbers;

(v) The liquid flow rate and exit gas temperature for water scrubbers;

(vi) The inlet gas temperature of carbon adsorption systems; and

(vii) The temperature during the heating phase of the regeneration cycle for carbon adsorbers or molecular sieves.

(3) The recorded parameters in paragraphs (b)(2)(i) through (b)(2)(vi) of this section shall be averaged over the test period (a minimum of 6 hours) to provide an average number. The highest temperature reading that is measured in paragraph (b)(2)(vii) of this section is to be identified as the reference temperature for use in paragraph (b)(6)(ii) of this section.

(4)(i) Immediately following completion of the emission tests specified in paragraph (b)(1) of this section, the owner or operator of a mercury cell chlor-alkali plant shall monitor and record manually or automatically at least once per hour the same parameters specified in paragraphs (b)(2)(i) through (b)(2)(vi) of this section.

(ii) Immediately following completion of the emission tests specified in paragraph (b)(1) of this section, the owner or operator shall monitor and record manually or automatically, during each heating phase of the regeneration cycle, the temperature specified in paragraph (b)(2)(vii) of this section.

(5) Monitoring devices used in accordance with paragraphs (b)(2) and (b)(4) of this section shall be certified by their manufacturer to be accurate to within 10 percent, and shall be operated, maintained, and calibrated according to the manufacturer's instructions. Records of the certifications and calibrations shall be retained at the chlor-alkali plant and made available for inspection by the Administrator as follows: Certification, for as long as the device is used for this purpose; calibration for a minimum of 2 years.

(6)(i) When the hourly value of a parameter monitored in accordance with paragraph (b)(4)(i) of this section exceeds, or in the case of liquid flow rate and available chlorine falls below the value of that same parameter determined in paragraph (b)(2) of this section for 24 consecutive hours, the Administrator is to be notified within the next 10 days.

(ii) When the maximum hourly value of the temperature measured in accordance with paragraph (b)(4)(ii) of this section is below the reference temperature recorded according to paragraph (b)(3) of this section for three consecutive regeneration cycles, the Administrator is to be notified within the next 10 days.

(7) Semiannual reports shall be submitted to the Administrator indicating the time and date on which the hourly value of each parameter monitored according to paragraphs (b)(4)(i) and (b)(4)(ii) of this section fell outside the value of that same parameter determined under paragraph (b)(3) of this section; and corrective action taken, and the time and date of the corrective action. Parameter excursions will be considered unacceptable operation and maintenance of the emission control system. In addition, while compliance with the emission limits is determined primarily by conducting a performance test according to the procedures in § 61.53(b), reports of parameter excursions may be used as evidence in judging the duration of a violation that is determined by a performance test.

(8) Semiannual reports required in paragraph (b)(7) of this section shall be submitted to the Administrator on September 15 and March 15 of each year. The first semiannual report is to be submitted following the first full 6 month reporting period. The semiannual report due on September 15 (March 15) shall include all excursions monitored through August 31 (February 28) of the same calendar year.

(c) As an alternative to the monitoring, recordkeeping, and reporting requirements in paragraphs (b)(2) through (8) of this section, an owner or operator may develop and submit for the Administrator's review and approval a plant-specific monitoring plan. To be approved, such a plan must ensure not only compliance with the emission limits of § 61.52(a) but also proper operation and maintenance of emissions control systems. Any site-specific monitoring plan submitted must, at a minimum, include the following:

(1) Identification of the critical parameter or parameters for the hydrogen stream and for the end-box ventilation stream that are to be monitored and an explanation of why the critical parameter(s) selected is the best indicator of proper control system performance and of mercury emission rates.

(2) Identification of the maximum or minimum value of each parameter (e.g., degrees temperature, concentration of mercury) that is not to be exceeded. The level(s) is to be directly correlated to the results of a performance test, conducted no more than 180 days prior to submittal of the plan, when the facility was in compliance with the emission limits of § 61.52(a).

(3) Designation of the frequency for recording the parameter measurements, with justification if the frequency is less than hourly. A longer recording frequency must be justified on the basis of the amount of time that could elapse during periods of process or control system upsets before the emission limits would be exceeded, and consideration is to be given to the time that would be necessary to repair the failure.

(4) Designation of the immediate actions to be taken in the event of an excursion beyond the value of the parameter established in 2.

(5) Provisions for reporting, semiannually, parameter excursions and the corrective actions taken, and provisions for reporting within 10 days any significant excursion.

(6) Identification of the accuracy of the monitoring device(s) or of the readings obtained.

(7) Recordkeeping requirements for certifications and calibrations.

(d) Mercury cell chlor-alkali plants—cell room ventilation system.

(1) Stationary sources determining cell room emissions in accordance with § 61.53(c)(4) shall maintain daily records of all leaks or spills of mercury. The records shall indicate the amount, location, time, and date the leaks or spills occurred, identify the cause of the leak or spill, state the immediate steps taken to minimize mercury emissions and steps taken to prevent future occurrences, and provide

ATTACHMENT 6

IMPACT OF TRACE CONSTITUENTS ON AIR QUALITY

FLORIDA CRUSHED STONE COMPANY
HERNANDO COUNTY, FLORIDA

	Emission Rate(1) (lb/hr)		Impact of Emission and No Threat Levels(2) (micrograms per cubic meter)					
			8-hr		24-hr		Annual	
Constituent	Baseline	WWS	Impact	NTL	Impact	NTL	Impact	NTL
As	<0.004	-	<0.01	2	<0.001	0.48	<0.00001	0.00023
Ba	-	0.054	<0.01	5	0.001	1.2	0.00009	50
Cd	<0.005	<0.005	<0.01	0.5	<0.001	0.12	<0.00001	0.00056
Cr	-	0.024	<0.01	5	<0.001	1.2	0.00004	1000
Co	-	0.022	<0.01	0.5	<0.001	0.12	-	-
Cu	-	<0.010	<0.01	1.0	<0.001	0.24	-	-
Fe	-	1.597	0.07	50	0.026	12	-	-
Pb	0.130	-	0.01	1.5	0.002	0.36	0.00022	0.09
Hg	-	0.149(3)	0.01	1.0	0.002	0.24	-	-
Mo	0.018	-	<0.01	50	<0.001	12	-	-
Ni	<0.018	-	<0.01	0.5	<0.001	0.12	<0.00003	0.00420
Se	-	0.012	<0.01	2	<0.001	0.48	-	-
Ag	-	0.015	<0.01	0.1	<0.001	0.024	0.00003	3
Ti	-	0.645	0.03	100	0.011	24	-	-
V	-	0.022	<0.01	0.5	<0.001	0.12	0.00004	20
2,3,7,8 TCDD	0.114x10^{-6}	-	-	-	-	-	1.9x10^{-10}	2.2x10^{-8}
Acetone	0.025	-	<0.01	35600	<0.001	8544	-	-
Benzene	0.101	-	<0.01	30	0.002	7.2	0.00017	0.12
Toluene	0.014	-	<0.01	3750	<0.001	900	0.00002	300
TCE	<0.003	-	<0.01	3350	<0.001	804	-	-
Chlorobenzene	0.007	-	<0.01	460	<0.001	110	-	-
Ethylbenzene	0.003	-	<0.01	4350	<0.001	1044	-	-
Xylene	0.008	-	<0.01	4350	<0.001	1044	-	-
Chloromethane	0.010	-	<0.01	-	<0.001	-	-	-
Bromomethane	<0.003	-	<0.01	200	<0.001	48	<0.00001	0.006
Carbon disulfide	<0.003	-	<0.01	120	<0.001	29	<0.00001	0.01
Styrene	0.002	-	<0.01	2150	<0.001	516	-	-

(1) Listed emission rate is the highest rate measured during Baseline and WWS tests with cement, power and lime plants operating.

(2) No Threat Levels - Policy based ambient guidelines established by FDER.

(3) Emission rate measured during baseline plus maximum amount of mercury that could be controlled by the wastewater sediment (see page 2c of 12).

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              *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986          ***

 CALCULATE (CONCENTRATION=1,DEPOSITION=2)                              ISW(1) =   1
 RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)               ISW(2) =   4
 DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)                      ISW(3) =   1
 TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)                              ISW(4) =   0
 CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)                         ISW(5) =   0
 LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)                      ISW(6) =   1

 COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)
 WITH THE FOLLOWING TIME PERIODS:
   HOURLY (YES=1,NO=0)                                                 ISW(7) =   0
   2-HOUR (YES=1,NO=0)                                                 ISW(8) =   0
   3-HOUR (YES=1,NO=0)                                                 ISW(9) =   0
   4-HOUR (YES=1,NO=0)                                                ISW(10) =   0
   6-HOUR (YES=1,NO=0)                                                ISW(11) =   0
   8-HOUR (YES=1,NO=0)                                                ISW(12) =   1
   12-HOUR (YES=1,NO=0)                                               ISW(13) =   0
   24-HOUR (YES=1,NO=0)                                               ISW(14) =   1
 PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)                                  ISW(15) =   1

 PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE
 SPECIFIED BY ISW(7) THROUGH ISW(14):
   DAILY TABLES (YES=1,NO=0)                                          ISW(16) =   0
   HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)                       ISW(17) =   1
   MAXIMUM 50 TABLES (YES=1,NO=0)                                     ISW(18) =   1
 METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)            ISW(19) =   1
 RURAL-URBAN OPTION (RU.=0,UR. MODE 1=1,UR. MODE 2=2,UR. MODE 3=3)    ISW(20) =   0
 WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)            ISW(21) =   1
 VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)     ISW(22) =   1
 SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)                    ISW(23) =   0
 PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)                ISW(24) =   1
 PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)          ISW(25) =   2
 PROGRAM USES BUOYANCY INDUCED DISPERSION (YES=1,NO=2)                ISW(26) =   1
 CONCENTRATIONS DURING CALM PERIODS SET = 0 (YES=1,NO=2)              ISW(27) =   1
 REG. DEFAULT OPTION CHOSEN (YES=1,NO=2)                              ISW(28) =   1
 TYPE OF POLLUTANT TO BE MODELLED (1=SO2,2=OTHER)                     ISW(29) =   2
 DEBUG OPTION CHOSEN (YES=1,NO=2)                                     ISW(30) =   2
 ABOVE GROUND (FLAGPOLE) RECEPTORS USED (YES=1,NO=0)                  ISW(31) =   0

 NUMBER OF INPUT SOURCES                                               NSOURC =   2
 NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)                              NGROUP =   2
 TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)                  IPERD =   0
 NUMBER OF X (RANGE) GRID VALUES                                       NXPNTS =   4
 NUMBER OF Y (THETA) GRID VALUES                                       NYPNTS =  36
 NUMBER OF DISCRETE RECEPTORS                                          NXWYPT =   0
 SOURCE EMISSION RATE UNITS CONVERSION FACTOR                              TK =.10000E+07
 HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED                      ZR =  10.00  METERS
 LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA                              IMET =   9
 DECAY COEFFICIENT FOR PHYSICAL OR CHEMICAL DEPLETION                   DECAY =0.000000E+00
 SURFACE STATION NO.                                                      ISS = 12842
 YEAR OF SURFACE DATA                                                     ISY = 86
 UPPER AIR STATION NO.                                                    IUS = 12842
 YEAR OF UPPER AIR DATA                                                   IUY = 86
 ALLOCATED DATA STORAGE                                                 LIMIT = 43500 WORDS
 REQUIRED DATA STORAGE FOR THIS PROBLEM RUN                             MIMIT =  4874 WORDS
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                        *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986          ***


                                 *** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***
                                           (DEGREES KELVIN PER METER)


        STABILITY                                 WIND SPEED CATEGORY
        CATEGORY          1              2              3              4              5              6
           A         .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00
           B         .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00
           C         .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00
           D         .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00
           E         .20000E-01     .20000E-01     .20000E-01     .20000E-01     .20000E-01     .20000E-01
           F         .35000E-01     .35000E-01     .35000E-01     .35000E-01     .35000E-01     .35000E-01

                                      *** RANGES OF POLAR GRID SYSTEM ***
                                                  (METERS)

   2000.0,    3000.0,    4000.0,    5000.0,

                                   *** RADIAL ANGLES OF POLAR GRID SYSTEM ***

                                                 (DEGREES)

     10.0,      20.0,      30.0,      40.0,      50.0,      60.0,      70.0,      80.0,      90.0,     100.0,
    110.0,     120.0,     130.0,     140.0,     150.0,     160.0,     170.0,     180.0,     190.0,     200.0,
    210.0,     220.0,     230.0,     240.0,     250.0,     260.0,     270.0,     280.0,     290.0,     300.0,
    310.0,     320.0,     330.0,     340.0,     350.0,     360.0,
```

```
                    *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986         ***

                              *** METEOROLOGICAL DAYS TO BE PROCESSED ***
                                               (IF=1)

1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 0

                   *** NUMBER OF SOURCE NUMBERS REQUIRED TO DEFINE SOURCE GROUPS ***
                                             (NSOGRP)

   1,   1,

                            *** SOURCE NUMBERS DEFINING SOURCE GROUPS ***
                                             (IDSOR)

    1,     2,

                   *** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
                                           (METERS/SEC)

                              1.54,    3.09,    5.14,    8.23,   10.80,


                                     *** WIND PROFILE EXPONENTS ***


  STABILITY                               WIND SPEED CATEGORY
  CATEGORY         1              2             3             4             5             6
     A        .70000E-01     .70000E-01    .70000E-01    .70000E-01    .70000E-01    .70000E-01
     B        .70000E-01     .70000E-01    .70000E-01    .70000E-01    .70000E-01    .70000E-01
     C        .10000E+00     .10000E+00    .10000E+00    .10000E+00    .10000E+00    .10000E+00
     D        .15000E+00     .15000E+00    .15000E+00    .15000E+00    .15000E+00    .15000E+00
     E        .35000E+00     .35000E+00    .35000E+00    .35000E+00    .35000E+00    .35000E+00
     F        .55000E+00     .55000E+00    .55000E+00    .55000E+00    .55000E+00    .55000E+00
```

```
                    *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986          ***

                                            *** SOURCE DATA ***

                    EMISSION RATE                                                TEMP.    EXIT VEL.
                      TYPE=0,1                                                   TYPE=0    TYPE=0
           T W      (GRAMS/SEC)                                                 (DEG.K);  (M/SEC);             BLDG.    BLDG.    BLDG.
           Y A NUMBER   TYPE=2                           BASE                   VERT.DIM  HORZ.DIM DIAMETER  HEIGHT   LENGTH   WIDTH
   SOURCE P K  PART.  (GRAMS/SEC)      X         Y       ELEV.     HEIGHT    TYPE=1    TYPE=1,2  TYPE=0    TYPE=0   TYPE=0   TYPE=0
   NUMBER E E  CATS. *PER METER**2 (METERS) (METERS) (METERS) (METERS) (METERS)  (METERS) (METERS) (METERS) (METERS) (METERS)
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

L Plants→1  0 0    0   0.10000E+02       0.0       0.0       0.0     97.60    465.00     19.37     5.69     0.00     0.00     0.00
ent Plant→2 0 0    0   0.10000E+02       0.0       0.0       0.0     97.60    384.00      9.23     5.69     0.00     0.00     0.00
     * CALM HOURS (=1) FOR DAY   1 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  1  1  1  0  0
     * CALM HOURS (=1) FOR DAY   2 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
     * CALM HOURS (=1) FOR DAY   3 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY   5 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  12 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
     * CALM HOURS (=1) FOR DAY  13 *  0  0  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  14 *  0  0  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0
     * CALM HOURS (=1) FOR DAY  15 *  0  0  0  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  20 *  0  0  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
     * CALM HOURS (=1) FOR DAY  21 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  1
     * CALM HOURS (=1) FOR DAY  22 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
     * CALM HOURS (=1) FOR DAY  24 *  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  25 *  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  1  1  1
     * CALM HOURS (=1) FOR DAY  26 *  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  28 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1
     * CALM HOURS (=1) FOR DAY  29 *  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0
     * CALM HOURS (=1) FOR DAY  30 *  0  0  1  0  0  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  31 *  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
     * CALM HOURS (=1) FOR DAY  33 *  1  0  0  1  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  38 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  1  1  0
     * CALM HOURS (=1) FOR DAY  39 *  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1  1
     * CALM HOURS (=1) FOR DAY  40 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
     * CALM HOURS (=1) FOR DAY  44 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
     * CALM HOURS (=1) FOR DAY  48 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0
     * CALM HOURS (=1) FOR DAY  49 *  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  52 *  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  53 *  0  0  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  54 *  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  56 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
     * CALM HOURS (=1) FOR DAY  57 *  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  59 *  0  0  0  0  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  60 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  61 *  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  62 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  64 *  0  0  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
     * CALM HOURS (=1) FOR DAY  65 *  0  0  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  67 *  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  70 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
     * CALM HOURS (=1) FOR DAY  73 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
     * CALM HOURS (=1) FOR DAY  74 *  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  76 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0
     * CALM HOURS (=1) FOR DAY  83 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  86 *  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
     * CALM HOURS (=1) FOR DAY  87 *  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     * CALM HOURS (=1) FOR DAY  90 *  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
```

Model at 10.0g/
emission rate.

Corrected Impact
= Modeled Impact
x Actual Emission R
10.0 g/sec

```
* CALM HOURS (=1) FOR DAY  93 *  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  94 *  0  0  0  0  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  96 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  97 *  1  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY  98 *  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 101 *  0  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 102 *  0  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 103 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 104 *  0  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 105 *  0  0  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 108 *  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 113 *  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 114 *  0  0  0  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 115 *  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 116 *  1  1  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 117 *  0  0  0  1  1  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 118 *  1  1  1  0  1  1  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 119 *  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
* CALM HOURS (=1) FOR DAY 120 *  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 121 *  0  0  1  1  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
* CALM HOURS (=1) FOR DAY 123 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 127 *  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 128 *  1  1  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 129 *  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 131 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 132 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  1
* CALM HOURS (=1) FOR DAY 135 *  0  0  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 137 *  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 140 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 141 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 142 *  1  1  1  1  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 143 *  0  1  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 144 *  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  1  0
* CALM HOURS (=1) FOR DAY 145 *  0  0  0  1  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 150 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 153 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 154 *  1  1  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 155 *  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 157 *  0  0  1  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 158 *  0  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 159 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 160 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1
* CALM HOURS (=1) FOR DAY 161 *  1  0  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 162 *  1  0  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 163 *  0  0  0  0  0  0  1  0  0  0  0  0  0  0  1  0  0  0  0  0  1  1  1  0
* CALM HOURS (=1) FOR DAY 164 *  0  0  0  0  1  1  1  0  0  0  0  1  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 165 *  0  0  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 166 *  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 168 *  0  0  0  0  0  1  1  0  0  0  1  0  0  1  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 170 *  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 171 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  1
* CALM HOURS (=1) FOR DAY 172 *  0  0  1  1  1  1  1  1  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 173 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0
* CALM HOURS (=1) FOR DAY 174 *  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 175 *  0  0  0  1  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  1  0  1  0  0
* CALM HOURS (=1) FOR DAY 176 *  1  0  0  0  0  0  0  0  0  0  0  1  1  0  0  0  1  1  1  1  1  1  0  0
* CALM HOURS (=1) FOR DAY 177 *  0  1  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  1  0  1  1  1  0
* CALM HOURS (=1) FOR DAY 178 *  1  1  1  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 179 *  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 180 *  0  1  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 181 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 188 *  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
* CALM HOURS (=1) FOR DAY 189 *  0  1  0  1  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 190 *  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
```

```
* CALM HOURS (=1) FOR DAY 194 *  1  1  0  0  1  1  1  0  0  0  0  0  0  0  0  0  0  0  1  0  1  1  0  0
* CALM HOURS (=1) FOR DAY 195 *  1  1  0  1  1  1  1  1  1  0  0  0  1  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 196 *  1  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 197 *  1  1  1  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 198 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 199 *  1  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0
* CALM HOURS (=1) FOR DAY 200 *  0  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 203 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  1  1  0
* CALM HOURS (=1) FOR DAY 204 *  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  1  1  0  1  1  1  1  0  0
* CALM HOURS (=1) FOR DAY 205 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1
* CALM HOURS (=1) FOR DAY 206 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  0  1  1
* CALM HOURS (=1) FOR DAY 207 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 208 *  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  1  1  0  0  1  0  0  0
* CALM HOURS (=1) FOR DAY 209 *  0  0  1  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 210 *  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 211 *  0  0  0  0  0  0  0  0  1  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 213 *  0  0  0  0  1  1  1  1  1  0  0  0  0  0  0  0  0  0  1  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 214 *  1  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 215 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 217 *  0  0  0  0  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 219 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 220 *  1  1  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 221 *  1  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
* CALM HOURS (=1) FOR DAY 225 *  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 226 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 227 *  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  1
* CALM HOURS (=1) FOR DAY 228 *  1  0  0  0  1  1  0  0  1  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0
* CALM HOURS (=1) FOR DAY 229 *  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 230 *  1  0  1  1  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0
* CALM HOURS (=1) FOR DAY 231 *  1  0  0  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 233 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 234 *  0  0  1  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  1  1  0  1  1  1
* CALM HOURS (=1) FOR DAY 235 *  1  1  1  1  1  1  0  1  1  0  0  0  0  0  0  0  0  0  0  1  1  0  0  1
* CALM HOURS (=1) FOR DAY 236 *  1  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0
* CALM HOURS (=1) FOR DAY 237 *  1  1  1  1  1  1  1  1  1  0  0  0  0  0  0  1  0  0  0  1  1  0  0  0
* CALM HOURS (=1) FOR DAY 238 *  0  1  1  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 239 *  0  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  0  0
* CALM HOURS (=1) FOR DAY 240 *  0  1  1  0  1  0  1  0  0  0  0  0  0  0  0  0  0  1  0  0  1  1  1  1
* CALM HOURS (=1) FOR DAY 241 *  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 243 *  0  1  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 244 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  1  0  0  1  0  1  1  1
* CALM HOURS (=1) FOR DAY 245 *  0  1  1  1  1  0  0  0  0  0  0  0  0  1  0  1  1  1  1  1  1  1  1  0
* CALM HOURS (=1) FOR DAY 246 *  1  1  1  1  1  1  1  0  0  1  0  0  0  0  0  0  0  1  1  0  1  1  1  1
* CALM HOURS (=1) FOR DAY 247 *  1  0  0  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 248 *  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 249 *  0  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1  1
* CALM HOURS (=1) FOR DAY 250 *  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0  0
* CALM HOURS (=1) FOR DAY 251 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 252 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0
* CALM HOURS (=1) FOR DAY 254 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 255 *  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1
* CALM HOURS (=1) FOR DAY 256 *  1  0  0  0  0  0  1  0  1  1  0  0  0  0  0  0  0  0  1  0  0  1  0  1
* CALM HOURS (=1) FOR DAY 257 *  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 264 *  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 265 *  1  0  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 266 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 267 *  0  0  0  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 270 *  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 271 *  0  0  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 274 *  1  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 275 *  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 276 *  0  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 277 *  1  1  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  1  0  1  1  1
* CALM HOURS (=1) FOR DAY 278 *  0  0  1  0  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  1  1  1  1
```

```
* CALM HOURS (=1) FOR DAY 282 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1
* CALM HOURS (=1) FOR DAY 283 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  1  1
* CALM HOURS (=1) FOR DAY 284 *  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 285 *  1  0  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  1  0  1  0  0
* CALM HOURS (=1) FOR DAY 286 *  0  1  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 287 *  0  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1
* CALM HOURS (=1) FOR DAY 288 *  1  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1  0  0
* CALM HOURS (=1) FOR DAY 293 *  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1  0  0
* CALM HOURS (=1) FOR DAY 297 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0  0
* CALM HOURS (=1) FOR DAY 300 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1  1
* CALM HOURS (=1) FOR DAY 301 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 309 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1
* CALM HOURS (=1) FOR DAY 316 *  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 320 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1  1  1  0
* CALM HOURS (=1) FOR DAY 323 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0  0
* CALM HOURS (=1) FOR DAY 324 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 329 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0
* CALM HOURS (=1) FOR DAY 333 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 335 *  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  1  1  1  0  1  0  1  0
* CALM HOURS (=1) FOR DAY 343 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  1  0
* CALM HOURS (=1) FOR DAY 349 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 350 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 351 *  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  1  1  0
* CALM HOURS (=1) FOR DAY 353 *  0  0  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 354 *  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 358 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 359 *  1  0  1  0  0  0  1  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 364 *  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  1  0  1  1  0  0  0  0
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                                                                                                    'N'-DAY
                                                                                                    365 DAYS
                                                                                                    SGROUP#  1
                              *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986          ***


                                * 365-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *

                                            * FROM SOURCES:        1,  - CPL Plants
                                              * FOR THE RECEPTOR GRID *

                           * MAXIMUM VALUE EQUALS     0.04598 AND OCCURRED AT (    4000.0,      90.0) *

  DIRECTION /                                                RANGE (METERS)
  (DEGREES) /      2000.0        3000.0        4000.0        5000.0
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     360.0 /      0.01119       0.01378       0.01391       0.01308
     350.0 /      0.01041       0.01260       0.01235       0.01128
     340.0 /      0.00966       0.01218       0.01193       0.01084
     330.0 /      0.00934       0.01307       0.01348       0.01269
     320.0 /      0.01084       0.01617       0.01723       0.01657
     310.0 /      0.01533       0.02369       0.02554       0.02450
     300.0 /      0.01732       0.02543       0.02697       0.02573
     290.0 /      0.01639       0.02250       0.02318       0.02177
     280.0 /      0.01629       0.02264       0.02374       0.02254
     270.0 /      0.01762       0.02513       0.02660       0.02544
     260.0 /      0.01715       0.02378       0.02475       0.02344
     250.0 /      0.01682       0.02385       0.02540       0.02443
     240.0 /      0.01617       0.02281       0.02473       0.02438
     230.0 /      0.01483       0.01989       0.02122       0.02088
     220.0 /      0.01274       0.01605       0.01644       0.01571
     210.0 /      0.00949       0.01165       0.01180       0.01116
     200.0 /      0.00643       0.00792       0.00823       0.00798
     190.0 /      0.00524       0.00688       0.00732       0.00718
     180.0 /      0.00519       0.00780       0.00876       0.00875
     170.0 /      0.00487       0.00768       0.00888       0.00904
     160.0 /      0.00425       0.00594       0.00638       0.00624
     150.0 /      0.00559       0.00834       0.00909       0.00887
     140.0 /      0.00669       0.01016       0.01103       0.01075
     130.0 /      0.00661       0.00996       0.01093       0.01077
     120.0 /      0.00804       0.01217       0.01346       0.01324
     110.0 /      0.01396       0.02071       0.02248       0.02173
     100.0 /      0.02358       0.03296       0.03386       0.03144
      90.0 /      0.03221       0.04497       0.04598       0.04242
      80.0 /      0.03451       0.04494       0.04355       0.03884
      70.0 /      0.03425       0.04306       0.04096       0.03624
      60.0 /      0.02922       0.03584       0.03392       0.03008
      50.0 /      0.02141       0.02601       0.02497       0.02239
      40.0 /      0.01531       0.01923       0.01937       0.01796
      30.0 /      0.01312       0.01709       0.01762       0.01665
      20.0 /      0.01270       0.01628       0.01634       0.01510
      10.0 /      0.01196       0.01494       0.01500       0.01395
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                                                                                                   HIGH
                                                                                                    8-HR
                                                                                                   SGROUP#  1
                             *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986         ***


                            * HIGHEST  8-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                         * FROM SOURCES:        1,  CPL Plants
                                           * FOR THE RECEPTOR GRID *

                         * MAXIMUM VALUE EQUALS     1.29610 AND OCCURRED AT (    2000.0,      90.0) *

DIRECTION /                                                  RANGE (METERS)
(DEGREES) /          2000.0              3000.0              4000.0              5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

    360.0 /     0.53457 (218, 2)    0.50023 (181, 2)    0.43211 (139, 2)    0.38560 (234, 2)
    350.0 /     0.82377 (126, 2)    0.84168 (126, 2)    0.64005 (126, 2)    0.46983 (126, 2)
    340.0 /     0.70738C(217, 2)    0.55447 (126, 2)    0.53797 (194, 2)    0.50176 (194, 2)
    330.0 /     0.66663 (148, 2)    0.73953 (148, 2)    0.58432 (148, 2)    0.54568 (329, 2)
    320.0 /     0.33721 (132, 2)    0.45894 (242, 2)    0.52460 (242, 2)    0.51866 (242, 2)
    310.0 /     0.64371C(189, 2)    0.72505C(189, 2)    0.75602 (328, 2)    0.79141 (328, 2)
    300.0 /     0.95170C(189, 2)    1.09545C(189, 2)    1.12849C(189, 2)    1.04288C(189, 2)
    290.0 /     0.74671C(189, 2)    0.88765 (315, 2)    0.85215 (315, 2)    0.72801 (315, 2)
    280.0 /     0.57572 (188, 2)    0.90561 (315, 2)    0.96621 (315, 2)    0.92184 (315, 2)
    270.0 /     0.84927C(176, 2)    1.06670 (188, 2)    0.99310 (188, 2)    0.82250 (188, 2)
    260.0 /     0.70300 (188, 2)    1.00673 (188, 2)    0.94554 (258, 2)    0.87804 (258, 2)
    250.0 /     0.63235 (260, 2)    0.97694 (260, 2)    0.98083 (260, 2)    0.87634 (260, 2)
    240.0 /     0.75858C(235, 2)    0.68632C(235, 2)    0.83308 (292, 2)    0.84761 (292, 2)
    230.0 /     1.01474C(235, 2)    0.76690C(235, 2)    0.72062 ( 88, 2)    0.69336 ( 88, 2)
    220.0 /     0.82302C(235, 2)    0.61310 ( 88, 2)    0.63902 ( 88, 2)    0.57164 ( 88, 2)
    210.0 /     0.72662 (149, 2)    0.65642 (113, 2)    0.53041 ( 12, 2)    0.56902 ( 12, 2)
    200.0 /     0.51252 (116, 2)    0.52739 (325, 2)    0.56832 (325, 2)    0.52649 (325, 2)
    190.0 /     0.53624 (108, 2)    0.45444 ( 87, 2)    0.41250 (326, 2)    0.40559 ( 11, 2)
    180.0 /     0.43991 (108, 2)    0.54843 ( 44, 2)    0.57610 ( 44, 2)    0.53816 ( 44, 2)
    170.0 /     0.36846 ( 44, 2)    0.63823 ( 44, 2)    0.68625 ( 44, 2)    0.64962 ( 44, 2)
    160.0 /     0.42169 (177, 2)    0.42240 (177, 2)    0.38600 (177, 2)    0.35906 ( 46, 2)
    150.0 /     0.50246 (162, 2)    0.49279 (119, 2)    0.50106 (119, 2)    0.45298 (119, 2)
    140.0 /     0.49960C(195, 2)    0.60173 (142, 2)    0.56741 (142, 2)    0.48769 (142, 2)
    130.0 /     0.52785 (112, 2)    0.71127 (112, 2)    0.68134 (112, 2)    0.59319 (112, 2)
    120.0 /     0.35356 (112, 2)    0.58332 (112, 2)    0.61934 (112, 2)    0.56551 (112, 2)
    110.0 /     0.60077 (205, 2)    0.76371 (106, 2)    0.79612 (106, 2)    0.73235 (106, 2)
    100.0 /     1.07424C(213, 2)    0.90464 (201, 2)    0.78015 (201, 2)    0.80031 (229, 2)
     90.0 /     1.29610C(213, 2)    1.20405C(278, 2)    1.15775C(278, 2)    0.99525C(278, 2)
     80.0 /     0.85567 (219, 2)    1.04894C(278, 2)    0.96022C(278, 2)    0.78997C(278, 2)
     70.0 /     1.05525C(197, 2)    0.92369 (196, 2)    0.87632 (115, 2)    0.76499 (115, 2)
     60.0 /     1.03395C(197, 2)    0.81085C(197, 2)    0.72307 ( 97, 2)    0.61200 ( 97, 2)
     50.0 /     0.86789 (250, 2)    0.79871 (250, 2)    0.74080 (250, 2)    0.67541 (  4, 2)
     40.0 /     0.65417C(244, 2)    0.51349 (250, 2)    0.54634C(170, 2)    0.62138C(170, 2)
     30.0 /     0.59971 (202, 2)    0.69058 (214, 2)    0.66073 (214, 2)    0.63081 ( 41, 2)
     20.0 /     0.66229 (214, 2)    0.97945 (214, 2)    0.92469 (214, 2)    0.77845 (214, 2)
     10.0 /     0.58119 (181, 2)    0.71190 (181, 2)    0.61159 (181, 2)    0.50046 (181, 2)
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                                                                                              2ND HIGH
                                                                                               8-HR
                                                                                              SGROUP#  1
                       *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986          ***

                   * SECOND HIGHEST  8-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                         * FROM SOURCES:        1,
                                           * FOR THE RECEPTOR GRID *

                   * MAXIMUM VALUE EQUALS      1.10880 AND OCCURRED AT (    3000.0,      90.0) *

 DIRECTION /                                                 RANGE (METERS)
 (DEGREES) /           2000.0              3000.0              4000.0              5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     360.0 /      0.48680 (126, 2)    0.48202 (254, 2)    0.41332 (181, 2)    0.38166 (139, 2)
     350.0 /      0.56484 (143, 2)    0.59138 (254, 2)    0.47659 (194, 2)    0.41924 (194, 2)
     340.0 /      0.52848 (126, 2)    0.52489C(217, 2)    0.48397 (281, 2)    0.49706 (281, 2)
     330.0 /      0.48109C(217, 2)    0.49174 (132, 2)    0.50924 (329, 2)    0.43902 (148, 2)
     320.0 /      0.32020 (222, 2)    0.44377 (218, 2)    0.48784 (218, 2)    0.47275 (329, 2)
     310.0 /      0.47245 (136, 2)    0.63614 (272, 2)    0.73655C(189, 2)    0.66857C(189, 2)
     300.0 /      0.66540 (220, 2)    0.79340 (220, 2)    0.74093 (220, 2)    0.68979 (238, 2)
     290.0 /      0.68061 (238, 2)    0.74180 (125, 2)    0.68522 (220, 2)    0.61032 (147, 2)
     280.0 /      0.55979 (315, 2)    0.80571 (188, 2)    0.71524 (188, 2)    0.67188 (313, 2)
     270.0 /      0.70453 (188, 2)    0.83380C(176, 2)    0.82598C(176, 2)    0.76156C(176, 2)
     260.0 /      0.69515 (260, 2)    0.98351 (260, 2)    0.91221 (188, 2)    0.76895 (260, 2)
     250.0 /      0.55026 (258, 2)    0.86080 (258, 2)    0.89354 (258, 2)    0.82053 (258, 2)
     240.0 /      0.69364 (174, 2)    0.66420 ( 89, 2)    0.70208 ( 89, 2)    0.71089 ( 90, 2)
     230.0 /      0.84285 (174, 2)    0.64260 (174, 2)    0.61081C(235, 2)    0.54584 (264, 2)
     220.0 /      0.60247 (174, 2)    0.57789C(235, 2)    0.56686 (293, 2)    0.54584 (293, 2)
     210.0 /      0.58942 (113, 2)    0.63240 (149, 2)    0.52516 (113, 2)    0.50965 (294, 2)
     200.0 /      0.45097 (108, 2)    0.49804 (108, 2)    0.51003 (108, 2)    0.48202 (108, 2)
     190.0 /      0.40429C(144, 2)    0.42605 (108, 2)    0.40823 ( 81, 2)    0.38369 (326, 2)
     180.0 /      0.42700C(144, 2)    0.40820 ( 43, 2)    0.47674 ( 43, 2)    0.46228 ( 43, 2)
     170.0 /      0.33841 (177, 2)    0.43436 ( 43, 2)    0.48103 ( 43, 2)    0.43894 ( 43, 2)
     160.0 /      0.29695C(203, 2)    0.30398 ( 43, 2)    0.36389 ( 43, 2)    0.35858 ( 43, 2)
     150.0 /      0.37941C(195, 2)    0.45071 (162, 2)    0.43238 (162, 2)    0.40492 (162, 2)
     140.0 /      0.45209 (162, 2)    0.49850C(213, 2)    0.48260C(213, 2)    0.41473C(213, 2)
     130.0 /      0.42847 (107, 2)    0.52091 (142, 2)    0.53011 (142, 2)    0.53857 (103, 2)
     120.0 /      0.32873 (122, 2)    0.45111 (122, 2)    0.41372C(256, 2)    0.40172C(256, 2)
     110.0 /      0.51964 (129, 2)    0.68593 (122, 2)    0.63771 (129, 2)    0.61219 (326, 2)
     100.0 /      0.78776 (201, 2)    0.81163C(213, 2)    0.76351 (229, 2)    0.68397 (158, 2)
      90.0 /      0.89684 (230, 2)    1.10880 (230, 2)    1.01965 (230, 2)    0.88329 (230, 2)
      80.0 /      0.82774C(213, 2)    0.94998 (151, 2)    0.80151 (151, 2)    0.69494 (192, 2)
      70.0 /      0.95676 (196, 2)    0.91377 (115, 2)    0.76194C(195, 2)    0.66618 (277, 2)
      60.0 /      0.68171C(195, 2)    0.78150 ( 97, 2)    0.67562 (171, 2)    0.60631 (171, 2)
      50.0 /      0.59356C(197, 2)    0.60338 (110, 2)    0.58625 (  4, 2)    0.65924 (250, 2)
      40.0 /      0.64707 (250, 2)    0.47751C(244, 2)    0.45761 ( 41, 2)    0.48444 ( 41, 2)
      30.0 /      0.57245C(244, 2)    0.68386 (240, 2)    0.64519 (240, 2)    0.56360 (214, 2)
      20.0 /      0.52340 (202, 2)    0.70477 (240, 2)    0.66733 (240, 2)    0.58013 (240, 2)
      10.0 /      0.43462 (218, 2)    0.53645 (214, 2)    0.49490 ( 70, 2)    0.44294 ( 70, 2)
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                                                                                                   MAX 50
                                                                                                    8-HR
                                                                                                   SGROUP#  1
                 *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986          ***

               * 50 MAXIMUM  8-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)      *

                                       * FROM SOURCES:        1,

                                 X      Y(METERS)                                           X      Y(METERS)
                                OR         OR                                              OR         OR
                               RANGE   DIRECTION                                         RANGE   DIRECTION
  RANK       CON.      PER. DAY (METERS) (DEGREES)         RANK       CON.      PER. DAY (METERS) (DEGREES)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

    1       1.29610C   2  213    2000.0       90.0           26       0.95170C   2  189    2000.0      300.0
    2       1.20405C   2  278    3000.0       90.0           27       0.94998    2  151    3000.0       80.0
    3       1.15775C   2  278    4000.0       90.0           28       0.94554    2  258    4000.0      260.0
    4       1.12849C   2  189    4000.0      300.0           29       0.93402    2  201    3000.0       90.0
    5       1.10880    2  230    3000.0       90.0           30       0.92469    2  214    4000.0       20.0
    6       1.09545C   2  189    3000.0      300.0           31       0.92369    2  196    3000.0       70.0
    7       1.08050C   2  213    3000.0       90.0           32       0.92184    2  315    5000.0      280.0
    8       1.07424C   2  213    2000.0      100.0           33       0.91545    2  258    3000.0      260.0
    9       1.06670    2  188    3000.0      270.0           34       0.91377    2  115    3000.0       70.0
   10       1.05525C   2  197    2000.0       70.0           35       0.91221    2  188    4000.0      260.0
   11       1.04894C   2  278    3000.0       80.0           36       0.91153C   2  195    3000.0       70.0
   12       1.04288C   2  189    5000.0      300.0           37       0.91134    2  260    4000.0      260.0
   13       1.03395C   2  197    2000.0       60.0           38       0.90834C   2  195    2000.0       70.0
   14       1.01965    2  230    4000.0       90.0           39       0.90561    2  315    3000.0      280.0
   15       1.01474C   2  235    2000.0      230.0           40       0.90464    2  201    3000.0      100.0
   16       1.00673    2  188    3000.0      260.0           41       0.89684    2  230    2000.0       90.0
   17       0.99525C   2  278    5000.0       90.0           42       0.89428C   2  213    4000.0       90.0
   18       0.99310    2  188    4000.0      270.0           43       0.89354    2  258    4000.0      250.0
   19       0.98351    2  260    3000.0      260.0           44       0.88765    2  315    3000.0      290.0
   20       0.98083    2  260    4000.0      250.0           45       0.88329    2  230    5000.0       90.0
   21       0.97945    2  214    3000.0       20.0           46       0.87804    2  258    5000.0      260.0
   22       0.97694    2  260    3000.0      250.0           47       0.87634    2  260    5000.0      250.0
   23       0.96621    2  315    4000.0      280.0           48       0.87632    2  115    4000.0       70.0
   24       0.96022C   2  278    4000.0       80.0           49       0.85789    2  250    2000.0       50.0
   25       0.95676    2  196    2000.0       70.0           50       0.86080    2  258    3000.0      250.0
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                                                                                                   HIGH
                                                                                                   24-HR
                                                                                                   SGROUP#  1
                             *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986          ***


                            * HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)      *
                                        * FROM SOURCES:        1, CPL Plants
                                          * FOR THE RECEPTOR GRID *

                         * MAXIMUM VALUE EQUALS      0.50453 AND OCCURRED AT (    2000.0,      90.0) *

DIRECTION /                                                  RANGE (METERS)
(DEGREES) /           2000.0               3000.0               4000.0               5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


    360.0 /      0.18632C(143, 1)     0.18363C(254, 1)     0.16498C(102, 1)     0.17138C(234, 1)
    350.0 /      0.27459 (126, 1)     0.28056 (126, 1)     0.21335 (126, 1)     0.18633C(194, 1)
    340.0 /      0.20131C(194, 1)     0.22698C(194, 1)     0.23910C(194, 1)     0.22301C(194, 1)
    330.0 /      0.22881 (148, 1)     0.26775 (148, 1)     0.23304 (148, 1)     0.19641 (148, 1)
    320.0 /      0.12846C(132, 1)     0.16457C( 93, 1)     0.17487 (242, 1)     0.17289 (242, 1)
    310.0 /      0.22530C(189, 1)     0.25378C(189, 1)     0.25783C(189, 1)     0.27132 (328, 1)
    300.0 /      0.33309C(189, 1)     0.38341C(189, 1)     0.39497C(189, 1)     0.36501C(189, 1)
    290.0 /      0.30262C(238, 1)     0.29589 (315, 1)     0.28406 (315, 1)     0.27000 (147, 1)
    280.0 /      0.24638C(188, 1)     0.35056C(188, 1)     0.32245C(188, 1)     0.30745 (315, 1)
    270.0 /      0.29710C(188, 1)     0.44977C(188, 1)     0.41894C(188, 1)     0.34721C(188, 1)
    260.0 /      0.29601C(188, 1)     0.42389C(188, 1)     0.38409C(188, 1)     0.31213C(188, 1)
    250.0 /      0.21342C(247, 1)     0.32628 (260, 1)     0.32810 (260, 1)     0.29397 (260, 1)
    240.0 /      0.29500C(235, 1)     0.26690C(235, 1)     0.28031C( 90, 1)     0.29296C( 90, 1)
    230.0 /      0.39462C(235, 1)     0.29824C(235, 1)     0.24026 ( 88, 1)     0.24526C(123, 1)
    220.0 /      0.32006C(235, 1)     0.22473C(235, 1)     0.25477C(293, 1)     0.24812C(293, 1)
    210.0 /      0.24221 (149, 1)     0.23870C(113, 1)     0.21779C( 87, 1)     0.19792C( 12, 1)
    200.0 /      0.20043C(108, 1)     0.22135C(108, 1)     0.22668C(108, 1)     0.21423C(108, 1)
    190.0 /      0.23833C(108, 1)     0.20198C( 87, 1)     0.17226C( 87, 1)     0.15906 ( 11, 1)
    180.0 /      0.19552C(108, 1)     0.19138C( 44, 1)     0.20219C( 44, 1)     0.19055C( 44, 1)
    170.0 /      0.15040C(177, 1)     0.22598C( 44, 1)     0.24493C( 44, 1)     0.23351C( 44, 1)
    160.0 /      0.18742C(177, 1)     0.18773C(177, 1)     0.17156C(177, 1)     0.14745C(177, 1)
    150.0 /      0.22332C(162, 1)     0.21902C(119, 1)     0.22270C(119, 1)     0.20132C(119, 1)
    140.0 /      0.20093C(162, 1)     0.29768C(142, 1)     0.30104C(142, 1)     0.27516C(142, 1)
    130.0 /      0.17677 (112, 1)     0.23969 (112, 1)     0.23755C(142, 1)     0.21730C(142, 1)
    120.0 /      0.13130C(205, 1)     0.19574 (112, 1)     0.20899 (112, 1)     0.19262 (112, 1)
    110.0 /      0.25299C(205, 1)     0.25955 (106, 1)     0.27620 (106, 1)     0.26194 (106, 1)
    100.0 /      0.41797C(213, 1)     0.33540 (201, 1)     0.33721C(158, 1)     0.31340C(229, 1)
     90.0 /      0.50453C(213, 1)     0.49280C(230, 1)     0.45318C(230, 1)     0.39258C(230, 1)
     80.0 /      0.33648C(230, 1)     0.36388C(230, 1)     0.32007C(278, 1)     0.27768C(119, 1)
     70.0 /      0.41037C(197, 1)     0.40623C(115, 1)     0.38957C(115, 1)     0.34006C(115, 1)
     60.0 /      0.40209C(197, 1)     0.31533C(197, 1)     0.28923C( 97, 1)     0.25925C(277, 1)
     50.0 /      0.38573C(250, 1)     0.35498C(250, 1)     0.32925C(250, 1)     0.29299C(250, 1)
     40.0 /      0.28759C(250, 1)     0.22822C(250, 1)     0.20487C( 53, 1)     0.20713C(170, 1)
     30.0 /      0.22667C(206, 1)     0.30746C(214, 1)     0.31120C(214, 1)     0.28518C(214, 1)
     20.0 /      0.28109C(214, 1)     0.41770C(214, 1)     0.39816C(214, 1)     0.33911C(214, 1)
     10.0 /      0.20215C(181, 1)     0.24762C(181, 1)     0.21273C(181, 1)     0.17407C(181, 1)
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                                                                                                   2ND HIGH
                                                                                                   24-HR
                                                                                                   SGROUP#  1
                              *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986         ***


                         * SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                            * FROM SOURCES:        1,
                                              * FOR THE RECEPTOR GRID *

                          * MAXIMUM VALUE EQUALS      0.42067 AND OCCURRED AT (    3000.0,      90.0) *

DIRECTION /                                                    RANGE (METERS)
(DEGREES) /              2000.0                3000.0                4000.0                5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


    360.0 /         0.17819 (218, 1)      0.17399C(181, 1)      0.15927C(234, 1)      0.14547C(102, 1)
    350.0 /         0.24368C(194, 1)      0.22836C(194, 1)      0.21182C(194, 1)      0.15661 (126, 1)
    340.0 /         0.19299C(217, 1)      0.19344C(132, 1)      0.18437C(281, 1)      0.18936C(281, 1)
    330.0 /         0.17805C(162, 1)      0.18733C(132, 1)      0.17942C(329, 1)      0.19374C(329, 1)
    320.0 /         0.12697C( 93, 1)      0.15825C(284, 1)      0.16897C(166, 1)      0.16940C(329, 1)
    310.0 /         0.17629C(178, 1)      0.23464C(282, 1)      0.25590 (328, 1)      0.24628C(282, 1)
    300.0 /         0.26634C(220, 1)      0.31761C(220, 1)      0.30949C(238, 1)      0.30698C(238, 1)
    290.0 /         0.26135C(189, 1)      0.29475C(238, 1)      0.28304C(238, 1)      0.26091C(238, 1)
    280.0 /         0.19653C(238, 1)      0.30189 (315, 1)      0.32213 (315, 1)      0.29129C( 94, 1)
    270.0 /         0.28309C(176, 1)      0.27795C(176, 1)      0.27539C(176, 1)      0.25400C(176, 1)
    260.0 /         0.26116C(247, 1)      0.32892 (260, 1)      0.31638 (258, 1)      0.29441 (258, 1)
    250.0 /         0.21110 (260, 1)      0.28777 (258, 1)      0.29996 (258, 1)      0.27742 (258, 1)
    240.0 /         0.25234C(174, 1)      0.23944C( 90, 1)      0.27787 (292, 1)      0.28281 (292, 1)
    230.0 /         0.30675C(174, 1)      0.23400C(174, 1)      0.23793C(123, 1)      0.23126 ( 88, 1)
    220.0 /         0.21948C(174, 1)      0.22060C(293, 1)      0.21461 ( 88, 1)      0.19366 ( 88, 1)
    210.0 /         0.21434C(113, 1)      0.21729C( 87, 1)      0.19097C(113, 1)      0.19689C( 87, 1)
    200.0 /         0.19524C(116, 1)      0.17656 (325, 1)      0.19058 (325, 1)      0.17713 (325, 1)
    190.0 /         0.15450C( 87, 1)      0.18936C(108, 1)      0.15508C(108, 1)      0.13833 ( 81, 1)
    180.0 /         0.13586C(144, 1)      0.16229C(236, 1)      0.17597C(236, 1)      0.17061C(236, 1)
    170.0 /         0.12987C( 44, 1)      0.14585 ( 43, 1)      0.16198 ( 43, 1)      0.16989C( 15, 1)
    160.0 /         0.11749C(162, 1)      0.10353 ( 43, 1)      0.12510 ( 43, 1)      0.12546 ( 43, 1)
    150.0 /         0.14163C(119, 1)      0.20032C(162, 1)      0.19217C(162, 1)      0.17996C(162, 1)
    140.0 /         0.19220C(142, 1)      0.21449C(200, 1)      0.20428C(200, 1)      0.18635C(200, 1)
    130.0 /         0.14946C(142, 1)      0.23317C(142, 1)      0.23263 (112, 1)      0.20695 (112, 1)
    120.0 /         0.11833 (112, 1)      0.16349C(101, 1)      0.18108C(101, 1)      0.17171C(101, 1)
    110.0 /         0.18088C(129, 1)      0.23797C(129, 1)      0.22196C(129, 1)      0.20406 (326, 1)
    100.0 /         0.27525 (201, 1)      0.32320C(205, 1)      0.32164C(205, 1)      0.30723C(158, 1)
     90.0 /         0.39860C(230, 1)      0.42067C(213, 1)      0.38592C(278, 1)      0.34818C(158, 1)
     80.0 /         0.32254C(213, 1)      0.34965C(278, 1)      0.30290C(157, 1)      0.26332C(278, 1)
     70.0 /         0.38000C(196, 1)      0.39580C(196, 1)      0.33928C(196, 1)      0.29608C(277, 1)
     60.0 /         0.24559C(250, 1)      0.31260C( 97, 1)      0.26521C(195, 1)      0.24480C( 97, 1)
     50.0 /         0.23083C(197, 1)      0.20714C(198, 1)      0.19733 (  4, 1)      0.22883 (  4, 1)
     40.0 /         0.25440C(244, 1)      0.21703C( 53, 1)      0.19051C(250, 1)      0.17760C( 53, 1)
     30.0 /         0.22262C(244, 1)      0.30394C(240, 1)      0.28675C(240, 1)      0.24661C(240, 1)
     20.0 /         0.21480C(240, 1)      0.31323C(240, 1)      0.29659C(240, 1)      0.25784C(240, 1)
     10.0 /         0.16839C(214, 1)      0.22596C(214, 1)      0.20417C(214, 1)      0.16765C(214, 1)
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                                                                                                   MAX 50
                                                                                                   24-HR
                                                                                                   SGROUP#  1
                        *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986          ***


                     * 50 MAXIMUM 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *


                                          * FROM SOURCES:        1,


                                       X      Y(METERS)                                          X      Y(METERS)
                                       OR        OR                                              OR        OR
                                     RANGE   DIRECTION                                         RANGE   DIRECTION
     RANK     CON.      PER. DAY   (METERS)  (DEGREES)        RANK     CON.      PER. DAY    (METERS)  (DEGREES)
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


       1     0.50453C    1   213    2000.0      90.0           26     0.36962C    1   158    4000.0       90.0
       2     0.49280C    1   230    3000.0      90.0           27     0.36775C    1   157    4000.0       90.0
       3     0.45318C    1   230    4000.0      90.0           28     0.36501C    1   189    5000.0      300.0
       4     0.44977C    1   188    3000.0     270.0           29     0.36388C    1   230    3000.0       80.0
       5     0.42389C    1   188    3000.0     260.0           30     0.35498C    1   250    3000.0       50.0
       6     0.42067C    1   213    3000.0      90.0           31     0.35056C    1   188    3000.0      280.0
       7     0.41894C    1   188    4000.0     270.0           32     0.34965C    1   278    3000.0       80.0
       8     0.41797C    1   213    2000.0     100.0           33     0.34904C    1    98    3000.0       90.0
       9     0.41770C    1   214    3000.0      20.0           34     0.34867     1   201    3000.0       90.0
      10     0.41037C    1   197    2000.0      70.0           35     0.34829C    1   213    4000.0       90.0
      11     0.40623C    1   115    3000.0      70.0           36     0.34818C    1   158    5000.0       90.0
      12     0.40209C    1   197    2000.0      60.0           37     0.34721C    1   188    5000.0      270.0
      13     0.40135C    1   278    3000.0      90.0           38     0.34695C    1   157    5000.0       90.0
      14     0.39860C    1   230    2000.0      90.0           39     0.34453C    1   158    3000.0       90.0
      15     0.39816C    1   214    4000.0      20.0           40     0.34396C    1    98    4000.0       90.0
      16     0.39580C    1   196    3000.0      70.0           41     0.34006C    1   115    5000.0       70.0
      17     0.39497C    1   189    4000.0     300.0           42     0.33928C    1   196    4000.0       70.0
      18     0.39462C    1   235    2000.0     230.0           43     0.33911C    1   214    5000.0       20.0
      19     0.39258C    1   230    5000.0      90.0           44     0.33721C    1   158    4000.0      100.0
      20     0.38957C    1   115    4000.0      70.0           45     0.33648C    1   230    2000.0       80.0
      21     0.38592C    1   278    4000.0      90.0           46     0.33546C    1   157    3000.0       90.0
      22     0.38573C    1   250    2000.0      50.0           47     0.33540     1   201    3000.0      100.0
      23     0.38409C    1   188    4000.0     260.0           48     0.33431     1   201    4000.0       90.0
      24     0.38341C    1   189    3000.0     300.0           49     0.33309C    1   189    2000.0      300.0
      25     0.38000C    1   196    2000.0      70.0           50     0.33175C    1   278    5000.0       90.0
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                                                                                         'N'-DAY
                                                                                         365 DAYS
                                                                                         SGROUP#  2
                        *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986          ***


                          * 365-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *

                                          * FROM SOURCES:        2,
                                            * FOR THE RECEPTOR GRID *

                      * MAXIMUM VALUE EQUALS      0.13176 AND OCCURRED AT (    2000.0,      90.0) *
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Cement Plant

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 DIRECTION /                                         RANGE (METERS)
 (DEGREES) /     2000.0       3000.0       4000.0       5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

    360.0 /    0.03984      0.03877      0.03362      0.02931
    350.0 /    0.03465      0.03174      0.02661      0.02272
    340.0 /    0.03480      0.03224      0.02781      0.02448
    330.0 /    0.04153      0.04077      0.03555      0.03112
    320.0 /    0.05271      0.05236      0.04558      0.03991
    310.0 /    0.07133      0.07115      0.06196      0.05438
    300.0 /    0.07418      0.07373      0.06360      0.05498
    290.0 /    0.06446      0.06300      0.05377      0.04598
    280.0 /    0.06393      0.06323      0.05428      0.04658
    270.0 /    0.07104      0.07130      0.06246      0.05469
    260.0 /    0.06697      0.06541      0.05644      0.04893
    250.0 /    0.06793      0.06907      0.06056      0.05265
    240.0 /    0.06559      0.07084      0.06535      0.05921
    230.0 /    0.05527      0.05835      0.05406      0.04963
    220.0 /    0.04380      0.04351      0.03937      0.03610
    210.0 /    0.03324      0.03259      0.02863      0.02539
    200.0 /    0.02369      0.02455      0.02229      0.02014
    190.0 /    0.02083      0.02305      0.02168      0.02000
    180.0 /    0.02286      0.02553      0.02353      0.02113
    170.0 /    0.02308      0.02603      0.02405      0.02150
    160.0 /    0.01841      0.01958      0.01807      0.01647
    150.0 /    0.02609      0.02805      0.02571      0.02326
    140.0 /    0.03075      0.03204      0.02869      0.02551
    130.0 /    0.03010      0.03162      0.02843      0.02531
    120.0 /    0.03734      0.03944      0.03519      0.03098
    110.0 /    0.06276      0.06467      0.05592      0.04732
    100.0 /    0.09782      0.09417      0.07788      0.06365
     90.0 /    0.13176      0.12429      0.10051      0.08032
     80.0 /    0.12856      0.11332      0.08874      0.06981
     70.0 /    0.11939      0.10181      0.07881      0.06214
     60.0 /    0.09769      0.08342      0.06548      0.05252
     50.0 /    0.07142      0.06248      0.04985      0.04054
     40.0 /    0.05447      0.05036      0.04109      0.03368
     30.0 /    0.04933      0.04759      0.04057      0.03482
     20.0 /    0.04706      0.04469      0.03769      0.03199
     10.0 /    0.04308      0.04114      0.03484      0.02972
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Use for impact
analysis

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                                                                                          HIGH
                                                                                          8-HR
                                                                                          SGROUP#  2
                        *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986          ***

                       * HIGHEST  8-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                            * FROM SOURCES:        2, Cement Plant
                                              * FOR THE RECEPTOR GRID *

                     * MAXIMUM VALUE EQUALS      3.51665 AND OCCURRED AT (     2000.0,      90.0) *

DIRECTION /                                            RANGE (METERS)
(DEGREES) /          2000.0              3000.0              4000.0              5000.0
-----------------------------------------------------------------------------------------------------

  360.0 /     1.33877 (181, 2)    1.24014 ( 79, 2)    1.12092 (206, 2)    1.01662 (206, 2)
  350.0 /     2.09678 (126, 2)    1.29934 (126, 2)    0.81467 (126, 2)    0.73406 (206, 2)
  340.0 /     1.45896 (126, 2)    1.14186 (281, 2)    0.94029 (281, 2)    0.79091 (207, 1)
  330.0 /     1.87008 (148, 2)    1.55205 (329, 2)    1.38339 (329, 2)    1.12583 (329, 2)
  320.0 /     1.49667C(164, 2)    1.60571C(164, 2)    1.33116C(164, 2)    1.10544 (329, 2)
  310.0 /     2.07084 (328, 2)    2.64816 (328, 2)    2.36261 (328, 2)    1.96105 (328, 2)
  300.0 /     2.10664 (134, 2)    1.81512 (134, 2)    1.45752 (238, 2)    1.17997 (328, 2)
  290.0 /     2.53321 (315, 2)    2.00865 (315, 2)    1.40770 (315, 2)    1.11605 (311, 2)
  280.0 /     2.58985 (315, 2)    2.35562 (315, 2)    1.82817 (315, 2)    1.40802 (315, 2)
  270.0 /     2.54989 (188, 2)    1.91771 (188, 2)    1.50390 (312, 2)    1.29643 (314, 2)
  260.0 /     2.62577 (260, 2)    2.29716 (258, 2)    1.88351 (258, 2)    1.50852 (258, 2)
  250.0 /     2.86405 (260, 2)    2.56487 (260, 2)    2.06280 (260, 2)    1.67758 (260, 2)
  240.0 /     2.02184 (292, 2)    2.33145 (292, 2)    1.99802 (292, 2)    1.61973 (292, 2)
  230.0 /     1.73825 ( 88, 2)    1.85407 ( 88, 2)    1.51114 ( 88, 2)    1.17584 ( 88, 2)
  220.0 /     1.66613 ( 88, 2)    1.63311 (293, 2)    1.32591 (293, 2)    1.12221 (338, 2)
  210.0 /     1.63840 (113, 2)    1.85868 ( 12, 2)    1.68605 ( 12, 2)    1.43729 ( 12, 2)
  200.0 /     1.92969 (325, 2)    1.60536 (325, 2)    1.22305 (325, 2)    0.97581 (325, 2)
  190.0 /     1.23788 (325, 2)    1.36985 (289, 2)    1.36675 (289, 2)    1.21922 (289, 2)
  180.0 /     1.21886 ( 44, 2)    1.14369 ( 44, 2)    1.00105C(172, 2)    0.84817C(172, 2)
  170.0 /     1.29628 ( 44, 2)    1.33181 ( 44, 2)    1.14132 ( 44, 2)    0.94352 ( 44, 2)
  160.0 /     0.92241 (177, 2)    0.82835 (319, 2)    0.87075 (  5, 2)    1.06412 (  5, 2)
  150.0 /     1.22145 (119, 2)    1.05014C(204, 2)    0.97210C(204, 2)    0.84660C(204, 2)
  140.0 /     1.65559 (142, 2)    1.21840 (142, 2)    1.01961 (289, 2)    0.87315 ( 13, 2)
  130.0 /     1.73108 (112, 2)    1.48632 (103, 2)    1.29280 (103, 2)    1.04430 (103, 2)
  120.0 /     1.52467 (112, 2)    1.43147 (112, 2)    1.10967 (112, 2)    0.92937 ( 20, 2)
  110.0 /     1.99169 (106, 2)    1.80339 (106, 2)    1.41187 (106, 2)    1.15816C(359, 2)
  100.0 /     2.57029 (129, 2)    2.11863 (229, 2)    1.88990 (229, 2)    1.56662 (229, 2)
   90.0 /     3.51665C(278, 2)    2.68594C(278, 2)    1.99204 (227, 2)    1.69916 (227, 2)
   80.0 /     3.01175C(278, 2)    2.19830C(278, 2)    1.53403 ( 62, 2)    1.21544 ( 62, 2)
   70.0 /     2.47192 (115, 2)    1.98177 (115, 2)    1.41799 (115, 2)    1.19101C(163, 2)
   60.0 /     2.09198 ( 97, 2)    1.68635 (277, 2)    1.38231 (277, 2)    1.10278 (277, 2)
   50.0 /     1.59464 (110, 2)    1.72450 (  4, 2)    1.53377 (  4, 2)    1.31793 (  4, 2)
   40.0 /     1.35513 (202, 2)    1.31459C(170, 2)    1.15456 (199, 2)    0.97025 (199, 2)
   30.0 /     2.00956 (214, 2)    1.48291 (214, 2)    1.10647C(195, 2)    0.91787C(195, 2)
   20.0 /     2.71324 (214, 2)    1.97523 (214, 2)    1.79641 (321, 2)    1.55323 (321, 2)
   10.0 /     1.99352 (181, 2)    1.38803 (181, 2)    1.01794 (102, 2)    0.88330 (102, 2)
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Use for impact analysis

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                                                                                                   2ND HIGH
                                                                                                    8-HR
                                                                                                   SGROUP#  2
                          *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986          ***


                       * SECOND HIGHEST  8-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                              * FROM SOURCES:       2,
                                                * FOR THE RECEPTOR GRID *

                        * MAXIMUM VALUE EQUALS      2.95557 AND OCCURRED AT (    2000.0,      90.0) *

 DIRECTION /                                              RANGE (METERS)
 (DEGREES) /           2000.0             3000.0             4000.0             5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

    360.0 /      1.32404 (139, 2)    1.13066 (139, 2)    1.05731 ( 79, 2)    0.93363 (  1, 2)
    350.0 /      1.55464 (254, 2)    1.01534 (254, 2)    0.77292 (330, 2)    0.67182C(199, 1)
    340.0 /      1.38167 (132, 2)    0.97564 (126, 2)    0.84769 (194, 2)    0.76182 (281, 2)
    330.0 /      1.30373 (132, 2)    1.20097 (148, 2)    0.84345 ( 41, 2)    0.79621 ( 41, 2)
    320.0 /      1.37938 (233, 2)    1.41203 (329, 2)    1.32035 (329, 2)    1.09704C(164, 2)
    310.0 /      1.86613 (272, 2)    1.84100 (286, 2)    1.61325 (297, 2)    1.38251 (297, 2)
    300.0 /      2.04901 (220, 2)    1.77011C(189, 2)    1.44898 (223, 2)    1.15380 (238, 2)
    290.0 /      1.96085 (125, 2)    1.69902 (147, 2)    1.36451 (311, 2)    1.07640 (296, 2)
    280.0 /      2.07656 (188, 2)    1.90248 (327, 2)    1.65752 (327, 2)    1.36735 (327, 2)
    270.0 /      1.71657 (261, 2)    1.64104 (312, 2)    1.38558 (314, 2)    1.28639 (312, 2)
    260.0 /      2.49335 (188, 2)    1.96363 (260, 2)    1.39501 (260, 2)    1.04883 (260, 2)
    250.0 /      2.44068 (258, 2)    2.27822 (258, 2)    1.79704 (258, 2)    1.38441 (258, 2)
    240.0 /      1.89855 ( 89, 2)    1.84431 (264, 2)    1.58330 ( 21, 2)    1.42122 ( 21, 2)
    230.0 /      1.53018 (264, 2)    1.48792 (292, 2)    1.20137 (264, 2)    1.04367 (293, 2)
    220.0 /      1.57683 (293, 2)    1.53580 ( 88, 2)    1.27486 (338, 2)    1.04426 (290, 2)
    210.0 /      1.49831 ( 12, 2)    1.45390 (294, 2)    1.32782 (294, 2)    1.11152 (294, 2)
    200.0 /      1.10562 ( 87, 2)    1.00844 (107, 2)    1.05203 (107, 2)    0.94674 (107, 2)
    190.0 /      1.20377 ( 87, 2)    1.12760 ( 11, 2)    1.10614 ( 11, 2)    0.99257 ( 11, 2)
    180.0 /      1.13978 (236, 2)    1.09599 (236, 2)    0.92888 ( 44, 2)    0.75024 ( 44, 2)
    170.0 /      1.01887 (319, 2)    1.07584 (319, 2)    0.90467 ( 15, 2)    0.76495 ( 15, 2)
    160.0 /      0.88772 (319, 2)    0.80345 (363, 2)    0.70540 (363, 2)    0.59681 (363, 2)
    150.0 /      1.15100 (169, 2)    0.99211 (100, 2)    0.84604 (169, 2)    0.76361 (169, 2)
    140.0 /      1.31434C(246, 2)    1.14359 (200, 2)    0.97092 ( 13, 2)    0.85450 (112, 2)
    130.0 /      1.50017 (142, 2)    1.37110 (112, 2)    1.00341 (112, 2)    0.80426 ( 92, 2)
    120.0 /      1.04023 (236, 2)    0.94238 ( 20, 2)    0.96356 ( 20, 2)    0.84722 (112, 2)
    110.0 /      1.91729 (129, 2)    1.60756 (229, 2)    1.33358 (229, 2)    1.11074 (106, 2)
    100.0 /      2.41973 (201, 2)    2.07568 (129, 2)    1.54611 (227, 2)    1.27971 (227, 2)
     90.0 /      2.95557 (230, 2)    2.36686 (230, 2)    1.82841C(278, 2)    1.59745 (  3, 2)
     80.0 /      2.53309 (151, 2)    1.82660 ( 62, 2)    1.45745C(278, 2)    1.14435 ( 98, 2)
     70.0 /      2.10988 (196, 2)    1.82618 (277, 2)    1.36792C(163, 2)    1.03862 (115, 2)
     60.0 /      1.83723C(127, 2)    1.62086 (171, 2)    1.31763 (171, 2)    1.08023 (171, 2)
     50.0 /      1.58873 (198, 2)    1.20686 (199, 2)    0.94155 (199, 2)    0.72797 (199, 2)
     40.0 /      1.28481 ( 53, 2)    1.30771 (199, 2)    1.13471C(170, 2)    0.95180C(170, 2)
     30.0 /      1.78601 (240, 2)    1.30410C(195, 2)    0.99574 (214, 2)    0.78256 ( 41, 2)
     20.0 /      1.92090 (240, 2)    1.86209 (321, 2)    1.33474 (214, 2)    0.95315 (214, 2)
     10.0 /      1.46075 ( 70, 2)    1.27604 ( 70, 2)    1.01408 (321, 2)    0.83303 (321, 2)
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                                                                                      MAX 50
                                                                                       8-HR
                                                                                      SGROUP#  2
                        *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986          ***

                      * 50 MAXIMUM  8-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *

                                      * FROM SOURCES:        2,

                                    X      Y(METERS)                                          X      Y(METERS)
                                    OR       OR                                               OR       OR
                                  RANGE   DIRECTION                                         RANGE   DIRECTION
   RANK      CON.      PER. DAY  (METERS)  (DEGREES)        RANK      CON.      PER. DAY  (METERS)  (DEGREES)
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     1      3.51665C    2  278    2000.0      90.0           26      2.33128    2  227    3000.0      90.0
     2      3.01175C    2  278    2000.0      80.0           27      2.29716    2  258    3000.0     260.0
     3      2.95557     2  230    2000.0      90.0           28      2.27822    2  258    3000.0     250.0
     4      2.86405     2  260    2000.0     250.0           29      2.23692    2  192    2000.0      80.0
     5      2.71324     2  214    2000.0      20.0           30      2.20791    2   98    2000.0      90.0
     6      2.68594C    2  278    3000.0      90.0           31      2.19830C   2  278    3000.0      80.0
     7      2.64816     2  328    3000.0     310.0           32      2.18019    2  150    2000.0      80.0
     8      2.62577     2  260    2000.0     260.0           33      2.11863    2  229    3000.0     100.0
     9      2.58985     2  315    2000.0     280.0           34      2.10988    2  196    2000.0      70.0
    10      2.57029     2  129    2000.0     100.0           35      2.10664    2  134    2000.0     300.0
    11      2.56487     2  260    3000.0     250.0           36      2.10540    2  230    2000.0      80.0
    12      2.54989     2  188    2000.0     270.0           37      2.10425    2  157    2000.0      80.0
    13      2.53321     2  315    2000.0     290.0           38      2.09834    2  277    2000.0      70.0
    14      2.53309     2  151    2000.0      80.0           39      2.09678    2  126    2000.0     350.0
    15      2.49335     2  188    2000.0     260.0           40      2.09198    2   97    2000.0      60.0
    16      2.47192     2  115    2000.0      70.0           41      2.07656    2  188    2000.0     280.0
    17      2.44552     2  201    2000.0      90.0           42      2.07568    2  129    3000.0     100.0
    18      2.44361     2  258    2000.0     260.0           43      2.07084    2  328    2000.0     310.0
    19      2.44068     2  258    2000.0     250.0           44      2.06826    2  184    3000.0      90.0
    20      2.42992     2  227    2000.0      90.0           45      2.06280    2  260    4000.0     250.0
    21      2.41973     2  201    2000.0     100.0           46      2.06020    2  124    2000.0     250.0
    22      2.36686     2  230    3000.0      90.0           47      2.05107    2  150    2000.0      90.0
    23      2.36261     2  328    4000.0     310.0           48      2.04901    2  220    2000.0     300.0
    24      2.35562     2  315    3000.0     280.0           49      2.04742C   2  189    2000.0     300.0
    25      2.33145     2  292    3000.0     240.0           50      2.04057    2   89    2000.0     250.0
```

```
                                                                                              HIGH
                                                                                              24-HR
                                                                                              SGROUP#  2
                         *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986          ***


                        * HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                    * FROM SOURCES:        2,
                                      * FOR THE RECEPTOR GRID *

                      * MAXIMUM VALUE EQUALS      1.31359 AND OCCURRED AT (    2000.0,      90.0) *

 DIRECTION /                                          RANGE (METERS)
 (DEGREES) /           2000.0              3000.0              4000.0              5000.0
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     360.0 /     0.49631C(254, 1)    0.46595C(206, 1)    0.47197C(206, 1)    0.42806C(206, 1)
     350.0 /     0.69892 (126, 1)    0.43311 (126, 1)    0.29546C(206, 1)    0.30908C(206, 1)
     340.0 /     0.52635C(132, 1)    0.43500C(281, 1)    0.37675C(194, 1)    0.33646C(194, 1)
     330.0 /     0.71166 (148, 1)    0.56053 (148, 1)    0.49840C(329, 1)    0.41549C(329, 1)
     320.0 /     0.55364C(164, 1)    0.59480C(164, 1)    0.49340C(164, 1)    0.42230C(329, 1)
     310.0 /     0.69104 (328, 1)    0.88872 (328, 1)    0.80583 (328, 1)    0.68598 (328, 1)
     300.0 /     0.82019C(220, 1)    0.78515C(238, 1)    0.64885C(238, 1)    0.51416C(238, 1)
     290.0 /     0.84440 (315, 1)    0.68679 (147, 1)    0.56147 (147, 1)    0.45321 (147, 1)
     280.0 /     0.92406C(188, 1)    0.78667C( 94, 1)    0.65395C( 94, 1)    0.53447C( 94, 1)
     270.0 /     1.07594C(188, 1)    0.81078C(188, 1)    0.69957C(235, 1)    0.67998C(235, 1)
     260.0 /     1.04983C(188, 1)    0.77177 (258, 1)    0.64056 (258, 1)    0.52346 (258, 1)
     250.0 /     0.95803 (260, 1)    0.86679 (260, 1)    0.71280 (260, 1)    0.60091 (260, 1)
     240.0 /     0.68522 ( 89, 1)    0.77740 (292, 1)    0.66664 (292, 1)    0.54515C( 90, 1)
     230.0 /     0.59672 (262, 1)    0.62512 ( 88, 1)    0.52591C(293, 1)    0.61852 (  8, 1)
     220.0 /     0.70117C(293, 1)    0.72883C(293, 1)    0.59950C(293, 1)    0.47650C(293, 1)
     210.0 /     0.59578C(113, 1)    0.64650C( 12, 1)    0.58645C( 12, 1)    0.49993C( 12, 1)
     200.0 /     0.64458 (325, 1)    0.54026 (325, 1)    0.41875 (325, 1)    0.34348 (325, 1)
     190.0 /     0.53501C( 87, 1)    0.46262 (289, 1)    0.48741 ( 11, 1)    0.47482 ( 11, 1)
     180.0 /     0.50657C(236, 1)    0.48711C(236, 1)    0.40804 ( 81, 1)    0.38923 ( 81, 1)
     170.0 /     0.46449C( 44, 1)    0.48717C( 44, 1)    0.42181C( 44, 1)    0.35007C( 44, 1)
     160.0 /     0.40996C(177, 1)    0.33638C(177, 1)    0.30403C(  5, 1)    0.37181C(  5, 1)
     150.0 /     0.54531C(119, 1)    0.42521C(246, 1)    0.32811C(162, 1)    0.29256 (289, 1)
     140.0 /     0.84402C(142, 1)    0.71263C(142, 1)    0.53285C(142, 1)    0.46966C(161, 1)
     130.0 /     0.67275C(142, 1)    0.58921C(142, 1)    0.52061C(113, 1)    0.44117C(113, 1)
     120.0 /     0.51181 (112, 1)    0.49156 (112, 1)    0.45178C( 20, 1)    0.45429C( 20, 1)
     110.0 /     0.75647C(129, 1)    0.67810C(129, 1)    0.56424 (106, 1)    0.49174C( 65, 1)
     100.0 /     0.97019 (201, 1)    0.91873C(227, 1)    0.78650C(227, 1)    0.66654C(227, 1)
      90.0 /     1.31359C(230, 1)    1.05195C(230, 1)    0.85137 (201, 1)    0.71649C(227, 1)
      80.0 /     1.00392C(278, 1)    0.76968C(119, 1)    0.61388C(119, 1)    0.51283C( 98, 1)
      70.0 /     1.09903C(115, 1)    0.88111C(115, 1)    0.63041C(115, 1)    0.46172C(115, 1)
      60.0 /     0.83679C( 97, 1)    0.74949C(277, 1)    0.61436C(277, 1)    0.49013C(277, 1)
      50.0 /     0.63624C(250, 1)    0.57693 (  4, 1)    0.51832 (  4, 1)    0.45285 (  4, 1)
      40.0 /     0.60024C( 53, 1)    0.52308C(199, 1)    0.46182C(199, 1)    0.38810C(199, 1)
      30.0 /     0.92393C(214, 1)    0.79511C(214, 1)    0.62170C(214, 1)    0.49148C(214, 1)
      20.0 /     1.16573C(214, 1)    0.87551C(214, 1)    0.60894C(214, 1)    0.51774 (321, 1)
      10.0 /     0.69340C(181, 1)    0.50619C(102, 1)    0.43051C(102, 1)    0.37503C(102, 1)
```

Cement Plant

Use for Impact Analysis

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                                                                                                   2ND HIGH
                                                                                                   24-HR
                                                                                                   SGROUP#  2
                       *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986          ***


                   * SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)      *
                                        * FROM SOURCES:         2,
                                          * FOR THE RECEPTOR GRID *

                   * MAXIMUM VALUE EQUALS      1.17222 AND OCCURRED AT (    2000.0,      90.0) *

 DIRECTION /                                              RANGE (METERS)
 (DEGREES) /          2000.0              3000.0              4000.0              5000.0
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


    360.0 /     0.46566C(181, 1)    0.41377 ( 79, 1)    0.40091C(  1, 1)    0.37462C(  1, 1)
    350.0 /     0.59224C(254, 1)    0.38679C(254, 1)    0.28869C(  1, 1)    0.27930C(  1, 1)
    340.0 /     0.48632 (126, 1)    0.41632C(194, 1)    0.35821C(281, 1)    0.31741 (232, 1)
    330.0 /     0.49666C(132, 1)    0.54890C(329, 1)    0.42429 (148, 1)    0.32485 (148, 1)
    320.0 /     0.47978C(233, 1)    0.50787C(329, 1)    0.48824C(329, 1)    0.40660C(164, 1)
    310.0 /     0.66361C(282, 1)    0.66946C(286, 1)    0.61123C(297, 1)    0.55746 ( 77, 1)
    300.0 /     0.75273C(238, 1)    0.66081 (272, 1)    0.56456 (272, 1)    0.49738 (186, 1)
    290.0 /     0.78241C(220, 1)    0.66956 (315, 1)    0.49274C(135, 1)    0.40715C(135, 1)
    280.0 /     0.86329 (315, 1)    0.78528 (315, 1)    0.60977 (315, 1)    0.47045 (315, 1)
    270.0 /     0.63444C( 94, 1)    0.69508C(235, 1)    0.57254C( 94, 1)    0.50189 (312, 1)
    260.0 /     0.87734 (260, 1)    0.75531C(188, 1)    0.57659C(172, 1)    0.49034C(172, 1)
    250.0 /     0.83667 (258, 1)    0.80268 (258, 1)    0.65232 (258, 1)    0.51955 (258, 1)
    240.0 /     0.68104C(264, 1)    0.75277C( 90, 1)    0.66109C( 90, 1)    0.54118C(264, 1)
    230.0 /     0.58414 ( 88, 1)    0.56870C(293, 1)    0.51053 ( 88, 1)    0.47364 (340, 1)
    220.0 /     0.61178 ( 88, 1)    0.62750 ( 88, 1)    0.52518 ( 88, 1)    0.42845 ( 88, 1)
    210.0 /     0.58418C( 87, 1)    0.53729C(293, 1)    0.45478C(293, 1)    0.37073 (294, 1)
    200.0 /     0.49139C( 87, 1)    0.44371C(108, 1)    0.35597C(108, 1)    0.33135 (338, 1)
    190.0 /     0.41264 (325, 1)    0.45256 ( 11, 1)    0.47362 (289, 1)    0.43813 (289, 1)
    180.0 /     0.42448C( 44, 1)    0.41998C(172, 1)    0.39371C(236, 1)    0.32984C(172, 1)
    170.0 /     0.36474C(161, 1)    0.40952C( 15, 1)    0.38092C( 15, 1)    0.32208C( 15, 1)
    160.0 /     0.29591 (319, 1)    0.28163 ( 43, 1)    0.25412 ( 43, 1)    0.22966 ( 43, 1)
    150.0 /     0.49343C(246, 1)    0.40722C(119, 1)    0.32403C(204, 1)    0.28890 ( 43, 1)
    140.0 /     0.61716C(200, 1)    0.56140C(200, 1)    0.51671C(161, 1)    0.40649C(142, 1)
    130.0 /     0.58433 (112, 1)    0.56622C(103, 1)    0.49250C(103, 1)    0.39783C(103, 1)
    120.0 /     0.49255C(236, 1)    0.47526C(101, 1)    0.39645 (112, 1)    0.32560C( 92, 1)
    110.0 /     0.67994 (106, 1)    0.65765 (106, 1)    0.55015C(129, 1)    0.48880 (106, 1)
    100.0 /     0.95904C(129, 1)    0.84092C(129, 1)    0.74092C(229, 1)    0.61078C(229, 1)
     90.0 /     1.17222C(278, 1)    1.01707 (201, 1)    0.84035C(227, 1)    0.69774 (201, 1)
     80.0 /     0.93573C(230, 1)    0.73277C(278, 1)    0.60857C( 98, 1)    0.47492C(119, 1)
     70.0 /     0.95122C(196, 1)    0.81164C(277, 1)    0.58591C(277, 1)    0.44453C(163, 1)
     60.0 /     0.74346C(277, 1)    0.63596C(195, 1)    0.50230C(171, 1)    0.41172C(171, 1)
     50.0 /     0.55260C(198, 1)    0.49257C(250, 1)    0.37814C(250, 1)    0.34220C(  3, 1)
     40.0 /     0.45854C(199, 1)    0.49865C( 53, 1)    0.37824C(170, 1)    0.34637C(231, 1)
     30.0 /     0.79378C(240, 1)    0.55603C(240, 1)    0.41301C( 53, 1)    0.34023C( 53, 1)
     20.0 /     0.85373C(240, 1)    0.62070 (321, 1)    0.59880 (321, 1)    0.44306C(214, 1)
     10.0 /     0.59559C(214, 1)    0.48279C(181, 1)    0.35393C(206, 1)    0.29399C(206, 1)
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                                                                                      MAX 50
                                                                                      24-HR
                                                                                      SGROUP#  2
                   *** FLORIDA CRUSHED STONE CPL PLANT - MET  = TAMPA 1986          ***

                 * 50 MAXIMUM 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)      *

                                   * FROM SOURCES:        2,

                                  X      Y(METERS)                                           X      Y(METERS)
                                  OR        OR                                               OR        OR
                                RANGE   DIRECTION                                          RANGE   DIRECTION
     RANK      CON.      PER. DAY  (METERS)  (DEGREES)        RANK      CON.      PER. DAY  (METERS)  (DEGREES)
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

       1      1.31359C    1  230    2000.0      90.0          26      0.91873C    1  227    3000.0     100.0
       2      1.17222C    1  278    2000.0      90.0          27      0.91835C    1  157    2000.0      80.0
       3      1.16573C    1  214    2000.0      20.0          28      0.91165C    1  227    2000.0     100.0
       4      1.09903C    1  115    2000.0      70.0          29      0.89531C    1  278    3000.0      90.0
       5      1.07594C    1  188    2000.0     270.0          30      0.88872     1  328    3000.0     310.0
       6      1.06904     1  201    2000.0      90.0          31      0.88111C    1  115    3000.0      70.0
       7      1.05195C    1  230    3000.0      90.0          32      0.87818C    1  158    2000.0     100.0
       8      1.04983C    1  188    2000.0     260.0          33      0.87734     1  260    2000.0     260.0
       9      1.02588C    1  227    2000.0      90.0          34      0.87551C    1  214    3000.0      20.0
      10      1.01707     1  201    3000.0      90.0          35      0.86679     1  260    3000.0     250.0
      11      1.00392C    1  278    2000.0      80.0          36      0.86329     1  315    2000.0     280.0
      12      0.98397C    1  227    3000.0      90.0          37      0.85373C    1  240    2000.0      20.0
      13      0.98311C    1  158    2000.0      90.0          38      0.85137     1  201    4000.0      90.0
      14      0.97019     1  201    2000.0     100.0          39      0.84440     1  315    2000.0     290.0
      15      0.96413C    1  157    2000.0      90.0          40      0.84436     1  151    2000.0      80.0
      16      0.95904C    1  129    2000.0     100.0          41      0.84402C    1  142    2000.0     140.0
      17      0.95803     1  260    2000.0     250.0          42      0.84159C    1   98    3000.0      90.0
      18      0.95306C    1  158    3000.0      90.0          43      0.84092C    1  129    3000.0     100.0
      19      0.95122C    1  196    2000.0      70.0          44      0.84035C    1  227    4000.0      90.0
      20      0.94738C    1  157    3000.0      90.0          45      0.83679C    1   97    2000.0      60.0
      21      0.93573C    1  230    2000.0      80.0          46      0.83667     1  258    2000.0     250.0
      22      0.93259C    1  277    2000.0      70.0          47      0.83615C    1  229    3000.0     100.0
      23      0.92965C    1   98    2000.0      90.0          48      0.82556C    1  171    2000.0      70.0
      24      0.92406C    1  188    2000.0     280.0          49      0.82503C    1  171    2000.0      80.0
      25      0.92393C    1  214    2000.0      30.0          50      0.82019C    1  220    2000.0     300.0
```

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400
Lawton Chiles, Governor
Carol M. Browner, Secretary

FAX TRANSMITTAL LETTER

DATE: 3-29-91

TO:

NAME: Dr. John Koogler
AGENCY: Koogler & Associates

TELEPHONE: 904-377-7158

OF PAGES (INCLUDE COVER SHEET): 7

FROM:

NAME: Bruce Mitchell

AGENCY: FDER/DARM/BAR

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

SENDER'S NAME: Sam

COMMENTS: FCS wastewater treatment sludge project:

① January 18, 1991 letter (4 pages)

② February 26, 1991 letter (2 pages)

MESSAGE CONFIRMATION

MAR-29-'91 FRI 11:43

TERM ID: DIV OF AIR RES MGMT P-9999

TEL NO: 904-922-6979

NO.	DATE	ST.TIME	TOTAL TIME	ID	DEPT CODE	OK	NG
699	03-29	11:38	00°04'59	904 377 7158		07	00

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

KA 307-90-05

March 11, 1991

RECEIVED
MAR 15 1991
DER - BAQM

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

Subject: Florida Crushed Stone Company
CPL Plant, Brooksville, Florida
Permit AC27-118674 and PSD-FL-091
Use of By-product Materials as Cement Kiln Feed

Dear Mr. Fancy:

Following several meetings and discussions with your staff and written correspondence between representatives of the Florida Crushed Stone Company and your staff, the Department granted the Florida Crushed Stone Company approval to conduct performance tests using a non-hazardous wastewater sediment as a raw material supplement during the normal production of Portland cement. This approval was granted through an amendment to the subject permits, dated September 24, 1990.

The approval required Florida Crushed Stone to conduct emission measurements for several organic and inorganic compounds while the CPL plant was operating under normal conditions (a baseline test) and to conduct similar measurements while the CPL plant was operating under conditions similar to baseline conditions but with the non-hazardous wastewater sediment blended with the kiln feed. The baseline tests were conducted during the period September 18-24, 1990 and the tests with the wastewater sediment were conducted during the period October 31-November 2, 1990. Copies of both reports have been submitted to your office.

For review purposes, the CPL plant operating data and pertinent emission data from the baseline and wastewater sediment test periods are summarized in Attachment 1. From this summary, it will be observed that the plant operating conditions were similar during both periods and for the most part, the emission rates of various compounds discharged from the CPL stack were also similar. Volatile organic compound emissions, including benzene, appear to have been slightly greater during the baseline period than during the test period, while emissions of TCDD/TCPF emissions were in the same trace emission rate range during both periods. Semi-volatile organic compounds and pesticides were not measured in the stack gas during the test period, as no semi-volatile organic compounds nor pesticides were present in the wastewater sediment (see complete test report).

The emission rate of particulate matter during the wastewater sediment test period averaged 67.9 pounds per hour and ranged from 61.0 to 77.1 pounds per hour for the three individual test runs. During the baseline period, the particulate matter emission rate averaged 56.8 pounds per hour and ranged from 49.0 to 62.2 pounds per hour for the three individual test runs. To further evaluate the particulate matter emissions rates measured during the two test periods, additional particulate matter emission data collected during the period December 1988 through February 1991 were reviewed. The average particulate matter emission rate for all tests conducted during this period when the cement, power and lime plants were operating, was 55.65 pounds per hour with 90 percent of the measurements falling between 39.3 and 72.0 pounds per hour. The measured range of emission rates was from 33.5 to 77.1 pounds per hour; including the wastewater sediment tests. Thus, even though particulate matter emissions appeared somewhat higher during the wastewater sediment tests, the emissions are in the range of particulate matter emissions measured during normal plant operations.

The emission rates of seven of the metals measured during the two test periods are summarized in Attachment 1. The emission data that are summarized are for those metals for which the Department has adopted guidelines for ambient concentrations. The emission rates of all of the metals included in the summary, with the exception of mercury, were in the same range during both test periods. The apparent increase in mercury emissions during the wastewater sediment test period is difficult to interpret. During the baseline and wastewater sediment test periods, mercury concentrations were measured in the baghouse dusts, the kiln feed materials and in the wastewater sediment; as well as in the stack gas. Similar measurements for mercury were made during a test using tire-derived fuel in the CPL plant in September 1990. The results of all of these analyses for mercury are shown in Attachment 2. During all three test periods, the mercury levels in the kiln feed were in the range of 0.4-0.5 parts per million (by weight), the mercury concentration in the wastewater sediment was 0.4 parts per million and the mercury concentrations in the baghouse dusts were 2.1 parts per million. As the mercury levels in the baghouse dust, the kiln feed and the wastewater sediment were consistent during all three test periods, it is difficult to explain why mercury emissions should be higher during the wastewater sediment test period.

Another way of analyzing mercury emissions is to consider the fact that wastewater sediment was blended with kiln feed at the rate of 1.75 tons per hour. The mercury concentration in the wastewater sediment was 0.4 parts per million (by weight). The total amount of mercury in the sediment fed on an hourly basis would have been 0.001 pounds per hour (1.75 tph x 2000 lb/ton x 0.4 E-06 Hg conc.). Thus, the mercury emissions apparently increased from 0.04 pounds per hour during the baseline period to 0.38 pounds per hour during the wastewater test period, when only an additional 0.001 pounds per hour of mercury were added to the CPL plant system.

In reviewing the mercury emission limits that would apply to the CPL plant when incorporating wastewater sediment into the kiln feed (40CFR61, Subpart E), it is noted that there are two acceptable procedures for demonstrating compliance with the emission limiting standards. One method of demonstrating compliance is the use of EPA Test Method 101A, the stack testing procedure described in 40CFR60, Appendix B. The second method is a sediment sampling procedure in which the mercury concentration in the sediment is measured and the sediment charging rate is measured. Based on these two sediment measurements (corrected to a dry sediment basis) and the assumption that all mercury entering the system is discharged to the atmosphere, mercury emissions can be calculated to demonstrate compliance. In the case of the wastewater sediment test at CPL, the calculated increase in mercury emissions, as stated in the previous paragraph, would have been 0.001 pounds per hour.

Regarding baseline emissions, the mercury emission rate from the CPL plant stack measured during the baseline period was 0.04 pounds per hour and the emission rate measured under similar conditions but with tire derived fuel being used to supplement the coal fired to the cement kiln was 0.01 pounds per hour. These two emission rates are consistent with one another and are approximately 10 percent of the emission rate measured during the wastewater sediment tests.

Based on an analysis of all of the factors related to mercury emissions, the mercury emission rate reported for the wastewater sediment test period is suspiciously high. There is no apparent relationship between this emission rate and other plant operating conditions; including the use of the wastewater sediment as a raw material supplement.

An analysis of plant operating data and the emission data for the baseline test period and the wastewater sediment test period indicates that the blending of wastewater sediment as a raw material supplement for normal cement kiln feed material will have no significant change on either plant operating conditions or air pollutant emission rates. As a result of this analysis, Florida Crushed Stone is requesting an amendment to Air

Construction Permit AC27-118674 and to PSD-FL-091 to allow for the beneficial reuse of non-hazardous wastewater sediments as a raw material supplement during the production of Portland cement. The following conditions are proposed for the utilization of these substitute materials:

1. Material Classification

   All materials accepted for reuse as a raw material supplement by Florida Crushed Stone will be classified as RCRA nonhazardous (i.e., neither characteristically hazardous nor listed as hazardous by RCRA), and Florida nonhazardous.

   In accordance with a Department request, permits from two sources representing potential supplies of substitute materials are include as Attachments 3 and 4 to document the nonhazardous nature of materials that will be considered by Florida Crushed Stone.

2. Acceptance Criteria

   Samples will be collected from each new material and analyzed to determine the composition of material generated at the source. Only materials having a composition that conforms to the conditions of the amended permit will be shipped to Florida Crushed Stone for reuse.

3. Handling and Storage Requirements

   Florida Crushed Stone proposes to accept both rail and truck shipments of materials for beneficial reuse. The materials will be stored along with the other raw material at the plant in raw material storage areas. Some material will be stored in the limestone storage area and will be fed to the raw mill with the limestone. Other materials will be stored in separate piles.

   Nearly all of the substitute materials used at Florida Crushed Stone will be moist (typically 30-80+ percent moisture; see Attachment 5 for example) and therefore will not be a source of fugitive dust emissions. As added insurance, however, all of the substitute materials will be subject to the fugitive dust control practices now in-place at the plant. These practices include covered storage for most raw materials and wetting of open piles, as needed, to control fugitive dust generation from the storage areas.

   Any water runoff from the stored materials will be contained in the existing CPL plant water management system. As only nonhazardous substitute materials will be used, runoff from the materials will not pose a threat to water quality.

All raw materials (including the materials proposed for reuse under this amendment) will be transferred from the raw material storage area into several raw material feed silos using a reclaimer. Material from each of the feed silos will be metered onto a common feed conveyor and subsequently into the raw mill for mixing and grinding. The feed rate from each of the feed silos will be adjusted to produce a final mix of raw materials with the appropriate cement chemistry.

4. <u>Material Characteristics and Feed Rates</u>

Only materials with a leachable metals content below the hazardous level according to the TCLP extraction procedure will be used by Florida Crushed Stone. In addition, the composition of materials used by Florida Crushed Stone will comply with the following restrictions:

Constituent	Maximum Concentration
Total Organic Chlorine	0.2 percent
Total Oil and Grease	2 percent
Arsenic	1250 mg/kg (5000 mg/kg)*
Antimony	2000 mg/kg
Barium	1000 mg/kg
Cadmium	1000 mg/kg
Chromium +6	100 mg/kg
Lead	4900 mg/kg
Mercury	1000 mg/kg
Silver	2000 mg/kg
Thallium	1600 mg/kg

The metals concentration limits for the substitute materials were formulated using the air quality analysis that is included as Attachment 6. The levels were set to assure that guidelines established under the Florida air toxics policy will not be exceeded. In general, the limits have been set to provide an adequate margin of safety so as to insure negligible impact.

Total feed rate of materials shall not exceed five percent of the total raw material feed to the cement kiln or 6.25 tons per hour, whichever is less.

* Florida Crushed Stone proposes to accept materials with arsenic concentrations up to 5,000 mg/kg, but will restrict

materials with arsenic concentrations between 1,250 and 5,000 mg/kg to no more than one percent of the total raw material feed to the process or 1.25 tons per hour, whichever is less.

5. Testing and Recording Keeping Practices

Before a substitute material from a new source is used at Florida Crushed Stone, samples will be collected and analyzed to determine the materials composition. Materials from a new source will not be shipped to Florida Crushed Stone unless the composition is consistent with the conditions of this permit amendment. Florida Crushed Stone will also notify the Florida Department of Environmental Regulation of the proposed use of each material at least 30 days before shipments are received. The notification will include a description of the material, its source and material analysis.

Each truck load or rail car load of material received by Florida Crushed Stone will be sampled. Samples will be segregated by source. One composite sample will be generated and analyzed for each five hundred tons or fraction thereof received from each source.

Florida Crushed Stone will maintain a file on each material received for use. The file will include information on the source, chemical analysis, shipments received, and material usage information.

The concentration limits for metals in substitute materials that may be used by Florida Crushed Stone were established through air quality modeling. Acceptable ambient levels for metals were determined based on Department guidelines. Air quality modeling was then conducted to determine an emission limit that would assure compliance with the ambient guidelines. Once an emission limit was established for each metal, an acceptable concentration of each metal in the wastewater sediment was calculated assuming a wastewater sediment feed rate of 6.25 tons per hour (5 percent of the kiln feed rate) and the assumption that 10 percent of the metals contained in the wastewater sediment would be released to the atmosphere.

The air quality modeling was conducted with the ISC-ST model, Version 90346. Meteorological data used with the model were from Tampa representing calendar year 1984. The CPL plant was modeled under two sets of operating conditions; one with the cement, power and lime plants all operating and the second with the cement plant only operating. The stack parameters for the two scenarios are summarized in Attachment 6. All modeling was conducted with an arbitrary emission rate of 10.0 grams per second.

The results of the air quality modeling predicted that the maximum annual impact with the cement plant only operating would be 2.34 times greater than the impact with the cement, power and lime plants all operating. This greater impact with the cement plant only operating is expected as the stack gas flow rate and temperature are both lower under this operating condition. For establishing acceptable metals limits for the substitute materials, the assumption was made that the cement plant only would operate and that these conditions would persist for 8760 hours per year. These assumptions will introduce a safety factor of at least 2.0.

The estimate of the partitioning of the metals in the substitute materials that would result in 10 percent of these metals being discharged to the atmosphere is based on a comparison of emission rates of trace metals measured during the baseline and wastewater sediment test periods and the quantity of metals in the wastewater sediment fed to the kiln. These data are summarized in Attachment 7. The partitioning coefficients ranged from an estimated 15 percent for silver to a fraction of a percent or less for several metals. The establishment of a representative partitioning coefficient was difficult as some of the emission rates were reported at the lower limit of detection and, in some cases, the emission rate of a metal during the wastewater sediment test was lower than the emission rate measured during the baseline period. Considering the limited data available, a review of the information summarized in Attachment 7 would indicate that the partitioning of 10 percent of the metals in the wastewater sediment to the stack gas is reasonably conservative.

Based on the results of the air quality modeling, the estimate of a partitioning coefficient and the other factors address herein, maximum acceptable concentrations of metals in a substitute material were calculated. Both the method of calculation and a summary of the maximum acceptable concentrations are presented in Attachment 6. The metals limits proposed in suggested condition No. 4 (above) are, with the exception of arsenic, well below the maximum acceptable limits summarized in Attachment 6. It should be remembered also that an additional factor of safety of at least 2.0 is incorporated in all calculations as a result of assumptions regarding plant operating conditions.

The suggested limits for chlorinated organic compounds and oil and grease are best estimates of the maximum concentrations of these materials that may be encountered. It is the intent of Florida Crushed Stone to minimize the concentrations of these compounds in substitute materials. Analyses performed on water and wastewater sediments evaluated to this point in time have indicated less than detectable quantities of chlorinated organic compounds and only trace amounts of oil and grease have been encountered.

Recognizing that it is not practical to place zero limits on oil and grease or chlorinated organic compounds, the limits of 2.0 percent and 0.2 percent, respectively, are suggested.

Florida Crushed Stone requests that the amended permit allow for the beneficial reuse of materials that meet the classification and composition requirements contained herein but that the substitute materials not be described as, or limited to, water or wastewater sediments or precipitates. The information presented herein demonstrates that nonhazardous substitute materials can be blended with the normal kiln feed without altering plant operating conditions or increasing air pollutant emission rates. It is also apparent that the acceptability of the substitute material will be a function of the composition of the material rather than its classification (as water or wastewater sediment, e.g.).

Florida Crushed Stone believes that the restrictions suggested herein are sufficient to assure that the use of any material meeting these restrictions will pose no threat to the environment. If there are any questions regarding the information transmitted herewith or if additional information is required, please do not hesitate to contact me.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:mab
Enc.

cc: Bruce Mitchell, FDER, Tallahassee
Tom Mountain, Florida Crushed Stone/CPL
Dan Davis, Radian Corporation

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

KA 307-90-05

March 11, 1991

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

Subject: Florida Crushed Stone Company
CPL Plant, Brooksville, Florida
Permit AC27-118674 and PSD-FL-091
Use of By-product Materials as Cement Kiln Feed

Dear Mr. Fancy:

Following several meetings and discussions with your staff and written correspondence between representatives of the Florida Crushed Stone Company and your staff, the Department granted the Florida Crushed Stone Company approval to conduct performance tests using a non-hazardous wastewater sediment as a raw material supplement during the normal production of Portland cement. This approval was granted through an amendment to the subject permits, dated September 24, 1990.

The approval required Florida Crushed Stone to conduct emission measurements for several organic and inorganic compounds while the CPL plant was operating under normal conditions (a baseline test) and to conduct similar measurements while the CPL plant was operating under conditions similar to baseline conditions but with the non-hazardous wastewater sediment blended with the kiln feed. The baseline tests were conducted during the period September 18-24, 1990 and the tests with the wastewater sediment were conducted during the period October 31-November 2, 1990. Copies of both reports have been submitted to your office.

For review purposes, the CPL plant operating data and pertinent emission data from the baseline and wastewater sediment test periods are summarized in Attachment 1. From this summary, it will be observed that the plant operating conditions were similar during both periods and for the most part, the emission rates of various compounds discharged from the CPL stack were also similar. Volatile organic compound emissions, including benzene, appear to have been slightly greater during the baseline period

PM/PM10
Actuals
: 67.9 vs 56.8
11.1 lbs/hr ↑
48.62 TPY ↑
potential

than during the test period, while emissions of TCDD/TCPF emissions were in the same trace emission rate range during both periods. Semi-volatile organic compounds and pesticides were not measured in the stack gas during the test period, as no semi-volatile organic compounds nor pesticides were present in the wastewater sediment (see complete test report).

The emission rate of particulate matter during the wastewater sediment test period averaged 67.9 pounds per hour and ranged from 61.0 to 77.1 pounds per hour for the three individual test runs. During the baseline period, the particulate matter emission rate averaged 56.8 pounds per hour and ranged from 49.0 to 62.2 pounds per hour for the three individual test runs. To further evaluate the particulate matter emissions rates measured during the two test periods, additional particulate matter emission data collected during the period December 1988 through February 1991 were reviewed. The average particulate matter emission rate for all tests conducted during this period when the cement, power and lime plants were operating, was 55.65 pounds per hour with 90 percent of the measurements falling between 39.3 and 72.0 pounds per hour. The measured range of emission rates was from 33.5 to 77.1 pounds per hour; including the wastewater sediment tests. Thus, even though particulate matter emissions appeared somewhat higher during the wastewater sediment tests, the emissions are in the range of particulate matter emissions measured during normal plant operations.

The emission rates of seven of the metals measured during the two test periods are summarized in Attachment 1. The emission data that are summarized are for those metals for which the Department has adopted guidelines for ambient concentrations. The emission rates of all of the metals included in the summary, with the exception of mercury, were in the same range during both test periods. The apparent increase in mercury emissions during the wastewater sediment test period is difficult to interpret. During the baseline and wastewater sediment test periods, mercury concentrations were measured in the baghouse dusts, the kiln feed materials and in the wastewater sediment; as well as in the stack gas. Similar measurements for mercury were made during a test using tire-derived fuel in the CPL plant in September 1990. The results of all of these analyses for mercury are shown in Attachment 2. During all three test periods, the mercury levels in the kiln feed were in the range of 0.4-0.5 parts per million (by weight), the mercury concentration in the wastewater sediment was 0.4 parts per million and the mercury concentrations in the baghouse dusts were 2.1 parts per million. As the mercury levels in the baghouse dust, the kiln feed and the wastewater sediment were consistent during all three test periods, it is difficult to explain why mercury emissions should be higher during the wastewater sediment test period.

Mercury

0.04 lbs/hr vs 0.38

∴ 0.34 x 8760 =

2978.4 lbs/yr

significant level:
200 lbs/yr

Another way of analyzing mercury emissions is to consider the fact that wastewater sediment was blended with kiln feed at the rate of 1.75 tons per hour. The mercury concentration in the wastewater sediment was 0.4 parts per million (by weight). The total amount of mercury in the sediment fed on an hourly basis would have been 0.001 pounds per hour (1.75 tph x 2000 lb/ton x 0.4 E-06 Hg conc.). Thus, the mercury emissions apparently increased from 0.04 pounds per hour during the baseline period to 0.38 pounds per hour during the wastewater test period, when only an additional 0.001 pounds per hour of mercury were added to the CPL plant system.

In reviewing the mercury emission limits that would apply to the CPL plant when incorporating wastewater sediment into the kiln feed (40CFR61, Subpart E), it is noted that there are two acceptable procedures for demonstrating compliance with the emission limiting standards. One method of demonstrating compliance is the use of EPA Test Method 101A, the stack testing procedure described in 40CFR60, Appendix B. The second method is a sediment sampling procedure in which the mercury concentration in the sediment is measured and the sediment charging rate is measured. Based on these two sediment measurements (corrected to a dry sediment basis) and the assumption that all mercury entering the system is discharged to the atmosphere, mercury emissions can be calculated to demonstrate compliance. In the case of the wastewater sediment test at CPL, the calculated increase in mercury emissions, as stated in the previous paragraph, would have been 0.001 pounds per hour.

Regarding baseline emissions, the mercury emission rate from the CPL plant stack measured during the baseline period was 0.04 pounds per hour and the emission rate measured under similar conditions but with tire derived fuel being used to supplement the coal fired to the cement kiln was 0.01 pounds per hour. These two emission rates are consistent with one another and are approximately 10 percent of the emission rate measured during the wastewater sediment tests.

Based on an analysis of all of the factors related to mercury emissions, the mercury emission rate reported for the wastewater sediment test period is suspiciously high. There is no apparent relationship between this emission rate and other plant operating conditions; including the use of the wastewater sediment as a raw material supplement.

An analysis of plant operating data and the emission data for the baseline test period and the wastewater sediment test period indicates that the blending of wastewater sediment as a raw material supplement for normal cement kiln feed material will have no significant change on either plant operating conditions or air pollutant emission rates. As a result of this analysis, Florida Crushed Stone is requesting an amendment to Air

ground water
contamination
potential -
other Dept. permits
required?

Construction Permit AC27-118674 and to PSD-FL-091 to allow for the beneficial reuse of non-hazardous wastewater sediments as a raw material supplement during the production of Portland cement. The following conditions are proposed for the utilization of these substitute materials:

1. Material Classification

   All materials accepted for reuse as a raw material supplement by Florida Crushed Stone will be classified as RCRA nonhazardous (i.e., neither characteristically hazardous nor listed as hazardous by RCRA), and Florida nonhazardous.

   In accordance with a Department request, permits from two sources representing potential supplies of substitute materials are include as Attachments 3 and 4 to document the nonhazardous nature of materials that will be considered by Florida Crushed Stone.

2. Acceptance Criteria

   Samples will be collected from each new material and analyzed to determine the composition of material generated at the source. Only materials having a composition that conforms to the conditions of the amended permit will be shipped to Florida Crushed Stone for reuse.

3. Handling and Storage Requirements

   Florida Crushed Stone proposes to accept both rail and truck shipments of materials for beneficial reuse. The materials will be stored along with the other raw material at the plant in raw material storage areas. Some material will be stored in the limestone storage area and will be fed to the raw mill with the limestone. Other materials will be stored in separate piles.

   Nearly all of the substitute materials used at Florida Crushed Stone will be moist (typically 30-80+ percent moisture; see Attachment 5 for example) and therefore will not be a source of fugitive dust emissions. As added insurance, however, all of the substitute materials will be subject to the fugitive dust control practices now in-place at the plant. These practices include covered storage for most raw materials and wetting of open piles, as needed, to control fugitive dust generation from the storage areas.

   Any water runoff from the stored materials will be contained in the existing CPL plant water management system. As only nonhazardous substitute materials will be used, runoff from the materials will not pose a threat to water quality.

All raw materials (including the materials proposed for reuse under this amendment) will be transferred from the raw material storage area into several raw material feed silos using a reclaimer. Material from each of the feed silos will be metered onto a common feed conveyor and subsequently into the raw mill for mixing and grinding. The feed rate from each of the feed silos will be adjusted to produce a final mix of raw materials with the appropriate cement chemistry.

4. Material Characteristics and Feed Rates

Only materials with a leachable metals content below the hazardous level according to the TCLP extraction procedure will be used by Florida Crushed Stone. In addition, the composition of materials used by Florida Crushed Stone will comply with the following restrictions:

Constituent	Maximum Concentration
Total Organic Chlorine	0.2 percent
Total Oil and Grease	2 percent
Arsenic	1250 mg/kg (5000 mg/kg)*
Antimony	2000 mg/kg
Barium	1000 mg/kg
Cadmium	1000 mg/kg
Chromium +6	100 mg/kg
Lead	4900 mg/kg
Mercury	1000 mg/kg
Silver	2000 mg/kg
Thallium	1600 mg/kg

The metals concentration limits for the substitute materials were formulated using the air quality analysis that is included as Attachment 6. The levels were set to assure that guidelines established under the Florida air toxics policy will not be exceeded. In general, the limits have been set to provide an adequate margin of safety so as to insure negligible impact.

Total feed rate of materials shall not exceed five percent of the total raw material feed to the cement kiln or 6.25 tons per hour, whichever is less.

* Florida Crushed Stone proposes to accept materials with arsenic concentrations up to 5,000 mg/kg, but will restrict

Why?
6.25 vs 1.75 TPH feed rate!

materials with arsenic concentrations between 1,250 and 5,000 mg/kg to no more than one percent of the total raw material feed to the process or 1.25 tons per hour, whichever is less.

5. Testing and Recording Keeping Practices

Before a substitute material from a new source is used at Florida Crushed Stone, samples will be collected and analyzed to determine the materials composition. Materials from a new source will not be shipped to Florida Crushed Stone unless the composition is consistent with the conditions of this permit amendment. Florida Crushed Stone will also notify the Florida Department of Environmental Regulation of the proposed use of each material at least 30 days before shipments are received. The notification will include a description of the material, its source and material analysis.

Each truck load or rail car load of material received by Florida Crushed Stone will be sampled. Samples will be segregated by source. One composite sample will be generated and analyzed for each five hundred tons or fraction thereof received from each source.

Florida Crushed Stone will maintain a file on each material received for use. The file will include information on the source, chemical analysis, shipments received, and material usage information.

The concentration limits for metals in substitute materials that may be used by Florida Crushed Stone were established through air quality modeling. Acceptable ambient levels for metals were determined based on Department guidelines. Air quality modeling was then conducted to determine an emission limit that would assure compliance with the ambient guidelines. Once an emission limit was established for each metal, an acceptable concentration of each metal in the wastewater sediment was calculated assuming a wastewater sediment feed rate of 6.25 tons per hour (5 percent of the kiln feed rate) and the assumption that 10 percent of the metals contained in the wastewater sediment would be released to the atmosphere.

The air quality modeling was conducted with the ISC-ST model, Version 90346. Meteorological data used with the model were from Tampa representing calendar year 1984. The CPL plant was modeled under two sets of operating conditions; one with the cement, power and lime plants all operating and the second with the cement plant only operating. The stack parameters for the two scenarios are summarized in Attachment 6. All modeling was conducted with an arbitrary emission rate of 10.0 grams per second.

The results of the air quality modeling predicted that the maximum annual impact with the cement plant only operating would be 2.34 times greater than the impact with the cement, power and lime plants all operating. This greater impact with the cement plant only operating is expected as the stack gas flow rate and temperature are both lower under this operating condition. For establishing acceptable metals limits for the substitute materials, the assumption was made that the cement plant only would operate and that these conditions would persist for 8760 hours per year. These assumptions will introduce a safety factor of at least 2.0.

The estimate of the partitioning of the metals in the substitute materials that would result in 10 percent of these metals being discharged to the atmosphere is based on a comparison of emission rates of trace metals measured during the baseline and wastewater sediment test periods and the quantity of metals in the wastewater sediment fed to the kiln. These data are summarized in Attachment 7. The partitioning coefficients ranged from an estimated 15 percent for silver to a fraction of a percent or less for several metals. The establishment of a representative partitioning coefficient was difficult as some of the emission rates were reported at the lower limit of detection and, in some cases, the emission rate of a metal during the wastewater sediment test was lower than the emission rate measured during the baseline period. Considering the limited data available, a review of the information summarized in Attachment 7 would indicate that the partitioning of 10 percent of the metals in the wastewater sediment to the stack gas is reasonably conservative.

Based on the results of the air quality modeling, the estimate of a partitioning coefficient and the other factors address herein, maximum acceptable concentrations of metals in a substitute material were calculated. Both the method of calculation and a summary of the maximum acceptable concentrations are presented in Attachment 6. The metals limits proposed in suggested condition No. 4 (above) are, with the exception of arsenic, well below the maximum acceptable limits summarized in Attachment 6. It should be remembered also that an additional factor of safety of at least 2.0 is incorporated in all calculations as a result of assumptions regarding plant operating conditions.

The suggested limits for chlorinated organic compounds and oil and grease are best estimates of the maximum concentrations of these materials that may be encountered. It is the intent of Florida Crushed Stone to minimize the concentrations of these compounds in substitute materials. Analyses performed on water and wastewater sediments evaluated to this point in time have indicated less than detectable quantities of chlorinated organic compounds and only trace amounts of oil and grease have been encountered.

? ? ?

No blanket for
material acceptability.

Recognizing that it is not practical to place zero limits on oil and grease or chlorinated organic compounds, the limits of 2.0 percent and 0.2 percent, respectively, are suggested.

Florida Crushed Stone requests that the amended permit allow for the beneficial reuse of materials that meet the classification and composition requirements contained herein but that the substitute materials not be described as, or limited to, water or wastewater sediments or precipitates. The information presented herein demonstrates that nonhazardous substitute materials can be blended with the normal kiln feed without altering plant operating conditions or increasing air pollutant emission rates. It is also apparent that the acceptability of the substitute material will be a function of the composition of the material rather than its classification (as water or wastewater sediment, e.g.).

Florida Crushed Stone believes that the restrictions suggested herein are sufficient to assure that the use of any material meeting these restrictions will pose no threat to the environment. If there are any questions regarding the information transmitted herewith or if additional information is required, please do not hesitate to contact me.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:mab
Enc.

cc: Bruce Mitchell, FDER, Tallahassee
Tom Mountain, Florida Crushed Stone/CPL
Dan Davis, Radian Corporation

ATTACHMENT 1

SUMMARY OF PLANT OPERATING CONDITIONS AND EMISSION DATA FOR BASELINE AND WWS(1) TEST PERIODS

FLORIDA CRUSHED STONE COMPANY
CPL PLANT
BROOKSVILLE, FLORIDA

	Baseline	WWS Test
Date	Sept. 18-24, 1990	Oct. 31-Nov 2, 1990
Plant Conditions		
Cement Plant		
Kiln Feed Rate (tph)	132	128
WWS Feed Rate (tph)	0	1.75
Clinker Production (tph)	80	76
Coal Firing Rate (tph)	8.5	8.5
Power/Lime Plants		
Elect. Power Generator (MW)	110	110
Lime Production (tph)	11	11
Stack Gas Flow/Characteristics		
Flow Rate (dscfm)	637713	603670
Temperature ($^{\circ}$F)	385	390
Moisture (%)	7.2	7.2
Oxygen (%)	10.4	10.1
Emission Data		
Particulate Matter (lb/hr)	(62.2/59.2/49.0) = 56.8	(65.8/77.1/61.0) = 67.9
Volatile Organic Compounds		
Total (lb/hr)	0.15	0.010
Benzene (lb/hr)	0.08	0.005
TCDD/TCDF(2)	0.000000054	0.000000048
Metals (lb/hr)		
Arsenic	<0.004	0.005
Barium	0.02	0.065
Cadmium	<0.005	0.003
Chromium (Total)	0.02	0.030
Lead	0.13	0.127
Mercury	0.04	0.383
Silver	<0.009	<0.016

---

(1) WWS - Wastewater sediment test

(2) TCDD/TCDF - Total dioxins and furans reported as 2378-TCDD based on toxicity equivalency from EPA publication EPA/625/3-87/012, March 1987, pg. 11.

ATTACHMENT 2

ppb
ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

KOOGLER AND ASSOCIATES,INC.
4014 NW 13TH STREET
GAINESVILLE, FL 32609-

DATE: 12/14/90
DHRS # 82282, E82001
YOUR REF/P.O.: FL CR STONE

Attn: MR. MASON JOYE

KOOGLER SAMPLES RECEIVED DECEMBER 3, 1990. (Page 2 of 4)

CLIENT STATION ID	LAB NUMBER	CO/S/AA ug/g	CU/S/ICP ug/g	FE/S/ICP ug/g	PB/S/ICP ug/g	MG/S/ICP ug/g	HG/S/CVAA ug/g
BL BAG DUST	44509	<1.7	23	8130	75	2600	2.1
BL KILN FEED	44510	2.5	16	9230	60	2460	0.4
TDF BAG DUST	44511	1.9	23	9660	89	2640	2.1
TDF KILN FEED	44512	2.5	15	8920	60	2420	0.4
WWT BAG DUST	44513	3.6	28	7770	80	2850	2.1
WWT KILN FEED	44514	2.2	26	11400	51	2270	0.5
WWT SLUDGE	44515	82	395	59100	103	37800	0.4

ALL METALS REPORTED ON DRY WEIGHT BASIS.

PROJECT MANAGER Tom Park

BL - Baseline Test
TDF - Tire Derived Fuel Test
WWT - Wastewater Sediment Test

Mercury Concentrations in Baghouse Dust, Kiln Feed Material and Wastewater Sediment

ATTACHMENT 3

City of Tampa's Permit Issued by the Florida Department of Environmental Regulation Covering Land Disposal of the Water Treatment Sediment

Florida Department of Environmental Regulation

Southwest District ● 4520 Oak Fair Boulevard ● Tampa, Florida 33610-7347 ● 813-623-5561

Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary
Dr. Richard Garrity, Deputy Assistant Secretary

December 14, 1989

Mr. Mark Hook
Tampa Water Department
7125 North 30th Street
Tampa, Florida 33610

Re: Old Manhattan Landfill Alum Residual Disposal
Surface Water Management System and Closure Permit
No.: SO29-155266, Hillsborough County

Dear Mr. Hook:

The FDER has no objections to the proposed surface water management system and closure designs submitted November 9, 1989. However, the plans and the report must be resubmitted, sealed by a professional engineer for approval. Upon approval by both FDER and the Southwest Florida Water Management District, you should begin construction of the surface water management system.

Closure is not approved at this time. A closure permit application is required 90 days prior to no longer using active portions of the landfill, as is required by specific condition #34 of the permit and Department rules.

If you have any questions, please call me at extension 382.

Sincerely,

Kim B. Ford, P.E.
Solid Waste Section
Division of Waste Management

KBF/ab

cc: Phil Davidson, P.E., SWFWMD
Paul Schipfer, HCEPC
Richard Gibney, P.E., Florida Land Design

RECEIVED
DEC 06 1989
WATER PRODUCTION

GENERAL CONDITIONS

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and are binding and enforceable pursuant to the authority of Section 403.141, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.

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

3. As provided in Subsections 403.087(6) and 403.712(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor infringement of federal, state or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.

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

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

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

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

GENERAL CONDITIONS (con't):

7. (con't):
a. Have access to and copy any records that must be kept under the conditions of the permit;

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

c. Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or department rules.

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

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department (17-6.130) with the following information:

(a) a description of and cause of noncompliance; 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.

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 involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Section 403.73 and 403.111, Florida Statutes. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedures and appropriate evidentiary rules.

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

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

GENERAL CONDITIONS (con't):

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

13. This permit also constitutes:

( ) Determination of Best Available Control Technology (BACT)

( ) Determination of Prevention of Significant Deterioration (PSD)

( ) Certification of Compliance with State Water Quality Standards (Section 401. PL 92-500)

( ) Compliance with New Source Performance Standards

14. The permittee shall comply with the following:

a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enfocement actions, the retention period for all records will be extended automatically, unless otherwise stipulated by the Department.

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. These materials shall be retained at least three years from the date of the sample, measurement, report or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurement;
- 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.

Florida Department of Environmental Regulation

Southwest District ● 4520 Oak Fair Boulevard ● Tampa, Florida 33610-7347 ● 813-623-5561

Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary
Richard Garrity, Deputy Assistant Secretary

RECEIVED
JAN 3 1989
WATER DEPARTMENT

DEC 29 1988

NOTICE OF PERMIT

Mr. David L. Tippin, P.E.
City of Tampa Water Department
306 E. Jackson Street, 5E
Tampa, Florida 33602

Re: Old Manhattan Avenue
Class I Sanitary Landfill

Dear Mr. Tippin:

Enclosed is Permit Number SO29-155266 to operate the solid waste Class I Sanitary Landfill, issued pursuant to Section(s) 403.087(1), Florida Statutes.

Any party of this Order (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 Apellate 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 Notice is filed with the Clerk of the Department

Executed in Tampa, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

Kim B. Ford, P.E.
Solid Waste Section
Division of Waste Management

KBF/ab

cc: Richard Donelan, OGC Tallahassee
John Reese, DER Tallahassee
Paul Schipfer, HCEPC

Florida Department of Environmental Regulation

Southwest District • 4520 Oak Fair Boulevard • Tampa, Florida 33610-7347 • 813-623-5561

Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary
Richard Garrity, Deputy Assistant Secretary

PERMITTEE
Mr. David L. Tippin, P.E.
City of Tampa Water Department
306 E. Jackson Street, 5E
Tampa, Florida 33602

PERMIT/CERTIFICATION
GMS ID No: 4029M00043
Permit No: SO29-155266
Date of Issue: DEC 29 1988
Expiration Date: 10/1/90
County: Hillsborough
Lat/Long: 27°51'30"
82°31'15"
Sec/Town/Rge: 20/30S/18E
Project: Old Manhattan Avenue Class I Sanitary Landfill

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 17-3, 17-4, 17-7 and 17-25. 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 department and made a part hereof and specifically described as follows:

To operate a solid waste Class I sanitary landfill (approximately 20 acres), referred to as Old Manhattan Avenue Class I Sanitary Landfill, subject to the specific conditions attached, disposing of alum residual material, near Manhattan Avenue and one half mile south of Chisholm Street, near MacDill Air Force Base, in south Tampa, Hillsborough County, Florida.

Replaces Permit No.: (new)

SPECIFIC CONDITIONS:

1. This site shall be classified as a Class I landfill, and shall be operated and closed in accordance with all applicable requirements of Chapters 17-3, 17-4, 17-7 and 17-25, Florida Administrative Code.

2. If normal operations are interrupted for a period greater than twenty-four (24) hours due to primary and/or back up equipment failure, written notification must be made to the Hillsborough County Environmental Protection Commission Director giving estimated time needed to repair the equipment and resume normal operations.

3. The operating authority shall be responsible for the control of odors and fugutive particulates arising from this operation. Such control shall prevent the creation of these nuisance conditions on adjoining property. Landfilling the alum residual material without daily cover is acceptable unless the Department determines otherwise. Portions of the landfill which have been filled shall be closed in accordance with all applicable requirements of Department rules. Landfilling operations shall minimize the size of the active portions of the landfill and shall maximize closure at the earliest possible time.

4. There shall be no open burning at this site. Any accidental fires which require longer than one (1) hour to extinguish must be promptly reported to the Department of Environmental Regulation or Hillsborough County Environmental Protection Commission.

5. The permittee shall not allow the disposal of hazardous waste at this site. Hazardous waste is a solid waste identified by the Department as a hazardous waste in Chapter 17-30, Florida Administrative Code. No solid waste, other than the waste described in the permit application and produced by the Hillsborough River Water Treatment Plant, shall be accepted or allowed to be disposed of at this landfill.

6. The landfill shall have a surface water management system designed, constructed, operated, and maintained to prevent surface water flow onto waste filled areas, and a stormwater runoff control system designed, constructed, operated and maintained to collect and control stormwater to meet requirements of Florida Administrative Code Rule 17-25 and requirements of the respective water management district. Adequate design plans and calculations shall be provided within 90 days following issuance of this permit or the permittee shall discontinue operation and submit a closue permit application. The landfill owner or operator shall receive approvals of the design prior to construction of systems. After construction has been completed, the engineer or authorized public officer shall complete a Certification of Construction Completion, Department Form 17-7.130(2). "As built" drawings should be submitted to the Department.

SPECIFIC CONDITIONS (cont'd)

7. Stormwater or other surface water which comes into contact with the solid waste or mixed with leachate shall be considered leachate, and shall be treated to meet applicable standards of Florida Administrative Code Rules 17-3 and 7-4 prior to discharge from the site. To assure that all discharges are free from leachate contamination, water quality sampling shall be provided by the permittee quarterly.

Aluminum
Iron
Phosphorus (elemental)
TKN
TOC
TDS
TSS
DO
pH
Temperature
Specific Conductance
Rainfall (inches)

Based upon the results of the analysis, the Department may require further testing in order to assure compliance with all Department rules and regulations.

8. The permittee shall make every effort to insure that surface waters are not contaminated by the waste disposal practices. To assure that all surface waters are free from leachate contamination, the permittee shall sample the surface waters prior to waste disposal and annually thereafter for the parameters listed in Florida Administrative Code Rules 17-3.061, 17-3.111, and 17-3.121, except that sampling for the pesticides and herbicides will not be required. The results of the analysis shall be submitted to the Department within 60 days following the sampling, along with an evaluation of the results and an assessment of the effectiveness of the landfill design and operation as relates to the prevention of surface water contamination. Any surface water contamination that may exist shall be addressed as part of the landfill assessment. The surface waters to be sampled may include those within the site or adjacent to the site, whichever may be affected by the waste disposal. The surface waters shall be sampled at a common discharge point approved by the Department. Based upon the results of the analysis, the Department may require further testing in order to assure compliance with all Department rules and regulations.

9. At least 30 days prior to performance of any sampling or analysis as required by this permit, a specific Permit Quality Assurance Plan shall be submitted to and approved by the Quality Assurance Section of the Department. The plan shall be required

Specific Conditions (cont'd)

from all persons performing sampling or analysis, or installation of monitoring wells, and shall be prepared in accordance with requirements described in 'DER Guidelines for Preparing Quality Assurance Plans, DER-QA-001/85", and shall be followed by all persons collecting or analyzing samples, or installing monitoring wells related to this permit. The permittee shall submit verification that such plan is approved, prior to performance of any sampling or analysis or installation of monitoring wells as required by this permit.

10. Within the first 60 days of disposal activities and quarterly thereafter, the permittee shall sample and test the sludge as follows:

Parameter	Units
Total Nitrogen	percent
Total Phosphorus	percent
Total Potassium	percent
Cadmium	mg/kg
Copper	mg/kg
Lead	mg/kg
Nickel	mg/kg
Zinc	mg/kg
pH	std. units
Solids	percent

Based upon the results of the analysis, the Department may require further testing in order to assure compliance with all Department rules and regulations.

11. All sludge to be disposed of shall be dewatered to a content of 50 percent or greater solids (by weight) before acceptance at the site. Florida Administrative Code Rule 17-7.540, "Criteria for Land Application or Disposal of Domestic Wastewater Treatment Sludge" and EPA 625/1-79-011, "Process Design Manual for Sludge, Treatment and Disposal", should be used as guidance for disposal activities.

12. The permittee shall not violate the prohibitions of Florida Administrative Code Rule 17-7.040. Prior to waste disposal, the permittee shall submit verification to the Department that it has been determined by the Federal Aviation Administration, the Florida Department of Transportation, or other appropriate federal or state agency charged with preventing airport hazards, that the proposed solid waste facility poses no safety hazards, that the proposed solid waste facility poses no safety hazards to aircraft in the vicinity.

Specific Conditions (cont'd)

13. The general public shall be restricted from the sludge disposal area for a period of 12 months after final acceptance of sludge.

14. The sludge disposal area shall be located no closer than 3,000 feet from any Class I water body or 200 feet from any other natural or artifical body of water, except canals used for irrigation purposes or bodies of water completely within the site which do not discharge from the site. The sludge disposal area shall be located no closer than 300 feet from shallow private water supply wells, and occupied building (residences, offices, manufacturing facilities, etc.). The sludge disposal area shall be located no closer than 500 feet from public water supply wells.

15. Topographical grades must be six percent or less before and after sludge disposal.

16. Stormwater runoff generated by storms up to a 10-year 1-hour event shall be prevented from entering or leaving the sludge land application area. Berms shall be placed for this purpose, if necessary. Within 30 days of issuance of this permit and prior to waste disposal, an adequate plan for the construction and maintenance of berms shall be submitted to the Department. The plan shall include the design, calculations, and other supporting information to demonstrate compliance.

17. Waste shall not be disposed of within 500 feet of any groundwater monitoring well for the first 270 days of waste disposal activities. Within the first 270 days of waste disposal activities, the permittee shall submit an evaluation of the Groundwater Monitoring Plan as per F.A.C. Rule 17-7.050(3)(e). The evaluation shall include all applicable information as required by F.A.C. Rule 17-4.245(6), and shall include an assessment of the effectiveness of the existing landfill design and operation as relates to the prevention of groundwater contamination. Any groundwater contamination that may exist, shall be addressed as part of a groundwater investigation for the landfill assessment. As part of the groundwater investigation, the permittee shall sample all groundwater monitor wells for the Primary and Secondary Drinking Water parameters included in Chapter 17-22, Florida Administrative Code, Public Drinking Water Systems and for the EPA Priority Pollutants. The specific primary and secondary parameters to be sampled and analyzed for are the Primary [17-22.210], and Secondary [17-22.220] Drinking Water Standards listed in Part II, Quality Standards, Analytical Methods, Sampling. The Groundwater Monitoring Plan shall be adequate to monitor any modifications to the existing landfill site. The results from the initial sampling efforts may be used for the groundwater investigation, however, the results from two quarterly sampling efforts shall be included as part of the groundwater investigation.

Specific Conditions (cont'd)

18. In accordance with Chapter 17-4, Florida Administrative Code (F.A.C.), the Groundwater Monitoring System shall be constructed by the permittee within ninety (90) days of the issuance of this permit and prior to the facility going into operation.

19. The Groundwater Monitoring System shall be designed and constructed by the permittee in accordance with the plans submitted on October 25, 1988 by the City of Tampa and revised information listed below.

The groundwater monitoring wells shall be tentatively located as follows:

Well Number	Aquifer	Location
MW-1	Surficial	300' south of the northwest corner of the site.
MW-2	Surficial	100' east of the southwest corner of the site.
MW-3	Surficial (background)	200' south of the northeast corner of the site.

A surveyed drawing shall be submitted showing the location of all monitoring wells (active and abandoned) which will be horizontally located by metes and bounds or equivalent surveying techniques. The surveyed drawing shall include the monitor well identification number as well as location and elevation of all permanent benchmark(s) and/or corner monument marker(s) at the site. The survey shall be conducted by a Florida Registered Surveyor. All wells are to be clearly labelled and easily visible at all times.

20. Upon completion of construction of the groundwater monitoring wells, the following information shall be submitted for all groundwater monitoring wells and any new well(s) constructed:

Well identification
Latitude/Longitude
Aquifer monitored
Screen type and slot size
Elevation at top of pipe
Elevation at land surface
Driller's Lithologic Log
Total depth of well
Casing diameter
Casing type and length
SWFWMD well construction permit numbers

21. Upon completion of construction of the groundwater monitoring system, the permittee shall sample all groundwater monitor wells for the Primary and Secondary Drinking Water parameters included in Chapter 17-22, Florida Administrative Code, Public Drinking Water Systems, fecal coliform, EPA Method 601, 602, and 608. The specific parameters for the Primary (17-22.210) and Secondary

Specific Conditions (cont'd)

(17-22.220) Drinking Water Standards are listed in Part II, Quality Standards, Analytical Methods, Sampling, 11/19/87 Revision.

22. All groundwater monitor wells shall be sampled quarterly for the following parameters. However, additional samples, wells, and parameters may be required based upon subsequent analyses.

PRIMARY STANDARDS	UNITS
Nitrate	mg/L
Sodium	mg/L
Turbidity	NTU

SECONDARY STANDARDS	UNITS
Chloride	mg/L
Total Dissolved Solids (TDS)	mg/L
pH	std. units
Copper	mg/L
Color	PTU
Iron	mg/L
Manganese	mg/L
Sulfate	mg/L
Zinc	mg/L
Foaming Agents(MBAS)	Lang. Index
Odor	

OTHERS	UNITS
Chemical Oxygen Demand	mg/L
Temperature	°C
Total Organic Carbon (TOC)	mg/L
Specific Conductance	umhos/cm
Water Level (N.G.V.D.)	feet
Bicarbonate	mg/L

23. All groundwater monitor wells shall be sampled and analyzed semi-annually for the volatile organic compounds. The specific parameters include the following:

Trichloroethylene
Tetrachloroethylene
Carbon Tetrachloride
Vinyl Chloride
1,1,1-Trichloroethane
1,2-Dichloroethane
Benzene
Ethylene Dibromide

Specific Conditions (cont'd)

24. If at any time background groundwater standards are exceeded at the edge of the zone of discharge, the permittee has fifteen (15) days in which to resample the monitor well(s) to verify the original analysis. Should the permittee choose not to resample, the Department will consider the water quality analysis as representative of current groundwater conditions at the facility.

25. The field testing, sample collection and preservation and laboratory testing, including quality control procedures, shall be in accordance with methods approved by the Department in accordance with Chapter 17-4.246 and 17-3.401, F.A.C.. Approved Methods as published by the Department or in Standard Methods, A.S.T.M. or EPA methods shall be used. Approved methods for chemical analyses are summarized in the Federal Register, December 1, 1976 (41FR52780) except that turbidity shall be measured by the Nephelometric Method.

26. All groundwater monitoring analyses shall be reported on the Department Form 17-1.216(2), Quarterly Report on Groundwater Monitoring. The permittee shall submit to the Department the results of the groundwater monitoring well water quality analysis no later than forty-five (45) days immediately following the end of the sampling period. The results shall be sent to the Department of Environmental Regulation, Southwest District Office, 4520 Oak Fair Boulevard, Tampa, Florida 33610-7347, and the Hillsborough County Environmental Protection Commission, 1900 9th Avenue, Tampa, Florida 33605.

27. If any monitoring well becomes damanges or inoperable, the permittee shall notify the Department immediately and a detailed written report shall follow within seven (7) days. The written report shall detail what problem has occurred and remedial measures that have been taken to prevent the recurrence. All monitoring well design and replacement shall be approved by the Department prior to installation.

28. Sixty (60) days prior to the renewal of this permit, the permittee shall sample all groundwater monitoring wells for the Primary and Secondary Drinking Water parameters included in Chapter 17-22, Florida Administrative Code, Public Drinking Water Systems, fecal coliform, EPA Method 601, 602, and 608. The specific parameters for Primary [17-22.210] and Secondary [17-22.220] Drinking Water are listed in Part II, Quality Standards, Analytical Methods, Sampling, 11/19/87 Revision.

29. Within sixty (60) days of issurance of this permit, all piezometers and wells not a part of the approved groundwater monitoring plan are to be plugged and abandoned in accordance with Chapter 17-21.10(4), F.A.C. and the Southwest Florida Water Management District. Ther permittee shall submit a written report to the Department providing verification of the plugging program.

Specific Conditions (cont'd)

A written request for exemption to the plugging of a well must be submitted to the Department's Solod Waste Section for approval.

30. The permittee shall ensure that the water quality standards for Class G-II groundwaters will not be exceeded at the boundary of the zone of discharge according to Sections 17-3.402 and 17-3.404, F.A.C.

31. The permittee shall ensure that the minimum criteria for groundwater specified in Section 17-3.402, F.A.C. shall not be violated within the zone of discharge.

32. After all significant construction of any phase of the facility has been completed, the engineer or the authorized public officer shall complete a Certification of Construction Completion, Department Form 17-7.130(2).

33. Prior to 60 days before the expiration of the Department Permit, the permiteee shall apply for a renewal of a permit or closure on forms and in a manner prescribed by the Department, in order to assure conformance with all applicable Department rules.

34. At least 90 days prior to the date when wastes will no longer be accepted for active portions of the landfill, the landfill owner or operator shall submit a closure permit application to the Department. The final cover shall be placed over the entire surface of each completed portion of the filled areas within 180 days after final waste deposit date. The permittee shall close the landfill in accordance with all applicable Department rules but may request approval of alternative procedures and requirements in accordance with Florida Administrative Code Rule 17-7.078. The request for approval of alternative procedures and requirements shall set forth at a minimum the following information:

(a) Specific landfill for which an exception is sought;

(b) The specific provisions of Sections 17-7.030 through 17-7.077 from which an exception is sought;

(c) The basis for the exception, including but not limited to the hardship which would result from compliance with the established provision;

(d) The alternate procedure or requirement for which approval is sought and a demonstration that the alternate procedure or requirement provides an equal degree of protection for the public and the environment;

(e) A demonstration of the effectiveness of the proposed alternate procedure.

Specific Conditions (cont'd)

35. The continued high-rising of waste on previously filled and active portions of the landfill may be limited by future revisions of Department rules or evidence of groundwater contamination. The permittee shall operate the landfill so as to maintain a minimum 2% top slope at all times. The permittee shall designate at least two separate areas in the landfill and shall complete the closure of at least 50% of each area before beginning to fill the next area.

36. The permittee shall make every effort to dispose of the alum residual material in a way that will improve the overall site appearance and shall develop a plan for the site with end-use in mind.

37. The permittee shall make every effort to develop a method for materials recovery from the alum residual material and a market for the recovered materials. The Department does not intend to extend the expiration date of this permit or allow continuing alum residual material disposal beyond the expiration date of this permit.

38. All solid waste, recovered materials or residues handled at the facility shall be stored in a manner so as not to constitute a fire or safety hazard or a sanitary nuisance, and shall comply with all applicable local and state regulations. Recovered resources resulting from the facility and which may be offered for sale shall comply with applicable regulations of all appropriate state agencies.

39. All required submittals shall be sent to the Department of Environmental Regulation, c/o Solid Waste Section, 4520 Oak Fair Boulevard, Tampa, Florida 33610-7347 and Hillsborough County Environmental Protection Commission, 1900 9th Avenue, Tampa, Florida 33605. Upon receipt and review of the required data, the Department will determine conditions for continued testing.

40. The permittee shall be aware of and operate under the attached "General Conditions". General Conditions are binding upon the permittee and enforceable pursuant to Chapter 403, Florida Statutes.

Issued this 29th day of December, 1988

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

Richard D. Garrity, Ph.D.
Deputy Assistant Secretary

CERTIFICATE OF SERVICE

This is to certify that this NOTICE OF PERMIT and all copies were mailed before the close of business on Dec. 27, 1988 to the listed persons.

FILING AND ACKNOWLEDGEMENT
FILED, on this date, pursuant to §120.52(10), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Betty Rodgers
Clerk

12/27/88
Date

Florida Department of Environmental Regulation

Southwest District ● 4520 Oak Fair Boulevard ● Tampa, Florida 33610-7347 ● 813-623-5561

Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary
Dr. Richard Garrity, Deputy Assistant Secretary

NOTICE OF PERMIT

SEP 07 1990

PERMITTEE
Mr. David L. Tippin, P.E.
City of Tampa Water Department
306 E. Jackson Street, 5E
Tampa, Florida 33602

Dear Mr. Tippin:

Enclosed is modification of existing permit, Permit Number SO29-155266, issued pursuant to Section(s) 403.087(1), Florida Statutes.

Persons whose substantial interests are affected by this permit have a right, pursuant to Section 120.57, Florida Statutes, to petition for an administrative determination (hearing) on it. The petition must conform to the requirements of Chapters 17-103 and 28-5.201, F.A.C., and must be filed (received) in the Department's Office of General Counsel, 2600 Blair Stone Road, Tallahassee 32301, within fourteen (14) days of receipt of this notice. Failure to file a petition within the fourteen (14) days constitutes a waiver of any right such person has to an administrative determination (hearing) pursuant to Section 120.57, Florida Statutes. This permit is final and effective on the date filed with the Clerk of the Department unless a request for extension of time in which to file a petition is filed within the time specified for filing a petition and conforms to Rule 17-103.070, F.A.C. Upon timely filing of a petition or a request for an extension of time this permit will not be effective until further Order of the Department.

When the Order (Permit) is final, any party to the Order has the right to seek judicial review of the Order 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 the Final Order is filed with the Clerk of the Department.

RECEIVED
SEP 10 1990
WATER PRODUCTION

Executed in Tampa, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

Kim B. Ford, P.E.
solid Waste Section
Division of Waste Management

KBF/bar

cc: John Reese, DER Tallahassee
Mark Hook, Tampa Water Dept.
Paul Schipfer, HCEPC

CERTIFICATE OF SERVICE

This is to certify that this NOTICE OF PERMIT and all copies were mailed before the close of business on 9-7-90 to the listed persons.

FILING AND ACKNOWLEDGEMENT
FILED, on this date, pursuant to §120.52(10), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Betty Rodgers 9-7-90
Clerk Date

Florida Department of Environmental Regulation

Southwest District ● 4520 Oak Fair Boulevard ● Tampa, Florida 33610-7347 ● 813-623-5561

Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary
Dr. Richard Garrity, Deputy Assistant Secretary

SEP 07 1990

PERMITTEE
Mr. David L. Tippin, P.E.
City of Tampa Water Department
306 E. Jackson Street, 5E
Tampa, Florida 33602

Re: Modification of Conditions
Permit No. SO29-155266
Old Manhattan Avenue Landfill
Hillsborough County

Dear Mr. Tippin:

Due to landfill changes, the Department hereby modifies the permit. The conditions are changed as follows:

<u>CONDITION</u>	<u>FROM</u>	<u>TO</u>
Expiration Date	10/1/90	4/1/9~~0~~1

This letter must be attached to your permit and becomes a part of that permit.

Sincerely,

Richard D. Garrity, Ph.D.
Deputy Assistant Secretary
Southwest District

RDG/kfr

Florida Department of Environmental Regulation

Southwest District ● 4520 Oak Fair Boulevard ● Tampa, Florida 33610-7347 ● 813-623-5561

Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary
Dr. Richard Garrity, Deputy Assistant Secretary

NOTICE OF PERMIT

SEP 21 1990

PERMITTEE
Mr. David L. Tippin, P.E.
City of Tampa Water Department
306 E. Jackson Street, 5E
Tampa, Florida 33602

Dear Mr. Tippin:

Enclosed is modification of existing permit, Permit Number SO29-155266, issued pursuant to Section(s) 403.087(1), Florida Statutes.

Persons whose substantial interests are affected by this permit have a right, pursuant to Section 120.57, Florida Statutes, to petition for an administrative determination (hearing) on it. The petition must conform to the requirements of Chapters 17-103 and 28-5.201, F.A.C., and must be filed (received) in the Department's Office of General Counsel, 2600 Blair Stone Road, Tallahassee 32301, within fourteen (14) days of receipt of this notice. Failure to file a petition within the fourteen (14) days constitutes a waiver of any right such person has to an administrative determination (hearing) pursuant to Section 120.57, Florida Statutes. This permit is final and effective on the date filed with the Clerk of the Department unless a request for extension of time in which to file a petition is filed within the time specified for filing a petition and conforms to Rule 17-103.070, F.A.C. Upon timely filing of a petition or a request for an extension of time this permit will not be effective until further Order of the Department.

When the Order (Permit) is final, any party to the Order has the right to seek judicial review of the Order 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 the Final Order is filed with the Clerk of the Department.

Mr. David L. Tippin, P.E.
City of Tampa Water Department

Executed in Tampa, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

Kim B. Ford, P.E.
solid Waste Section
Division of Waste Management

KBF/bar

cc: John Reese, DER Tallahassee
Mark Hook, Tampa Water Dept.
Paul Schipfer, HCEPC

CERTIFICATE OF SERVICE

This is to certify that this NOTICE OF PERMIT and all copies were mailed before the close of business on 9/21/90 to the listed persons.

FILING AND ACKNOWLEDGEMENT
FILED, on this date, pursuant to §120.52(10), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Clerk 9/21/90
Date

Florida Department of Environmental Regulation
Southwest District ● 4520 Oak Fair Boulevard ● Tampa, Florida 33610-7347 ● 813-623-5561
Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary
Dr. Richard Garrity, Deputy Assistant Secretary

SEP 21 1990

PERMITTEE
Mr. David L. Tippin, P.E.
City of Tampa Water Department
306 E. Jackson Street, 5E
Tampa, Florida 33602

Re: Modification of Conditions
Permit No. SO29-155266
Old Manhattan Avenue Landfill
Hillsborough County

Dear Mr. Tippin:

Due to landfill changes, the Department hereby modifies the permit. The conditions are changed as follows:

CONDITION	FROM	TO
Expiration Date	10/1/90	4/1/91

This letter must be attached to your permit and becomes a part of that permit.

Sincerely,

Richard D. Garrity, Ph.D.
Deputy Assistant Secretary
Southwest District

DATE CH [redacted] FROM
4/1/90 [redacted]/1/91

ATTACHMENT 4

Jacksonville Electric Authority' Permits Issued by the Florida Department of Environmental Regulation Covering Water Discharges From the Surface Impoundments Where the Wastewater Treatment Sediments are Stored

KOOGLER & ASSOCIATES

BEST AVAILABLE COPY

LA. ARCH. FILE # 4.3.6
BW

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

NORTHEAST DISTRICT
3426 BILLS ROAD
JACKSONVILLE, FLORIDA 32207
904/798-4200

BOB MARTINEZ
GOVERNOR
DALE TWACHTMANN
SECRETARY
ERNEST E. FREY
DISTRICT MANAGER
GARY L. SHAFFER
ASSISTANT DISTRICT MANAGER

RECEIVED
DEC 02 1987
DIVISION

ASSOCIATE MANAGING DIRECTOR
POWER PRODUCTION
RECEIVED

CONSOLIDATED CITY OF JACKSONVILLE
OFFICE OF THE MANAGING DIRECTOR
NOV 30 1987
RECEIVED
JACKSONVILLE ELECTRIC AUTHORITY

NOTICE OF PERMIT

Mr. Royce Lyles, Managing Director
Jacksonville Electric Authority
233 West Duval Street
Jacksonville, Florida 32202

Dear Mr. Lyles:

Duval County - Industrial Waste
Jacksonville Electric Authority
Chemical Waste Treatment Facility

Enclosed is a modification to Permit Number IO16-119726, dated November 30, 1987, to operate an industrial wastewater treatment facility, issued pursuant to Section 403.087, Florida Statutes (F.S.).

Persons whose substantial interests are affected by this permit have a right, pursuant to Section 120.57, F.S., to petition for an administrative determination (hearing) on it. The petition must conform to the requirements of Chapters 17-103 and 28-5.201, Florida Administrative Code (FAC), and must be filed (received) in the Department's Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32301, within fourteen (14) days of receipt of this notice. Failure to file a petition within the fourteen (14) days constitutes a waiver of any right such person has to an administrative determination (hearing) pursuant to Section 120.57, F.S. This permit is final and effective on the date filed with the Clerk of the Department unless a petition is filed in accordance with this paragraph or unless a request for extension of time in which to file a petition is filed within the time specified for filing a petition and conforms to Rule 17-103.070, FAC. Upon timely filing of a petition or a request for an extension of time this permit will not be effective until further Order of the Department.

When the Order (Permit) is final, any party to the Order has the right to seek judicial review of the Order pursuant to Section 120.68, F.S., 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 the Final Order is filed with the Clerk of the Department.

Executed in Jacksonville, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

Ernest E. Frey

Ernest E. Frey
District Manager

EEF:rlr

Copies furnished to: Mr. Donald Bayly, BES
Mr. Richard Breitmoser, P.E.

CERTIFICATE OF SERVICE

This is to certify that this NOTICE OF PERMIT and all copies were mailed before the close of business on 11-30-87 to the listed persons.

FILING AND ACKNOWLEDGEMENT
FILED, on this date, pursuant to §120.52 Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.
Delia Richards 11-30-87
Clerk Date

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

NORTHEAST DISTRICT
3426 BILLS ROAD
JACKSONVILLE, FLORIDA 32207
904/798-4200

BOB MARTINEZ
GOVERNOR
DALE TWACHTMANN
SECRETARY
ERNEST E. FREY
DISTRICT MANAGER
GARY L. SHAFFER
ASSISTANT DISTRICT MANAGER

REVISED November 30, 1987

PERMITTEE:

Mr. Royce Lyles , Managing Director
Jacksonville Electric Authority
233 West Duval Street
Jacksonville, FL 32202

I.D. Number: GMS3116M00199
Permit/Cert Number: I016-119726
Date of Issue: June 5, 1987
Expiration Date: April 30, 1992
County: Duval
Lat/Long: 30°25'15"N/81°33'07"W
Section/Township/Range:
Project: Chemical Waste Treatment Facility, Northside Generating Station

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 17-3, 17-4, 17-6, and 17-22. 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 operation of a 3.0 MGD Chemical Waste Treatment Facility consisting of two lined surge basins, a lime injection and flocculation system, two sludge settling ponds and a neutralization system with discharge to evaporation/percolation ponds serving Jacksonville Electric Authority's Northside Generating Station.

Located at 4377 Heckscher Drive, Jacksonville, Duval County, Florida.

In accordance with the application dated April 30, 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.

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

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 noncompliance 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)
    ( ) Certification of Compliance with State Water Quality Standards (Section 401, PL 92-500)
    ( ) 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.

    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 period of 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.

Revised November 30, 1987

PERMITTEE:

Royce Lyles, Managing Director
Jacksonville Electric authority
Northside Generating Station

I.D. Number: GMS3116M00199
Permit/Cert Number: I016-119726
Date of Issue: June 5, 1987
Expiration Date: April 30, 1992

SPECIFIC CONDITIONS:

1. During the period of operation allowed by this permit, the permittee shall furnish one copy of the monthly operation report on the operation of the pollution control plant. These reports shall include all data and information required from the General and Specific Conditions of this permit. Such reports shall also contain information on the quantities of waste sludge generated at the source, type and degree of its treatment and the site of its ultimate disposal. Reports shall be submitted on a monthly basis to the Florida Department of Environmental Regulation, Northeast District Office, 3426 Bills Road, Jacksonville, Florida 32207; and to Jacksonville Bio-Environmental Services Division, 515 West 6th Street, Jacksonville, Florida 32206.

2. The discharge authorized by this permit shall be consistent at all times with the water quality standards set forth in Chapter 17-3, Part IV except as provided for otherwise in this permit.

3. No additional connection shall be made to this facility without prior approval of this agency.

4. The permit holder shall also comply with county, municipal, federal or other state regulations.

5. Waste sludge or other solid wastes shall not be discharged into the receiving waters either directly or indirectly and disposal of waste sludge shall be in accordance with all applicable Department Rules.

PERMITTEE:

Mr. Royce Lyles, Managing Director
Jacksonville Electric Authority
Northside Generating Station

I.D. Number: GMS3116M00199
Permit/Cert Number: I016-119726
Date of Issue: June 5, 1987
Expiration Date: April 30, 1992

SPECIFIC CONDITIONS:

6. Pursuant to the groundwater monitoring plan submittal as required by Florida Administrative Code Rule 17-4.245(6), Permittee shall initiate the following monitoring program:

a. The zone of discharge extends horizontally to the property line and vertically to the base of the shallow water table aquifer, in accordance with Florida Administrative Code Rule 17-4.245(4)(b). This will remain in effect unless, pursuant to Florida Administrative Code Rule 17-4.245(5)(b), it becomes necessary to seek a change. Minimum criteria, specified in Florida Administrative Code Rule 17-3.402, shall apply within the zone of discharge pursuant to Florida Administrative Code Rule 17-3.404.

b. The following groundwater sampling points are established as related to the attached site map:

Background Well(s)

NS19 Located approximately 1000 feet northwest of the northwest corner of Pond C.

Intermediate Well(s)

NS14 Located approximately 50 feet west of the northwest corner of the gas turbine area.

NS23 Located approximately 30 feet southeast of the southeast corner of Pond B.

Compliance Well(s)

NS22 Located approximately 70 feet southeast of the southeast corner of Pond B and approximately 10 feet north of the borrow pit which connects to San Carlos Creek.

NS26 Located approximately 50 feet south of the southern edge of the borrow pit which is connected to San Carlos Creek.

Tank Farm Well(s)

NS16 Located between the northwest property boundary and the four tanks that are approximately 1600 feet northwest of the closed chemical waste percolation pond.

NS25 Located directly south of the tank farm between the tank farm and San Carlos Creek.

SPECIFIC CONDITIONS:

6. (continued)

c. Groundwater monitoring for the tank farm area is incorporated into this permit. Wells NS16 and NS25 are to be sampled quarterly for the purpose of monitoring the groundwater downgradient from the tank farm. Analysis is required for the following:

A Scan for Volatile Organic Compounds (VOC) and
Purgeable Aromatics by EPA Methods 601 and 602, including
Xylene

d. Quarterly sampling of monitoring wells NS14, NS19, NS22, NS23 and NS26 is required for the following parameters:

Total Organic Carbon (TOC)
Total organic Halogens (TOX)
Primary Drinking Water Metals
Secondary Drinking Water Standards

In addition to the parameters listed in 6d. above, monitoring well NS22 shall be sampled quarterly for a complete Volatile Organic Carbon (VOC) Scan. After two (2) years the Permittee can request that this VOC Scan requirement be eliminated if the data warrants it.

e. Water levels shall be recorded prior to evacuating the wells for sample collection. Measurements, referenced to Mean Sea Level (MSL), shall include groundwater surface elevation, the top well casing and land surface at each site at a precision of plus or minus 0.01 feet. This information shall be submitted with the analytical results.

f. If at anytime the quarterly parameters show an exceedance of a Maximum Contaminent Level (MCL) or should a statistical increase or decrease in a concentration over background levels for those parameters without MCL's whichever is applicable, then the affected well shall be immediately resampled to verify results. An expanded analysis will be required if results are verified.

g. A report of the analytical results of the sampling shall be submitted to the Department of Environmental Regulation at the letterhead address on DER Form 17-1.216(2) and Bio-Environmental Services Division at 515 W. 6th Street, Jacksonville, Fla., 32206 within thirty (30) days of receipt of analysis by Permittee. Included with the report shall be a statement of the current nature of the discharge plume, if one exists, relative to the previous report with regard to its' size, direction and rate of movement.

SPECIFIC CONDITIONS:

h. Compliance with groundwater standards shall be determined by analyses of unfiltered (or settled) groundwater samples.

i. Following the first year of sampling, data will be reviewed with the Department and permittee to evaluate changes in parameters and sampling frequencies that may be appropriate.

j. Water Quality Standards for Class G-II groundwater shall not be exceeded at the boundary of the zone of discharge pursuant to Florida Administrative Code Rule 17-3.404. Also the minimum criteria of Florida Administrative Code Rule 17-3.402, shall not be violated within the zone of discharge.

k. Each monitoring well shall be clearly identified with a non-corrosive name plate. Monitoring wells shall be fitted with a sanitary seal or shall be otherwise adequately capped when not in use to avoid extraneous influence.

l. Sampling and analytical procedures shall conform to the Department approved procedures which were incorporated into the approved groundwater monitoring plan submitted by the Permittee.

m. If an approved monitoring well becomes damaged or inoperable, then the Permittee shall notify the Department and a detailed written report shall follow within seven days. The written report shall detail what problem has occured and what remedial measures that have been taken to prevent the recurrance. All monitoring well design and replacement shall be approved by the Department prior to installation.

PERMITTEE:

Mr. Royce Lyles, Managing Director
Jacksonville Electric Authority
Northside Generating Station

Revised November 30, 1987
I.D. Number: GMS3116M00199
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Date of Issue: June 5, 1987
Expiration Date: April 30, 1992

SPECIFIC CONDITIONS:

7. The Permittee is required to perform the following influent and effluent monitoring in conjunction with the groundwater monitoring plan as outlined in the following table:

PARAMETERS	SAMPLING LOCATION Note (1)	MEASURE FREQUENCY	SAMPLE METHOD/ TYPE
Flow	Influent	Continuous	Flow Meter/ Totalizer
pH(2)	Influent	5 days/wk	grab
pH(2)	Effluent	5 days/wk	grab
Specific Cond.	Influent	5 days/wk	grab
Specific Cond.	Effluent	5 days/wk	grab
TDS(2)	Influent	5 days/wk	grab
TDS(2)	Effluent	5 days/wk	grab
TSS	Effluent	Monthly	grab
Sulfate(2)	Effluent	Monthly	grab
Oil & Grease	Effluent	Monthly	grab

Revised November 30, 1987

PERMITTEE:

Mr. Royce Lyles, Managing Director
Jacksonville Electric Authroity
Northside Generating Station

I.D. Number: GMS3116M00199
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SPECIFIC CONDITIONS:

7. (cont'd)

PARAMETERS	SAMPLING LOCATION Note (1)	MEASURE FREQUENCY	SAMPLE METHOD/ TYPE
Cadmium	Influent	Quarterly	grab
Cadmium	Effluent	Monthly	grab
Chromium	Influent	Quarterly	grab
Chromium	Effluent	Monthly	grab
Copper(2)	Influent	Quarterly	grab
Copper(2)	Effluent	Monthly	grab
Iron(2)	Influent	Quarterly	grab
Iron(2)	Effluent	Monthly	grab
Lead	Influent	Quarterly	grab
Lead	Effluent	Monthly	grab
Manganese(2)	Influent	Quarterly	grab
Manganese(2)	Effluent	Monthly	grab
Nickel	Influent	Quarterly	grab
Nickel	Effleunt	Monthly	grab
Zinc(2)	Influent	Quarterly	grab
Zinc(2(	Effluent	Monthly	grab

SPECIFIC CONDITIONS:

7. (cont'd)

Note (1) Sample locations are:

Influent - from wastewater surge basins. These samples for reporting purposes and/or for determining treatment plant efficiency.

Effluent - from the wastewater discharge after pH adjustment but prior to the percolation ponds.

Note (2) Secondary Drinking Water Standard parameters not in effect as of the issue date of this permit. The permit will be modified upon changes in the Florida Administrative Code.

Note (3) After two (2) years of analysis, the Permittee may request that sampling for all or part of the metals be eliminated if the analysis results indicate the metals are not present in the influent.

8. The Permittee shall collect a grab sample of the overflow from the final percolation/evaporation ponds every time there is an overflow event. The sample shall be analyzed for the following parameters:

Cadmium
Chromium
Copper
Iron
Lead
Manganese
Nickel
Oil & Grease
pH
Specific Conductivity
Sulfates
TDS
TSS
Zinc

9. The Wastewater Treatment Facility shall at all times be maintained in good working order and operate as efficiently as possible. All installed treatment equipment shall be operated to achieve the highest possible levels of treatment and efficiency.

10. The operation of the pollution control facility shall be under the supervision of a person who is qualified by formal training and/or practical experience in water pollution control.

11. Adequate means shall be provided to insure that contaminants from spills of wastewater will be collected and routed to the wastewater treatment system.

12. No wastewater shall be allowed to deliberately bypass the existing treatment facility.

PERMITTEE:

Royce Lyles, Managing Director
Jacksonville Electric Authority
Northside Generating Station

REVISED November 30, 1987
I.D. Number: GMS3116M00199
Permit/Cert Number: I016-119726
Date of Issue: June 5, 1987
Expiration Date: April 30, 1992

SPECIFIC CONDITIONS:

13. There shall be no discharge of contaminated storm water to waters of the state.

14. The Permittee shall within two (2) months of the issue date of this permit initiate a study of long term sludge disposal alternatives and submit a complete plan and conceptual design for sludge disposal to the Department for approval within one (1) year from study initiation.

Revised this 30th day of November, 1987

CITY OF JACKSONVILLE
BIO-ENVIRONMENTAL SERVICES DIVISION

Donald C. Bayly

Donald C. Bayly, Division Chief

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

Ernest E. Frey

Ernest E. Frey, District Manager

BEST AVAILABLE COPY

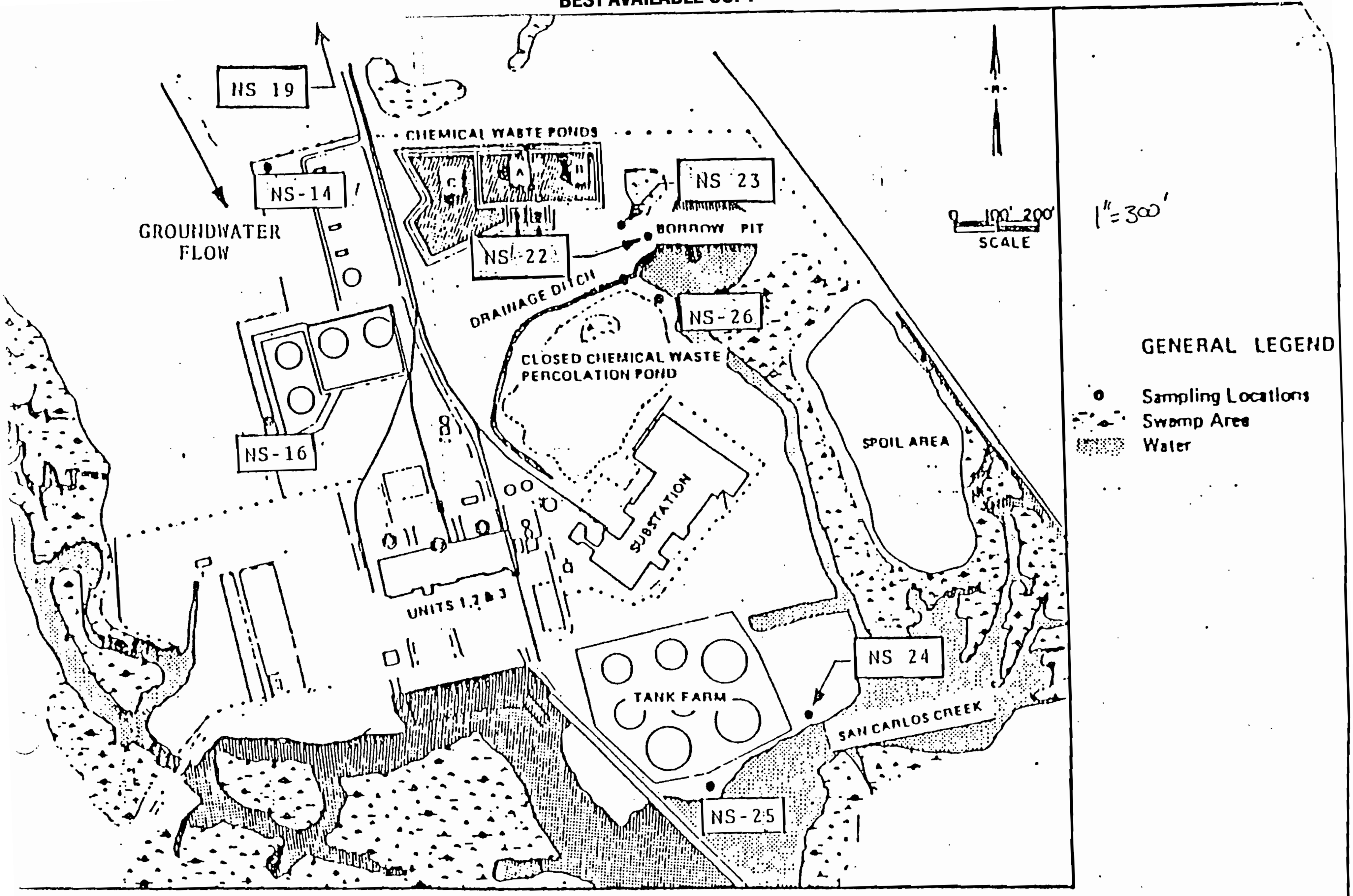

Figure 2-1. Liquid Sampling Locations

Revised 4/5/85
Added NS - 14,16,25,26

ATTACHMENT 5

Composition of Example Materials to be Covered Under the Proposed Permit Amendment

ELEMENTAL ANALYSIS OF JEA WASTEWATER TREATMENT SEDIMENTS

Plant Sample Description	Composition, Wet Basis (mg/kg)				
	Northside Surge Basin	Northside Treated Sediment	Northside Old Sediment	Kennedy Old Sediment	Southside Old Sediment
Aluminum	4,400	4,400	4,900	14,000	6,200
Arsenic	6,500	600	1,900	2,300	2,300
Barium	570	270	570	890	700
Beryllium	ND	ND	ND	ND	ND
Cadmium	56	19	18	40	35
Calcium	4,200	130,000	92,000	26,000	5,300
Chromium	1,600	190	300	940	1,700
Cobalt	330	120	70	400	260
Copper	390	620	910	1,100	880
Iron	170,000	76,000	140,000	170,000	280,000
Lead	500	50	770	980	690
Molybdenum	16,000	480	260	350	9,000
Nickel	20,000	5,200	4,300	9,300	3,,800
Selenium	330	70	110	200	500
Silver	20	3.9	10	10	12
Thallium	300	25	58	68	72
Vanadium	64,000	4,800	19,000	22,000	22,000
Zinc	350	400	790	1,500	640
Percent Moisture	83.4	87	59.6	72.8	74.9

TCLP ANALYTICAL RESULTS FOR JEA WASTEWATER TREATMENT SEDIMENTS

Plant Sample Description		Northside Surge Basin	Northside Treated Sediment	Northside Old Sediment	Kennedy Old Sediment	Southside Old Sediment	Blank* Fluid 1	Blank+ Fluid 2
TCLP Extract (mg/L)	RCRA Max.							
Arsenic	5	0.028	0.006	0.009	0.008	0.006	0.006	<0.002
Barium	100	0.55	0.37	0.72	0.92	0.43	0.61	0.71
Beryllium		0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	1	0.057	0.028	<0.003	0.021	0.025	<0.003	<0.003
Chromium	5	0.034	0.034	0.02	0.015	0.02	<0.009	<0.009
Cobalt		0.52	0.26	<0.01	0.52	0.73	<0.01	<0.01
Copper		0.08	0.09	0.02	<0.01	0.3	<0.01	<0.01
Iron		0.88	<0.03	<0.03	78	0.1	<0.03	<0.03
Lead	5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	0.2	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum		14	0.15	0.16	0.07	0.42	<0.05	<0.05
Nickel		26	15	0.99	10	8.4	<0.02	<0.02
Selenium	1	0.014	<0.005	<0.05	<0.005	0.009	<0.005	<0.005
Silver	5	<0.009	0.021	0.016	0.012	0.009	<0.009	<0.009
Thallium		<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09
Vanadium		12	<0.02	4.6	0.11	0.15	<0.02	<0.02
Zinc		0.78	0.48	0.17	1.1	2.2	0.24	0.35

*TCLP Extraction Fluid (Sodium Acetate Buffer)
+TCLP Extraction Fluid (Acetic Acid) -- Used Only for Northside Treated Sediment

METALS ANALYSIS TALLAHASSEE ELECTRIC DEPARTMENT WASTEWATER TREATMENT SEDIMENT

Metal	Sediment Basis A mg/kg dry basis	Sediment Basin B mg/kg dry basis
Silver	<0.73	<0.69
Aluminum	450	740
Arsenic	94	120
Barium	57	48
Beryllium	16	23
Calcium	3000	5300
Cadmium	0.43	0.59
Cobalt	13	11
Chromium	170	100
Copper	480	820
Iron	46,000	60,000
Nickel	520	510
Lead	<4.4	<4.1
Selenium	<7.8	<7.3
% Moisture	71	84

ANALYSIS OF CITY OF TAMPA WATER TREATMENT SEDIMENT

Components	mg/kg (moisture-free basis)
Aluminum	30,569
Barium	4.6
Cadmium	0.022
Chromium	36
Copper	3.31
Iron	1,147.9
Lead	0.26
Mercury	<0.005
Silver	0.546
Zinc	2.8
Typical Moisture Content	50%

Naturally occurring organic matter (~18%) (tannins and lignins from decayed plant matter)

EP TOX LEACHATE ANALYSIS RESULTS FOR CITY OF TAMPA WATER TREATMENT SEDIMENT

Metal	Reported Value (ppm)	Detection Limit (ppm)	EP Toxicity Limit
Arsenic	D	0.001	5
Barium	D	0.1	100
Cadmium	D	0.001	1
Chromium	D	0.001	5
Lead	D	0.001	5
Mercury	D	0.0005	0.2
Selenium	0.002	0.001	1
Silver	D	0.01	5

D = Below Detection Limit

ATTACHMENT 6

SUMMARY OF AIR QUALITY MODELING RESULTS AND CALCULATIONS OF WWS METALS LIMITS

Metal	Acceptable Ambient Level (ug/m3)	Baseline Emissions(1) (lb/hr)	Baseline Maximum Annual Impact(2) (ug/m3)		Additional Emissions Allowed(3) (lb/hr)		Possible Metal Concentration in WWS(4) (ug/g)	
			C	CPL	C	CPL	C	CPL
As	$2.3x10^{-3}$	0.004	$5.8x10^{-6}$	$2.5x10^{-6}$	1.57	3.69	1,260	(7)
Sb	0.3	NM(10)	-	-	-	-	164,600(8)	(7)
Ba	50	0.02	$2.9x10^{-5}$	-	(11)	-	(11)	(7)
Be	$4.1x10^{-3}$	NM	-	-	-	-	1,260(9)	(7)
Cd	$5.5x10^{-3}$	0.005	$7.3x10^{-6}$	-	3.77	-	3,014	(7)
Cr^{+6}	$8.3x10^{-4}$	0.02(6)	$2.9x10^{-5}$		0.55	-	439(6)	(7)
Pb	0.09	0.13	$1.9x10^{-4}$	-	61.61	-	49,285	(7)
Hg	0.3	0.04	$5.8x10^{-5}$	-	205.8	-	164,600	(7)
Ag	3	0.009	$1.3x10^{-5}$	-	2058	-	>1,000,000	(7)
Th	0.3	NM	-	-	-	-	164,600(8)	(7)

(1) Measured emission rate during Baseline Test with Cement, Power and Lime Plants operating.

(2) Annual average ambient concentration resulting from measured Baseline emission rate. Under Condition "C" (Cement Plant only), ambient concentrations were calculated with Cement Plant stack gas flows. Under Condition "CPL" (Cement, Power and Lime Plants), ambient concentrations were calculated with CPL stack gas flow. Assumed 100% annual operating factor for both conditions.

(3) Emissions in addition to Baseline emissions that can be tolerated without exceeding AAL.

(4) Concentration of metal in wastewater sediment that will result in "additional emissions" defined in Footnote (3), assuming WWS feed rate of 5 percent of kiln feed (12,500 lb/hr) and assuming 10 percent of the metals in the WWS are discharged from the stack.

(5) C = Cement Plant only operating; CPL = Cement, Power and Lime Plants operating.

(6) Assuming all chromium measured during Baseline Test was hexavalent; chromium as stack gas was actually trivalent. The 439 ug/g concentration in WWS is as Cr+6.

(7) Allowable metal concentration in WWS when CPL Plants operate can be 2.34 times higher than that allowed when Cement Plant only operates.

(8) Assumed to have same permissible concentrations as mercury because of similar AAL.

(9) Assumed to have same permissible concentrations as arsenic because of similar AAL.

(10) NM-Not measured during Baseline or WWS tests.

(11) Additional emissions can be greater than the total proposed WWS feed rate, metal concentration could be greater than 100 percent.

Example Calculation

Measured Arsenic emission rate during the WWS test

= 0.004 lb/hr

Annual Arsenic concentration in ambient air

= [0.004 lb/hr (measured)] /[79.4 lb/hr (modeled)]

x 0.1157 $\mu g/m^3$ (modeled impact)

= 5.8×10^{-6} $\mu g/m^3$

Acceptable Ambient Level (AAL)

= 2.3×10^{-3} $\mu g/m^3$

Increase in ambient level without exceeding AAL

= $(2.3 \times 10^{-3}) - (5.8 \times 10^{-6})$

= 2.294×10^{-3} $\mu g/m^3$

Emission rate resulting in ambient impact of 2.294×10^{-3} $\mu g/m^3$

= [(2.294×10^{-3}) - 0.1157 (modeled impact)]

x 79.4 lb/hr

= 1.57 lb/hr

Arsenic concentration in WWS, at a feed rate of 12,500 lb/hr, resulting in 1.57 lb/hr.

= $1.57/(12500 \times 10^{-6})$

= 126.0 $\mu g/g$

Acceptable arsenic concentration in WWS if 90 percent of arsenic remains in cement clinker.

= 12.6 $\mu g/g/(1-0.9)$

= 1260 $\mu g/g$

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ISCST                (DATED 90346)
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          *** FCS CONCENTRATIONS RUN  MET = TPA86                        ***

CALCULATE (CONCENTRATION=1,DEPOSITION=2)                          ISW(1) =   1
RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)           ISW(2) =   4
DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)                  ISW(3) =   1
TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)                          ISW(4) =   0
CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)                     ISW(5) =   0
LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)                  ISW(6) =   1

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)
WITH THE FOLLOWING TIME PERIODS:
  HOURLY (YES=1,NO=0)                                             ISW(7) =   1
  2-HOUR (YES=1,NO=0)                                             ISW(8) =   0
  3-HOUR (YES=1,NO=0)                                             ISW(9) =   0
  4-HOUR (YES=1,NO=0)                                            ISW(10) =   0
  6-HOUR (YES=1,NO=0)                                            ISW(11) =   0
  8-HOUR (YES=1,NO=0)                                            ISW(12) =   0
  12-HOUR (YES=1,NO=0)                                           ISW(13) =   0
  24-HOUR (YES=1,NO=0)                                           ISW(14) =   1
PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)                              ISW(15) =   1

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE
SPECIFIED BY ISW(7) THROUGH ISW(14):
  DAILY TABLES (YES=1,NO=0)                                      ISW(16) =   0
  HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)                   ISW(17) =   1
  MAXIMUM 50 TABLES (YES=1,NO=0)                                 ISW(18) =   1
METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)        ISW(19) =   1
RURAL-URBAN OPTION (RU.=0,UR. MODE 1=1,UR. MODE 2=2,UR. MODE 3=3)  ISW(20) =   0
WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)        ISW(21) =   1
VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)  ISW(22) =   1
SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)                ISW(23) =   0
PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)            ISW(24) =   1
PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)      ISW(25) =   2
PROGRAM USES BUOYANCY INDUCED DISPERSION (YES=1,NO=2)            ISW(26) =   1
CONCENTRATIONS DURING CALM PERIODS SET = 0 (YES=1,NO=2)          ISW(27) =   1
REG. DEFAULT OPTION CHOSEN (YES=1,NO=2)                          ISW(28) =   1
TYPE OF POLLUTANT TO BE MODELLED (1=SO2,2=OTHER)                 ISW(29) =   2
DEBUG OPTION CHOSEN (YES=1,NO=2)                                 ISW(30) =   2
ABOVE GROUND (FLAGPOLE) RECEPTORS USED (YES=1,NO=0)              ISW(31) =   0

NUMBER OF INPUT SOURCES                                           NSOURC =   2
NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)                          NGROUP =   2
TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)              IPERD =   0
NUMBER OF X (RANGE) GRID VALUES                                   NXPNTS =   6
NUMBER OF Y (THETA) GRID VALUES                                   NYPNTS =  36
NUMBER OF DISCRETE RECEPTORS                                      NXWYPT =   0
SOURCE EMISSION RATE UNITS CONVERSION FACTOR                          TK =.10000E+07
HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED                  ZR =  10.00  METERS
LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA                          IMET =   9
DECAY COEFFICIENT FOR PHYSICAL OR CHEMICAL DEPLETION               DECAY =0.000000E+00
SURFACE STATION NO.                                                  ISS = 12842
YEAR OF SURFACE DATA                                                 ISY = 86
UPPER AIR STATION NO.                                                IUS = 12842
YEAR OF UPPER AIR DATA                                               IUY = 86
ALLOCATED DATA STORAGE                                             LIMIT = 43500 WORDS
REQUIRED DATA STORAGE FOR THIS PROBLEM RUN                         MIMIT =  6604 WORDS
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                    *** FCS CONCENTRATIONS RUN  MET = TPA86                         ***

                                *** METEOROLOGICAL DAYS TO BE PROCESSED ***
                                                  (IF=1)

1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 0

                     *** NUMBER OF SOURCE NUMBERS REQUIRED TO DEFINE SOURCE GROUPS ***
                                                 (NSOGRP)

     1,   1,

                                *** SOURCE NUMBERS DEFINING SOURCE GROUPS ***
                                                 (IDSOR)

      1,     2,

                     *** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
                                               (METERS/SEC)

                                     1.54,    3.09,    5.14,    8.23,   10.80,


                                        *** WIND PROFILE EXPONENTS ***


   STABILITY                                WIND SPEED CATEGORY
   CATEGORY         1              2              3              4              5              6
       A        .70000E-01     .70000E-01     .70000E-01     .70000E-01     .70000E-01     .70000E-01
       B        .70000E-01     .70000E-01     .70000E-01     .70000E-01     .70000E-01     .70000E-01
       C        .10000E+00     .10000E+00     .10000E+00     .10000E+00     .10000E+00     .10000E+00
       D        .15000E+00     .15000E+00     .15000E+00     .15000E+00     .15000E+00     .15000E+00
       E        .35000E+00     .35000E+00     .35000E+00     .35000E+00     .35000E+00     .35000E+00
       F        .55000E+00     .55000E+00     .55000E+00     .55000E+00     .55000E+00     .55000E+00
```

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                 *** FCS CONCENTRATIONS RUN  MET = TPA86                                ***



                               *** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***
                                           (DEGREES KELVIN PER METER)


        STABILITY                                    WIND SPEED CATEGORY
        CATEGORY          1              2              3              4              5              6
           A         .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00
           B         .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00
           C         .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00
           D         .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00     .00000E+00
           E         .20000E-01     .20000E-01     .20000E-01     .20000E-01     .20000E-01     .20000E-01
           F         .35000E-01     .35000E-01     .35000E-01     .35000E-01     .35000E-01     .35000E-01

                                    *** RANGES OF POLAR GRID SYSTEM ***
                                                 (METERS)

 1000.0,    1250.0,    1500.0,    2000.0,    3000.0,    5000.0,


                                  *** RADIAL ANGLES OF POLAR GRID SYSTEM ***

                                                 (DEGREES)

   10.0,      20.0,      30.0,      40.0,      50.0,      60.0,      70.0,      80.0,      90.0,     100.0,
  110.0,     120.0,     130.0,     140.0,     150.0,     160.0,     170.0,     180.0,     190.0,     200.0,
  210.0,     220.0,     230.0,     240.0,     250.0,     260.0,     270.0,     280.0,     290.0,     300.0,
  310.0,     320.0,     330.0,     340.0,     350.0,     360.0,
```

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                             *** FCS CONCENTRATIONS RUN  MET = TPA86                        ***

                                                       *** SOURCE DATA ***

                EMISSION RATE                                                   TEMP.    EXIT VEL.
                   TYPE=0,1                                                     TYPE=0    TYPE=0
        T W      (GRAMS/SEC)                                                   (DEG.K);  (M/SEC);            BLDG.     BLDG.     BLDG.
        Y A NUMBER    TYPE=2                         BASE                      VERT.DIM  HORZ.DIM DIAMETER  HEIGHT    LENGTH     WIDTH
 SOURCE P K  PART.  (GRAMS/SEC)      X         Y      ELEV.     HEIGHT   TYPE=1   TYPE=1,2  TYPE=0    TYPE=0    TYPE=0    TYPE=0
 NUMBER E E  CATS. *PER METER**2 (METERS)  (METERS)  (METERS)  (METERS)  (METERS)  (METERS)  (METERS)  (METERS)  (METERS)  (METERS)
-----------------------------------------------------------------------------------------------------------------------------------
Cement, Power & Lime Plants Operating
Cement Plant only Operating
      1  0 0     0   0.10000E+02      0.0       0.0       0.0     97.60    408.00      8.79      5.69      0.00      0.00      0.00
      2  0 0     0   0.10000E+02      0.0       0.0       0.0     97.60    472.00     17.37      5.69      0.00      0.00      0.00
* CALM HOURS (=1) FOR DAY   1 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  1  1  1  0  0
* CALM HOURS (=1) FOR DAY   2 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY   3 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY   5 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  12 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY  13 *  0  0  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  14 *  0  0  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0
* CALM HOURS (=1) FOR DAY  15 *  0  0  0  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  20 *  0  0  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY  21 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  1
* CALM HOURS (=1) FOR DAY  22 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
* CALM HOURS (=1) FOR DAY  24 *  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  25 *  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  1  1  1
* CALM HOURS (=1) FOR DAY  26 *  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  28 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1
* CALM HOURS (=1) FOR DAY  29 *  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0
* CALM HOURS (=1) FOR DAY  30 *  0  0  1  0  0  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  31 *  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
* CALM HOURS (=1) FOR DAY  33 *  1  0  0  1  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  38 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  1  1  0
* CALM HOURS (=1) FOR DAY  39 *  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1  1
* CALM HOURS (=1) FOR DAY  40 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY  44 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY  48 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0
* CALM HOURS (=1) FOR DAY  49 *  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  52 *  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  53 *  0  0  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  54 *  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  56 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY  57 *  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  59 *  0  0  0  0  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  60 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  61 *  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  62 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  64 *  0  0  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY  65 *  0  0  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  67 *  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  70 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
* CALM HOURS (=1) FOR DAY  73 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY  74 *  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  76 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0
* CALM HOURS (=1) FOR DAY  83 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  86 *  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY  87 *  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  90 *  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  91 *  1  0  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
```

```
* CALM HOURS (=1) FOR DAY  92 *  1  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY  93 *  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  94 *  0  0  0  0  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  96 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY  97 *  1  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY  98 *  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 101 *  0  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 102 *  0  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 103 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 104 *  0  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 105 *  0  0  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 108 *  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 113 *  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 114 *  0  0  0  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 115 *  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 116 *  1  1  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 117 *  0  0  0  1  1  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 118 *  1  1  1  0  1  1  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 119 *  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
* CALM HOURS (=1) FOR DAY 120 *  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 121 *  0  0  1  1  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
* CALM HOURS (=1) FOR DAY 123 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 127 *  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 128 *  1  1  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 129 *  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 131 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 132 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  1
* CALM HOURS (=1) FOR DAY 135 *  0  0  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 137 *  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 140 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 141 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 142 *  1  1  1  1  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 143 *  0  1  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 144 *  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  1  0
* CALM HOURS (=1) FOR DAY 145 *  0  0  0  1  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 150 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 153 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 154 *  1  1  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 155 *  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 157 *  0  0  1  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 158 *  0  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 159 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 160 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1
* CALM HOURS (=1) FOR DAY 161 *  1  0  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 162 *  1  0  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 163 *  0  0  0  0  0  0  1  0  0  0  0  0  0  0  1  0  0  0  0  0  1  1  1  0
* CALM HOURS (=1) FOR DAY 164 *  0  0  0  0  1  1  1  0  0  0  0  1  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 165 *  0  0  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 166 *  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 168 *  0  0  0  0  0  1  1  0  0  0  1  0  0  1  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 170 *  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 171 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  1
* CALM HOURS (=1) FOR DAY 172 *  0  0  1  1  1  1  1  1  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 173 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0
* CALM HOURS (=1) FOR DAY 174 *  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 175 *  0  0  0  1  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  1  0  1  0  0
* CALM HOURS (=1) FOR DAY 176 *  1  0  0  0  0  0  0  0  0  0  0  1  1  0  0  0  1  1  1  1  1  1  0  0
* CALM HOURS (=1) FOR DAY 177 *  0  1  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  1  0  1  1  1  0
* CALM HOURS (=1) FOR DAY 178 *  1  1  1  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 179 *  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 180 *  0  1  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 181 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 188 *  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
* CALM HOURS (=1) FOR DAY 189 *  0  1  0  1  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 190 *  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 191 *  0  0  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
```

```
* CALM HOURS (=1) FOR DAY 193 *  0  0  0  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 194 *  1  1  0  0  1  1  1  0  0  0  0  0  0  0  0  0  0  0  1  0  1  1  0  0
* CALM HOURS (=1) FOR DAY 195 *  1  1  0  1  1  1  1  1  1  0  0  0  1  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 196 *  1  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 197 *  1  1  1  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 198 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 199 *  1  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0
* CALM HOURS (=1) FOR DAY 200 *  0  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 203 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  1  1  0
* CALM HOURS (=1) FOR DAY 204 *  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  1  1  0  1  1  1  1  0  0
* CALM HOURS (=1) FOR DAY 205 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1
* CALM HOURS (=1) FOR DAY 206 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  0  1  1
* CALM HOURS (=1) FOR DAY 207 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 208 *  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  1  1  0  0  1  0  0  0
* CALM HOURS (=1) FOR DAY 209 *  0  0  1  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 210 *  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 211 *  0  0  0  0  0  0  0  0  1  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 213 *  0  0  0  0  1  1  1  1  1  0  0  0  0  0  0  0  0  0  1  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 214 *  1  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 215 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 217 *  0  0  0  0  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 219 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 220 *  1  1  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 221 *  1  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
* CALM HOURS (=1) FOR DAY 225 *  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 226 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 227 *  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  1
* CALM HOURS (=1) FOR DAY 228 *  1  0  0  0  1  1  0  0  1  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0
* CALM HOURS (=1) FOR DAY 229 *  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 230 *  1  0  1  1  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0
* CALM HOURS (=1) FOR DAY 231 *  1  0  0  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 233 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 234 *  0  0  1  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  1  1  0  1  1  1
* CALM HOURS (=1) FOR DAY 235 *  1  1  1  1  1  1  0  1  1  0  0  0  0  0  0  0  0  0  0  1  1  0  0  1
* CALM HOURS (=1) FOR DAY 236 *  1  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0
* CALM HOURS (=1) FOR DAY 237 *  1  1  1  1  1  1  1  1  1  0  0  0  0  0  0  1  0  0  0  1  1  0  0  0
* CALM HOURS (=1) FOR DAY 238 *  0  1  1  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 239 *  0  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  0  0
* CALM HOURS (=1) FOR DAY 240 *  0  1  1  0  1  0  1  0  0  0  0  0  0  0  0  0  0  1  0  0  1  1  1  1
* CALM HOURS (=1) FOR DAY 241 *  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 243 *  0  1  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 244 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  1  0  0  1  0  1  1  1
* CALM HOURS (=1) FOR DAY 245 *  0  1  1  1  1  0  0  0  0  0  0  0  0  1  0  1  1  1  1  1  1  1  1  0
* CALM HOURS (=1) FOR DAY 246 *  1  1  1  1  1  1  1  0  0  1  0  0  0  0  0  0  0  1  1  0  1  1  1  1
* CALM HOURS (=1) FOR DAY 247 *  1  0  0  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 248 *  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 249 *  0  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1  1
* CALM HOURS (=1) FOR DAY 250 *  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0  0
* CALM HOURS (=1) FOR DAY 251 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 252 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0
* CALM HOURS (=1) FOR DAY 254 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 255 *  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1
* CALM HOURS (=1) FOR DAY 256 *  1  0  0  0  0  0  1  0  1  1  0  0  0  0  0  0  0  0  1  0  0  1  0  1
* CALM HOURS (=1) FOR DAY 257 *  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 264 *  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 265 *  1  0  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 266 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 267 *  0  0  0  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 270 *  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 271 *  0  0  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 274 *  1  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 275 *  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 276 *  0  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 277 *  1  1  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  1  0  1  1  1
* CALM HOURS (=1) FOR DAY 278 *  0  0  1  0  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  1  1  1  1
* CALM HOURS (=1) FOR DAY 279 *  1  1  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
```

```
* CALM HOURS (=1) FOR DAY 281 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0
* CALM HOURS (=1) FOR DAY 282 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1
* CALM HOURS (=1) FOR DAY 283 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  1  1
* CALM HOURS (=1) FOR DAY 284 *  1  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1
* CALM HOURS (=1) FOR DAY 285 *  1  0  1  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  1  0  1  0  0
* CALM HOURS (=1) FOR DAY 286 *  0  1  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 287 *  0  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1
* CALM HOURS (=1) FOR DAY 288 *  1  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1  0  0
* CALM HOURS (=1) FOR DAY 293 *  0  1  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1  0  0
* CALM HOURS (=1) FOR DAY 297 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0  0
* CALM HOURS (=1) FOR DAY 300 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1  1
* CALM HOURS (=1) FOR DAY 301 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 309 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1
* CALM HOURS (=1) FOR DAY 316 *  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 320 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  1  1  1  1  0
* CALM HOURS (=1) FOR DAY 323 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0  0
* CALM HOURS (=1) FOR DAY 324 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 329 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0
* CALM HOURS (=1) FOR DAY 333 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 335 *  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  1  1  1  0  1  0  1  0
* CALM HOURS (=1) FOR DAY 343 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  1  0
* CALM HOURS (=1) FOR DAY 349 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0  1  0  0
* CALM HOURS (=1) FOR DAY 350 *  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 351 *  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  1  1  0
* CALM HOURS (=1) FOR DAY 353 *  0  0  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 354 *  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 358 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 359 *  1  0  1  0  0  0  1  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 364 *  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  1  0  1  1  0  0  0  0
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                                                                                                    'N'-DAY
                                                                                                    365 DAYS
                                                                                                    SGROUP#  1
                             *** FCS CONCENTRATIONS RUN  MET = TPA86                        ***


                               * 365-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *

                                          * FROM SOURCES:        1,
                                            * FOR THE RECEPTOR GRID *

                          * MAXIMUM VALUE EQUALS      0.11571 AND OCCURRED AT (    2000.0,      90.0) *

 DIRECTION /                                            RANGE (METERS)
 (DEGREES) /       1000.0       1250.0      1500.0      2000.0      3000.0      5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


    360.0 /      0.02009      0.02451     0.02916     0.03552     0.03589     0.02781
    350.0 /      0.01767      0.02195     0.02601     0.03064     0.02919     0.02145
    340.0 /      0.01515      0.02025     0.02483     0.02973     0.02878     0.02250
    330.0 /      0.01378      0.02070     0.02716     0.03478     0.03556     0.02818
    320.0 /      0.01574      0.02502     0.03383     0.04436     0.04552     0.03576
    310.0 /      0.02175      0.03412     0.04628     0.06160     0.06416     0.05046
    300.0 /      0.02587      0.03762     0.04938     0.06473     0.06714     0.05129
    290.0 /      0.02607      0.03522     0.04442     0.05645     0.05730     0.04277
    280.0 /      0.02562      0.03453     0.04354     0.05563     0.05717     0.04309
    270.0 /      0.02644      0.03698     0.04746     0.06140     0.06435     0.05058
    260.0 /      0.02609      0.03627     0.04600     0.05820     0.05919     0.04532
    250.0 /      0.02543      0.03551     0.04558     0.05939     0.06293     0.04945
    240.0 /      0.02437      0.03363     0.04313     0.05726     0.06392     0.05473
    230.0 /      0.02274      0.03040     0.03798     0.04866     0.05278     0.04573
    220.0 /      0.01996      0.02625     0.03199     0.03905     0.03985     0.03348
    210.0 /      0.01516      0.01993     0.02422     0.02937     0.02945     0.02334
    200.0 /      0.01038      0.01365     0.01673     0.02090     0.02225     0.01851
    190.0 /      0.00795      0.01078     0.01359     0.01780     0.02011     0.01789
    180.0 /      0.00714      0.01049     0.01399     0.01936     0.02217     0.01888
    170.0 /      0.00664      0.01024     0.01398     0.01977     0.02319     0.01983
    160.0 /      0.00621      0.00931     0.01220     0.01612     0.01784     0.01543
    150.0 /      0.00746      0.01205     0.01640     0.02235     0.02501     0.02136
    140.0 /      0.00851      0.01431     0.01967     0.02657     0.02887     0.02365
    130.0 /      0.00866      0.01430     0.01951     0.02631     0.02879     0.02360
    120.0 /      0.01106      0.01754     0.02389     0.03256     0.03586     0.02895
    110.0 /      0.01930      0.03009     0.04048     0.05425     0.05821     0.04394
    100.0 /      0.03276      0.05091     0.06699     0.08559     0.08593     0.05999
     90.0 /      0.04472      0.06947     0.09123     0.11571     0.11393     0.07615
     80.0 /      0.05054      0.07474     0.09485     0.11400     0.10466     0.06654
     70.0 /      0.05226      0.07357     0.09115     0.10662     0.09481     0.05965
     60.0 /      0.04658      0.06237     0.07578     0.08758     0.07782     0.05031
     50.0 /      0.03574      0.04573     0.05491     0.06398     0.05830     0.03889
     40.0 /      0.02656      0.03302     0.03982     0.04825     0.04662     0.03224
     30.0 /      0.02310      0.02873     0.03496     0.04341     0.04344     0.03239
     20.0 /      0.02272      0.02820     0.03404     0.04174     0.04107     0.02998
     10.0 /      0.02181      0.02653     0.03154     0.03834     0.03810     0.02832
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                                                                                                  HIGH
                                                                                                   1-HR
                                                                                                  SGROUP#  1
                          *** FCS CONCENTRATIONS RUN  MET = TPA86                         ***


                         * HIGHEST  1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                      * FROM SOURCES:        1,
                                        * FOR THE RECEPTOR GRID *

                       * MAXIMUM VALUE EQUALS      8.45278 AND OCCURRED AT (    2000.0,     210.0) *

DIRECTION /                                            RANGE (METERS)
(DEGREES) /          1000.0              1250.0              1500.0              2000.0              3000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

    360.0 /     7.56675 (198,11)    5.86749 (143,12)    5.04577 (143,12)    5.47271 (  1,12)    5.77793 ( 79, 9)
    350.0 /     7.82702 (143,12)    7.06663 (143,12)    6.17263 (143,12)    4.89373 (143,12)    4.62913 (  1,12)
    340.0 /     7.72931 (217,11)    6.68003 (217,11)    5.80881 (217,11)    4.79906 (126,12)    4.53864 (207, 8)
    330.0 /     7.42830 (162,12)    5.53505 (162,12)    4.88507 (148,13)    5.46462 (215, 9)    6.04621 (128, 9)
    320.0 /     6.26097 (173,13)    4.05919 (173,13)    4.60494 ( 93,13)    5.46459 (215, 9)    5.76912 (215, 9)
    310.0 /     7.01497 (173,13)    5.29746 (178,11)    4.78042 (109,12)    4.91701 ( 71,10)    5.06203 ( 71,10)
    300.0 /     7.57165 (237,13)    5.37744 (237,13)    4.95787 (136,13)    4.91133 (274,12)    4.48712 (178, 9)
    290.0 /     7.52613 (238,13)    5.38802 (238,13)    4.85834 (134,13)    4.84329 (188,12)    5.86399 (249,14)
    280.0 /     7.56217 (222,14)    5.43408 (222,14)    4.95982 (265,12)    4.92664 (243,14)    4.20158 (143,10)
    270.0 /     7.79560 (176,14)    7.08119 (176,14)    6.19661 (176,14)    4.92130 (176,14)    4.90902 (143,10)
    260.0 /     7.54252 (247,13)    5.52907 (247,13)    5.09580 (173,12)    4.89307 (188,15)    5.23503 ( 18,13)
    250.0 /     7.58717 (221,12)    6.13913 (257,12)    4.72126 ( 89,12)    4.82528 (258,13)    4.90650 (308, 8)
    240.0 /     6.58462 (237,12)    5.58710 (237,12)    4.83912 ( 90,12)    4.71694 (109,13)    4.31279 ( 22,11)
    230.0 /     7.44347 (189,11)    6.27380 (174,12)    5.27722 (174,12)    4.87648 (187,14)    6.00542 (356, 9)
    220.0 /     6.71633 (179,11)    6.10633 (179,11)    5.26666 (179,11)    4.89166 (259,15)    4.45032 ( 21,11)
    210.0 /     7.61564 (251,12)    6.41109 (116,11)    7.05440 (360,13)    8.45278 (360,13)    6.87757 (360,13)
    200.0 /     7.12459 (116,11)    6.41108 (116,11)    5.57955 (116,11)    4.75559 (265,14)    4.93118 (107,10)
    190.0 /     7.20523 (108,12)    6.24928 (108,12)    5.43111 (108,12)    4.79669 (236,12)    5.93572 (289,12)
    180.0 /     7.33693 (152,11)    5.88122 (144,14)    4.75439 (108,12)    4.37264 ( 44,15)    4.35374 (289,12)
    170.0 /     6.61840 (177,13)    4.72459 (177,13)    4.64872 (142,14)    4.66861 (142,14)    4.43293 (364,13)
    160.0 /     7.38038 (177,13)    5.30831 (177,13)    5.03214 (203,13)    4.71860 (203,13)    3.91318 ( 13,13)
    150.0 /     7.28174 (162,11)    5.94028 (162,11)    5.07023 (162,11)    4.71068 (119,10)    5.24392 (289,13)
    140.0 /     7.20806 (195,14)    6.15052 (195,14)    4.74149 (162,11)    4.94507 (218,16)    4.51667 (289,13)
    130.0 /     5.59386 (195,14)    4.70178 (195,14)    4.79682 (112,12)    4.81034 (161,15)    3.98506 ( 92,13)
    120.0 /     6.14633 (131,13)    4.22755 (141,13)    4.85834 (141,13)    5.33754 (201, 9)    4.87132 (164,16)
    110.0 /     7.41405 (205,11)    5.89753 (205,11)    4.98279 (205,11)    4.75780 (129,11)    5.68830 (164,16)
    100.0 /     7.38035 (179,14)    5.59607 (213,11)    5.22224 (152,14)    4.92803 (200,14)    5.70217 (193,11)
     90.0 /     7.90847 (213,11)    6.80532 (213,11)    5.87455 (213,11)    6.27795 (  3,12)    6.15879 (  3,12)
     80.0 /     7.21239 (251,13)    6.54650 (199,11)    5.67940 (199,11)    4.91133 (153,12)    5.17911 (176,10)
     70.0 /     7.54179 (199,12)    6.04288 (234,14)    5.29374 (197,13)    5.61709 (176,10)    6.06122 (176,10)
     60.0 /     7.49200 (182,11)    6.89520 (165,11)    6.20339 (165,11)    4.99759 (165,11)    5.48071 (  4,13)
     50.0 /     7.54176 (221,14)    6.19580 (117,11)    5.34618 (117,11)    4.94967 (  4,13)    5.75967 (  3,13)
     40.0 /     7.58747 (244,13)    5.43192 (244,13)    4.44359 (215,13)    4.85976 (215,13)    4.69113 ( 49,15)
     30.0 /     7.50732 (202,11)    6.13778 (202,11)    5.28123 (202,11)    5.01474 (  1,13)    4.99935 (  1,13)
     20.0 /     7.58812 (153,11)    5.68341 (203,14)    4.93663 (140,12)    6.64541 (  1,13)    6.83851 (  1,13)
     10.0 /     7.55092 (242,14)    5.68341 (203,14)    4.72318 (138,12)    4.89307 (226,12)    4.96228 (206,10)
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                                                                                                             HIGH
                                                                                                              1-HR
                                                                                                             SGROUP#  1
                             *** FCS CONCENTRATIONS RUN  MET = TPA86                        ***


                            * HIGHEST  1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                             * FROM SOURCES:        1,
                                               * FOR THE RECEPTOR GRID *

                          * MAXIMUM VALUE EQUALS      8.45278 AND OCCURRED AT (    2000.0,     210.0) *

DIRECTION /                                                 RANGE (METERS)
(DEGREES) /           5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


    360.0 /      4.87625 (206,10)
    350.0 /      4.56224 (206, 9)
    340.0 /      6.21809 (207, 8)
    330.0 /      4.67823 (128, 9)
    320.0 /      4.30631 (150,10)
    310.0 /      4.25541 (329, 9)
    300.0 /      4.25075 (251,10)
    290.0 /      5.51958 (217, 8)
    280.0 /      3.43209 (136, 8)
    270.0 /      4.26160 (178,10)
    260.0 /      3.83471 ( 18,13)
    250.0 /      5.51094 (308, 8)
    240.0 /      4.69942 (258, 8)
    230.0 /      5.25938 (364,15)
    220.0 /      4.33111 (338,10)
    210.0 /      4.42897 (360,13)
    200.0 /      4.52721 (107,10)
    190.0 /      5.15171 (289,10)
    180.0 /      3.33259 (162,16)
    170.0 /      4.32116 (364,13)
    160.0 /      3.67133 (251,11)
    150.0 /      4.81230 ( 25,14)
    140.0 /      4.24245 (163,16)
    130.0 /      4.17594 (229,10)
    120.0 /      3.51766 (164,16)
    110.0 /      4.20822 (164,16)
    100.0 /      5.31702 ( 14,11)
     90.0 /      5.68904 (201, 8)
     80.0 /      3.59219 (122, 8)
     70.0 /      4.50221 (163,12)
     60.0 /      5.12372 (  1,14)
     50.0 /      4.47097 ( 25,16)
     40.0 /      5.79065 ( 49,15)
     30.0 /      3.75872 ( 49,16)
     20.0 /      5.79021 ( 49,17)
     10.0 /      4.08915 (206,10)
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                                                                                                   2ND HIGH
                                                                                                    1-HR
                                                                                                   SGROUP#  1
                            *** FCS CONCENTRATIONS RUN  MET = TPA86                    ***


                        * SECOND HIGHEST  1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                         * FROM SOURCES:       1,
                                           * FOR THE RECEPTOR GRID *

                        * MAXIMUM VALUE EQUALS     7.58768 AND OCCURRED AT (    1000.0,     350.0) *

 DIRECTION /                                               RANGE (METERS)
 (DEGREES) /              1000.0               1250.0               1500.0               2000.0               3000.0
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


     360.0 /     7.17471 (218,14)     5.46259 (198,11)     4.67283 (139,13)     4.79251 (208,11)     5.76407 (206,10)
     350.0 /     7.58768 (234,12)     6.17250 (194,11)     5.28908 (194,11)     4.76323 (126,14)     4.08390 ( 79, 9)
     340.0 /     7.06754 (238,12)     5.16988 (238,12)     5.00038 (243,12)     4.64039 (243,12)     4.18856 (216, 9)
     330.0 /     7.06753 (238,12)     5.16987 (238,12)     4.67281 (148,11)     4.85312 (148,13)     5.76915 (215, 9)
     320.0 /     4.76032 (162,12)     3.77122 ( 93,13)     4.58521 ( 94,13)     5.16269 (233,10)     4.69584 (233,10)
     310.0 /     6.83261 (178,11)     4.58016 (173,13)     4.67871 (136,11)     4.89166 (272,14)     4.20644 (329, 9)
     300.0 /     7.46041 (189,13)     5.34971 (189,13)     4.71740 (147,12)     4.77472 (186,11)     4.38098 (251,10)
     290.0 /     7.38082 (242,12)     5.38054 (242,12)     4.54217 ( 95,12)     4.82106 (220,16)     4.31377 (217, 8)
     280.0 /     7.50569 (237,11)     5.43226 (237,11)     4.54558 (243,14)     4.76145 (104,14)     4.16609 (147,14)
     270.0 /     7.16133 (125,14)     4.68239 (125,14)     4.83874 (261,13)     4.84329 (222,12)     4.22424 (313,11)
     260.0 /     7.22119 (242,11)     5.52780 (176,14)     4.73708 (176,14)     4.85834 (247,12)     4.09534 (318,14)
     250.0 /     7.16828 (114,14)     5.45767 (221,12)     4.72097 (257,12)     4.75595 (235,14)     4.09550 (258,16)
     240.0 /     6.58064 (146,12)     5.58532 (174,13)     4.65468 (109,13)     4.69745 (264,13)     4.27389 (100, 8)
     230.0 /     7.33735 (146,12)     6.10633 (179,11)     5.26666 (179,11)     4.84329 (154,12)     4.01278 (295,12)
     220.0 /     6.60080 (221,13)     5.98615 (149,11)     5.23339 (149,11)     4.77332 (222,15)     4.22545 ( 44,10)
     210.0 /     7.36023 (221,13)     6.32682 (149,11)     5.57955 (116,11)     4.85312 (149,13)     4.01420 (290,11)
     200.0 /     6.11175 (251,12)     4.70251 (251,12)     4.37558 (265,14)     4.74909 (178,12)     4.53012 (325,11)
     190.0 /     6.58034 (152,11)     5.57545 (144,14)     4.22583 (144,14)     4.56547 ( 91,13)     4.67577 (289,10)
     180.0 /     6.85991 (144,14)     5.53195 (108,12)     4.48742 (144,14)     4.29534 (319,11)     3.78060 (363,12)
     170.0 /     4.70896 (152,11)     3.81952 (142,14)     4.23145 (206,11)     4.63804 (279,15)     4.10503 (101,10)
     160.0 /     4.39282 (162,11)     4.38801 (203,13)     4.72043 (107,12)     4.53187 (107,12)     3.87052 (112,10)
     150.0 /     5.59386 (195,14)     4.70178 (195,14)     4.60493 (169,14)     4.64262 (169,14)     4.02558 (220,17)
     140.0 /     6.89292 (162,11)     5.58817 (162,11)     4.62066 (195,14)     4.90997 (200,16)     4.29894 (213,10)
     130.0 /     3.68952 (162,11)     4.12111 (112,12)     4.73514 (107,13)     4.59066 (169,16)     3.95615 (236,16)
     120.0 /     5.33003 (171,12)     4.05695 (131,13)     4.80814 (212,13)     4.76215 (212,13)     4.84198 (201, 9)
     110.0 /     7.08890 (171,12)     4.75803 (171,12)     4.75588 (118,14)     4.69078 (106,11)     4.11860 (129,16)
     100.0 /     6.93235 (213,12)     5.37894 (213,12)     5.17966 (201,12)     4.85834 (173,14)     4.33492 (117,10)
      90.0 /     7.50550 (194,14)     5.37893 (213,12)     5.14475 (201,14)     4.90048 (201,11)     5.68227 (201, 8)
      80.0 /     7.18759 (199,11)     5.15110 (234,14)     4.99826 (137,14)     4.91133 (278,14)     3.98649 (280,13)
      70.0 /     7.22577 (219,12)     5.82648 (165,11)     5.15092 (165,11)     4.90793 (153,14)     5.70381 (163,12)
      60.0 /     7.19936 (246,12)     5.95557 (182,11)     5.12188 (162,13)     4.94967 (  4,13)     4.40372 ( 14,12)
      50.0 /     7.39991 (231,12)     6.02891 (179,12)     5.07321 (248,14)     4.91133 (159,11)     5.74159 (249,16)
      40.0 /     6.78088 (158,12)     5.23091 (206,12)     4.42785 (206,12)     4.71176 (105,11)     4.25418 (199, 9)
      30.0 /     7.42484 (244,14)     5.28787 (244,14)     4.42785 (206,12)     4.70888 (151,11)     4.53003 (  3,14)
      20.0 /     7.56666 (165,13)     5.56961 (153,11)     4.39179 (241,13)     5.65158 (140,12)     4.88828 (140,12)
      10.0 /     7.19119 (220,13)     5.37194 (242,14)     4.72318 (139,14)     4.75779 (138,12)     4.26511 ( 29,12)
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                                                                                                            2ND HIGH
                                                                                                             1-HR
                                                                                                            SGROUP#  1
                              *** FCS CONCENTRATIONS RUN  MET = TPA86                               ***


                          * SECOND HIGHEST  1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                                * FROM SOURCES:       1,
                                                  * FOR THE RECEPTOR GRID *

                           * MAXIMUM VALUE EQUALS     7.58768 AND OCCURRED AT (    1000.0,     350.0) *

DIRECTION /                                            RANGE (METERS)
(DEGREES) /           5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


   360.0 /      4.43837 ( 79, 9)
   350.0 /      3.78778 (199, 8)
   340.0 /      4.39673 (  1,10)
   330.0 /      3.92526 (139, 8)
   320.0 /      4.03943 (180, 8)
   310.0 /      4.10776 (165, 8)
   300.0 /      4.11187 (186, 8)
   290.0 /      4.56904 (249,14)
   280.0 /      3.33307 (166, 8)
   270.0 /      4.06536 ( 18,12)
   260.0 /      3.34070 (259,17)
   250.0 /      4.34721 ( 85, 8)
   240.0 /      4.05942 (131, 8)
   230.0 /      5.13754 (356, 9)
   220.0 /      4.31918 ( 44,10)
   210.0 /      3.46255 ( 12,10)
   200.0 /      3.41608 ( 23, 9)
   190.0 /      4.45205 (289,12)
   180.0 /      3.25285 (236,10)
   170.0 /      4.27160 (101,10)
   160.0 /      3.08363 ( 46,15)
   150.0 /      4.66109 (289,13)
   140.0 /      3.91027 (289,13)
   130.0 /      3.34991 (236,13)
   120.0 /      3.22295 (201, 9)
   110.0 /      4.02396 (129, 8)
   100.0 /      5.24028 (193,11)
    90.0 /      4.06140 (  3,12)
    80.0 /      3.37588 (176,10)
    70.0 /      4.04554 (176,10)
    60.0 /      3.65285 (  4,13)
    50.0 /      4.44981 (249,16)
    40.0 /      4.43172 (199, 9)
    30.0 /      3.63047 (195,10)
    20.0 /      4.53428 (  1,13)
    10.0 /      3.43294 (241, 9)
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                                                                                                                    MAX 50
                                                                                                                     1-HR
                                                                                                                    SGROUP#  1
                             *** FCS CONCENTRATIONS RUN  MET = TPA86                            ***


                         * 50 MAXIMUM  1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)      *


                                             * FROM SOURCES:        1,


                                          X      Y(METERS)                                                X      Y(METERS)
                                          OR        OR                                                    OR        OR
                                        RANGE   DIRECTION                                               RANGE   DIRECTION
   RANK       CON.      HOUR DAY      (METERS)  (DEGREES)          RANK       CON.      HOUR DAY      (METERS)  (DEGREES)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


     1       8.45278    13  360       2000.0      210.0              26       7.44347    11  189       1000.0      230.0
     2       7.90847    11  213       1000.0       90.0              27       7.42830    12  162       1000.0      330.0
     3       7.82702    12  143       1000.0      350.0              28       7.42703    11  121       1000.0       20.0
     4       7.79560    14  176       1000.0      270.0              29       7.42484    14  244       1000.0       30.0
     5       7.72931    11  217       1000.0      340.0              30       7.41405    11  205       1000.0      110.0
     6       7.61564    12  251       1000.0      210.0              31       7.39991    12  231       1000.0       50.0
     7       7.58812    11  153       1000.0       20.0              32       7.38082    12  242       1000.0      290.0
     8       7.58768    12  234       1000.0      350.0              33       7.38038    13  177       1000.0      160.0
     9       7.58747    13  244       1000.0       40.0              34       7.38035    14  179       1000.0      100.0
    10       7.58717    12  221       1000.0      250.0              35       7.37078    11  117       1000.0       50.0
    11       7.57165    13  237       1000.0      300.0              36       7.36023    13  221       1000.0      210.0
    12       7.56675    11  198       1000.0      360.0              37       7.33735    12  146       1000.0      230.0
    13       7.56666    13  165       1000.0       20.0              38       7.33693    11  152       1000.0      180.0
    14       7.56217    14  222       1000.0      280.0              39       7.28174    11  162       1000.0      150.0
    15       7.55092    14  242       1000.0       10.0              40       7.26937    11  123       1000.0      280.0
    16       7.54252    13  247       1000.0      260.0              41       7.24434    12  250       1000.0       50.0
    17       7.54179    12  199       1000.0       70.0              42       7.22579    12  235       1000.0      230.0
    18       7.54176    14  221       1000.0       50.0              43       7.22577    12  219       1000.0       70.0
    19       7.52977    11  194       1000.0      350.0              44       7.22212    12  189       1000.0      290.0
    20       7.52613    13  238       1000.0      290.0              45       7.22119    11  242       1000.0      260.0
    21       7.50732    11  202       1000.0       30.0              46       7.21239    13  251       1000.0       80.0
    22       7.50569    11  237       1000.0      280.0              47       7.20806    14  195       1000.0      140.0
    23       7.50550    14  194       1000.0       90.0              48       7.20523    12  108       1000.0      190.0
    24       7.49200    11  182       1000.0       60.0              49       7.19936    12  246       1000.0       60.0
    25       7.46041    13  189       1000.0      300.0              50       7.19750    13  235       1000.0      230.0
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                                                                                                                    HIGH
                                                                                                                    24-HR
                                                                                                                    SGROUP#  1
                                 *** FCS CONCENTRATIONS RUN  NET = TPA86                           ***


                                * HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)      *
                                                 * FROM SOURCES:        1,
                                                   * FOR THE RECEPTOR GRID *

                             * MAXIMUM VALUE EQUALS      1.18683 AND OCCURRED AT (    2000.0,      90.0) *

DIRECTION /                                                       RANGE (METERS)
(DEGREES) /             1000.0                1250.0                1500.0                2000.0                3000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


    360.0 /      0.59667 (218, 1)      0.39339 (218, 1)      0.42766C(254, 1)      0.45233C(254, 1)      0.46306C(206, 1)
    350.0 /      0.43491C(194, 1)      0.58882 (126, 1)      0.68572 (126, 1)      0.65301 (126, 1)      0.42045 (126, 1)
    340.0 /      0.39265C(238, 1)      0.38457 (126, 1)      0.45440 (126, 1)      0.48101C(132, 1)      0.39206C(281, 1)
    330.0 /      0.41269C(162, 1)      0.49274 (148, 1)      0.60685 (148, 1)      0.64473 (148, 1)      0.52131 (148, 1)
    320.0 /      0.27297C(238, 1)      0.28661C(132, 1)      0.36633C(132, 1)      0.43628C(233, 1)      0.44559C(329, 1)
    310.0 /      0.54842C(189, 1)      0.45917C(189, 1)      0.46356 (272, 1)      0.58308C(282, 1)      0.80374 (328, 1)
    300.0 /      0.77935C(189, 1)      0.66017C(189, 1)      0.64613C(220, 1)      0.73388C(220, 1)      0.71246C(238, 1)
    290.0 /      0.86970C(238, 1)      0.67776C(238, 1)      0.60625 (315, 1)      0.75008 (315, 1)      0.63240 (147, 1)
    280.0 /      0.63477C(238, 1)      0.51415C(188, 1)      0.69915C(188, 1)      0.82352C(188, 1)      0.72890C( 94, 1)
    270.0 /      0.45568C(176, 1)      0.58403C(188, 1)      0.80612C(188, 1)      0.96076C(188, 1)      0.77223C(188, 1)
    260.0 /      0.50840C(247, 1)      0.60879C(188, 1)      0.82222C(188, 1)      0.94548C(188, 1)      0.72200C(188, 1)
    250.0 /      0.48377C(120, 1)      0.47306 (260, 1)      0.66224 (260, 1)      0.83778 (260, 1)      0.78866 (260, 1)
    240.0 /      0.59961C(235, 1)      0.54299C(235, 1)      0.55207C(235, 1)      0.59900 ( 89, 1)      0.70790 (292, 1)
    230.0 /      0.82178C(235, 1)      0.64438C(235, 1)      0.56401C(235, 1)      0.52368 (262, 1)      0.57935 ( 88, 1)
    220.0 /      0.69569C(235, 1)      0.51888C(235, 1)      0.45522C(113, 1)      0.59985C(293, 1)      0.66190C(293, 1)
    210.0 /      0.39203C(142, 1)      0.44861C(113, 1)      0.54858C(113, 1)      0.55630C(113, 1)      0.59223C( 12, 1)
    200.0 /      0.33998C(116, 1)      0.35275C(108, 1)      0.45576 (325, 1)      0.57945 (325, 1)      0.51818 (325, 1)
    190.0 /      0.42022C(108, 1)      0.38611C(108, 1)      0.44181C( 87, 1)      0.48968C( 87, 1)      0.45173 (289, 1)
    180.0 /      0.36016C(108, 1)      0.30992C(108, 1)      0.32152C(236, 1)      0.43579C(236, 1)      0.44252C(236, 1)
    170.0 /      0.38728C(177, 1)      0.30608C(177, 1)      0.30111C( 44, 1)      0.41801C( 44, 1)      0.45718C( 44, 1)
    160.0 /      0.45102C(177, 1)      0.38697C(177, 1)      0.36044C(177, 1)      0.37496C(177, 1)      0.32010C(177, 1)
    150.0 /      0.41495C(162, 1)      0.36053C(162, 1)      0.42272C(119, 1)      0.49329C(119, 1)      0.39383C(246, 1)
    140.0 /      0.40045C(195, 1)      0.42181C(142, 1)      0.59599C(142, 1)      0.74900C(142, 1)      0.66478C(142, 1)
    130.0 /      0.31078C(195, 1)      0.35409 (112, 1)      0.46219 (112, 1)      0.59391C(142, 1)      0.54761C(142, 1)
    120.0 /      0.27099C(205, 1)      0.22901C(205, 1)      0.33539 (112, 1)      0.46169 (112, 1)      0.46252 (112, 1)
    110.0 /      0.45786C(205, 1)      0.44845C(205, 1)      0.56868C(129, 1)      0.68615C(129, 1)      0.64768C(129, 1)
    100.0 /      0.79093C(213, 1)      0.68293C(213, 1)      0.77318 (201, 1)      0.87660 (201, 1)      0.85326C(227, 1)
     90.0 /      0.91300C(213, 1)      0.84534C(230, 1)      1.06271C(230, 1)      1.18683C(230, 1)      0.98894C(230, 1)
     80.0 /      0.84695C(219, 1)      0.73141C(230, 1)      0.87535C(230, 1)      0.89559C(278, 1)      0.70824C(119, 1)
     70.0 /      1.03104C(197, 1)      0.88099C(197, 1)      0.85987C(196, 1)      0.99249C(115, 1)      0.83483C(115, 1)
     60.0 /      1.01605C(197, 1)      0.86131C(197, 1)      0.73864C(197, 1)      0.75969C( 97, 1)      0.67340C(277, 1)
     50.0 /      0.84750C(250, 1)      0.67190C(250, 1)      0.62412C(250, 1)      0.59640C(250, 1)      0.54231 (  4, 1)
     40.0 /      0.79137C(244, 1)      0.56340C(244, 1)      0.44618C( 53, 1)      0.53822C( 53, 1)      0.48098C(199, 1)
     30.0 /      0.71534C(244, 1)      0.50592C(244, 1)      0.64277C(214, 1)      0.80644C(214, 1)      0.72707C(214, 1)
     20.0 /      0.45007C(206, 1)      0.63859C(214, 1)      0.87622C(214, 1)      1.03716C(214, 1)      0.82496C(214, 1)
     10.0 /      0.50282 (218, 1)      0.45769C(181, 1)      0.58346C(181, 1)      0.63128C(181, 1)      0.46685C(102, 1)
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                                                                                          HIGH
                                                                                          24-HR
                                                                                          SGROUP#  1
                         *** FCS CONCENTRATIONS RUN  MET = TPA86                         ***


                        * HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                    * FROM SOURCES:        1,
                                      * FOR THE RECEPTOR GRID *

                      * MAXIMUM VALUE EQUALS      1.18683 AND OCCURRED AT (    2000.0,      90.0) *

 DIRECTION /                                           RANGE (METERS)
 (DEGREES) /            5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

    360.0 /      0.42746C(206, 1)
    350.0 /      0.30849C(206, 1)
    340.0 /      0.32406C(194, 1)
    330.0 /      0.39314C(329, 1)
    320.0 /      0.39519C(329, 1)
    310.0 /      0.65846 (328, 1)
    300.0 /      0.49363C(238, 1)
    290.0 /      0.43473 (147, 1)
    280.0 /      0.50836C( 94, 1)
    270.0 /      0.65290C(235, 1)
    260.0 /      0.49572 (258, 1)
    250.0 /      0.54965 (260, 1)
    240.0 /      0.52023C( 90, 1)
    230.0 /      0.55050 (  8, 1)
    220.0 /      0.45336C(293, 1)
    210.0 /      0.48361C( 12, 1)
    200.0 /      0.33738 (325, 1)
    190.0 /      0.44119 ( 11, 1)
    180.0 /      0.36250 ( 81, 1)
    170.0 /      0.34049C( 44, 1)
    160.0 /      0.33319C(  5, 1)
    150.0 /      0.28215 (289, 1)
    140.0 /      0.42670C(161, 1)
    130.0 /      0.41938C(113, 1)
    120.0 /      0.41742C( 20, 1)
    110.0 /      0.46428 (106, 1)
    100.0 /      0.64195C(227, 1)
     90.0 /      0.70577C(227, 1)
     80.0 /      0.49760C( 98, 1)
     70.0 /      0.45234C(115, 1)
     60.0 /      0.46305C(277, 1)
     50.0 /      0.44284 (  4, 1)
     40.0 /      0.38281C(199, 1)
     30.0 /      0.46642C(214, 1)
     20.0 /      0.43308C(214, 1)
     10.0 /      0.36213C(102, 1)
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                                                                                                    2ND HIGH
                                                                                                    24-HR
                                                                                                    SGROUP#  1
                          *** FCS CONCENTRATIONS RUN  MET = TPA86                         ***


                      * SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                          * FROM SOURCES:        1,
                                            * FOR THE RECEPTOR GRID *

                       * MAXIMUM VALUE EQUALS      1.03791 AND OCCURRED AT (    2000.0,      90.0) *

DIRECTION /                                              RANGE (METERS)
(DEGREES) /           1000.0              1250.0              1500.0              2000.0              3000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


   360.0 /      0.44454C(165, 1)    0.35496 (126, 1)    0.41230C(181, 1)    0.42704C(181, 1)    0.40316 ( 79, 1)
   350.0 /      0.42879C(234, 1)    0.43846C(254, 1)    0.53481C(254, 1)    0.54423C(254, 1)    0.37219C(254, 1)
   340.0 /      0.37027C(162, 1)    0.34822 (148, 1)    0.44509C(132, 1)    0.44872 (126, 1)    0.38097C(194, 1)
   330.0 /      0.39480C(238, 1)    0.34449C(132, 1)    0.43566C(132, 1)    0.45702C(132, 1)    0.48974C(329, 1)
   320.0 /      0.27222C(173, 1)    0.27538C( 93, 1)    0.35964C( 93, 1)    0.40612C( 93, 1)    0.42843C(233, 1)
   310.0 /      0.43075C(237, 1)    0.37666C(237, 1)    0.45640C(282, 1)    0.57852 (328, 1)    0.59846C(286, 1)
   300.0 /      0.69231C(238, 1)    0.57404C(238, 1)    0.60861C(189, 1)    0.64932C(238, 1)    0.61641C(220, 1)
   290.0 /      0.65752C(189, 1)    0.53287C(189, 1)    0.58778C(220, 1)    0.69274C(220, 1)    0.62995 (315, 1)
   280.0 /      0.52017C(237, 1)    0.44671C(238, 1)    0.57788 (315, 1)    0.75776 (315, 1)    0.72643 (315, 1)
   270.0 /      0.37509C(237, 1)    0.44714C(176, 1)    0.47735 (261, 1)    0.55426C( 94, 1)    0.63287C(235, 1)
   260.0 /      0.39860C(234, 1)    0.52009C(247, 1)    0.68755 (260, 1)    0.78919 (260, 1)    0.70399 (258, 1)
   250.0 /      0.43661C(114, 1)    0.44083C(247, 1)    0.55290 (258, 1)    0.73012 (258, 1)    0.73740 (258, 1)
   240.0 /      0.53227C(174, 1)    0.45919C(174, 1)    0.43593C( 90, 1)    0.58864C( 90, 1)    0.68334C( 90, 1)
   230.0 /      0.63132C(174, 1)    0.55315C(174, 1)    0.44673C(174, 1)    0.51173 ( 88, 1)    0.51196 (262, 1)
   220.0 /      0.45762C(174, 1)    0.39340C(174, 1)    0.43074C(235, 1)    0.54142 ( 88, 1)    0.58127 ( 88, 1)
   210.0 /      0.38369 (149, 1)    0.43248 (149, 1)    0.43550 (149, 1)    0.52467C( 87, 1)    0.49983C( 87, 1)
   200.0 /      0.33103C(142, 1)    0.31775 (325, 1)    0.39416C(108, 1)    0.44731C(108, 1)    0.41766C(108, 1)
   190.0 /      0.29653C(144, 1)    0.33542C( 87, 1)    0.35592C(108, 1)    0.37284 (325, 1)    0.40617 ( 11, 1)
   180.0 /      0.31181C(144, 1)    0.26733C(144, 1)    0.29462C( 44, 1)    0.38539C( 44, 1)    0.37919 ( 81, 1)
   170.0 /      0.19633C(144, 1)    0.21597C(142, 1)    0.26194C(142, 1)    0.30673C(161, 1)    0.37076C( 15, 1)
   160.0 /      0.24584C(162, 1)    0.21099C(203, 1)    0.24260C(203, 1)    0.25868 (319, 1)    0.26127 ( 43, 1)
   150.0 /      0.31077C(195, 1)    0.30918C(119, 1)    0.34988C(246, 1)    0.43434C(246, 1)    0.38787C(119, 1)
   140.0 /      0.38781C(162, 1)    0.35086C(200, 1)    0.46360C(200, 1)    0.54450C(200, 1)    0.50723C(200, 1)
   130.0 /      0.20513C(162, 1)    0.32493C(142, 1)    0.46200C(142, 1)    0.53619 (112, 1)    0.51301C(103, 1)
   120.0 /      0.27052C(131, 1)    0.22862 (112, 1)    0.31945C(236, 1)    0.42854C(236, 1)    0.43906C(101, 1)
   110.0 /      0.38175C(213, 1)    0.42911C(129, 1)    0.47027 (106, 1)    0.61202 (106, 1)    0.61341 (106, 1)
   100.0 /      0.69958C(194, 1)    0.61400 (201, 1)    0.73624C(129, 1)    0.86776C(129, 1)    0.79952C(129, 1)
    90.0 /      0.84057C(194, 1)    0.84354C(213, 1)    0.84354C(278, 1)    1.03791C(278, 1)    0.95890 (201, 1)
    80.0 /      0.64860C(199, 1)    0.65639C(219, 1)    0.75644C(278, 1)    0.86602C(230, 1)    0.69481C(278, 1)
    70.0 /      0.88646C(219, 1)    0.78427C(196, 1)    0.82854C(115, 1)    0.87256C(196, 1)    0.75066C(277, 1)
    60.0 /      0.66956C(219, 1)    0.52252C(219, 1)    0.66393C( 97, 1)    0.65842C(195, 1)    0.58919C(195, 1)
    50.0 /      0.58841C(197, 1)    0.51351C(197, 1)    0.48711C(198, 1)    0.50519C(198, 1)    0.47634C(250, 1)
    40.0 /      0.67888C(250, 1)    0.50367C(250, 1)    0.43335C(250, 1)    0.42223 (202, 1)    0.46686C( 53, 1)
    30.0 /      0.45699C(206, 1)    0.47543C(240, 1)    0.63691C(240, 1)    0.71964C(240, 1)    0.53248C(240, 1)
    20.0 /      0.42067C(121, 1)    0.48029C(240, 1)    0.65840C(240, 1)    0.76955C(240, 1)    0.58952C(240, 1)
    10.0 /      0.45871C(165, 1)    0.37859C(214, 1)    0.49413C(214, 1)    0.53905C(214, 1)    0.46276C(181, 1)
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                                                                                          2ND HIGH
                                                                                          24-HR
                                                                                          SGROUP#  1
                         *** FCS CONCENTRATIONS RUN  MET = TPA86                   ***


                     * SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                      * FROM SOURCES:        1,
                                        * FOR THE RECEPTOR GRID *

                      * MAXIMUM VALUE EQUALS      1.03791 AND OCCURRED AT (    2000.0,      90.0) *

 DIRECTION /                                        RANGE (METERS)
 (DEGREES) /           5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


    360.0 /      0.37260C(  1, 1)
    350.0 /      0.26312C(  1, 1)
    340.0 /      0.29658C(207, 1)
    330.0 /      0.31081 (148, 1)
    320.0 /      0.31204C(233, 1)
    310.0 /      0.50796 ( 77, 1)
    300.0 /      0.47561 (186, 1)
    290.0 /      0.38412C(135, 1)
    280.0 /      0.45421 (315, 1)
    270.0 /      0.46589 (312, 1)
    260.0 /      0.46840C(172, 1)
    250.0 /      0.49861 (258, 1)
    240.0 /      0.51591 (292, 1)
    230.0 /      0.42592C(293, 1)
    220.0 /      0.41302 ( 88, 1)
    210.0 /      0.35054 (294, 1)
    200.0 /      0.31542 (107, 1)
    190.0 /      0.43373 (289, 1)
    180.0 /      0.29695C(236, 1)
    170.0 /      0.30814C( 15, 1)
    160.0 /      0.21624 ( 43, 1)
    150.0 /      0.27427C(204, 1)
    140.0 /      0.39410C(142, 1)
    130.0 /      0.38039C(103, 1)
    120.0 /      0.30694 (112, 1)
    110.0 /      0.45057C( 65, 1)
    100.0 /      0.58213C(229, 1)
     90.0 /      0.68123 (201, 1)
     80.0 /      0.45702C(119, 1)
     70.0 /      0.43323C(163, 1)
     60.0 /      0.38859C(171, 1)
     50.0 /      0.34235C(  3, 1)
     40.0 /      0.31881C(231, 1)
     30.0 /      0.32296C( 53, 1)
     20.0 /      0.37899C( 49, 1)
     10.0 /      0.29355C(206, 1)
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                                                                                                    MAX 50
                                                                                                    24-HR
                                                                                                    SGROUP#  1
                          *** FCS CONCENTRATIONS RUN  MET = TPA86                        ***

                       * 50 MAXIMUM 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *

                                          * FROM SOURCES:        1,

                                     X      Y(METERS)                                            X      Y(METERS)
                                     OR        OR                                                OR        OR
                                   RANGE    DIRECTION                                          RANGE    DIRECTION
    RANK       CON.      PER. DAY  (METERS)  (DEGREES)          RANK       CON.      PER. DAY  (METERS)  (DEGREES)
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

      1       1.18683C   1  230    2000.0      90.0              26       0.86776C   1  129    2000.0     100.0
      2       1.06271C   1  230    1500.0      90.0              27       0.86602C   1  230    2000.0      80.0
      3       1.03791C   1  278    2000.0      90.0              28       0.86131C   1  197    1250.0      60.0
      4       1.03716C   1  214    2000.0      20.0              29       0.85987C   1  196    1500.0      70.0
      5       1.03104C   1  197    1000.0      70.0              30       0.85677C   1  158    2000.0      90.0
      6       1.01605C   1  197    1000.0      60.0              31       0.85326C   1  227    3000.0     100.0
      7       0.99249C   1  115    2000.0      70.0              32       0.84750C   1  250    1000.0      50.0
      8       0.98894C   1  230    3000.0      90.0              33       0.84695C   1  219    1000.0      80.0
      9       0.96275    1  201    2000.0      90.0              34       0.84534C   1  230    1250.0      90.0
     10       0.96076C   1  188    2000.0     270.0              35       0.84489C   1  278    3000.0      90.0
     11       0.95890    1  201    3000.0      90.0              36       0.84354C   1  213    1250.0      90.0
     12       0.94548C   1  188    2000.0     260.0              37       0.84354C   1  278    1500.0      90.0
     13       0.92805C   1  227    3000.0      90.0              38       0.84057C   1  194    1000.0      90.0
     14       0.91300C   1  213    1000.0      90.0              39       0.84006C   1  157    2000.0      90.0
     15       0.90008C   1  227    2000.0      90.0              40       0.83778    1  260    2000.0     250.0
     16       0.89559C   1  278    2000.0      80.0              41       0.83683C   1   98    2000.0      90.0
     17       0.88646C   1  219    1000.0      70.0              42       0.83483C   1  115    3000.0      70.0
     18       0.88099C   1  197    1250.0      70.0              43       0.82854C   1  115    1500.0      70.0
     19       0.87660    1  201    2000.0     100.0              44       0.82496C   1  214    3000.0      20.0
     20       0.87622C   1  214    1500.0      20.0              45       0.82352C   1  188    2000.0     280.0
     21       0.87535C   1  230    1500.0      80.0              46       0.82222C   1  188    1500.0     260.0
     22       0.87340C   1  158    3000.0      90.0              47       0.82178C   1  235    1000.0     230.0
     23       0.87260C   1  157    3000.0      90.0              48       0.82083C   1  157    2000.0      80.0
     24       0.87256C   1  196    2000.0      70.0              49       0.81013C   1  213    1500.0      90.0
     25       0.86970C   1  238    1000.0     290.0              50       0.80644C   1  214    2000.0      30.0
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                                                                                                   'N'-DAY
                                                                                                   365 DAYS
                                                                                                   SGROUP#  2
                            *** FCS CONCENTRATIONS RUN  MET = TPA86                         ***


                              * 365-DAY AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *

                                         * FROM SOURCES:       2,
                                           * FOR THE RECEPTOR GRID *

                         * MAXIMUM VALUE EQUALS     0.04939 AND OCCURRED AT (    3000.0,      90.0) *

 DIRECTION /                                              RANGE (METERS)
 (DEGREES) /      1000.0       1250.0       1500.0       2000.0       3000.0       5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


     360.0 /     0.00585      0.00823      0.00999      0.01255      0.01550      0.01433
     350.0 /     0.00505      0.00741      0.00915      0.01150      0.01381      0.01202
     340.0 /     0.00377      0.00606      0.00798      0.01061      0.01323      0.01165
     330.0 /     0.00261      0.00477      0.00706      0.01036      0.01416      0.01343
     320.0 /     0.00261      0.00487      0.00776      0.01223      0.01788      0.01804
     310.0 /     0.00400      0.00685      0.01070      0.01735      0.02626      0.02683
     300.0 /     0.00565      0.00875      0.01267      0.01938      0.02793      0.02777
     290.0 /     0.00643      0.00939      0.01273      0.01814      0.02449      0.02322
     280.0 /     0.00641      0.00941      0.01270      0.01796      0.02454      0.02391
     270.0 /     0.00630      0.00959      0.01334      0.01947      0.02731      0.02724
     260.0 /     0.00609      0.00940      0.01314      0.01890      0.02571      0.02488
     250.0 /     0.00572      0.00910      0.01288      0.01859      0.02590      0.02596
     240.0 /     0.00549      0.00903      0.01265      0.01786      0.02495      0.02620
     230.0 /     0.00536      0.00893      0.01210      0.01627      0.02164      0.02233
     220.0 /     0.00484      0.00818      0.01078      0.01392      0.01738      0.01683
     210.0 /     0.00373      0.00638      0.00828      0.01038      0.01275      0.01219
     200.0 /     0.00262      0.00448      0.00572      0.00699      0.00865      0.00869
     190.0 /     0.00191      0.00335      0.00443      0.00570      0.00746      0.00770
     180.0 /     0.00145      0.00272      0.00398      0.00577      0.00850      0.00924
     170.0 /     0.00116      0.00235      0.00369      0.00569      0.00872      0.00980
     160.0 /     0.00104      0.00219      0.00344      0.00505      0.00694      0.00708
     150.0 /     0.00108      0.00242      0.00402      0.00638      0.00932      0.00973
     140.0 /     0.00104      0.00259      0.00455      0.00756      0.01126      0.01172
     130.0 /     0.00112      0.00264      0.00462      0.00752      0.01119      0.01183
     120.0 /     0.00183      0.00354      0.00580      0.00911      0.01358      0.01433
     110.0 /     0.00355      0.00643      0.01016      0.01587      0.02321      0.02375
     100.0 /     0.00584      0.01090      0.01724      0.02675      0.03665      0.03410
      90.0 /     0.00787      0.01478      0.02336      0.03625      0.04939      0.04516
      80.0 /     0.00969      0.01720      0.02596      0.03843      0.04891      0.04128
      70.0 /     0.01131      0.01867      0.02665      0.03791      0.04672      0.03852
      60.0 /     0.01150      0.01769      0.02371      0.03211      0.03865      0.03179
      50.0 /     0.00986      0.01441      0.01821      0.02334      0.02786      0.02341
      40.0 /     0.00785      0.01102      0.01339      0.01664      0.02067      0.01892
      30.0 /     0.00681      0.00928      0.01127      0.01431      0.01843      0.01749
      20.0 /     0.00650      0.00883      0.01083      0.01408      0.01804      0.01641
      10.0 /     0.00627      0.00861      0.01049      0.01336      0.01671      0.01522
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                                                                                                    HIGH
                                                                                                     1-HR
                                                                                                    SGROUP#  2
                        *** FCS CONCENTRATIONS RUN  MET = TPA86                        ***


                        * HIGHEST  1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                     * FROM SOURCES:        2,
                                       * FOR THE RECEPTOR GRID *

                      * MAXIMUM VALUE EQUALS      6.23377 AND OCCURRED AT (    1250.0,      90.0) *

DIRECTION /                                            RANGE (METERS)
(DEGREES) /           1000.0              1250.0              1500.0              2000.0              3000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

    360.0 /     3.97941 (143,12)    5.25837 (143,12)    4.70905 (143,12)    3.74790 (143,12)    3.54952 (207, 9)
    350.0 /     4.71084 (143,12)    6.11631 (143,12)    5.52962 (143,12)    4.55545 (143,12)    3.35888 (143,12)
    340.0 /     4.06341 (217,11)    5.61918 (217,11)    5.19102 (217,11)    4.28582 (217,11)    3.47995 (216, 9)
    330.0 /     3.08283 (162,12)    4.12037 (217,11)    3.89247 (162,12)    3.23339 (162,12)    3.00249 (233,11)
    320.0 /     3.34671 (173,13)    3.03523 (173,13)    2.50533 (162,12)    1.96287 ( 93,13)    2.39046 (153, 9)
    310.0 /     4.07601 (178,11)    4.70052 (178,11)    4.20420 (178,11)    3.36728 (178,11)    3.06907 (253,13)
    300.0 /     4.07601 (178,11)    4.70052 (178,11)    4.20419 (178,11)    3.36727 (178,11)    3.56566 (253,12)
    290.0 /     3.84051 (238,14)    3.68496 (242,12)    3.53525 (242,12)    2.94932 (242,12)    2.24211 (253,12)
    280.0 /     3.81257 (155,12)    4.50838 (176,14)    4.01323 (176,14)    3.09015 (176,14)    2.64963 (172,16)
    270.0 /     4.67595 (176,14)    6.11546 (176,14)    5.53489 (176,14)    4.57098 (176,14)    3.45812 (313,11)
    260.0 /     3.91028 (242,11)    4.99826 (176,14)    4.47077 (176,14)    3.52518 (176,14)    2.70877 (172,15)
    250.0 /     3.78125 (120,12)    3.58911 (221,12)    3.50413 (257,12)    3.18671 (257,12)    2.62310 ( 21,12)
    240.0 /     3.39325 ( 93,12)    3.41719 (146,12)    3.29842 (146,12)    2.93229 (174,13)    3.32930 (326,11)
    230.0 /     4.42836 (235,12)    5.08295 (235,12)    4.53824 (235,12)    3.78525 (179,11)    2.85133 (174,12)
    220.0 /     3.93745 (235,12)    4.54018 (235,12)    4.44699 (149,11)    3.78525 (179,11)    2.82358 (179,11)
    210.0 /     4.10596 (116,11)    5.57583 (116,11)    5.05886 (116,11)    4.12539 (116,11)    3.00949 (149,11)
    200.0 /     4.10596 (116,11)    5.57583 (116,11)    5.05887 (116,11)    4.12539 (116,11)    2.99759 (116,11)
    190.0 /     3.59389 (108,12)    5.20888 (108,12)    4.86052 (108,12)    4.00796 (108,12)    2.94992 (108,12)
    180.0 /     3.20599 (108,12)    4.70338 (108,12)    4.37252 (108,12)    3.52387 (108,12)    2.51415 (108,12)
    170.0 /     2.70483 (177,13)    3.16640 (177,13)    2.89297 (177,13)    2.43128 (112,10)    3.10017 ( 44,12)
    160.0 /     3.01079 (177,13)    3.49984 (177,13)    3.22324 (177,13)    2.78371 (112,10)    3.58349 (112,10)
    150.0 /     3.36529 (162,11)    4.81358 (162,11)    4.56204 (162,11)    3.74403 (162,11)    2.73500 (162,11)
    140.0 /     3.18066 (162,11)    4.57093 (162,11)    4.32323 (162,11)    3.50848 (162,11)    3.50143 (213,10)
    130.0 /     1.65842 (162,11)    2.51937 (162,11)    2.65834 (195,14)    2.29145 (195,14)    2.44976 ( 46,13)
    120.0 /     3.25188 (131,13)    3.07896 (131,13)    2.87575 (205,11)    2.19711 (141,13)    2.34305 (122, 9)
    110.0 /     3.75264 (171,12)    4.63910 (205,11)    4.45199 (205,11)    3.67368 (205,11)    3.17435 (122, 9)
    100.0 /     4.93813 (213,11)    5.27509 (213,11)    4.55388 (213,11)    3.57084 (213,11)    3.37928 (129, 9)
     90.0 /     5.88431 (213,11)    6.23377 (213,11)    5.44980 (213,11)    4.40711 (213,11)    3.37926 (129, 9)
     80.0 /     3.88178 (213,11)    4.21744 (199,11)    4.64960 (199,11)    4.05306 (199,11)    3.08993 (199,11)
     70.0 /     3.89832 (146,11)    4.40471 (165,11)    4.54104 (165,11)    3.75727 (165,11)    2.70813 (165,11)
     60.0 /     4.13095 (117,11)    5.02698 (165,11)    5.18500 (165,11)    4.44737 (165,11)    3.46758 (212, 9)
     50.0 /     4.93331 (117,11)    5.60686 (117,11)    4.94868 (117,11)    4.00885 (117,11)    2.91081 (117,11)
     40.0 /     3.99119 (206,12)    4.62063 (206,12)    4.14229 (206,12)    3.31944 (206,12)    2.81026 (169,11)
     30.0 /     4.85783 (202,11)    5.51204 (202,11)    4.89022 (202,11)    3.96186 (202,11)    2.87862 (202,11)
     20.0 /     3.76415 (239,13)    3.91903 (202,11)    3.73647 (153,11)    3.12865 (153,11)    3.24915 (  2,13)
     10.0 /     3.85380 (220,13)    3.60995 (206,14)    3.20246 (206,14)    2.70547 (203,14)    2.91233 (182, 9)
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                                                                                                                         HIGH
                                                                                                                          1-HR
                                                                                                                         SGROUP#  2
                              *** FCS CONCENTRATIONS RUN  MET = TPA86                              ***


                             * HIGHEST  1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                                * FROM SOURCES:       2,
                                                    * FOR THE RECEPTOR GRID *

                          * MAXIMUM VALUE EQUALS      6.23377 AND OCCURRED AT (    1250.0,      90.0) *

DIRECTION /                                                     RANGE (METERS)
(DEGREES) /             5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


    360.0 /      2.80152 (207, 9)
    350.0 /      2.22038 (143,12)
    340.0 /      3.27297 (298,10)
    330.0 /      2.45101 (233,11)
    320.0 /      2.99447 (153, 9)
    310.0 /      2.81273 ( 48,10)
    300.0 /      2.95672 (225,11)
    290.0 /      2.01526 ( 68, 9)
    280.0 /      2.68081 (313,10)
    270.0 /      2.87633 (313,11)
    260.0 /      2.66916 (305, 9)
    250.0 /      2.40988 ( 15,13)
    240.0 /      2.59809 ( 21,13)
    230.0 /      2.49915 (359,12)
    220.0 /      2.27934 (355,12)
    210.0 /      3.02000 ( 12,10)
    200.0 /      2.34685 (107, 9)
    190.0 /      2.87230 (326,12)
    180.0 /      2.34104 (363,12)
    170.0 /      2.51744 ( 44,12)
    160.0 /      2.58620 ( 46,15)
    150.0 /      2.03859 (119,10)
    140.0 /      2.90847 (213,10)
    130.0 /      3.13735 ( 46,13)
    120.0 /      2.42279 (256,11)
    110.0 /      2.96613 ( 55,11)
    100.0 /      2.37124 (129, 9)
     90.0 /      2.52411 (248,10)
     80.0 /      2.32411 ( 98,10)
     70.0 /      2.68525 (163,11)
     60.0 /      2.83785 (212, 9)
     50.0 /      2.87391 (  4,16)
     40.0 /      2.87004 (169,11)
     30.0 /      2.64790 ( 41,15)
     20.0 /      3.30472 (209,10)
     10.0 /      2.69089 (182, 9)
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                                                                                                   2ND HIGH
                                                                                                    1-HR
                                                                                                   SGROUP#  2
                             *** FCS CONCENTRATIONS RUN  MET = TPA86                     ***


                         * SECOND HIGHEST  1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                          * FROM SOURCES:       2,
                                            * FOR THE RECEPTOR GRID *

                          * MAXIMUM VALUE EQUALS     4.93771 AND OCCURRED AT (    1250.0,     350.0) *

 DIRECTION /                                              RANGE (METERS)
 (DEGREES) /            1000.0              1250.0              1500.0              2000.0              3000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


    360.0 /     3.84050 (218,14)    3.80355 (194,11)    3.59309 (194,11)    2.85519 (198,11)    2.89497 (127, 9)
    350.0 /     3.68147 (266,12)    4.93771 (194,11)    4.70364 (194,11)    3.89851 (194,11)    2.88423 (194,11)
    340.0 /     3.48264 (266,12)    4.27570 (143,12)    3.79027 (143,12)    2.88863 (238,12)    3.16618 (217,11)
    330.0 /     2.89920 (238,12)    3.99649 (162,12)    3.75375 (217,11)    2.89203 (217,11)    2.82506 (180, 9)
    320.0 /     2.22116 (178,11)    2.61704 (178,11)    2.32158 (173,13)    1.95574 ( 94,13)    2.28893 (313,12)
    310.0 /     3.74030 (173,13)    3.37687 (173,13)    2.78753 (220,11)    2.21282 (220,11)    2.54903 (241,10)
    300.0 /     3.84095 (243,13)    3.51662 (243,13)    3.17129 (242,12)    2.58942 (242,12)    2.50868 (189, 9)
    290.0 /     3.69242 (149,12)    3.51947 (238,13)    3.31143 (189,12)    2.75252 (189,12)    2.16567 (242,12)
    280.0 /     3.49300 (149,12)    3.73775 (123,11)    3.62853 (123,11)    3.02961 (123,11)    2.39331 (174, 9)
    270.0 /     3.81257 (125,14)    3.50131 (187,12)    2.98907 (187,12)    2.40546 (187,12)    3.38034 (176,14)
    260.0 /     3.84052 (234,13)    4.11488 (242,11)    3.74212 (242,11)    3.07988 (247,13)    2.45004 (176,14)
    250.0 /     3.68461 (244,12)    3.50089 (244,12)    3.31170 (221,12)    2.76608 (221,12)    2.43054 (257,12)
    240.0 /     3.19921 (120,12)    3.20338 (235,12)    3.29061 (174,13)    2.73537 (237,12)    2.62310 ( 21,12)
    230.0 /     3.97205 (235,13)    4.32053 (235,13)    4.40465 (179,11)    3.73963 (174,12)    2.82358 (179,11)
    220.0 /     3.34764 (235,13)    4.10627 (149,11)    4.40465 (179,11)    3.78073 (149,11)    2.79520 (149,11)
    210.0 /     3.75746 (142,13)    4.66082 (251,12)    4.64945 (149,11)    3.99872 (149,11)    2.99759 (116,11)
    200.0 /     3.17676 (142,13)    3.78054 (251,12)    3.61387 (251,12)    2.86570 (251,12)    2.25458 (325,12)
    190.0 /     2.69069 (152,11)    3.36889 (152,11)    3.23793 (152,11)    2.86455 (144,14)    2.81386 (326,12)
    180.0 /     2.99676 (152,11)    3.73284 (152,11)    3.60881 (152,11)    3.03059 (144,14)    2.27920 (144,14)
    170.0 /     1.92592 (152,11)    2.46298 (108,12)    2.32590 (152,11)    2.35282 (177,13)    3.07421 (112,10)
    160.0 /     1.99216 (162,11)    2.97875 (162,11)    2.78970 (162,11)    2.67983 (177,13)    2.16314 (203,13)
    150.0 /     1.93885 (177,13)    2.48014 (195,14)    2.65834 (195,14)    2.29145 (195,14)    2.35970 (119,10)
    140.0 /     1.78974 (195,14)    3.09042 (195,14)    3.34685 (195,14)    3.04307 (195,14)    2.54597 (112,11)
    130.0 /     1.60011 (131,13)    2.48015 (195,14)    2.35815 (162,11)    2.18151 (112,12)    2.19855 ( 43,12)
    120.0 /     2.83324 (171,12)    3.03101 (205,11)    2.58245 (131,13)    2.16684 (205,11)    2.13677 (212,13)
    110.0 /     3.63492 (131,13)    3.61845 (171,12)    3.16169 (171,12)    2.56913 (171,12)    2.99170 ( 55,11)
    100.0 /     4.19646 (213,12)    4.79419 (213,12)    4.27702 (213,12)    3.42258 (213,12)    2.48518 (213,11)
     90.0 /     4.19645 (213,12)    4.79418 (213,12)    4.27701 (213,12)    3.42257 (213,12)    3.19532 (213,11)
     80.0 /     3.85302 (251,13)    4.19899 (213,11)    3.57014 (213,11)    2.85869 (219,11)    2.74896 ( 98,10)
     70.0 /     3.86731 (195,11)    4.20393 (195,11)    3.82548 (146,11)    3.11156 (146,11)    2.26376 (146,11)
     60.0 /     3.95318 (252,13)    4.74160 (117,11)    4.47774 (182,11)    3.70696 (182,11)    3.38197 (165,11)
     50.0 /     4.05194 (250,12)    4.54683 (252,13)    4.29311 (231,12)    3.54868 (231,12)    2.60576 (231,12)
     40.0 /     3.83227 (202,11)    4.39815 (202,11)    3.84765 (202,11)    2.99148 (202,11)    2.37432 (206,12)
     30.0 /     3.99119 (206,12)    4.62063 (206,12)    4.14229 (206,12)    3.31944 (206,12)    2.37432 (206,12)
     20.0 /     3.76408 (179,13)    3.86149 (153,11)    3.50194 (121,11)    2.93998 (121,11)    3.13757 (202,10)
     10.0 /     3.67870 (206,14)    3.52338 (212,12)    3.14257 (212,12)    2.58391 (206,14)    2.15559 (226,12)
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                                                                                                                                                                 2ND HIGH
                                                                                                                                                                  1-HR
                                                                                                                                                                 SGROUP#  2
                                         *** FCS CONCENTRATIONS RUN  MET = TPA86                              ***


                                   * SECOND HIGHEST  1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                                            * FROM SOURCES:       2,
                                                               * FOR THE RECEPTOR GRID *

                                    * MAXIMUM VALUE EQUALS      4.93771 AND OCCURRED AT (    1250.0,     350.0) *

 DIRECTION /                                                           RANGE (METERS)
 (DEGREES) /           5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     360.0 /      2.72427 (216,10)
     350.0 /      2.21124 (146,10)
     340.0 /      2.85735 (194,10)
     330.0 /      2.36648 (180, 9)
     320.0 /      2.35122 (149, 9)
     310.0 /      2.70308 (253,13)
     300.0 /      2.68233 (253,12)
     290.0 /      1.89050 (136, 9)
     280.0 /      2.25803 (174, 9)
     270.0 /      2.82972 (188, 9)
     260.0 /      2.59385 (222,10)
     250.0 /      2.22014 ( 21,12)
     240.0 /      2.58004 (326,11)
     230.0 /      2.44700 (347,11)
     220.0 /      2.02641 ( 88, 8)
     210.0 /      2.07510 (362,13)
     200.0 /      2.17428 (338,11)
     190.0 /      1.94380 (108,12)
     180.0 /      2.24664 ( 43,13)
     170.0 /      2.37636 ( 46,14)
     160.0 /      2.55295 (112,10)
     150.0 /      1.93042 (176,16)
     140.0 /      2.76367 ( 13,11)
     130.0 /      1.94828 ( 43,12)
     120.0 /      1.85669 (122, 9)
     110.0 /      2.71407 (326,13)
     100.0 /      2.31255 ( 46,17)
      90.0 /      2.37122 (129, 9)
      80.0 /      2.11933 (248,10)
      70.0 /      2.53464 (153,10)
      60.0 /      2.70433 (255,10)
      50.0 /      2.55345 (  4,15)
      40.0 /      2.56747 (205,10)
      30.0 /      2.36554 ( 41,12)
      20.0 /      3.01859 (202,10)
      10.0 /      2.66598 (  4,14)
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                                                                                                      2ND HIGH
                                                                                                       1-HR
                                                                                                      SGROUP#  2
                         *** FCS CONCENTRATIONS RUN  MET = TPA86                            ***

                      * SECOND HIGHEST  1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)      *
                                        * FROM SOURCES:        2,
                                          * FOR THE RECEPTOR GRID *

                       * MAXIMUM VALUE EQUALS      4.93771 AND OCCURRED AT (    1250.0,     350.0) *

 DIRECTION /                                            RANGE (METERS)
 (DEGREES) /           1000.0               1250.0               1500.0               2000.0               3000.0
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     360.0 /      3.84050 (218,14)     3.80355 (194,11)     3.59309 (194,11)     2.85519 (198,11)     2.89497 (127, 9)
     350.0 /      3.68147 (266,12)     4.93771 (194,11)     4.70364 (194,11)     3.89851 (194,11)     2.88423 (194,11)
     340.0 /      3.48264 (266,12)     4.27570 (143,12)     3.79027 (143,12)     2.88863 (238,12)     3.16618 (217,11)
     330.0 /      2.89920 (238,12)     3.99649 (162,12)     3.75375 (217,11)     2.89203 (217,11)     2.82506 (180, 9)
     320.0 /      2.22116 (178,11)     2.61704 (178,11)     2.32158 (173,13)     1.95574 ( 94,13)     2.28893 (313,12)
     310.0 /      3.74030 (173,13)     3.37687 (173,13)     2.78753 (220,11)     2.21282 (220,11)     2.54903 (241,10)
     300.0 /      3.84095 (243,13)     3.51662 (243,13)     3.17129 (242,12)     2.58942 (242,12)     2.50868 (189, 9)
     290.0 /      3.69242 (149,12)     3.51947 (238,13)     3.31143 (189,12)     2.75252 (189,12)     2.16567 (242,12)
     280.0 /      3.49300 (149,12)     3.73775 (123,11)     3.62853 (123,11)     3.02961 (123,11)     2.39331 (174, 9)
     270.0 /      3.81257 (125,14)     3.50131 (187,12)     2.98907 (187,12)     2.40546 (187,12)     3.38034 (176,14)
     260.0 /      3.84052 (234,13)     4.11488 (242,11)     3.74212 (242,11)     3.07988 (247,13)     2.45004 (176,14)
     250.0 /      3.68461 (244,12)     3.50089 (244,12)     3.31170 (221,12)     2.76608 (221,12)     2.43054 (257,12)
     240.0 /      3.19921 (120,12)     3.20338 (235,12)     3.29061 (174,13)     2.73537 (237,12)     2.62310 ( 21,12)
     230.0 /      3.97205 (235,13)     4.32053 (235,13)     4.40465 (179,11)     3.73963 (174,12)     2.82358 (179,11)
     220.0 /      3.34764 (235,13)     4.10627 (149,11)     4.40465 (179,11)     3.78073 (149,11)     2.79520 (149,11)
     210.0 /      3.75746 (142,13)     4.66082 (251,12)     4.64945 (149,11)     3.99872 (149,11)     2.99759 (116,11)
     200.0 /      3.17676 (142,13)     3.78054 (251,12)     3.61387 (251,12)     2.86570 (251,12)     2.25458 (325,12)
     190.0 /      2.69069 (152,11)     3.36889 (152,11)     3.23793 (152,11)     2.86455 (144,14)     2.81386 (326,12)
     180.0 /      2.99676 (152,11)     3.73284 (152,11)     3.60881 (152,11)     3.03059 (144,14)     2.27920 (144,14)
     170.0 /      1.92592 (152,11)     2.46298 (108,12)     2.32590 (152,11)     2.35282 (177,13)     3.07421 (112,10)
     160.0 /      1.99216 (162,11)     2.97875 (162,11)     2.78970 (162,11)     2.67983 (177,13)     2.16314 (203,13)
     150.0 /      1.93885 (177,13)     2.48014 (195,14)     2.65834 (195,14)     2.29145 (195,14)     2.35970 (119,10)
     140.0 /      1.78974 (195,14)     3.09042 (195,14)     3.34685 (195,14)     3.04307 (195,14)     2.54597 (112,11)
     130.0 /      1.60011 (131,13)     2.48015 (195,14)     2.35815 (162,11)     2.18151 (112,12)     2.19855 ( 43,12)
     120.0 /      2.83324 (171,12)     3.03101 (205,11)     2.58245 (131,13)     2.16684 (205,11)     2.13677 (212,13)
     110.0 /      3.63492 (131,13)     3.61845 (171,12)     3.16169 (171,12)     2.56913 (171,12)     2.99170 ( 55,11)
     100.0 /      4.19646 (213,12)     4.79419 (213,12)     4.27702 (213,12)     3.42258 (213,12)     2.48518 (213,11)
      90.0 /      4.19645 (213,12)     4.79418 (213,12)     4.27701 (213,12)     3.42257 (213,12)     3.19532 (213,11)
      80.0 /      3.85302 (251,13)     4.19899 (213,11)     3.57014 (213,11)     2.85869 (219,11)     2.74896 ( 98,10)
      70.0 /      3.86731 (195,11)     4.20393 (195,11)     3.82548 (146,11)     3.11156 (146,11)     2.26376 (146,11)
      60.0 /      3.95318 (252,13)     4.74160 (117,11)     4.47774 (182,11)     3.70696 (182,11)     3.38197 (165,11)
      50.0 /      4.05194 (250,12)     4.54683 (252,13)     4.29311 (231,12)     3.54868 (231,12)     2.60576 (231,12)
      40.0 /      3.83227 (202,11)     4.39815 (202,11)     3.84765 (202,11)     2.99148 (202,11)     2.37432 (206,12)
      30.0 /      3.99119 (206,12)     4.62063 (206,12)     4.14229 (206,12)     3.31944 (206,12)     2.37432 (206,12)
      20.0 /      3.76408 (179,13)     3.86149 (153,11)     3.50194 (121,11)     2.93998 (121,11)     3.13757 (202,10)
      10.0 /      3.67870 (206,14)     3.52338 (212,12)     3.14257 (212,12)     2.58391 (206,14)     2.15559 (226,12)
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                                                                                                    MAX 50
                                                                                                     1-HR
                                                                                                    SGROUP#  2
                            *** FCS CONCENTRATIONS RUN  MET = TPA86                          ***

                         * 50 MAXIMUM  1-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *

                                          * FROM SOURCES:        2,

                                   X      Y(METERS)                                          X      Y(METERS)
                                   OR        OR                                              OR        OR
                                  RANGE   DIRECTION                                         RANGE   DIRECTION
    RANK      CON.     HOUR DAY  (METERS)  (DEGREES)        RANK      CON.     HOUR DAY  (METERS)  (DEGREES)
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


     1      6.23377   11  213    1250.0       90.0           26      4.93331   11  117    1000.0       50.0
     2      6.11631   12  143    1250.0      350.0           27      4.89022   11  202    1500.0       30.0
     3      6.11546   14  176    1250.0      270.0           28      4.86052   12  108    1500.0      190.0
     4      5.88431   11  213    1000.0       90.0           29      4.85783   11  202    1000.0       30.0
     5      5.61918   11  217    1250.0      340.0           30      4.81358   11  162    1250.0      150.0
     6      5.60686   11  117    1250.0       50.0           31      4.79419   12  213    1250.0      100.0
     7      5.57583   11  116    1250.0      200.0           32      4.79418   12  213    1250.0       90.0
     8      5.57583   11  116    1250.0      210.0           33      4.74160   11  117    1250.0       60.0
     9      5.53489   14  176    1500.0      270.0           34      4.71084   12  143    1000.0      350.0
    10      5.52962   12  143    1500.0      350.0           35      4.70905   12  143    1500.0      360.0
    11      5.51204   11  202    1250.0       30.0           36      4.70364   11  194    1500.0      350.0
    12      5.44980   11  213    1500.0       90.0           37      4.70338   12  108    1250.0      180.0
    13      5.27509   11  213    1250.0      100.0           38      4.70052   11  178    1250.0      310.0
    14      5.25837   12  143    1250.0      360.0           39      4.70052   11  178    1250.0      300.0
    15      5.20888   12  108    1250.0      190.0           40      4.67595   14  176    1000.0      270.0
    16      5.19102   11  217    1500.0      340.0           41      4.66082   12  251    1250.0      210.0
    17      5.18500   11  165    1500.0       60.0           42      4.65454   11  182    1250.0       60.0
    18      5.08295   12  235    1250.0      230.0           43      4.64960   11  199    1500.0       80.0
    19      5.05887   11  116    1500.0      200.0           44      4.64945   11  149    1500.0      210.0
    20      5.05886   11  116    1500.0      210.0           45      4.63910   11  205    1250.0      110.0
    21      5.02698   11  165    1250.0       60.0           46      4.62063   12  206    1250.0       40.0
    22      4.99826   14  176    1250.0      260.0           47      4.62063   12  206    1250.0       30.0
    23      4.94868   11  117    1500.0       50.0           48      4.57650   11  217    1250.0      350.0
    24      4.93813   11  213    1000.0      100.0           49      4.57098   14  176    2000.0      270.0
    25      4.93771   11  194    1250.0      350.0           50      4.57093   11  162    1250.0      140.0
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                                                                                               HIGH
                                                                                               24-HR
                                                                                               SGROUP#  2
                          *** FCS CONCENTRATIONS RUN  MET = TPA86                   ***


                         * HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                      * FROM SOURCES:        2,
                                        * FOR THE RECEPTOR GRID *

                       * MAXIMUM VALUE EQUALS      0.63344 AND OCCURRED AT (    1250.0,      90.0) *

DIRECTION /                                          RANGE (METERS)
(DEGREES) /          1000.0              1250.0              1500.0              2000.0              3000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


    360.0 /      0.31933 (218, 1)    0.29665 (218, 1)    0.23940 (218, 1)    0.18740C(143, 1)    0.19529C(254, 1)
    350.0 /      0.23557C(143, 1)    0.30596C(143, 1)    0.27680C(143, 1)    0.30165 (126, 1)    0.29390 (126, 1)
    340.0 /      0.18471C(217, 1)    0.25543C(217, 1)    0.23598C(217, 1)    0.19943C(194, 1)    0.22605C(194, 1)
    330.0 /      0.17127C(162, 1)    0.22204C(162, 1)    0.21629C(162, 1)    0.25416 (148, 1)    0.28474 (148, 1)
    320.0 /      0.14551C(173, 1)    0.14541C(162, 1)    0.13958C(162, 1)    0.14610C(132, 1)    0.17639C( 93, 1)
    310.0 /      0.21453C(178, 1)    0.25078C(189, 1)    0.23964C(189, 1)    0.22848C(189, 1)    0.27108C(309, 1)
    300.0 /      0.30076C(238, 1)    0.35069C(189, 1)    0.34199C(189, 1)    0.34015C(189, 1)    0.38992C(189, 1)
    290.0 /      0.38549C(238, 1)    0.39554C(238, 1)    0.34729C(238, 1)    0.31376C(238, 1)    0.32030 (315, 1)
    280.0 /      0.28941C(238, 1)    0.30136C(238, 1)    0.25365C(238, 1)    0.27309C(188, 1)    0.37223C(188, 1)
    270.0 /      0.26015C(176, 1)    0.34345C(176, 1)    0.31946C(176, 1)    0.32423C(186, 1)    0.47205C(186, 1)
    260.0 /      0.21336C(234, 1)    0.28103C(176, 1)    0.25929C(176, 1)    0.32711C(188, 1)    0.44610C(188, 1)
    250.0 /      0.21414C(120, 1)    0.21009C(120, 1)    0.19689C(247, 1)    0.23977 (260, 1)    0.35074 (260, 1)
    240.0 /      0.30151C(235, 1)    0.35380C(235, 1)    0.33736C(235, 1)    0.30613C(235, 1)    0.27808C(235, 1)
    230.0 /      0.46719C(235, 1)    0.52622C(235, 1)    0.48078C(235, 1)    0.39938C(235, 1)    0.30120C(235, 1)
    220.0 /      0.40476C(235, 1)    0.45492C(235, 1)    0.40688C(235, 1)    0.32147C(235, 1)    0.26034 ( 88, 1)
    210.0 /      0.20875C(142, 1)    0.26907C(116, 1)    0.24924C(116, 1)    0.25291 (149, 1)    0.25207C(113, 1)
    200.0 /      0.19555C(116, 1)    0.26569C(116, 1)    0.24131C(116, 1)    0.21114C(108, 1)    0.23278C(108, 1)
    190.0 /      0.20023C(108, 1)    0.29343C(108, 1)    0.28111C(108, 1)    0.24290C(108, 1)    0.21582C( 87, 1)
    180.0 /      0.17815C(108, 1)    0.26161C(108, 1)    0.24377C(108, 1)    0.19701C(108, 1)    0.20285C( 44, 1)
    170.0 /      0.15065C(177, 1)    0.17948C(177, 1)    0.17202C(177, 1)    0.15474C(177, 1)    0.23829C( 44, 1)
    160.0 /      0.16816C(177, 1)    0.20161C(177, 1)    0.19939C(177, 1)    0.19587C(177, 1)    0.19698C(177, 1)
    150.0 /      0.18715C(162, 1)    0.26959C(162, 1)    0.26097C(162, 1)    0.22847C(162, 1)    0.23130C(119, 1)
    140.0 /      0.17679C(162, 1)    0.25499C(162, 1)    0.24383C(162, 1)    0.22014C(142, 1)    0.32276C(142, 1)
    130.0 /      0.09214C(162, 1)    0.14000C(162, 1)    0.14774C(195, 1)    0.19704 (112, 1)    0.25473 (112, 1)
    120.0 /      0.14144C(131, 1)    0.16389C(205, 1)    0.16228C(205, 1)    0.13461 (112, 1)    0.21367 (112, 1)
    110.0 /      0.24881C(213, 1)    0.28582C(213, 1)    0.26852C(205, 1)    0.26396C(205, 1)    0.28480C(129, 1)
    100.0 /      0.50879C(213, 1)    0.56739C(213, 1)    0.50964C(213, 1)    0.42394C(213, 1)    0.42367C(129, 1)
     90.0 /      0.56625C(213, 1)    0.63344C(213, 1)    0.58323C(213, 1)    0.51730C(213, 1)    0.52754C(230, 1)
     80.0 /      0.41690C(219, 1)    0.43286C(213, 1)    0.39363C(213, 1)    0.37184C(230, 1)    0.38316C(230, 1)
     70.0 /      0.45766C(219, 1)    0.46200C(197, 1)    0.44744C(197, 1)    0.42614C(197, 1)    0.43842C(115, 1)
     60.0 /      0.43169C(197, 1)    0.45584C(197, 1)    0.43999C(197, 1)    0.41703C(197, 1)    0.33429C( 97, 1)
     50.0 /      0.44015C(250, 1)    0.47327C(250, 1)    0.44260C(250, 1)    0.39487C(250, 1)    0.36159C(250, 1)
     40.0 /      0.36017C(250, 1)    0.38493C(250, 1)    0.35167C(250, 1)    0.29141C(250, 1)    0.23466C( 53, 1)
     30.0 /      0.29316C(244, 1)    0.33404C(244, 1)    0.28592C(244, 1)    0.24298C(240, 1)    0.33353C(214, 1)
     20.0 /      0.23061C(206, 1)    0.25486C(206, 1)    0.23224C(206, 1)    0.31982C(214, 1)    0.44770C(214, 1)
     10.0 /      0.27015 (218, 1)    0.25198 (218, 1)    0.20502C(165, 1)    0.22619C(181, 1)    0.26279C(181, 1)
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                                                                                                                     HIGH
                                                                                                                     24-HR
                                                                                                                     SGROUP#  2
                              *** FCS CONCENTRATIONS RUN  MET = TPA86                          ***


                             * HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                              * FROM SOURCES:       2,
                                                 * FOR THE RECEPTOR GRID *

                          * MAXIMUM VALUE EQUALS      0.63344 AND OCCURRED AT (    1250.0,      90.0) *

 DIRECTION /                                              RANGE (METERS)
 (DEGREES) /          5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

    360.0 /      0.17247C(234, 1)
    350.0 /      0.18635C(194, 1)
    340.0 /      0.22346C(194, 1)
    330.0 /      0.20878C(329, 1)
    320.0 /      0.18471C(329, 1)
    310.0 /      0.28965 (328, 1)
    300.0 /      0.36672C(189, 1)
    290.0 /      0.28194 (147, 1)
    280.0 /      0.31799 (315, 1)
    270.0 /      0.35357C(188, 1)
    260.0 /      0.31716C(188, 1)
    250.0 /      0.30318 (260, 1)
    240.0 /      0.30895C( 90, 1)
    230.0 /      0.24981C(123, 1)
    220.0 /      0.28712 ( 88, 1)
    210.0 /      0.34002C( 12, 1)
    200.0 /      0.21923C(108, 1)
    190.0 /      0.17479 ( 11, 1)
    180.0 /      0.19667C( 44, 1)
    170.0 /      0.24224C( 44, 1)
    160.0 /      0.15113C(177, 1)
    150.0 /      0.20261C(119, 1)
    140.0 /      0.28480C(142, 1)
    130.0 /      0.22663C(142, 1)
    120.0 /      0.20156 (112, 1)
    110.0 /      0.27448 (106, 1)
    100.0 /      0.33384C(229, 1)
     90.0 /      0.40724C(230, 1)
     80.0 /      0.29299C(119, 1)
     70.0 /      0.35061C(115, 1)
     60.0 /      0.31619C(255, 1)
     50.0 /      0.29401C(250, 1)
     40.0 /      0.20913C(170, 1)
     30.0 /      0.29726C(214, 1)
     20.0 /      0.34729C(214, 1)
     10.0 /      0.17680C(181, 1)
```

```
                                                                                                              2ND HIGH
                                                                                                              24-HR
                                                                                                              SGROUP#  2
                                *** FCS CONCENTRATIONS RUN  MET = TPA86                     ***


                           * SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                                 * FROM SOURCES:        2,
                                                   * FOR THE RECEPTOR GRID *

                            * MAXIMUM VALUE EQUALS      0.44320 AND OCCURRED AT (    2000.0,      90.0) *

DIRECTION /                                                  RANGE (METERS)
(DEGREES) /            1000.0               1250.0               1500.0               2000.0               3000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


    360.0 /      0.19897C(143, 1)     0.26292C(143, 1)     0.23545C(143, 1)     0.17939 (218, 1)     0.18425C(181, 1)
    350.0 /      0.21473 (218, 1)     0.27752C(194, 1)     0.27216C(194, 1)     0.24386C(194, 1)     0.23822C(254, 1)
    340.0 /      0.16107C(238, 1)     0.21729C(143, 1)     0.21529C(194, 1)     0.19488C(217, 1)     0.20630C(132, 1)
    330.0 /      0.16199C(238, 1)     0.20267C(238, 1)     0.19536C(238, 1)     0.17968C(162, 1)     0.19892C(132, 1)
    320.0 /      0.11690C(178, 1)     0.14530C(238, 1)     0.13335C(238, 1)     0.14289C( 93, 1)     0.17118C(284, 1)
    310.0 /      0.20526C(189, 1)     0.24742C(178, 1)     0.22137C(178, 1)     0.18205C(220, 1)     0.25688C(189, 1)
    300.0 /      0.29277C(189, 1)     0.31562C(238, 1)     0.27960C(238, 1)     0.28867C(220, 1)     0.33827C(220, 1)
    290.0 /      0.25167C(189, 1)     0.30434C(189, 1)     0.29150C(189, 1)     0.26693C(189, 1)     0.30913C(238, 1)
    280.0 /      0.21242C(237, 1)     0.25655C(237, 1)     0.23415C(237, 1)     0.21315 (315, 1)     0.32791 (315, 1)
    270.0 /      0.15947 (125, 1)     0.18773C(237, 1)     0.17609C(237, 1)     0.28639C(176, 1)     0.28246 (313, 1)
    260.0 /      0.20760C(176, 1)     0.22025C(247, 1)     0.24995C(247, 1)     0.27693C(247, 1)     0.34891 (260, 1)
    250.0 /      0.20470C(244, 1)     0.19451C(244, 1)     0.19442C(114, 1)     0.22899C(247, 1)     0.31306 (258, 1)
    240.0 /      0.18857C( 93, 1)     0.26164C(174, 1)     0.29568C(174, 1)     0.25453C(174, 1)     0.26161C( 90, 1)
    230.0 /      0.20335C(178, 1)     0.30859C(174, 1)     0.34890C(174, 1)     0.31125C(174, 1)     0.23599C(174, 1)
    220.0 /      0.17357C(178, 1)     0.23319C(174, 1)     0.26342C(174, 1)     0.22044C(174, 1)     0.24611C(293, 1)
    210.0 /      0.19615C(116, 1)     0.21621C(235, 1)     0.24703 (149, 1)     0.23829C(113, 1)     0.23905C( 12, 1)
    200.0 /      0.17651C(142, 1)     0.20364C(108, 1)     0.21165C(108, 1)     0.19697C(116, 1)     0.18855C( 87, 1)
    190.0 /      0.11211 (152, 1)     0.15757C(116, 1)     0.14583C(144, 1)     0.17479C( 87, 1)     0.19170C(108, 1)
    180.0 /      0.12486 (152, 1)     0.15554 (152, 1)     0.15268C(144, 1)     0.13775C(144, 1)     0.17846C(236, 1)
    170.0 /      0.08610C(108, 1)     0.13684C(108, 1)     0.12643C(108, 1)     0.14018C( 44, 1)     0.15190 ( 43, 1)
    160.0 /      0.11071C(162, 1)     0.16589C(162, 1)     0.15642C(162, 1)     0.11940 (112, 1)     0.15220 (112, 1)
    150.0 /      0.10850C(177, 1)     0.13779C(195, 1)     0.14769C(195, 1)     0.16086C(119, 1)     0.20848C(162, 1)
    140.0 /      0.09943C(195, 1)     0.17169C(195, 1)     0.18594C(195, 1)     0.20372C(162, 1)     0.23117C(200, 1)
    130.0 /      0.07671C(195, 1)     0.13781C(195, 1)     0.13115C(162, 1)     0.17109C(142, 1)     0.25424C(142, 1)
    120.0 /      0.13497C(171, 1)     0.13439C(131, 1)     0.11419C(131, 1)     0.13338C(205, 1)     0.18071C(101, 1)
    110.0 /      0.17887C(171, 1)     0.25803C(205, 1)     0.24543C(213, 1)     0.23154C(129, 1)     0.28165 (106, 1)
    100.0 /      0.32404C(194, 1)     0.33255C(194, 1)     0.28293C(194, 1)     0.34427C(129, 1)     0.35819 (201, 1)
     90.0 /      0.38218C(194, 1)     0.39050C(194, 1)     0.34054C(194, 1)     0.44320C(230, 1)     0.43496C(278, 1)
     80.0 /      0.38111C(213, 1)     0.41931C(219, 1)     0.37613C(219, 1)     0.33180C(219, 1)     0.37686C(278, 1)
     70.0 /      0.43580C(197, 1)     0.43690C(219, 1)     0.37009C(219, 1)     0.40945C(196, 1)     0.41628C(196, 1)
     60.0 /      0.32363C(219, 1)     0.32725C(250, 1)     0.29992C(250, 1)     0.25971C(195, 1)     0.33273C(255, 1)
     50.0 /      0.24668C(117, 1)     0.28041C(117, 1)     0.25497C(197, 1)     0.24052C(197, 1)     0.21952C(198, 1)
     40.0 /      0.32395C(244, 1)     0.36761C(244, 1)     0.31930C(244, 1)     0.25655C(244, 1)     0.23046C(250, 1)
     30.0 /      0.24443C(206, 1)     0.28407C(206, 1)     0.26397C(206, 1)     0.23369C(206, 1)     0.32226C(240, 1)
     20.0 /      0.20914C(239, 1)     0.19890C(121, 1)     0.19923C(121, 1)     0.24498C(240, 1)     0.33559C(240, 1)
     10.0 /      0.22309C(206, 1)     0.22810C(206, 1)     0.20477C(206, 1)     0.18931C(214, 1)     0.23849C(214, 1)
```

```
                                                                                                                       2ND HIGH
                                                                                                                       24-HR
                                                                                                                       SGROUP#  2
                              *** FCS CONCENTRATIONS RUN  MET = TPA86                             ***


                         * SECOND HIGHEST 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *
                                                * FROM SOURCES:       2,
                                                   * FOR THE RECEPTOR GRID *

                          * MAXIMUM VALUE EQUALS      0.44320 AND OCCURRED AT (    2000.0,      90.0) *

 DIRECTION /                                                    RANGE (METERS)
 (DEGREES) /            5000.0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


    360.0 /      0.15612 (216, 1)
    350.0 /      0.15924 (126, 1)
    340.0 /      0.19507C(281, 1)
    330.0 /      0.20488 (148, 1)
    320.0 /      0.17934C(309, 1)
    310.0 /      0.28190C(309, 1)
    300.0 /      0.32155C(238, 1)
    290.0 /      0.26828C(238, 1)
    280.0 /      0.30743C( 94, 1)
    270.0 /      0.25475C(176, 1)
    260.0 /      0.30844 (258, 1)
    250.0 /      0.29192 (258, 1)
    240.0 /      0.30109 (292, 1)
    230.0 /      0.24882 ( 88, 1)
    220.0 /      0.26388C(293, 1)
    210.0 /      0.20688C( 87, 1)
    200.0 /      0.17867 (325, 1)
    190.0 /      0.14703 ( 81, 1)
    180.0 /      0.17994C(236, 1)
    170.0 /      0.18026C( 15, 1)
    160.0 /      0.13070 ( 43, 1)
    150.0 /      0.18668C(162, 1)
    140.0 /      0.26771C( 13, 1)
    130.0 /      0.22132C(113, 1)
    120.0 /      0.18196C(101, 1)
    110.0 /      0.21489C( 64, 1)
    100.0 /      0.31809C(158, 1)
     90.0 /      0.36684C(158, 1)
     80.0 /      0.27092C( 62, 1)
     70.0 /      0.30641C(277, 1)
     60.0 /      0.27216C(277, 1)
     50.0 /      0.23020 (  4, 1)
     40.0 /      0.18499C( 53, 1)
     30.0 /      0.24902C(240, 1)
     20.0 /      0.26164C(240, 1)
     10.0 /      0.17555C( 57, 1)
```

```
                                                                                                   MAX 50
                                                                                                   24-HR
                                                                                                   SGROUP#  2
                          *** FCS CONCENTRATIONS RUN  MET = TPA86                        ***


                       * 50 MAXIMUM 24-HOUR AVERAGE CONCENTRATION (MICROGRAMS/CUBIC METER)     *


                                         * FROM SOURCES:        2,


                                        X      Y(METERS)                                            X      Y(METERS)
                                        OR        OR                                                OR        OR
                                      RANGE   DIRECTION                                           RANGE   DIRECTION
     RANK      CON.      PER. DAY   (METERS)  (DEGREES)         RANK      CON.      PER. DAY   (METERS)  (DEGREES)
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


       1      0.63344C   1  213     1250.0       90.0            26      0.43690C   1  219     1250.0       70.0
       2      0.58323C   1  213     1500.0       90.0            27      0.43580C   1  197     1000.0       70.0
       3      0.56739C   1  213     1250.0      100.0            28      0.43496C   1  278     3000.0       90.0
       4      0.56625C   1  213     1000.0       90.0            29      0.43286C   1  213     1250.0       80.0
       5      0.52754C   1  230     3000.0       90.0            30      0.43169C   1  197     1000.0       60.0
       6      0.52622C   1  235     1250.0      230.0            31      0.43013C   1  213     3000.0       90.0
       7      0.51730C   1  213     2000.0       90.0            32      0.42614C   1  197     2000.0       70.0
       8      0.50964C   1  213     1500.0      100.0            33      0.42394C   1  213     2000.0      100.0
       9      0.50879C   1  213     1000.0      100.0            34      0.42367C   1  129     3000.0      100.0
      10      0.48078C   1  235     1500.0      230.0            35      0.41931C   1  219     1250.0       80.0
      11      0.47327C   1  250     1250.0       50.0            36      0.41703C   1  197     2000.0       60.0
      12      0.47205C   1  188     3000.0      270.0            37      0.41690C   1  219     1000.0       80.0
      13      0.46719C   1  235     1000.0      230.0            38      0.41628C   1  196     3000.0       70.0
      14      0.46200C   1  197     1250.0       70.0            39      0.40945C   1  196     2000.0       70.0
      15      0.45766C   1  219     1000.0       70.0            40      0.40724C   1  230     5000.0       90.0
      16      0.45584C   1  197     1250.0       60.0            41      0.40688C   1  235     1500.0      220.0
      17      0.45492C   1  235     1250.0      220.0            42      0.40476C   1  235     1000.0      220.0
      18      0.44770C   1  214     3000.0       20.0            43      0.39938C   1  235     2000.0      230.0
      19      0.44744C   1  197     1500.0       70.0            44      0.39554C   1  238     1250.0      290.0
      20      0.44610C   1  188     3000.0      260.0            45      0.39487C   1  250     2000.0       50.0
      21      0.44320C   1  230     2000.0       90.0            46      0.39363C   1  213     1500.0       80.0
      22      0.44260C   1  250     1500.0       50.0            47      0.39050C   1  194     1250.0       90.0
      23      0.44015C   1  250     1000.0       50.0            48      0.38992C   1  189     3000.0      300.0
      24      0.43999C   1  197     1500.0       60.0            49      0.38549C   1  238     1000.0      290.0
      25      0.43842C   1  115     3000.0       70.0            50      0.38493C   1  250     1250.0       40.0
```

ATTACHMENT 7

KOOGLER & ASSOCIATES

ESTIMATE OF FRACTION OF TRACE METALS IN WWS DISCHARGED WITH STACK GAS

FLORIDA CRUSHED STONE COMPANY
CPL PLANT
BROOKSVILLE, FLORIDA

Metal	Metals in WWS Fed to Kiln During Test Period (lb/hr)	Measured Emission Rate Increase WWS vs BL (lb/hr)	Fraction WWS Metal in Stack Gas (%)
As	0.017	0.002(1)	12(1)
Ba	0.602	0.045	7.5
Cd	0.39	0.001(1)	2.6(1)
Cr	0.658	0.01	1.5
Co	0.287	0.018(1)	6.3(1)
Cu	1.383	(2)	(2)
Pb	0.361	0	0
Hg	0.001	0.343(3)	(3)
Mo	0.350	(2)	(2)
Ni	9.765	0.014(1)	0.1(1)
Se	0.004	ND(1)	ND(1)
Ag	<0.046	0.012	15(1)
Ti	0.245	0.684(3)	(3)
Va	14.980	0.037	0.2(1)
Zn	1.096	(2)	(2)

(1) Estimated or not determined (ND) as one or both measured emission rates are below level of quantification.

(2) Measured decrease in emissions during WWS test.

(3) Increase in emissions was greater than could be accounted for by metal in WWS.

Hand Delivered 2-26-91 ~~Party~~ [illegible]

OERTEL, HOFFMAN, FERNANDEZ & COLE, P. A.

ATTORNEYS AT LAW

SUZANNE BROWNLESS
M. CHRISTOPHER BRYANT
R. L. CALEEN, JR.
C. ANTHONY CLEVELAND
TERRY COLE
ROBERT C. DOWNIE, II
MARTHA J. EDENFIELD
SEGUNDO J. FERNANDEZ
KENNETH F. HOFFMAN
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PATRICIA A. RENOVITCH
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TALLAHASSEE, FLORIDA 32301

MAILING ADDRESS:
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TALLAHASSEE, FLORIDA 32314-6507

TELEPHONE (904) 877-0099
FACSIMILE (904) 877-0981

JOHN H. MILLICAN
ENVIRONMENTAL CONSULTANT
(NOT A MEMBER OF THE FLORIDA BAR)

J. P. SUBRAMANI, PH. D., P. E.
ENVIRONMENTAL CONSULTANT
(NOT A MEMBER OF THE FLORIDA BAR)

February 26, 1991

HAND DELIVERY

RECEIVED
FEB 26 1991
DER - BAQM

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

RE: Emissions Test Report - Wastewater Treatment Sludge, Florida Crushed Stone - AC 27-118674

Dear Mr. Fancy:

Thank you for your January 22, 1991 letter to Mr. Charles Hetrick and enclosing the emissions test report when the wastewater treatment sludge was being burned at the Florida Crushed Stone facility (FCS). On behalf of Mr. Hetrick and Hernando County, I am providing the following comments to you.

We assume the wastewater treatment sludge used during the testing period originated from the JEA facility. This is not so stated in the report and therefore needs to be verified. Secondly, the origin of the sludge source within the JEA facility needs to be identified. This information is critical to the evaluation of metal emissions test results. The heavy metal concentrations of the sludge actually burned at the FCS facility appear to be much lower than the concentration ranges listed in the Radian report which was submitted as part of the construction permit application. In particular, we draw your attention to the concentration ranges specified in the construction permit application versus the actual sludge concentrations in the test report for arsenic, chromium, iron, molybdenum, nickel, selenium, etc. Therefore, the emissions of these heavy metals as reported during the test runs very well could be much lower than the emissions which would result when other sludge batches containing higher concentrations are burned.

The FCS test report lists the emissions of dioxins and furans in toxicity equivalent quantities. As pointed out in our January 18, 1991 letter which commented on the FCS tire derived fuel test report, the toxicity equivalent factors (TEFs) used in the FCS test reports are significantly lower than the TEFs contained in recent EPA documents. Again, we question the basis of TEFs used in the FCS report. Secondly, the NSPS rules for municipal waste combustors promulgated by EPA on February 11, 1991 specify the total dioxins and furans emission limits as follows: 30 ng/dscfm for new municipal waste combustors and 60-125 ng/dscfm for existing combustors. The EPA rules further specify that compliance with the dioxin/furan emission limits is to be based on total measurement of dioxins and furans and not based on TEFs. In comparison, the total dioxin/furan emissions from the FCS stack tests averaged a concentration of 166 ng/dscfm.

Another item of concern to the County is the mercury emissions which, during the sludge burning tests, averaged 173 grams/hour or 4150 grams per day. Although the sludge mercury concentration was determined at 0.4 ppm, at the time of test burns, no information is available in the construction permit application as to the variation of mercury concentrations in the sludge from the JEA facility. Mercury emission higher than the 4150 grams per day level is quite possible when other sludge batches are burned in the future. In comparison, the NSPS limitation for mercury emissions from sludge incinerators is limited to 3200 grams per day.

On behalf of the County, I would request that DER seriously evaluate the above concerns prior to authorizing another test burn at the FCS facility. Also, it seems that stack tests were conducted at the FCS facility on October 2, 1990 as the test report contains source test calculations for that day. We would like to review, in closer detail, the results of those stack tests.

We would appreciate your response to this letter and to our earlier January 18, 1991 letter.

Sincerely,

JP Subramani

J.P. Subramani

JPS:gg

cc: Mr. Charles Hetrick
Mr. Larry Jennings
Ms. Kathy Liles

BAR meeting on 1-23-91 @ Florida Crushed Stone Co.

Bruce Mitchell	(904)488-1344	DARM/BAR
JOHN KOOGLER	904/377-5822	K&A/FCS
VAL HARRIS	(512)454-4797	RADIAN
Dan Davis	(512)454-4797	Radian
Tom Mountain	(904) 799-7881	Florida Crushed Stone Co.
Clair Fancy	904 488 1344	DARM/BAR
John Glunn	904-488-1344	DARM/Toxics

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CORPORATION

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Daniel S. Davis
Project Manager

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Valerie V. Harris, Ph.D.
Staff Engineer
Process Engineering Department

FCS

FLORIDA CRUSHED STONE COMPANY

THOMAS (TOM) W. MOUNTAIN, SR.
ADMINISTRATIVE ASSISTANT

POST OFFICE BOX 1508
BROOKSVILLE, FLORIDA 34605-1508

OFFICE 904-799-7881
FAX 904-796-6281
RESIDENCE 904-799-7342

1-23-91

① Mod. / Amend current C.P.(s)

② Allow the expanded use of utility WWTS

① eliminate land disposal — Special Permits w SW/HW?

② ultimate analysis of each new site

③ ✓ solid waste of any previous landfill acceptability

④ ✓ w F. Glunn on setting maximums of toxic concerns

⑤ Hg is present in the coal and natural feed

⑥ Toxics: metals ✓ the no-threat levels (F. Glunn)

[use a super sediment approach]

⑦ will accept no chlorinated organics

Example Compositions of Materials Proposed for Beneficial Reuse at Florida Crushed Stone, (mg/kg)

Metal	JEA #1	JEA #2	JEA #3	JEA #4	JEA #5	TED #1	TED #2	City of Tampa	Range
Aluminum	730	572	1980	3808	1556	131	116	68400	116 - 68400
Arsenic	1079	78	768	626	577	27	19	0	19 - 1079
Barium	95	35	230	242	176	17	8	0	8 - 242
Cadmium	9	2	7	11	9	0	0	1	1 - 11
Chromium	266	25	121	256	43	49	16	50	16 - 266
Cobalt	55	16	28	109	65	4	2	0	2 - 109
Copper	65	81	368	299	221	140	129	100	65 - 368
Iron	28220	9880	56560	46240	70280	25026	9420	2135	2135 - 70280
Lead	83	7	311	267	173	1	1	5	1 - 311
Magnesium	6806	11050	6464	6800	1631	52	97	50	50 - 11050
Molybdenum	2656	62	105	95	2259	11	5	0	5 - 2656
Nickel	3320	6760	1737	2530	954	151	80	0	80 - 6760
Selenium	55	9	44	54	125	2	1	0	1 - 125
Silver	3	1	4	3	3	0	0	5	1 - 5
Titanium	116	14	141	237	248	0	0	0	14 - 248
Vanadium	10624	624	7676	5984	5522	1135	926	0	624 - 10624
Zinc	58	52	319	408	161	32	22	11	11 - 408
Moisture (%)	83	87	60	73	75	71	84	50	

File Copy

Florida Department of Environmental Regulation
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400
Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

January 22, 1991

Ms. Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides & Toxics Management Division
U.S. EPA, Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Dear Ms. Harper:

Re: Emissions Test Report - Wastewater Treatment Sludge
Florida Crushed Stone Company

Enclosed is the above referenced report regarding recent performance tests conducted at Florida Crushed Stone's existing facility located in Hernando County, Florida. Even though a formal request to continuously use wastewater treatment sludge at FCS has not yet been received by the Department's Bureau of Air Regulation (BAR), please evaluate and provide comments to the BAR by February 26, 1991.

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

Sincerely,

for James K. Pennington
C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/BM/plm

Enclosures

c: B. Thomas, SW Dist. 1-22-91 Ran
J. Koogler, P.E., K&A hand delivered 1-23-91 Ran
Readiy File } 1-22-91 Ran
Bruce Mitchell }

File Copy

Florida Department of Environmental Regulation

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

Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

January 22, 1991

Mr. Charles B. Hetrick
County Administrator
Board of Hernando County Commission
20 North Main Street, Room 262
Brooksville, Florida 34601

Dear Mr. Hetrick:

Re: Emissions Test Report - Wastewater Treatment Sludge
Florida Crushed Stone Company

Enclosed is the above referenced report regarding recent performance tests conducted at Florida Crushed Stone's existing facility located in Hernando County, Florida. Even though a formal request to continuously use wastewater treatment sludge at FCS has not yet been received by the Department's Bureau of Air Regulation (BAR), please evaluate and provide comments to the BAR by February 26, 1991.

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

Sincerely,

for James K. Pennington
C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/BM/plm

Enclosures

c: B. Thomas, SW Dist. 1-22-91 RAN
J. Koogler, P.E., K&A hand delivered 1-23-91 RAN
Reading File
Bruce Mitchell } 1-22-91 RAN

File Copy

Florida Department of Environmental Regulation
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400
Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

January 22, 1991

Mrs. Chris Shaver, Chief
Permit Review and Technical Support Branch
National Park Service
Air Quality Division
Post Office Box 25287
Denver, Colorado 80255

Dear Mrs. Shaver:

Re: Emissions Test Report - Wastewater Treatment Sludge
Florida Crushed Stone Company

Enclosed is the above referenced report regarding recent performance tests conducted at Florida Crushed Stone's existing facility located in Hernando County, Florida. Even though a formal request to continuously use wastewater treatment sludge at FCS has not yet been received by the Department's Bureau of Air Regulation (BAR), please evaluate and provide comments to the BAR by February 26, 1991.

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James K. Pennington
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Florida Department of Environmental Regulation

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

Bob Martinez, Governor | Dale Twachtmann, Secretary | John Shearer, Assistant Secretary

January 22, 1991

Mr. Bill Thomas, Administrator
Air Programs
Southwest District
4520 Oak Fair Boulevard
Tampa, Florida 33610-7347

Dear Mr. Thomas:

Re: Emissions Test Report - Wastewater Treatment Sludge
Florida Crushed Stone Company

Enclosed is the above referenced report regarding recent performance tests conducted at Florida Crushed Stone's existing facility located in Hernando County, Florida. Even though a formal request to continuously use wastewater treatment sludge at FCS has not yet been received by the Department's Bureau of Air Regulation (BAR), please evaluate and provide comments to the BAR by February 26, 1991.

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

Sincerely,

for James K. Pennington

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

CHF/BM/plm

Enclosures

c: J. Koogler, P.E., K&A hand delivered 1-23-91 RRN
Reading File }
Bruce Mitchell } 1-22-91 RRN

Hand Delivered 1-18-91

OERTEL, HOFFMAN, FERNANDEZ & COLE, P. A.

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JOHN H. MILLICAN
ENVIRONMENTAL CONSULTANT
(NOT A MEMBER OF THE FLORIDA BAR)

J. P. SUBRAMANI, PH. D., P. E.
ENVIRONMENTAL CONSULTANT
(NOT A MEMBER OF THE FLORIDA BAR)

January 18, 1991

HAND DELIVERY

RECEIVED
JAN 18 1991
DER - BAQM

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

RE: Emission Test Reports at Baseline and TDF Conditions at Florida Crushed Stone Facility; AC27-118674

Dear Mr. Fancy:

Thank you for your December 18, 1990 letter to Commissioner John Richardson and enclosing the Florida Crushed Stone (FCS) test results. On behalf of Hernando County, I have been asked by Mr. Lawrence Jennings, Manager of Planning Department, Hernando County, to provide comments to you.

We have reviewed the information contained in the emission reports which were generated for the baseline operation and tire burning (TDF) conditions. I believe the test data raise more questions than provide answers.

Information submitted by FCS with its original application request revealed that emissions of total particulate, heavy metals (particularly zinc) and polynuclear aromatic compounds would increase when TDF is burned. The attached Table 1 which was compiled from the FCS data show the opposite trend. Secondly, the information on dioxin/furan emissions needs to be further clarified and very closely examined.

Emissions of dioxin and its isomers are reported in toxic equivalent quantities. We question the appropriateness as well as the basis for the toxic equivalence factors (TEF) used in the emissions reports. Attached Table 2 lists the TEFs contained in an EPA Risk Assessment Document versus TEFs used in the FCS report. There are significant differences in TEFs contained in the FCS report which need resolution.

Thirdly, it is noted that the 2,3,7,8-dioxin isomer was found only during the first test run under the baseline conditions at 0.007 nanograms. No dioxin was found in any of the other five test runs. We would like to evaluate the potential dioxin problem further and would appreciate receiving any information available from other test facilities on dioxin emissions. In this regard, we again request that you provide us a copy of the Modesto Energy Company's emissions report which was submitted to DER. We also request a copy of the NO_x test data information as soon as it becomes available.

The citizens and the Board of Hernando County Commissioners are concerned about the potential increases in the emissions of deleterious substances including dioxin/furans, heavy metals, PNAs and other incomplete combustion products (PICs) from the burning of TDFs. We request that you and your staff carefully review the test reports from FCS, and hold public hearings prior to authorizing the burning of TDFs.

Sincerely,

JP Subramani

J. P. Subramani

JPS:gg

Enclosure

cc: Mr. Lawrence Jennings
Ms. Katherine Liles
B. Mitchell } 1-18-91 PA
J. Glenn }
CHF/BA

B. Thomas - 1-22-91 RRM

Greg Worley-EPA } FAX'd 1-23-91 RRM
John Bunyak-NPS }

TABLE 1

Emissions from Florida Crushed Stone (lbs/hr)

	Baseline Test	**TDF Test**
Particulate	56.80	52.21
SO_2	595.15	551.3
VOC	0.14	0.44
Semi VOC	5.01	0.90
Dioxin/Furan	5.4×10^{-9}	7×10^{-9}
Metal Emissions:		
Al	6.86	8.13
Fe	1.39	1.30
Zn	3.12	1.68

TABLE 2

Dioxin/Furan Toxic Equivalence Factors (TEF)

(From "1989 update to the Interim Procedures for Estimating Risks Associated with Exposures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans", March 1989, EPA/625/3-89/016)

Dioxin Isomer	**TEF**	**TEF in FCS Report**
2378 - tetra	1	1
12378 - penta	0.5	0.5
123478 - hexa	0.1	0.04 (different)
123789 - hexa	0.1	0.04 (different)
123678 - hexa	0.1	0.04 (different)
1234678 - hepta	0.01	0.001 (different)
12346789 - octa	0.0001	0 (different)
FURAN ISOMER		
2378 - Tetra	0.1	0.1
12378 - penta	0.05	0.1 (different)
23478 - penta	0.5	0.1 (different)
123478 - hexa	0.1	0.01 (different)
123789 - hexa	0.1	0.01 (different)
123678 - hexa	0.1	0.01 (different)
234678 - hexa	0.1	0.01 (different)
1234678 - hepta	0.01	0.001 (different)
1234789 - hepta	0.01	0.001 (different)
12346789 - octa	0.001	0 (different)

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

RECEIVED
JAN 16 1991
DER - BAQM

KA 307-90-05

January 15, 1991

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

Subject: Emission Measurements Report on Wastewater Treatment Test

Dear Mr. Mitchell:

Enclosed are three (3) copies of our report which describes the results of particulate matter, volatile organic compounds, furans and dioxins, metals and visible emission measurements with wastewater treatment sediment included in the kiln feed, conducted on October 31-November 2, 1990.

If you have any questions concerning the enclosed reports or need additional copies, please do not hesitate to give me a call.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler / MAB
John B. Koogler, Ph.D., P.E.

JBK:mab

SUMMARY OF PARTICULATE MATTER, VOLATILE ORGANIC COMPOUNDS, FURANS AND DIOXINS, METALS AND VISIBLE EMISSION MEASUREMENTS WITH WASTEWATER TREATMENT SEDIMENT INCLUDED IN KILN FEED

CENTRAL POWER AND LIME, INC.
CEMENT/POWER/LIME PLANTS
BROOKSVILLE, FLORIDA

PERMIT NO. AC27-118674 AND
PSD-FL-091 AND AMENDMENT

RECEIVED
JAN 16 1991
DER-BAQM

OCTOBER 31 - NOVEMBER 2, 1990

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 N.W. 13TH STREET
GAINESVILLE, FL 32609
(904) 377-5822

KOOGLER & ASSOCIATES

TABLE OF CONTENTS

To the best of my knowledge, all applicable field and analytical procedures comply with Florida Department of Environmental Regulation requirements and all test data and plant operating data are true and correct.

JOHN B. KOOGLER
12925

John B. Koogler, PH.D., P.E.
State of Florida
Registration No. 12925

12/18/90
Date

SEAL

1.0 INTRODUCTION

Central Power and Lime, Inc. owns and operates a cement/power/lime (CPL) plant near Brooksville, Florida. On October 31 - November 2, 1990, Koogler & Associates, Environmental Services of Gainesville, Florida, conducted air pollutant emission measurements and visible emissions observations at the plant. The purpose of the testing was to measure emissions of particulate matter, metals, volatile organic compounds, furans and dioxins while including wastewater treatment sediment in the feed to the cement plant. The sediment consisted almost entirely of inorganic compounds removed from storm water by sedimentation. The sediment supplies some of the inorganic constituents necessary for the production of Portland cement.

Under normal plant operations, the three plants are fired with coal and the exhaust gas streams from the three plants are integrated into the overall cement plant, power plant and lime plant system. During the test period, the cement plant was operating at a kiln feed rate of 128 tons per hour and a clinker production rate of 76 tons per hour. This is within 10 percent of the permitted limits (AC27-118674) of 123.75 tons per hour kiln feed and 75.0 tons per hour of clinker production. The coal feed rate to the kiln during the test period was 8.5 tons per hour, compared with a maximum permitted coal feed rate of 10.3 tons per hour. The power plant was operating at 110 MW per hour during the test period and the lime calciner was operating at a production rate of 11 tons per hour. The wastewater sediment was mixed with the kiln feed in the raw mill at a rate of 1.75 tons per hour.

Air streams from the cement/power/lime plants all discharge through a common stack; thus, the measured emission rates were the combined emission rates from all three sources. Total particulate matter concentration in the stack gas averaged 0.0131 grains per dry standard cubic foot and the mass emission rate averaged 67.95 pounds per hour. Visible emissions observations were conducted during two 30-minute periods. The highest opacity observed was 10 percent, the average opacity was 0.9 percent and the highest six-minute rolling average opacity was 2.9 percent.

Volatile organic compounds emissions averaged 0.0097 pounds per hour. Furan emissions averaged 0.000000029 pounds per hour and dioxin emissions averaged 0.000000018 pounds per hour.

Metals emissions ranged from 29.8 pounds per hour for aluminum to 0.003 pounds per hour for cadmium.

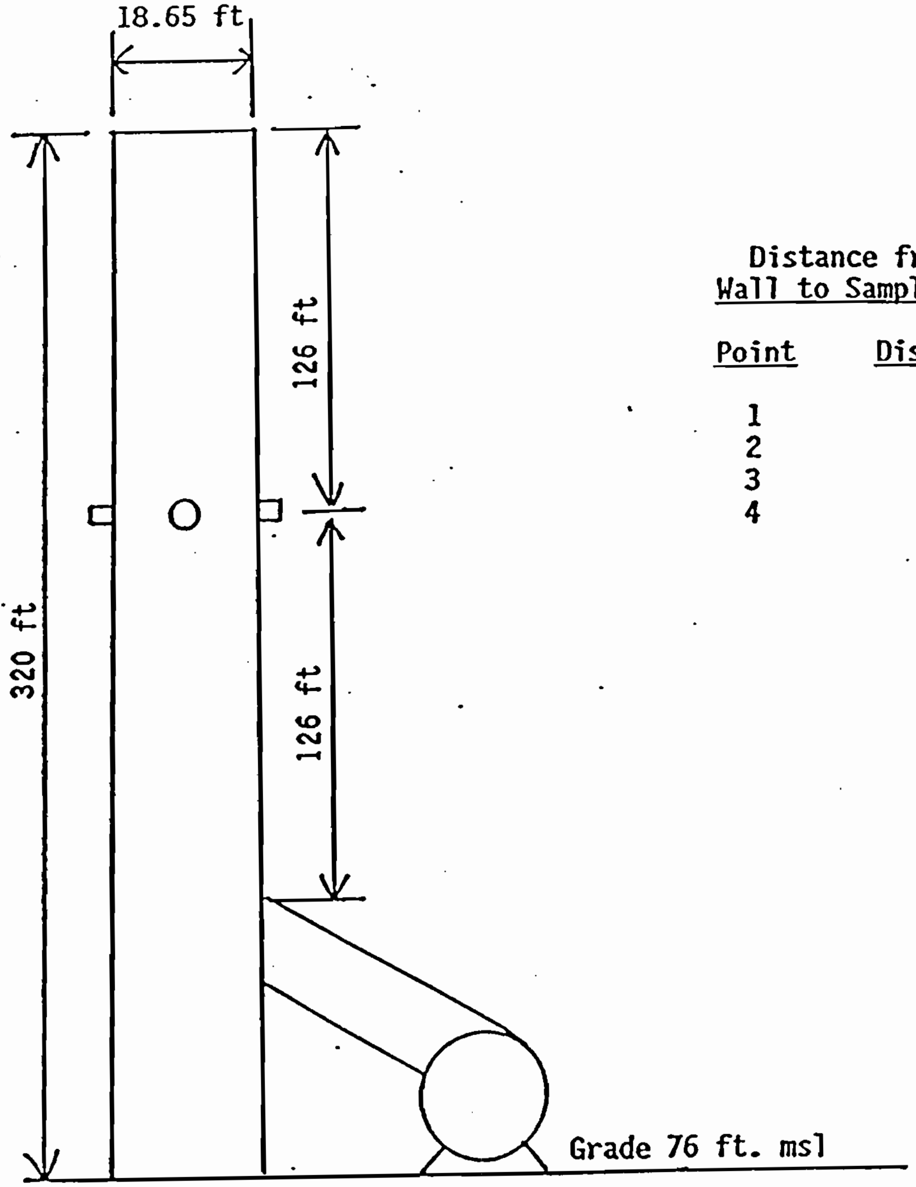
The results of the particulate matter emission measurements are summarized in Table 1. Volatile organic compound emissions are summarized in Table 2, the furan and dioxin emissions are summarized in Table 3, and the metals emissions are summarized in Table 4. All field and laboratory sheets are included in the Appendix of this report.

Samples of the wastewater treatment sediment, kiln feed, and baghouse dust were collected and analyzed for metals, organochlorine pesticides and PCBs, and polynuclear aromatic hydrocarbons. The metal analyses are shown in Table 5. The organochlorine pesticides, PCBs, and polynuclear aromatic hydrocarbons analyses did not show any compound above the detection limit for the analytical methods used. The laboratory analyses for the organic compounds are reported in the Appendix.

2.0 SAMPLING POINT LOCATION

Four sampling ports are located in the 18.65 foot diameter stack. The ports are located approximately 126 feet above the point where the stack gas is introduced to the stack and approximately 126 feet below the top of the stack. With the sampling ports 126 feet (6.7 stack diameters) upstream and downstream of flow disturbances, it was determined that 16 sampling points would be required for the sampling and velocity traverse. Thus, four points were sampled through each of the four ports.

Figure 1 is a schematic diagram of the stack showing the location of the sampling ports and the locations of the sampling points.



Distance from Stack
Wall to Sampling Points

Point	Distance (in)
1	7.2
2	23.5
3	43.4
4	72.3

FIGURE 1
Cement/Power/Lime Plant Stack

Florida Crushed Stone Company
CPL Plant
Brooksville, Florida

KOOGLER & ASSOCIATES

3.0 FIELD AND ANALYTICAL PROCEDURES

Particulate matter and metals emission measurements were made using EPA multi-metals sampling train. The probe wash and filter from the train was first weighed for total particulate matter and then analyzed with the impinger catch for metals. The sampling point locations for the EPA Method 5 test were established in accordance with EPA Method 1 as adopted by FDER in Section 17-2.700(6)(b)1, FAC.

Stack gas velocity measurements and stack gas moisture measurements were made in conjunction with particulate matter/metals tests in accordance with EPA Method 2 (17-2.700(6)(b)2, FAC) and EPA Method 4 (17-2.700(6)(b)9, FAC).

Volatile organic compounds were collected with the Volatile Organic Sampling Train (VOST) in tenax/tenax-charcoal traps which is equivalent to the EPA Method 18 alternative allowing packed columns for sample collection. Furans and dioxins were collected in XAD traps by Modified Method 5.

Oxygen was determined with a continuous monitor with a Zirconium oxide cell. Visible emissions observations were made in accordance with EPA Method 9.

4.0 SUMMARY OF RESULTS

The particulate matter emission measurements made on October 31, 1990, are summarized in Table 1. The combined particulate matter emission rate from the cement/power/lime plants ranged from 60.96 to 77.11 pounds per hour and averaged 67.95 pounds per hour versus the allowable 82.1. This mass emission rate corresponds to a particulate matter concentration in the stack gas of 0.0131 grains per dry standard cubic foot. The stack gas flow rate from the plants averaged 603,670 standard cubic feet per minute, dry. The stack gas temperature averaged 389.9^{O}F with an average moisture content of 7.1 percent. Visible emissions observations were conducted for two 30-minute periods. The average opacity of emissions was 0.9 percent and the highest six-minute rolling average opacity was 2.9 percent.

Volatile organic compounds ranged from 0.0005 pounds per hour for trichlorofluoromethane to 0.0048 pounds per hour for benzene and totaled 0.0097 pounds per hour. These measurements are summarized in Table 2.

Furans averaged 0.000000029 pounds per hour and dioxins averaged 0.000000018 pounds per hour. These results are summarized in Table 3.

Metals emissions measurements ranged from 29.8 pounds per hour for aluminum to 0.003 pounds per hour for cadmium. Results are summarized in Table 4.

Samples of sludge, kiln feed and baghouse dust were collected during the tests and were analyzed by Method 608 for organochlorine pesticides and PCBs, and by Method 610 for polynuclear aromatic hydrocarbons. No specific compound was found above the detection limit for these methods (See the laboratory data sheets for details).

All field and analytical data sheets, the calculations of emission rates, plant operating information, equipment calibration sheets, and a list of project participants are included in the Appendix of this report.

TABLE 1
SUMMARY OF SOURCE EMISSION TEST DATA FOR PARTICULATE MATTER

FLORIDA CRUSHED STONE
PM & MM
103190

Run No.	Process Weight Rate (Tons/Hr)	Stack Gas Flow Rate (SCFMD)	Stack Gas Temperature (Deg F)	Stack Gas Moisture (%)	Particulate Matter Conc. (gr/dscf)	Particulate Matter Emission Rate (Lbs/Hr)
1	128.0	618556	390.3	6.7	0.0124	65.77
2	128.0	606996	386.4	7.3	0.0148	77.11
3	128.0	585459	393.0	7.3	0.0122	60.96
Average	128.0*	603670	389.9	7.1	0.0131	67.95

*Cement plant feed rate, plus power plant at 110 MW per hour and calciner at 11 tons per hour

Allowable Emissions:

Cement Kiln/Cooler @ 0.4 lb/ton feed
= (0.4)(123.75 tph, permitted) = 49.5 lb/hr

Power Plant/Lime Plant @ 0.03 lb/MMBtu
= (0.03)(1086 MMBtu/hr) = 32.6 lb/hr

TOTAL 82.1 lb/hr

TABLE 2

SUMMARY OF VOLATILE ORGANIC COMPOUNDS EMISSION RATES

CENTRAL POWER AND LIME, INC.
BROOKSVILLE, FLORIDA
OCTOBER 31-NOVEMBER 2, 1900

	(lb/hr)			
Compound	1	2	3	Avg
Chloromethane	0.00168	0.00235	0.00190	0.00198
Vinyl Chloride	0.00006	0.00012	0.00007	0.00008
Bromomethane	0.00027	0.00031	0.00028	0.00029
Chloroethane	0.00010	0.00010	0.00008	0.00009
Trichlorofluoromethane	0.00003	0.00003	0.00010	0.00005
Acetone	0.00051	0.00008	0.00021	0.00027
Carbon Disulfide	0.00015	0.00015	0.00017	0.00016
Benzene	0.00391	0.00536	0.00536	0.00488
Toluene	0.00045	0.00061	0.00075	0.00060
Chlorobenzene	0.00025	0.00021	0.00019	0.00022
Ethylbenzene	0.00009	0.00005	0.00010	0.00008
Xylene (Total)	0.00034	0.00027	0.00025	0.00042
Styrene	0.00034	0.00080	0.00064	0.00059
TOTAL	0.00818	0.01044	0.01010	0.00971

$$\text{Emissions (lb/hr)} = \frac{X\ \text{ng}}{20\ \text{l}} \times 28.32\ \frac{\text{l}}{\text{ft3}} \times Q\ \frac{\text{ft3}}{\text{min}} \times 60\ \frac{\text{min}}{\text{hr}} \times \frac{1}{453.6 \times 10^{9}}\ \frac{\text{lb}}{\text{ng}}$$

$$= (X\ \text{ng})\ (Q\ \text{ft3/min}) \times 1.873 \times 10^{-10}$$

$Q = 596{,}228$ ft3/min

$$= X\ (\text{ng}) \times 1.1167 \times 10^{-6}$$

where Q = Stack gas flow rate (dscfm), see Table 1, Runs 2 and 3

X = Sample weight of compound (nanograms)

TABLE 3

SUMMARY OF FURANS AND DIOXINS EMISSION RATES

CENTRAL POWER AND LIME, INC.
BROOKSVILLE, FLORIDA
OCTOBER 31 - NOVEMBER 2, 1990

	Emission Rates (10^{-6} lb/hr)					
	Run 1	Run 2	Run 3	Avg	Equiv. Toxicity	Equivalent 2378-tetra Dioxin Emissions (10^{-6} lb/hr)
Dioxins						
2378-tetra	ND	ND	ND	ND	1.00000	ND
12378-penta	ND	0.034	0.014	0.016	0.50000	0.0080
123478-hexa	ND	0.034*	ND	0.011	0.04000	0.0004
123789-hexa	0.057	0.068	0.046	0.057	0.04000	0.0023
123678-hexa	0.076	0.068	0.061	0.068	0.04000	0.0027
1234678-hepta	0.668*	0.762	0.461	0.630	0.00100	0.0006
octa	2.100	2.711	1.474	2.095	0	0.000
Other tetra	0.286	0.220	0.507	0.338	0.01000	0.0034
Other penta	0.172	0.051	0.140	0.121	0.00500	0.0006
Other hexa	0.611	0.474	0.461	0.515	0.00040	0.0002
Other hepta	0.267	0.932	0.676	0.625	0.00001	<0.0001
Subtotal as 2378-TCDD						0.0183
Furans						
2378-tetra	0.191	0.169*	0.138	0.166	0.10000	0.0166
12378-penta	0.057	0.034	0.015	0.041	0.10000	0.0041
23478-penta	0.095	0.034	0.031	0.053	0.10000	0.0053
23478-hexa	0.172	0.051*	0.015*	0.079	0.01000	0.0008
123678-hexa	0.076	0.034*	0.011*	0.040	0.01000	0.0004
234678-hexa	0.153	0.051	0.031	0.078	0.01000	<0.0008
123789-hexa	ND	ND	ND	ND	0.01000	ND
234678-hepta	0.267	0.085	0.031*	0.128	0.00100	0.0001
234789-hepta	ND	ND	ND	ND	0.00100	ND
octa	ND	ND	ND	ND	0	ND
Other tetra	1.164	0.373	0.814	0.784	0.00100	0.0008
Other penta	0.611	0.220	0.123	0.318	0.00100	0.0003
Other hexa	0.496	0.119	0.020	0.212	0.00010	<0.0001
Other hepta	0.095	0.034	ND	0.043	0.00001	<0.0001
Subtotal as 2378-TCDD						0.0294
TOTAL as 2378-TCDD					0.000000048 lb/hr	

*Dioxins/furans plus other compounds eluted at same time.

TABLE 4

SUMMARY OF METALS EMISSION RATES

CENTRAL POWER AND LIME, INC.
CEMENT/POWER/LIME PLANTS
OCTOBER 31-NOVEMBER 2, 1990

Metal	Run 1	Run 2 (lb/hr)	Run 3	Average of 3 Runs (lb/hr)
Aluminum	30.452	31.126	27.836	29.805
Arsenic	0.009	0.004	0.003	0.005
Barium	0.065	0.061	0.069	0.065
Cadmium	0.005	0.003	0.002	0.003
Chromium	0.036	0.028	0.025	0.030
Cobalt	<0.023	<0.023	<0.023	<0.023
Copper	0.039	0.017	0.002	0.019
Iron	1.931	2.377	1.533	1.947
Lead	0.257	0.075	0.050	0.127
Magnesium	2.637	2.690	2.364	2.564
Mercury	0.768	0.216	0.164	0.383
Molybdenum	<0.006	<0.006	<0.006	<0.006
Nickel	0.022	0.011	<0.009	0.014
Selenium	<0.016	<0.016	<0.016	<0.016
Silver	<0.016	<0.016	<0.016	<0.016
Titanium	0.934	0.970	0.809	0.904
Vanadium	0.039	0.038	0.034	0.037
Zinc	1.570	1.064	0.397	1.010

TABLE 5
SUMMARY OF METALS ANALYSES

CENTRAL POWER & LIME, INC.
CEMENT/POWER/LIME PLANTS
OCTOBER 31-NOVEMBER 2, 1990

Metal	WWT Sediment(1) (ug/g)(4)	Kiln Feed(2) (ug/g)	Baghouse Dust(3) (ug/g)
Aluminum	29,900	7,900	10,900
Arsenic	4.8	3.2	5.4
Barium	172	53	88
Cadmium	11	3.0	3.0
Chromium	188	29	36
Cobalt	82	2.2	3.6
Copper	395	26	28
Iron	59,100	11,400	7,770
Lead	103	51	80
Magnesium	37,800	2,270	2,850
Mercury	0.4	0.5	2.1
Molybdenum	100	9.1	12
Nickel	2,790	12	11
Selenium	1.0	0.7	1.5
Silver	<13	<13	<13
Titanium	70	65	153
Vanadium	4,280	40	62
Zinc	313	13	22

(1) Wastewater treatment sediment.
(2) Kiln feed including the WWT sediment.
(3) Baghouse dust during the time when WWT sediment was included in the kiln feed.
(4) ug/g = parts per million (wt. basis)

APPENDIX

CALCULATIONS

KOOGLER & ASSOCIATES

PARTICULATE MATTER
& METALS

```
GENERAL DATA                                          DATA FILE NAME: FLCRSTONE
------------                                          --------------

 Company      : FLORIDA CRUSHED STONE
 Source/Unit  : PM & MM
 Date         : 103190                 Cp           :     0.840
 Stack dia.   : 223.80 inch    OR  :   Duct Length  :      0.00 inch
 Oxygen Corr.:     7.0 percent         Duct Width   :      0.00 inch
                                       Std. Temp.   :        68 dF

FUEL ANALYSIS DATA,
 (for calculating F-Factor)            Process Wt.
-----------------------------          --------
Hydrogen,wt% :    0.00       Run 1 :   132.0 tons/hr
Carbon,   wt% :    0.00       Run 2 :   132.0
Sulfur,   wt% :    0.00       Run 3 :   132.0
Nitrogen,wt% :    0.00
Oxygen,   wt% :    0.00
Btu/lb        :       0

F-Factor      :         dscf/MMBtu; enter this value or {F9} for result.
FIELD DATA                                    RUN      RUN      RUN
----------                                      1        2        3

  Meter Temp., Tm (dF) ..............      81.31    78.69    80.19
  Stack Temp., Ts (dF) ..............     390.25   386.44   393.00
  Sq.Rt. dP .........................     0.9180   0.9040   0.8750
  dH (in. H2O) ......................       2.21     2.12     2.01
  Meter Vol.,Vm (ft3) ...............     53.072   52.029   50.620
  Meter Y ...........................      0.994    0.994    0.994
  Bar. Press.,Pb (in.Hg.) ...........      30.14    30.14    30.14
  Vol. H2O, Vlc (ml) ................       80.0     86.0     83.0
  Static Press.,Ps (in.H2O) .........      -0.05    -0.05    -0.05
  Test Time (min.) ..................       64.0     64.0     64.0
  Nozzle Dia.,Dn (in.) ..............      0.261    0.261    0.261
  Oxygen, O2 (%) ....................      10.40     9.99     9.88
  Carbon Dioxide, CO2 (%) ...........      10.60    11.01    11.02
  Carbon Monoxide, CO (%) ...........       0.00     0.00     0.00

  Is this Method 5 or Method 5/8 ?              (5 or 58) :          5

LABORATORY RESULTS                            RUN      RUN      RUN
------------------                              1        2        3

  GRAVIMETRIC ANALYSIS :
  Front Half Wash (FHW) ............. 0.02270 0.02970 0.02220 grams
  Filterable Particulate (MF) ....... 0.01920 0.01960 0.01700
  Condensible Particulate (BHW) ..... 0.00000 0.00000 0.00000

  SO2 ANALYSIS :
  SO2 Analysis (H2O2 impingers)......    0.00     0.00     0.00 mg H2SO4
  Sample Volume, ml .................       0        0        0
  Sample Aliquot, ml ................       0        0        0
  Volume of Titer, ml ...............    0.00     0.00     0.00
  Volume of Titer Blank, ml .........    0.00     0.00     0.00
                                 Normality of BaCl .......... 0.0000000
```

```
LABORATORY RESULTS (Continued)
------------------------------

  SULFATE ANALYSIS (FRONT HALF) :
  Front Half Sulfate (FHS) ..........    0.00    0.00    0.00 mg H2SO4
  Sample Volume, ml .................     100     100     100
  Sample Aliquot, ml ................      10      10      10
  Volume of Titer, ml ...............    0.00    0.00    0.00
  Volume of Titer Blank, ml .........    0.00    0.00    0.00
                                 Normality of BaCl .......... 0.0000000

  SULFATE ANALYSIS (BACK HALF) :
  Back Half Sulfate (BHS) ...........    0.00    0.00    0.00 mg H2SO4
  Sample Volume, ml .................     100     100     100
  Sample Aliquot, ml ................      10      10      10
  Volume of Titer, ml ...............    0.00    0.00    0.00
  Volume of Titer IPA Blank, ml .....    0.00    0.00    0.00
                                 Normality of BaCl .......... 0.0000000
```

SOURCE TEST CALCULATIONS

```
 PLANT : FLORIDA CRUSHED STONE                   RUN NO.:          1
         PM & MM                                 DATE    :    103190


 STD.TEMP, Tstd    =     68 DEG. F    ¦ STATIC PRESS.,Ps =    -0.05 in. H2O
 METER TEMP, Tm    = 81.31 DEG. F     ¦ PITOT COFF., Cp  =    0.840
 STACK TEMP, Ts    = 390.3 DEG. F     ¦ STACK I.D.       =   223.80 inch
 AVG.VEL.HEAD,dP =   0.84 in. H2O     ¦ DUCT LENGTH      =          inch
 METER ORIFICE,dH=   2.21 in. H2O     ¦ DUCT WIDTH       =          inch
 METER VOL., Vm    =53.072 Cu.Ft.     ¦ STACK AREA, As   = 273.179 Sq.Ft.
 METER COFF., Y    = 0.994            ¦ TEST TIME        =    64.00 min.
 BAR. PRESS., Pb = 30.14 in.Hg        ¦ NOZZLE DIA.      =    0.261 inch
 COND.(Vlc)        =   80.0 ml        ¦ NOZZLE DIA., An  = 3.7E-04 Sq.Ft.

 GAS ANALYSIS      = 10.40   % O2           0.00   % CO
                     10.60   % CO2         79.00   % N2

************************************************************************

Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460)......      =   52.114   dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc       =    3.766   scf

Bws = Vw(std) / (Vm(std) + Vw(std))...........       =    0.067 ¦ Lower
                                                                ¦ Bws
Bws @ Saturated Conditions = Vapor Press. of H2O                ¦ value
@ Dew Point Temp. / (Ps, in.Hg.) .............       =    1.000 ¦ used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =    99.46

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]     =    30.11

Ms = (Md x (1-Bws)) + (18.0 x Bws)............       =    29.30

P(stack) = Pbar + (Ps / 13.6) ................       =    30.14 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x P(stack))] ......................       =    64.69   ft/sec

Qs = vs x As x 60 ............................       = ********* acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (P(stack)/29.92) ..................       =  618,556  dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) /
    (T(std) + 460) / 29.92] x 100 / [ Time x
    P(stack) x An x vs x 60] ..................       =    97.02   %
```

```
                         SOURCE TEST CALCULATIONS


  PLANT : FLORIDA CRUSHED STONE                     RUN NO.:        2
          PM & MM                                   DATE   :   103190


  STD.TEMP, Tstd   =    68 DEG. F    | STATIC PRESS.,Ps =   -0.05 in. H2O
  METER TEMP, Tm   = 78.69 DEG. F    | PITOT COFF., Cp  =   0.840
  STACK TEMP, Ts   = 386.4 DEG. F    | STACK I.D.       =  223.80 inch
  AVG.VEL.HEAD,dP =   0.82 in. H2O   | DUCT LENGTH      =         inch
  METER ORIFICE,dH=   2.12 in. H2O   | DUCT WIDTH       =         inch
  METER VOL., Vm   =52.029 Cu.Ft.    | STACK AREA, As   = 273.179 Sq.Ft.
  METER COFF., Y   = 0.994           | TEST TIME        =   64.00 min.
  BAR. PRESS., Pb  = 30.14 in.Hg     | NOZZLE DIA.      =   0.261 inch
  COND.(Vlc)       =  86.0 ml        | NOZZLE DIA., An  = 3.7E-04 Sq.Ft.

  GAS ANALYSIS     =  9.99  % O2           0.00  % CO
                     11.01  % CO2         79.00  % N2

*************************************************************************

 Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
           (Pb + (dH / 13.6)) / (Tm + 460)......      =   51.327   dscf

 Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc       =    4.048   scf

 Bws = Vw(std) / (Vm(std) + Vw(std))............      =    0.073 | Lower
                                                                 | Bws
 Bws @ Saturated Conditions = Vapor Press. of H2O                | value
 @ Dew Point Temp. / (Ps, in.Hg.)  .............      =    1.000 | used.

 %EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =    91.94

 Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]     =    30.16

 Ms = (Md x (1-Bws)) + (18.0 x Bws)............       =    29.27

 P(stack) = Pbar + (Ps / 13.6) .................      =    30.14 in. Hg

 vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
      / (Ms x P(stack))] .......................      =    63.59   ft/sec

 Qs = vs x As x 60 .............................      = ********* acf/min

 Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
           x (P(stack)/29.92) ..................      =  606,996   dscf/min

 I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) /
     (T(std) + 460) / 29.92] x 100 / [ Time x
     P(stack) x An x vs x 60] ..................      =    97.37    %
```

```
                         SOURCE TEST CALCULATIONS


  PLANT : FLORIDA CRUSHED STONE                    RUN NO.:          3
          PM & MM                                  DATE    :    103190


  STD.TEMP, Tstd    =    68 DEG. F    | STATIC PRESS.,Ps =   -0.05 in. H2O
  METER TEMP, Tm    = 80.19 DEG. F    | PITOT COFF., Cp  =   0.840
  STACK TEMP, Ts    = 393.0 DEG. F    | STACK I.D.       =  223.80 inch
  AVG.VEL.HEAD,dP =   0.77 in. H2O    | DUCT LENGTH      =         inch
  METER ORIFICE,dH=   2.01 in. H2O    | DUCT WIDTH       =         inch
  METER VOL., Vm    =50.620 Cu.Ft.    | STACK AREA, As   = 273.179 Sq.Ft.
  METER COFF., Y    = 0.994           | TEST TIME        =   64.00 min.
  BAR. PRESS., Pb = 30.14 in.Hg       | NOZZLE DIA.      =   0.261 inch
  COND.(Vlc)        =   83.0 ml       | NOZZLE DIA., An  = 3.7E-04 Sq.Ft.

  GAS ANALYSIS      =   9.88   % O2          0.00   % CO
                       11.02   % CO2        79.10   % N2

*************************************************************************

 Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
           (Pb + (dH / 13.6)) / (Tm + 460)......      =   49.786   dscf

 Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc       =    3.907   scf

 Bws  = Vw(std) / (Vm(std) + Vw(std))............     =    0.073 | Lower
                                                                 | Bws
 Bws @ Saturated Conditions = Vapor Press. of H2O                | value
 @ Dew Point Temp. / (Ps, in.Hg.) .............       =    1.000 | used.

 %EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =    89.80

 Md  =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]    =    30.16

 Ms  = (Md x (1-Bws)) + (18.0 x Bws).............     =    29.27

 P(stack) = Pbar + (Ps / 13.6) .................      =    30.14 in. Hg

 vs  = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
      / (Ms x P(stack))] .......................      =    61.79   ft/sec

 Qs  = vs x As x 60 ............................      = ********* acf/min

 Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
           x (P(stack)/29.92) ..................      =  585,459  dscf/min

 I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) /
     (T(std) + 460) / 29.92] x 100 / [ Time x
     P(stack) x An x vs x 60] ..................      =    97.92   %
```

A. FIELD DATA SUMMARY

PLANT : FLORIDA CRUSHED STONE
PM & MM
DATE : 103190

	RUN 1	RUN 2	RUN 3
Vlc = Vol water collected in train, ml	80.0	86.0	83.0
Vm = Sample gas vol, meter cond., dacf	53.072	52.029	50.620
Y = Meter calibration factor	0.9940	0.9940	0.9940
Pbar = Barometric pressure, in. Hg	30.14	30.14	30.14
Pstatic = Stack static pressure, in. H2O	-0.05	-0.05	-0.05
dH = Avg meter pressure diff, in. H2O	2.21	2.12	2.01
Tm = Absolute meter temp., degrees R	541.3	538.7	540.2
Vm(std) = Sample gas vol, Std. cond., dscf	52.114	51.327	49.786
Bws = Water vapor in gas stream, fraction	0.067	0.073	0.073
MF = Moisture factor (1 - Bws)	0.933	0.927	0.927
CO2 = Carbon Dioxide, dry, volume %	10.60	11.01	11.02
O2 = Oxygen, dry, volume %	10.40	9.99	9.88
N2 = Nitrogen, dry volume %	79.00	79.00	79.10
Md = Molecular weight of stack gas, dry	30.11	30.16	30.16
Ms = Molecular weight of stack gas, wet	29.30	29.27	29.27
Cp = Pitot tube coefficient	0.84	0.84	0.84
Sq.Rt. dP = Avg. square root of each dP	0.9180	0.9040	0.8750
Ts = Absolute stack temp., degrees R	850.3	846.4	853.0
A = Area of stack, ft2	273.18	273.18	273.18
Qstd = Volumetric flowrate, dscfm	618,556	606,996	585,459
An = Nozzle area, ft2	3.71E-04	3.71E-04	3.71E-04
0 = Sample time, minutes	64.00	64.00	64.00
%I = Isokinetic variation, percent	97.02	97.37	97.92

B. PARTICULATE DATA SUMMARY

PLANT : FLORIDA CRUSHED STONE
PM & MM
DATE : 103190

	RUN 1	RUN 2	RUN 3
Particulate Weight (FHW + MF + BHW), mg ...	41.90	49.30	39.20
Meter Volume, standard cond., Vm(std)	52.114	51.327	49.786
Carbon Dioxide, percent	10.60	11.01	11.02
Particulate Concentration :			
gr/scf	0.0116	0.0137	0.0113
gr/dscf	0.0124	0.0148	0.0122
gr/dscf @ 12 % CO2	0.0140	0.0162	0.0132
Particulate Emission Rate :			
lbs/hr	65.77	77.11	60.96

```
                         EMISSION RATE CALCULATIONS

  PLANT :FLORIDA CRUSHED STONE                   RUN NO.:          1
         PM & MM                                 DATE    :    103190
                                                 O2 CORR.:      7.0 %
         STANDARD TEMP. :        68 DEG. F
*************************************************************************
Front Half Wash (FHW)      0.02270 grams    ! Vm(std)   52.114 ft3
Mass Filter (MF)           0.01920 grams    ! Vw(std)    3.766 ft3
Back Half Wash (BHW)       0.00000 grams    ! Qs(std) 618,556 dscfm
Front Half Sulfate (FHS)           mg H2SO4 ! Bws        0.067
Back Half Sulfate (BHS)            mg H2SO4 ! CO2        10.60 %
H2O2 Catch (SO2)                   mg H2SO4 ! O2         10.40 %
*************************************************************************
F-FACTOR
--------
10E6 x [3.64(%H) + 1.53(%C) + 0.57(%S) + 0.14(%N) -
0.46(%O2)] / (Btu/lb) x [(Tstd + 460)/528] .........        dscf/MMBtu

FILTERABLE PARTICULATE
----------------------
15.432 x (FHW + MF) / [Vm(std) + Vw(std)] ..........  0.0116 gr/scf
15.432 x (FHW + MF) / Vm(std) ......................  0.0124 gr/dscf
gr/dscf x (12 / %CO2) ..............................  0.0140 @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................   65.77 lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

TOTAL PARTICULATE
-----------------
15.432 x (FHW + MF + BHW) / [(Vm(std) + Vw(std)] ...  0.0116 gr/scf
15.432 x (FHW + MF + BHW) / (Vm(std) ...............  0.0124 gr/dscf
gr/dscf x (12 / %CO2) ..............................  0.0140 @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................   65.77 lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

TOTAL SULFATE
-------------
0.015432 x (FHS + BHS) / [Vm(std) + Vw(std)] .......         gr/scf
0.015432 x (FHS + BHS) / Vm(std) ...................         gr/dscf
gr/dscf x (12 / %CO2) ..............................         @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................         lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

SULFUR DIOXIDE (SO2)
--------------------
1.60864 x [T(std) + 460] x (mg H2SO4) / [ 98.076 x
Vm(std)] ...........................................         ppm
ppm x [(20.9 - Oxygen Corr.) / (20.9 - %O2)] .......         @ O2 corr.
ppm x (1 - Bws) ....................................         ppm (wet)
8.223E-5 x Qs(std) x 64.062 x ppm / [T(std) + 460]..         lb/hr
F-Factor x 64.062 x [1.3711E-6 / [T(std)+ 460]] x
[20.9 / (20.9 - %O2)] x ppm ........................         lb/MMBtu
lb/hr / (dscfm x 60 min/hr) ........................         lb/dscf
```

```
                       EMISSION RATE CALCULATIONS

 PLANT :FLORIDA CRUSHED STONE                  RUN NO.:         2
        PM & MM                                DATE    :   103190
                                               O2 CORR.:     7.0 %
        STANDARD TEMP. :        68 DEG. F
**********************************************************************
Front Half Wash (FHW)      0.02970 grams     ¦ Vm(std)  51.327 ft3
Mass Filter (MF)           0.01960 grams     ¦ Vw(std)   4.048 ft3
Back Half Wash (BHW)       0.00000 grams     ¦ Qs(std) 606,996 dscfm
Front Half Sulfate (FHS)           mg H2SO4 ¦ Bws       0.073
Back Half Sulfate (BHS)            mg H2SO4 ¦ CO2       11.01 %
H2O2 Catch (SO2)                   mg H2SO4 ¦ O2         9.99 %
**********************************************************************
F-FACTOR
--------
10E6 x [3.64(%H) + 1.53(%C) + 0.57(%S) + 0.14(%N) -
0.46(%O2)] / (Btu/lb) x [(Tstd + 460)/528] .........       dscf/MMBtu

FILTERABLE PARTICULATE
----------------------
15.432 x (FHW + MF) / [Vm(std) + Vw(std)] ..........  0.0137 gr/scf
15.432 x (FHW + MF) / Vm(std) ......................  0.0148 gr/dscf
gr/dscf x (12 / %CO2) ..............................  0.0162 @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................   77.11 lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

TOTAL PARTICULATE
-----------------
15.432 x (FHW + MF + BHW) / [(Vm(std) + Vw(std)] ...  0.0137 gr/scf
15.432 x (FHW + MF + BHW) / (Vm(std) ...............  0.0148 gr/dscf
gr/dscf x (12 / %CO2) ..............................  0.0162 @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................   77.11 lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

TOTAL SULFATE
-------------
0.015432 x (FHS + BHS) / [Vm(std) + Vw(std)] .......         gr/scf
0.015432 x (FHS + BHS) / Vm(std) ...................         gr/dscf
gr/dscf x (12 / %CO2) ..............................         @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................         lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

SULFUR DIOXIDE (SO2)
--------------------
1.60864 x [T(std) + 460] x (mg H2SO4) / [ 98.076 x
Vm(std)] ...........................................         ppm
ppm x [(20.9 - Oxygen Corr.) / (20.9 - %O2)] .......         @ O2 corr.
ppm x (1 - Bws) ....................................         ppm (wet)
8.223E-5 x Qs(std) x 64.062 x ppm / [T(std) + 460]..         lb/hr
F-Factor x 64.062 x [1.3711E-6 / [T(std)+ 460]] x
[20.9 / (20.9 - %O2)] x ppm ........................         lb/MMBtu
lb/hr / (dscfm x 60 min/hr) ........................         lb/dscf
```

EMISSION RATE CALCULATIONS

```
 PLANT :FLORIDA CRUSHED STONE                RUN NO.:        3
        PM & MM                              DATE    :   103190
                                             O2 CORR.:     7.0 %
        STANDARD TEMP. :       68 DEG. F
*************************************************************************
Front Half Wash (FHW)      0.02220 grams    | Vm(std)  49.786 ft3
Mass Filter (MF)           0.01700 grams    | Vw(std)   3.907 ft3
Back Half Wash (BHW)       0.00000 grams    | Qs(std) 585,459 dscfm
Front Half Sulfate (FHS)           mg H2SO4 | Bws       0.073
Back Half Sulfate (BHS)            mg H2SO4 | CO2       11.02 %
H2O2 Catch (SO2)                   mg H2SO4 | O2         9.88 %
*************************************************************************
F-FACTOR
--------
10E6 x [3.64(%H) + 1.53(%C) + 0.57(%S) + 0.14(%N) -
0.46(%O2)] / (Btu/lb) x [(Tstd + 460)/528] .........        dscf/MMBtu

FILTERABLE PARTICULATE
----------------------
15.432 x (FHW + MF) / [Vm(std) + Vw(std)] ..........  0.0113 gr/scf
15.432 x (FHW + MF) / Vm(std) ......................  0.0122 gr/dscf
gr/dscf x (12 / %CO2) ..............................  0.0132 @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................   60.96 lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

TOTAL PARTICULATE
-----------------
15.432 x (FHW + MF + BHW) / [(Vm(std) + Vw(std)] ...  0.0113 gr/scf
15.432 x (FHW + MF + BHW) / (Vm(std) ...............  0.0122 gr/dscf
gr/dscf x (12 / %CO2) ..............................  0.0132 @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................   60.96 lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

TOTAL SULFATE
-------------
0.015432 x (FHS + BHS) / [Vm(std) + Vw(std)] .......         gr/scf
0.015432 x (FHS + BHS) / Vm(std) ...................         gr/dscf
gr/dscf x (12 / %CO2) ..............................         @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................         lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

SULFUR DIOXIDE (SO2)
--------------------
1.60864 x [T(std) + 460] x (mg H2SO4) / [ 98.076 x
Vm(std)] ...........................................         ppm
ppm x [(20.9 - Oxygen Corr.) / (20.9 - %O2)] .......         @ O2 corr.
ppm x (1 - Bws) ....................................         ppm (wet)
8.223E-5 x Qs(std) x 64.062 x ppm / [T(std) + 460]..         lb/hr
F-Factor x 64.062 x [1.3711E-6 / [T(std)+ 460]] x
[20.9 / (20.9 - %O2)] x ppm ........................         lb/MMBtu
lb/hr / (dscfm x 60 min/hr) ........................         lb/dscf
```

KOOGLER AND ASSOCIATES, ENVIRONMENTAL SERVICES
SUMMARY OF VISIBLE EMISSIONS

PLANT : FLORIDA CRUSHED STONE
SOURCE: STACK - SLUDGE
DATE : OCTOBER 31, 1990
TIME : 0908-0938

SECONDS /	5	15	30	45
	OPACITY (%)			
MINUTES / 1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	5	5	5	5
11	5	5	5	0
12	0	0	0	5
13	5	5	0	0
14	0	0	0	0
15	5	5	5	5
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	5	10	5	5
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0
30	0	5	5	0

AVERAGE OPACITY: 0.9 %

MAXIMUM OPACITY: 10 %

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

THIS IS TO CERTIFY THAT

N. MASON JOYE, has completed the STATE OF FLORIDA visible emissions evaluation training and is a qualified observer of visible emissions as specified by EPA reference method 9.

THIS CERTIFICATE EXPIRES Dec 5, 1990

Michael R. Clark
CERTIFICATE OFFICER

N. Mason Joye
BEARER'S SIGNATURE

KOOGLER AND ASSOCIATES, ENVIRONMENTAL SERVICES
SIX-MINUTE AVERAGES OF VISIBLE EMISSIONS

PLANT : FLORIDA CRUSHED STONE
SOURCE: STACK - SLUDGE
DATE : OCTOBER 31, 1990
TIME : 0908-0938

MINUTES	--- SIX-MINUTE ROLLING AVERAGES ---			
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.2	0.4	0.6	0.8
11	1.0	1.3	1.5	1.5
12	1.5	1.5	1.5	1.7
13	1.9	2.1	2.1	2.1
14	2.1	2.1	2.1	2.1
15	2.3	2.5	2.7	2.9
16	2.7	2.5	2.3	2.1
17	1.9	1.7	1.5	1.5
18	1.5	1.5	1.5	1.3
19	1.0	0.8	0.8	0.8
20	0.8	0.8	0.8	0.8
21	0.6	0.4	0.2	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.2	0.6	0.8	1.0
26	1.0	1.0	1.0	1.0
27	1.0	1.0	1.0	1.0
28	1.0	1.0	1.0	1.0
29	1.0	1.0	1.0	1.0
30	1.0	1.3	1.5	1.5

HIGHEST SIX-MINUTE ROLLING AVERAGE: 2.9 %

KOOGLER AND ASSOCIATES, ENVIRONMENTAL SERVICES
SUMMARY OF VISIBLE EMISSIONS

PLANT : FLORIDA CRUSHED STONE
SOURCE: STACK - SLUDGE
DATE : OCTOBER 31, 1990
TIME : 1428-1458

SECONDS /	5	15	30	45
	OPACITY (%)			
MINUTES / 1	0	5	5	5
2	5	5	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	5
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	5	5	5
12	5	5	5	5
13	0	0	0	0
14	0	0	5	5
15	0	0	0	0
16	0	0	0	0
17	0	0	5	5
18	5	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	5	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0
30	0	0	0	0

AVERAGE OPACITY: 0.8 %

MAXIMUM OPACITY: 5 %

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

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CERTIFICATE OFFICER

N. Mason Joye
BEARER'S SIGNATURE

KOOGLER AND ASSOCIATES, ENVIRONMENTAL SERVICES
SIX-MINUTE AVERAGES OF VISIBLE EMISSIONS

PLANT : FLORIDA CRUSHED STONE
SOURCE: STACK - SLUDGE
DATE : OCTOBER 31, 1990
TIME : 1428-1458

MINUTES	--- SIX-MINUTE ROLLING AVERAGES ---			
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	1.3
7	1.3	1.0	0.8	0.6
8	0.4	0.2	0.2	0.2
9	0.2	0.2	0.2	0.2
10	0.2	0.2	0.2	0.2
11	0.2	0.4	0.6	0.6
12	0.8	1.0	1.3	1.5
13	1.5	1.5	1.5	1.5
14	1.5	1.5	1.7	1.9
15	1.9	1.9	1.9	1.9
16	1.9	1.9	1.9	1.9
17	1.9	1.7	1.7	1.7
18	1.7	1.5	1.3	1.0
19	1.0	1.0	1.0	1.0
20	1.0	1.0	0.8	0.6
21	0.6	0.6	0.6	0.6
22	0.6	0.8	0.8	0.8
23	0.8	0.8	0.6	0.4
24	0.2	0.2	0.2	0.2
25	0.2	0.2	0.2	0.2
26	0.2	0.2	0.2	0.2
27	0.2	0.2	0.2	0.2
28	0.2	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0

HIGHEST SIX-MINUTE ROLLING AVERAGE: 1.9 %

SUMMARY OF SOURCE EMISSION TEST DATA
DIOXINS & FURANS

FLORIDA CRUSHED STONE
KILN - MM5
OCTOBER 2, 1990

Run No.	Process Weight Rate (Tons/Hr)	Stack Gas Flow Rate (SCFMD)	Stack Gas Temperature (Deg F)	Stack Gas Moisture (%)	Particulate Matter Conc. (gr/dscf)	Particulate Matter Emission Rate (Lbs/Hr)
1	0.0	619833	367.0	8.7	0.3594	1909.00
2	0.0	626589	369.0	8.7	0.3155	1694.27
3	0.0	609223	383.0	7.6	0.2941	1535.46
Average	0.0	618548	373.0	8.4	0.3230	1712.91 *

Allowable Particulate Matter Emission Rate = 0.00 lbs/Hr
(Chapter 17-2, Florida Administrative Code)

* Based on Sample Weight of 1.0grams

```
qq/xg\a                                               DATA FILE NAME: FCS100290
------------                                          --------------
 Company       : FLORIDA CRUSHED STONE
 Source/Unit : KILN - MM5
 Date          : OCTOBER 2, 1990          Cp             :     0.840
 Stack dia.  : 223.80 inch     OR   :   Duct Length :      0.00 inch
 Oxygen Corr.:     7.0 percent           Duct Width   :      0.00 inch
                                         Std. Temp.   :        68 dF

FUEL ANALYSIS DATA,
 (for calculating F-Factor)              Process Wt.
---------------------------              ---------
Hydrogen,wt% :   0.00          Run 1 :      0.0 tons/hr
Carbon,  wt% :   0.00          Run 2 :      0.0
Sulfur,  wt% :   0.00          Run 3 :      0.0
Nitrogen,wt% :   0.00
Oxygen,  wt% :   0.00
Btu/lb       :      0

F-Factor     :          dscf/MMBtu; enter this value or {F9} for result.
FIELD DATA                                      RUN      RUN      RUN
----------                                        1        2        3

  Meter Temp., Tm (dF) ..............    80.00    80.50    81.50
  Stack Temp., Ts (dF) ..............   367.00   369.00   383.00
  Sq.Rt. dP .........................   0.9230   0.9340   0.9070
  dH (in. H2O) ......................     1.70     2.00     2.18
  Meter Vol.,Vm (ft3) ...............   43.635   49.711   53.408
  Meter Y ...........................    0.994    0.994    0.994
  Bar. Press.,Pb (in.Hg.) ...........    30.17    30.17    30.17
  Vol. H2O, Vlc (ml) ................     87.0     99.5     92.0
  Static Press.,Ps (in.H2O) .........    -0.05    -0.05    -0.05
  Test Time (min.) ..................     64.0     64.0     64.0
  Nozzle Dia.,Dn (in.) ..............    0.261    0.261    0.261
  Oxygen, O2 (%) ....................    10.14    10.40    10.28
  Carbon Dioxide, CO2 (%) ...........    10.86    10.60    10.72
  Carbon Monoxide, CO (%) ...........     0.00     0.00     0.00

  Is this Method 5 or Method 5/8 ?              (5 or 58) :            5

LABORATORY RESULTS                              RUN      RUN      RUN
------------------                                1        2        3

  GRAVIMETRIC ANALYSIS :
  Front Half Wash (FHW) ............. 1.00000 1.00000 1.00000 grams
  Filterable Particulate (MF) ....... 0.00000 0.00000 0.00000
  Condensible Particulate (BHW) ..... 0.00000 0.00000 0.00000

  SO2 ANALYSIS :
  SO2 Analysis (H2O2 impingers)......     0.00     0.00     0.00 mg H2SO4
  Sample Volume, ml .................        0        0        0
  Sample Aliquot, ml ................        0        0        0
  Volume of Titer, ml ...............     0.00     0.00     0.00
  Volume of Titer Blank, ml .........     0.00     0.00     0.00
                                     Normality of BaCl .......... 0.0000000
```

```
LABORATORY RESULTS (Continued)
------------------------------

  SULFATE ANALYSIS (FRONT HALF) :
  Front Half Sulfate (FHS) ..........    0.00     0.00     0.00 mg H2SO4
  Sample Volume, ml .................     100      100      100
  Sample Aliquot, ml ................      10       10       10
  Volume of Titer, ml ...............    0.00     0.00     0.00
  Volume of Titer Blank, ml .........    0.00     0.00     0.00
                                Normality of BaCl .......... 0.0000000

  SULFATE ANALYSIS (BACK HALF) :
  Back Half Sulfate (BHS) ...........    0.00     0.00     0.00 mg H2SO4
  Sample Volume, ml .................     100      100      100
  Sample Aliquot, ml ................      10       10       10
  Volume of Titer, ml ...............    0.00     0.00     0.00
  Volume of Titer IPA Blank, ml .....    0.00     0.00     0.00
                                Normality of BaCl .......... 0.0000000
```

```
                         SOURCE TEST CALCULATIONS


  PLANT : FLORIDA CRUSHED STONE                    RUN NO.:           1
          KILN - MM5                               DATE    : OCTOBER 2, 1990


  STD.TEMP, Tstd    =    68 DEG. F    ! STATIC PRESS., Ps =   -0.05 in. H2O
  METER TEMP, Tm    =    80 DEG. F    ! PITOT COFF., Cp   =   0.840
  STACK TEMP, Ts    = 367.0 DEG. F    ! STACK I.D.        =  223.80 inch
  AVG.VEL.HEAD,dP  =  0.85 in. H2O   ! DUCT LENGTH       =         inch
  METER ORIFICE,dH=  1.70 in. H2O   ! DUCT WIDTH        =         inch
  METER VOL., Vm    =43.635 Cu.Ft.    ! STACK AREA, As    = 273.179 Sq.Ft.
  METER COFF., Y    = 0.994           ! TEST TIME         =   64.00 min.
  BAR. PRESS., Pb   = 30.17 in.Hg     ! NOZZLE DIA.       =   0.261 inch
  COND.(Vlc)        =  87.0 ml        ! NOZZLE DIA., An   = 3.7E-04 Sq.Ft.

  GAS ANALYSIS      = 10.14  % O2            0.00  % CO
                      10.86  % CO2          79.00  % N2

 ************************************************************************

 Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460)......      =   42.941   dscf

 Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc      =    4.095   scf

 Bws = Vw(std) / (Vm(std) + Vw(std))............     =    0.087 ! Lower
                                                                ! Bws
 Bws @ Saturated Conditions = Vapor Press. of H2O               ! value
 @ Dew Point Temp. / (Ps, in.Hg.) .............      =    1.000 ! used.

 %EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =    94.62

 Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]    =    30.14

 Ms = (Md x (1-Bws)) + (18.0 x Bws).............     =    29.09

 P(stack) = Pbar + (Ps / 13.6) .................     =    30.17 in. Hg

 vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x P(stack))] ......................       =    64.35   ft/sec

 Qs = vs x As x 60 ...........................       = ********* acf/min

 Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (P(stack)/29.92) ..................      =  619,833  dscf/min

 I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) /
     (T(std) + 460) / 29.92] x 100 / [ Time x
     P(stack) x An x vs x 60] ..................     =    79.78    %
```

```
                        SOURCE TEST CALCULATIONS


  PLANT : FLORIDA CRUSHED STONE                   RUN NO.:          2
          KILN - MM5                              DATE    : OCTOBER 2, 1990


  STD.TEMP, Tstd     =     68 DEG. F    ¦ STATIC PRESS.,Ps =    -0.05 in. H2O
  METER TEMP, Tm     = 80.50 DEG. F     ¦ PITOT COFF., Cp  =    0.840
  STACK TEMP, Ts     = 369.0 DEG. F     ¦ STACK I.D.       =   223.80 inch
  AVG.VEL.HEAD,dP =   0.87 in. H2O      ¦ DUCT LENGTH      =          inch
  METER ORIFICE,dH=   2.00 in. H2O      ¦ DUCT WIDTH       =          inch
  METER VOL., Vm     =49.711 Cu.Ft.     ¦ STACK AREA, As   = 273.179 Sq.Ft.
  METER COFF., Y     = 0.994            ¦ TEST TIME        =    64.00 min.
  BAR. PRESS., Pb = 30.17 in.Hg         ¦ NOZZLE DIA.      =    0.261 inch
  COND.(Vlc)         =   99.5 ml        ¦ NOZZLE DIA., An  = 3.7E-04 Sq.Ft.

  GAS ANALYSIS       = 10.40   % O2              0.00   % CO
                       10.60   % CO2            79.00   % N2

*************************************************************************

Vm(std)  = [ T(std) + 460 / 29.92 ] x Vm x Y x
           (Pb + (dH / 13.6)) / (Tm + 460)......       =    48.911    dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc         =     4.683    scf

Bws = Vw(std) / (Vm(std) + Vw(std))...........         =     0.087 ¦ Lower
                                                                   ¦ Bws
Bws @ Saturated Conditions = Vapor Press. of H2O                   ¦ value
@ Dew Point Temp. / (Ps, in.Hg.)  ............         =     1.000 ¦ used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =     99.46

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]       =     30.11

Ms = (Md x (1-Bws)) + (18.0 x Bws).............        =     29.05

P(stack) = Pbar + (Ps / 13.6) ................         =     30.17 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x P(stack))] .......................        =     65.23    ft/sec

Qs = vs x As x 60 ............................         = ********* acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (P(stack)/29.92) .................         =   626,589  dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) /
    (T(std) + 460) / 29.92] x 100 / [ Time x
    P(stack) x An x vs x 60] ..................        =     89.89    %
```

```
                         SOURCE TEST CALCULATIONS


 PLANT : FLORIDA CRUSHED STONE                  RUN NO.:          3
         KILN - MM5                             DATE    : OCTOBER 2, 1990


 STD.TEMP, Tstd    =    68 DEG. F   | STATIC PRESS.,Ps  =   -0.05 in. H2O
 METER TEMP, Tm    = 81.50 DEG. F   | PITOT COFF., Cp   =   0.840
 STACK TEMP, Ts    = 383.0 DEG. F   | STACK I.D.        =  223.80 inch
 AVG.VEL.HEAD,dP =  0.82 in. H2O   | DUCT LENGTH       =         inch
 METER ORIFICE,dH=  2.18 in. H2O   | DUCT WIDTH        =         inch
 METER VOL., Vm   =53.408 Cu.Ft.    | STACK AREA, As    = 273.179 Sq.Ft.
 METER COFF., Y    = 0.994          | TEST TIME         =   64.00 min.
 BAR. PRESS., Pb = 30.17 in.Hg     | NOZZLE DIA.       =   0.261 inch
 COND.(Vlc)        =  92.0 ml       | NOZZLE DIA., An   = 3.7E-04 Sq.Ft.

 GAS ANALYSIS      = 10.28  % O2           0.00  % CO
                     10.72  % CO2         79.00  % N2

************************************************************************

Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460)......      =   52.473   dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc       =    4.330   scf

Bws = Vw(std) / (Vm(std) + Vw(std))...........       =    0.076 | Lower
                                                                | Bws
Bws @ Saturated Conditions = Vapor Press. of H2O                | value
@ Dew Point Temp. / (Ps, in.Hg.) ............        =    1.000 | used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =    97.20

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]    =    30.13

Ms = (Md x (1-Bws)) + (18.0 x Bws).............      =    29.20

P(stack) = Pbar + (Ps / 13.6) .................      =    30.17 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x P(stack))] .......................      =    63.72   ft/sec

Qs = vs x As x 60 .............................      = ********* acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (P(stack)/29.92) ..................      =  609,223  dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) /
    (T(std) + 460) / 29.92] x 100 / [ Time x
    P(stack) x An x vs x 60] ..................      =    99.18    %
```

A. FIELD DATA SUMMARY

PLANT : FLORIDA CRUSHED STONE
KILN - MM5
DATE : OCTOBER 2, 1990

	RUN 1	RUN 2	RUN 3
Vlc = Vol water collected in train, ml	87.0	99.5	92.0
Vm = Sample gas vol, meter cond., dacf	43.635	49.711	53.408
Y = Meter calibration factor	0.9940	0.9940	0.9940
Pbar = Barometric pressure, in. Hg	30.17	30.17	30.17
Pstatic = Stack static pressure, in. H2O	-0.05	-0.05	-0.05
dH = Avg meter pressure diff, in. H2O	1.70	2.00	2.18
Tm = Absolute meter temp., degrees R	540.0	540.5	541.5
Vm(std) = Sample gas vol, Std. cond., dscf	42.941	48.911	52.473
Bws = Water vapor in gas stream, fraction	0.087	0.087	0.076
MF = Moisture factor (1 - Bws)	0.913	0.913	0.924
CO2 = Carbon Dioxide, dry, volume %	10.86	10.60	10.72
O2 = Oxygen, dry, volume %	10.14	10.40	10.28
N2 = Nitrogen, dry volume %	79.00	79.00	79.00
Md = Molecular weight of stack gas, dry	30.14	30.11	30.13
Ms = Molecular weight of stack gas, wet	29.09	29.05	29.20
Cp = Pitot tube coefficient	0.84	0.84	0.84
Sq.Rt. dP = Avg. square root of each dP	0.9230	0.9340	0.9070
Ts = Absolute stack temp., degrees R	827.0	829.0	843.0
A = Area of stack, ft2	273.18	273.18	273.18
Qstd = Volumetric flowrate, dscfm	619,833	626,589	609,223
An = Nozzle area, ft2	3.71E-04	3.71E-04	3.71E-04
0 = Sample time, minutes	64.00	64.00	64.00
%I = Isokinetic variation, percent	79.78	89.89	99.18

B. PARTICULATE DATA SUMMARY

PLANT : FLORIDA CRUSHED STONE
KILN - MM5
DATE : OCTOBER 2, 1990

	RUN 1	RUN 2	RUN 3
Particulate Weight (FHW + MF + BHW), mg ...	1000.00	1000.00	1000.00
Meter Volume, standard cond., Vm(std)	42.941	48.911	52.473
Carbon Dioxide, percent	10.86	10.60	10.72
Particulate Concentration :			
gr/scf	0.3281	0.2879	0.2717
gr/dscf	0.3594	0.3155	0.2941
gr/dscf @ 12 % CO2	0.3971	0.3572	0.3292
Particulate Emission Rate :			
lbs/hr	1909.00	1694.27	1535.46

```
                         EMISSION RATE CALCULATIONS

  PLANT :FLORIDA CRUSHED STONE               RUN NO.:          1
         KILN - MM5                          DATE    : OCTOBER 2, 1990
                                             O2 CORR.:      7.0 %
        STANDARD TEMP. :       68 DEG. F
*************************************************************************
Front Half Wash (FHW)      1.00000 grams     ! Vm(std)  42.941 ft3
Mass Filter (MF)           0.00000 grams     ! Vw(std)   4.095 ft3
Back Half Wash (BHW)       0.00000 grams     ! Qs(std) 619,833 dscfm
Front Half Sulfate (FHS)           mg H2SO4  ! Bws       0.087
Back Half Sulfate (BHS)            mg H2SO4  ! CO2       10.86 %
H2O2 Catch (SO2)                   mg H2SO4  ! O2        10.14 %
*************************************************************************
F-FACTOR
--------
10E6 x [3.64(%H) + 1.53(%C) + 0.57(%S) + 0.14(%N) -
0.46(%O2)] / (Btu/lb) x [(Tstd + 460)/528] .........        dscf/MMBtu

FILTERABLE PARTICULATE
----------------------
15.432 x (FHW + MF) / [Vm(std) + Vw(std)] ..........  0.3281 gr/scf
15.432 x (FHW + MF) / Vm(std) ......................  0.3594 gr/dscf
gr/dscf x (12 / %CO2) ..............................  0.3971 @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................ 1909.00 lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

TOTAL PARTICULATE
-----------------
15.432 x (FHW + MF + BHW) / [(Vm(std) + Vw(std)] ...  0.3281 gr/scf
15.432 x (FHW + MF + BHW) / (Vm(std) ...............  0.3594 gr/dscf
gr/dscf x (12 / %CO2) ..............................  0.3971 @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................ 1909.00 lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

TOTAL SULFATE
-------------
0.015432 x (FHS + BHS) / [Vm(std) + Vw(std)] .......         gr/scf
0.015432 x (FHS + BHS) / Vm(std) ...................         gr/dscf
gr/dscf x (12 / %CO2) ..............................         @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................         lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

SULFUR DIOXIDE (SO2)
--------------------
1.60864 x [T(std) + 460] x (mg H2SO4) / [ 98.076 x
Vm(std)] ...........................................         ppm
ppm x [(20.9 - Oxygen Corr.) / (20.9 - %O2)] .......         @ O2 corr.
ppm x (1 - Bws) ....................................         ppm (wet)
8.223E-5 x Qs(std) x 64.062 x ppm / [T(std) + 460]..         lb/hr
F-Factor x 64.062 x [1.3711E-6 / [T(std)+ 460]] x
[20.9 / (20.9 - %O2)] x ppm ........................         lb/MMBtu
lb/hr / (dscfm x 60 min/hr) ........................         lb/dscf
```

```
                         EMISSION RATE CALCULATIONS

  PLANT :FLORIDA CRUSHED STONE                    RUN NO.:         2
         KILN - MM5                               DATE    : OCTOBER 2, 1990
                                                  O2 CORR.:      7.0 %
         STANDARD TEMP. :        68 DEG. F
***********************************************************************
Front Half Wash (FHW)      1.00000 grams     ; Vm(std)  48.911 ft3
Mass Filter (MF)           0.00000 grams     ; Vw(std)   4.683 ft3
Back Half Wash (BHW)       0.00000 grams     ; Qs(std) 626,589 dscfm
Front Half Sulfate (FHS)           mg H2SO4 ; Bws        0.087
Back Half Sulfate (BHS)            mg H2SO4 ; CO2        10.60 %
H2O2 Catch (SO2)                   mg H2SO4 ; O2         10.40 %
***********************************************************************
F-FACTOR
--------

10E6 x [3.64(%H) + 1.53(%C) + 0.57(%S) + 0.14(%N) -
0.46(%O2)] / (Btu/lb) x [(Tstd + 460)/528] .........          dscf/MMBtu

FILTERABLE PARTICULATE
----------------------

15.432 x (FHW + MF) / [Vm(std) + Vw(std)] ..........  0.2879 gr/scf
15.432 x (FHW + MF) / Vm(std) ......................  0.3155 gr/dscf
gr/dscf x (12 / %CO2) ..............................  0.3572 @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................ 1694.27 lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

TOTAL PARTICULATE
-----------------

15.432 x (FHW + MF + BHW) / [(Vm(std) + Vw(std)] ...  0.2879 gr/scf
15.432 x (FHW + MF + BHW) / (Vm(std) ...............  0.3155 gr/dscf
gr/dscf x (12 / %CO2) ..............................  0.3572 @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................ 1694.27 lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

TOTAL SULFATE
-------------

0.015432 x (FHS + BHS) / [Vm(std) + Vw(std)] .......         gr/scf
0.015432 x (FHS + BHS) / Vm(std) ...................         gr/dscf
gr/dscf x (12 / %CO2) ..............................         @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................         lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

SULFUR DIOXIDE (SO2)
--------------------

1.60864 x [T(std) + 460] x (mg H2SO4) / [ 98.076 x
Vm(std)] ...........................................         ppm
ppm x [(20.9 - Oxygen Corr.) / (20.9 - %O2)] .......         @ O2 corr.
ppm x (1 - Bws) ....................................         ppm (wet)
8.223E-5 x Qs(std) x 64.062 x ppm / [T(std) + 460]..         lb/hr
F-Factor x 64.062 x [1.3711E-6 / [T(std)+ 460]] x
[20.9 / (20.9 - %O2)] x ppm ........................         lb/MMBtu
```

```
                         EMISSION RATE CALCULATIONS

  PLANT :FLORIDA CRUSHED STONE                  RUN NO.:          3
         KILN - MM5                             DATE    : OCTOBER 2, 1990
                                                O2 CORR.:      7.0 %
         STANDARD TEMP. :       68 DEG. F
*************************************************************************
Front Half Wash (FHW)       1.00000 grams     ¦ Vm(std)   52.473 ft3
Mass Filter (MF)            0.00000 grams     ¦ Vw(std)    4.330 ft3
Back Half Wash (BHW)        0.00000 grams     ¦ Qs(std) 609,223 dscfm
Front Half Sulfate (FHS)            mg H2SO4  ¦ Bws        0.076
Back Half Sulfate (BHS)             mg H2SO4  ¦ CO2        10.72 %
H2O2 Catch (SO2)                    mg H2SO4  ¦ O2         10.28 %
*************************************************************************
F-FACTOR
--------
10E6 x [3.64(%H) + 1.53(%C) + 0.57(%S) + 0.14(%N) -
0.46(%O2)] / (Btu/lb) x [(Tstd + 460)/528] .........         dscf/MMBtu

FILTERABLE PARTICULATE
----------------------
15.432 x (FHW + MF) / [Vm(std) + Vw(std)] ..........  0.2717 gr/scf
15.432 x (FHW + MF) / Vm(std) ......................  0.2941 gr/dscf
gr/dscf x (12 / %CO2) ..............................  0.3292 @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................ 1535.46 lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

TOTAL PARTICULATE
-----------------
15.432 x (FHW + MF + BHW) / [(Vm(std) + Vw(std)] ...  0.2717 gr/scf
15.432 x (FHW + MF + BHW) / (Vm(std) ...............  0.2941 gr/dscf
gr/dscf x (12 / %CO2) ..............................  0.3292 @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................ 1535.46 lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

TOTAL SULFATE
-------------
0.015432 x (FHS + BHS) / [Vm(std) + Vw(std)] .......         gr/scf
0.015432 x (FHS + BHS) / Vm(std) ...................         gr/dscf
gr/dscf x (12 / %CO2) ..............................         @ 12% CO2
0.00857 x Qs(std) x gr/dscf ........................         lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..         lb/MMBtu

SULFUR DIOXIDE (SO2)
--------------------
1.60864 x [T(std) + 460] x (mg H2SO4) / [ 98.076 x
Vm(std)] ...........................................         ppm
ppm x [(20.9 - Oxygen Corr.) / (20.9 - %O2)] .......         @ O2 corr.
ppm x (1 - Bws) ....................................         ppm (wet)
8.223E-5 x Qs(std) x 64.062 x ppm / [T(std) + 460]..         lb/hr
F-Factor x 64.062 x [1.3711E-6 / [T(std)+ 460]] x
[20.9 / (20.9 - %O2)] x ppm ........................         lb/MMBtu
lb/hr / (dscfm x 60 min/hr) ........................         lb/dscf
```

FIELD AND LABORATORY DATA SHEETS

KOOGLER & ASSOCIATES

KOOGLER & ASSOCIATES, *Environmental Services*

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SOURCE SAMPLING FIELD DATA SHEET

Plant Fla Crushed Stone CPL

Sampling Location Stack - Sludge

Type of Control Baghouse

Type of Samples Part - Multi metals

Date 10-31-90 Run No. 1

Time Start 0922 Time End 1036

Sample Time 4 min/pt 64 Total min

DB ____ °F, WB ____ °F, VP @ DP ____ "Hg

Bar. Press. 30.14 "Hg, Stack Press. ____ "Hg

Moisture 8 %, FDA ____, Gas Density Factor ____

Temp. 65 °F, W/D E, W/S 3-8

Weather Clear Thermocouple Readout KA1

Sample Box No: KA1 meter Box No. KA1

Meter ΔH@ 1.7 Pitot Corr. Factor 0.84

Nozzle Dia 0.2607 in., Probe Length 7' glass ft

Probe Heater Setting 4 Nomograph C_f 2.62

Stack Dimensions 18.65' in

Stack Area 273.2 ft^2

Effective Stack Area 273.2 ft^2

Stack Height ____ ft

Stack Dimensions

Umbilical Cord 100'

Thermocouple Probe No. KA-7Ø

Pitot Tube No. KA-SI

Mat'l Processing Rate ____

Final Gas Meter Reading 913.572 ft^3

Initial Gas Meter Reading 860.500 ft^3 53.072

Condensate Increase in Impingers 80 ml

Moisture in Silica Gel 5.1 gm

Silica Gel Container No. 67 Filter No. 2789

Orsat: $\%CO_2$ ____

$\%O_2$ ____

$\%CO$ ____

$\%N_2$ ____

Test Conducted By: R Paul - S Bell

Stack Test Observers: SCOTT SHEPLAK AND JASON GORRIE

Leak Check Meter Box

Initial 0.003 cfm @ 15 In H_2

Final 0.00 cfm @ 5 In Hg

Pitot Tubes

Impact 3 In H_2O for 15 sec. [✓ Stable], Leak

Static 3 In H_2O for 15 sec. [✓ Stable], Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. 2.21 ("H_2O)		Stack Gas Temp. (°F)	Sample Box Temp. (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)	10.425 O_2 %
				0.843	Calc.	Actual	390.25	247.75	44.31	81.31		
1-1			60.5	0.96	2.52	2.52	400	257	72	77	5	10.4
2			65.3	0.92	2.4	2.4	400	253	56	78	5	10.4
3			68.1	0.88	2.3	2.3	397	254	61	80	5	10.5
4			71.3	0.75	1.97	1.97	396	245	61	81	4	10.5
2-1			74.4	0.95	2.49	2.49	394	257	66	82	5	10.4
2			77.5	0.86	2.25	2.25	392	255	62	83	5	
3			80.9	0.84	2.2	2.2	391	255	63	84	4	
4			84.2	0.77	2.02	2.02	387	263	63	84	4	

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Sample Box Temp (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)	O_2 %
					Calc.	Actual						
3-1			87.4	0.69	1.81	1.81	383	236	69	83	4	10.6
2			90.4	0.86	2.25	2.25	384	242	64	83	4	10.5
3			93.7	0.86	2.25	2.25	386	255	64	83	4	10.5
4			97.1	0.89	2.33	2.33	387	243	65	83	5	10.4
4-1			900.4	0.84	2.2	2.2	386	243	68	81	5	10.4
2			3.8	0.87	228	2.28	388	237	66	80	5	10.1
3			6.9	0.84	2.2	2.2	388	233	65	80	5	10.2
4			10.5	0.73	1.91	1.91	386	236	64	79	4	10.1

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SOURCE SAMPLING FIELD DATA SHEET

Plant Fla Crushed Stone CPL
Sampling Location Stack - Sludge
Type of Control Baghouse
Type of Samples Part - Multi metals
Date 10-31-90 Run No. 2
Time Start 1145 Time End 1302
Sample Time 4 min/pt 64 Total min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. 30.14 "Hg, Stack Press. ____ "Hg
Moisture 8 %, FDA ____, Gas Density Factor ____
Temp. 75 °F, W/D E, W/S 3-8
Weather Clear. Thermocouple Readout KA-1
Sample Box No: KA-1 meter Box No. KA-1
Meter ΔH@ 1.7 Pitot Corr. Factor 0.84
Nozzle Dia 0.2607 in., Probe Length 7 glass ft
Probe Heater Setting 4 Nomograph C_f 2.62
Stack Dimensions 18.65' in
Stack Area 273.2 ft^2
Effective Stack Area 273.2 ft^2
Stack Height ____ ft

Stack Dimensions

Umbilical Cord 100'
Thermocouple Probe No. KA-77
Pitot Tube No. KA-5I

Mat'l Processing Rate ____
Final Gas Meter Reading 965.831 ft^3 52,029
Initial Gas Meter Reading 913.802 ft^3
Condensate Increase in Impingers 86 ml
Moisture in Silica Gel 9.1 gm
Silica Gel Container No. 26 Filter No. 2788

Orsat:				
$\%CO_2$				
$\%O_2$				
%CO				
$\%N_2$				

Test Conducted By: R Paul - S Bell

Stack Test Observers: ____

Leak Check Meter Box
Initial 0.006 cfm @ 13 In H_2
Final 0.00 cfm @ 10 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. [✓ Stable], Leak
Static 3 In H_2O for 15 sec. [✓ Stable], Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O")	Meter Orifice Press. Diff. 2.116 ("H_2O")		Stack Gas Temp. (°F)	Sample Box Temp. (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)
				0.817	Calc.	Actual	386.44	241.81	59.69	78.69	
1-1			13.8	0.70	1.83	1.83	384	235	74	77	8
2			16.8	0.84	2.2	2.2	385	243	56	77	9
3			20.0	0.90	2.36	2.36	384	240	57	78	9
4			23.5	0.83	2.17	2.17	384	237	57	78	9
2-1			26.8	0.85	2.23	2.23	383	234	59	78	9
2			30.2	0.85	2.23	2.23	383	241	57	78	9
3			33.6	0.87	2.28	2.28	384	236	56	78	9
4			36.9	0.71	1.86	1.86	385	242	56	78	10

9.988
02 90
10.3
10.3
9.9
10.0
10.0
10.0
10.0
10.

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Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Sample Box Temp (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)	O_2 %
					Calc.	Actual						
3-1			40.3	0.69	1.81	1.81	383	242	65	78	7	10.1
2			43.4	0.84	2.2	2.2	390	246	59	78	9	9.9
3			46.6	0.80	2.1	2.1	389	253	59	79	9	9.9
4			49.8	0.84	2.2	2.2	390	248	58	80	9	9.8
4-1			53.1	0.74	1.94	1.94	389	253	62	80	7	10.3
2			56.1	0.76	1.99	1.99	390	246	59	80	8	9.9
3			59.2	0.80	2.1	2.1	390	234	60	81	8	9.6
4			62.4	0.90	2.36	2.36	390	239	61	81	10	9.8

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SOURCE SAMPLING FIELD DATA SHEET

Plant Fla Crushed Stone CPL
Sampling Location Stack - Sludge
Type of Control Baghouse
Type of Samples Part Multimetals
Date 10-31-90 Run No. 3
Time Start 1358 Time End 1413
Sample Time 4 min/pt 64 Total min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. 30.14 "Hg, Stack Press. ____ "Hg
Moisture 8 %, FDA ____, Gas Density Factor ____
Temp. 78 °F, W/D E, W/S 5-15
Weather Clear Thermocouple Readout KA-1
Sample Box No: KA-1 Meter Box No. KA-1
Meter ΔH@ 1.7 Pitot Corr. Factor 0.84
Nozzle Dia 0.2607 in., Probe Length 7 glass ft
Probe Heater Setting ____ Nomograph C_f 2.62
Stack Dimensions 18.65' in
Stack Area 273.2 ft^2
Effective Stack Area 273.2 ft^2
Stack Height ____ ft

Stack Dimensions

Umbilical Cord 100'
Thermocouple Probe No. KA-77
Pitot Tube No. KA-SI

Mat'l Processing Rate ____
Final Gas Meter Reading 1016.720 ft^3 50.620
Initial Gas Meter Reading 966.100 ft^3
Condensate Increase in Impingers 83 ml
Moisture in Silica Gel 8.9 gm
Silica Gel Container No. 60 Filter No. 2787

Orsat:				
$\%CO_2$				
$\%O_2$				
%CO				
$\%N_2$				

Test Conducted By: RPaul - SBell

Stack Test Observers: ____

Leak Check Meter Box
Initial 0.009 cfm @ 13 In H_2
Final 0.00 cfm @ 5 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. [✓ Stable], ~~Leak~~
Static 3 In H_2O for 15 sec. [✓ Stable], Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O) 2.013		Stack Gas Temp. (°F)	Sample Box Temp. (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)	9.88
				0.766	Calc.	Actual	393	254.25	56.0	80.19		0.2 90
1-1			66.1	0.69	1.81	1.81	387	265	72	81	4	10.1
2			69.2	0.78	2.04	2.04	391	262	55	81	5	10.1
3			72.4	0.84	2.2	2.2	392	250	52	80	5	9.7
4			75.7	0.79	2.07	2.07	394	249	52	80	5	10.0
2-1			78.9	0.65	1.7	1.7	393	245	58	79	4	9.7
2			81.8	0.80	2.1	2.1	395	251	52	79	5	
3			85.1	0.75	1.97	1.97	395	256	53	79	5	
4			88.2	0.80	2.1	2.1	395	255	53	80	5	

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Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Sample Box Temp (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)	O_2 %
					Calc.	Actual						
3-1			91.4	0.77	202	2.02	396	246	57	80	5	10.0
2			94.5	0.80	2.1	2.1	396	247	54	80	5	10.0
3			97.8	0.82	2.15	2.15	394	251	55	80	5	10.2
4			1001.1	0.69	1.81	1.81	393	253	55	80	4	10.0
4-1			4.2	0.64	1.68	1.68	391	256	59	81	4	9.6
2			6.9	0.79	207	2.07	393	266	57	81	5	9.6
3			10.2	0.82	215	2.15	394	265	56	81	5	9.6
4			13.4	0.85	2.23	2.23	392	251	56	81	5	9.6

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SAMPLING RATE CALCULATIONS

Date 10-31-90

Plant Name FCA

Location Stack-Sludge

Source Cement Stack

ΔH = Orifice Reading (Inches H_2O)
Dn = Nozzle Diameter (Inches)
ΔH@ = Meter Box Constant
Bw = Moisture Fraction
Tm = Meter Temperature (°F)
Ts = Stack Temperature (°F)
Ms = Wet Molecular Weight of Stack Gas (From Table)
ΔP = Pitot Reading (Inches H_2O)

$$\left[\frac{Tm + 460}{Ms(Ts+460)} (1 - Bw)^2 \; \Delta H@ \; (Dn)^4 \; 17741\right] \Delta P = \Delta H$$

Moisture Fraction	Ms
0.0	29.0
0.05	28.5
0.10	27.9
0.15	27.4
0.20	26.8
0.25	26.2
0.30	25.7
0.35	25.2
0.40	24.6

$$\frac{540}{28.2\,(860)} \quad 24252.$$

	Run 1	Run 2	Run 3
$\frac{Tm + 460}{Ms\ (Ts + 460)}$ =	0.0223		
x $(1 - Bw)^2$ =	0.8464		
x ΔH@ =	1.7		
x $(Dn)^4$ =	0.0046		
x 17741 =	17741		
x ΔP =	2.62		
	568.39		

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SAMPLING RATE CALCULATIONS

Date 11-2-90

Plant Name ICA

Location Brooksville

Source Stack-Sludge
MM5

ΔH = Orifice Reading (Inches H_2O)
Dn = Nozzle Diameter (Inches)
$\Delta H@$ = Meter Box Constant
Bw = Moisture Fraction
Tm = Meter Temperature (°F)
Ts = Stack Temperature (°F)
Ms = Wet Molecular Weight of Stack Gas (From Table)
ΔP = Pitot Reading (Inches H_2O)

$$\left[\frac{Tm + 460}{Ms(Ts+460)} (1 - Bw)^2 \ \Delta H@ \ (Dn)^4 \ 17741\right] \ \Delta P = \Delta H$$

Moisture Fraction	Ms
0.0	29.0
0.05	28.5
0.10	27.9
0.15	27.4
0.20	26.8
0.25	26.2
0.30	25.7
0.35	25.2
0.40	24.6

$$\frac{535}{28.3\ (850)} \quad 24055$$

	Run 1	Run 2	Run 3
$\frac{Tm + 460}{Ms\ (Ts + 460)}$ =	0.0222		
x $(1 - Bw)^2$ =	0.8649		
x $\Delta H@$ =	1.7		
x $(Dn)^4$ =	0.0046		
x 17741 =	17741		
x ΔP =	2.67		

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ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

PARTICULATE LAB DATA SHEET

10-31-90
TEST DATE ~~10-2-90~~

PLANT NAME FLORIDA CRUSHED STONE
BROOKSVILLE, FL.

SOURCE WWT-SLUDGE

	Run 1	Run 2	Run 3	Blank
Container No.	I	II	III	IV
Total Volume (ml)	110	200	200	200
Aliquot Evaporated (ml)	110	200	200	200
Final Weight (g)	97.1163	99.7128	96.0429	97.7693
Tare Weight (g)	- 97.0931	- 99.6826	- 96.0202	- 97.7688
Gross Weight Gained (g)	0.0232	0.0302	0.0227	0.0005
Average Blank (g)	- .0005	- .0005	- .0005	-
Net Weight (g)	0.0227	0.0297	0.0222	
Aliquot Factor	x	x	x	x
Total Net Weight (mg)				
Container No.	1A	2A	3A	
Filter No.	2789	2788	2787	
Final Weight (g)	0.4277	0.4252	0.4265	
Tare Weight (g)	- 0.4085	- 0.4056	- 0.4095	-
Gross Weight Gained (g)	0.0192	0.0196 ~~0.42~~	0.0170	
Average Blank (g)	-	-	-	-
Total Net Weight (mg)	0.0192	0.0196	0.0170	

Tare Balance Check

0.0 ✓ 10.0 ✓
1.0 ✓ 50.0 ✓
5.0 ✓ 100.0 ✓
T/H 78/41

By NMJ

Date 11-12-90

Final Balance Check

0.0 ✓ 10.0 ✓
1.0 ✓ 50.0 ✓
5.0 ✓ 100.0 ✓
T/H 78/41

By NMJ

Date 11-12-90

CHAIN OF CUSTODY RECORD

Project Number 307-90-05

Project Name FLORIDA CRUSHED STONE

Sample Location BROOKSVILLE, FL,
WWT - SLUDGE

Sample Identification	Remarks			
RUN 1, FILTER RUN 1, WASH RUN 1, IMP. 1+2	ALUMINUM ARSENIC CHROMIUM (TOTAL) LEAD ZINC	BARIUM COPPER NICKEL IRON VANADIUM MERCURY	TITANIUM MAGNESIUM SILVER COBALT MOLYBIUM SELENIUM	#1
RUN 1, IMP. 3+4	MERCURY			
RUN 2, FILTER RUN 2, WASH RUN 2, IMP. 1+2	SAME AS #1 ABOVE			
RUN 2, IMP. 3+4	MERCURY			

Sampled By: (Signature) N.M. Joye Date: 10-31+11-2 ~~11-6+7-90~~ Time: see data sheets

Relinquished By: (Sign) N. M. Joye Date: 11-13-90 Time: 2:33 PM

Received By: (Sign) ____ Date: ____ Time: ____

Relinquished By: (Sign) ____ Date: ____ Time: ____

Received By: (Sign) ____ Date: ____ Time: ____

Relinquished By: (Sign) ____ Date: ____ Time: ____

Received By Lab: (Sign) Tom Park, PPB Date: 11/13/90 Time: 1435

Sample Shipped VIA: ____ UPS ____ Fed Express ____ Bus

Shipping Bill Number: ____

KOOGLER & ASSOCIATES

CHAIN OF CUSTODY RECORD

Project Number 307-90-05

Project Name FLORIDA CRUSHED STONE

Sample Location BROOKSVILLE, FL.

WWT - SLUDGE

Sample Identification	Remarks
RUN 3, FILTER	SAME AS #1 ABOVE
RUN 3, WASH	
RUN 3, IMP. 1+2	
RUN 3, IMP. 3+4	MERCURY
~~DRIED SLUDGE Nov. 2~~	~~SAME METALS AS #1~~
~~KILN FEED Nov. 2~~	~~" " "~~
~~BAGHOUSE DUST Nov. 2~~	~~" " "~~

Sampled By: (Signature) A. M. Joye Date: 10-31/11-2 Time: see data sheets

Relinquished By: (Sign) A. M. Joye Date: 11-13-90 2:33PM Time: 2:33PM

Received By: (Sign) ________ Date: ______ Time: ______

Relinquished By: (Sign) ________ Date: ______ Time: ______

Received By: (Sign) ________ Date: ______ Time: ______

Relinquished By: (Sign) ________ Date: ______ Time: ______

Received By Lab: (Sign) Tom Poch, MB Date: 11/13/90 Time: 1435

Sample Shipped VIA: ______ UPS ______ Fed Express ______ Bus

Shipping Bill Number: ____________

ppb
ENVIRONMENTAL LABORATORIES, INC.

November 30, 1990

Mr. Mason Joye
Koogler and Associates
4014 N.W. 13th Street
Gainesville, Florida 32609

Dear Mason:

Enclosed are the results of our analysis of the samples that we received November 13, 1990.

All data were determined in accordance with published procedures (EPA-600/4-79-020, Methods for Chemical Analysis of Water and Wastes, Revised March 1983). PPB is certified by the Florida DHRS (Lab Nos. 82282 and E82001).

If you have any questions concerning this report, please do not hesitate to give me a call.

Sincerely,

Tom Park

Tom Park
Project Manager

TP/slb

Enclosure

PPB-BILL90.8{WP}INV90651

ppb
ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

Mr. Mason Joye
Koogler and Associates
4014 NW 13th Street

PROJECT: 87-028
DATE: 12/06/90
DHRS#: 82282, E82001

Table 1. Metals Data for Filters, Beaker Residues, and Impinger Solutions Received November 13, 1990. (All Results expressed as total micrograms.)

Station ID: PPB#:	Run 1-FCS 44228/29	Run 2-FCS 44230/31	Run 3-FCS 44232/33
Aluminum	19,400	19,900	17,900
Arsenic	5.7	2.5	1.9
Barium	42	39	45
Cadmium	2.9	1.7	1.2
Chromium	23	18	16
Cobalt	<15	<15	<15
Copper	25	11	1.2
Iron	1,230	1520	986
Lead	164	48	32
Magnesium	1,680	1,720	1,520
Mercury	217	125	66
Molybdenum	<4	<4	<4
Nickel	14	6.8	<6
Selenium	<10	<10	<10
Silver	<10	<10	<10
Titanium	595	620	520
Vanadium	25	24	22
Zinc	1,000	680	255

Tom Park
Project Manager

$$\text{EMISSIONS (lb/hr)} = \frac{\text{WT}(\mu g)}{ft^3} \times \frac{Q\, ft^3}{\text{MIN.}} \times 60 \frac{\text{MIN}}{hr} \times \frac{1}{453.6 \times 10^6} \frac{lb}{\mu g}$$

ft^3 = VOLUME

Q = FLOW)

ppb
ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALAYSES

Mr. Mason Joye
Koogler and Associates
4014 NW 13th Street
Gainesville, FL 32609

PROJECT: 87-028
DATE: 11/30/90
DHRS#: 82282, E82001

Table 2. Impinger Solution Data for samples received November 13, 1990.

	Run 1-FCS Impinger	Run 2-FCS Impinger	Run 3-FCS Impinger
Station ID:	3 & 4	3 & 4	3 & 4
PPB#:	44225	44226	44227
Mercury, ug	272	13.0	39.4

Tom Park
PROJECT MANAGER

VISIBLE EMISSION OBSERVATION FORM

No.

COMPANY NAME: FLORIDA CRUSHED STONE

STREET ADDRESS:

BROOKSVILLE

CITY: BROOKSVILLE

STATE: FL

ZIP:

PHONE (KEY CONTACT):

SOURCE ID NUMBER:

PROCESS EQUIPMENT: WWT

OPERATING MODE:

CONTROL EQUIPMENT: BAGHOUSE

OPERATING MODE:

DESCRIBE EMISSION POINT: CEMENT STACK

HEIGHT ABOVE GROUND LEVEL: 300'

HEIGHT RELATIVE TO OBSERVER: Start 300' End

DISTANCE FROM OBSERVER: Start 600' End

DIRECTION FROM OBSERVER: Start W End

DESCRIBE EMISSIONS: Start CLEAR End SAME

EMISSION COLOR: Start CLEAR End

IF WATER DROPLET PLUME: Attached ☐ NA Detached ☐

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: Start ONE STACK DIA. ABOVE End SAME

DESCRIBE PLUME BACKGROUND: Start CLEAR End CLEAR

BACKGROUND COLOR: Start BLUE End SAME

SKY CONDITIONS: Start CLEAR End SAME

WIND SPEED: Start 4-5 End 5-7

WIND DIRECTION: Start W End NW

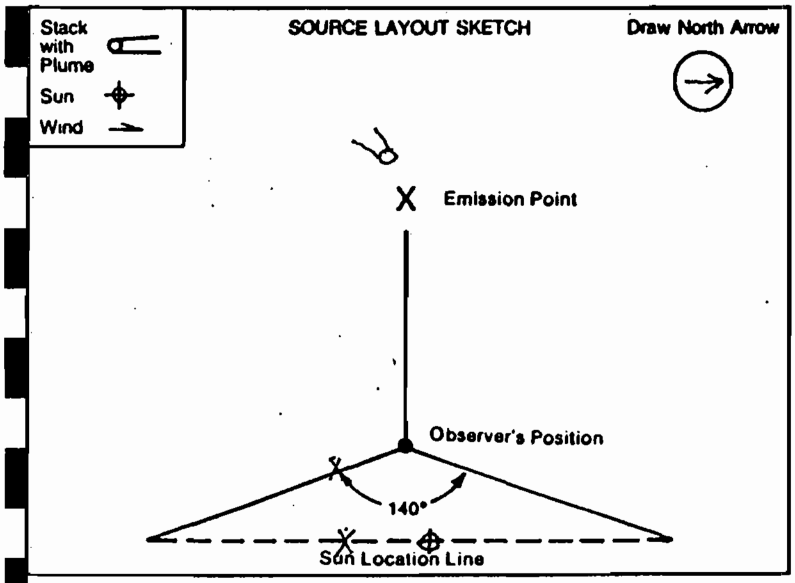
AMBIENT TEMP: Start 74 End 75

WET BULB TEMP:

RH, percent: 41%

SOURCE LAYOUT SKETCH

Draw North Arrow



ADDITIONAL INFORMATION:

OBSERVATION DATE: 10-31-90

START TIME: 0908

END TIME: 0938

MIN \ SEC	0	15	30	45	COMMENTS
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	5	5	5	5	
11	5	5	5	0	
12	0	0	0	5	
13	5	5	0	0	
14	0	0	0	0	
15	5	5	5	5	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	5	10	5	5	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	5	5	0	

OBSERVER'S NAME (PRINT): N. MASON JOYE

OBSERVER'S SIGNATURE: N. Mason Joye

DATE: 10-31-90

ORGANIZATION: KOOGLER & ASSOCIATES

CERTIFIED BY: ETA

DATE: 6-6-90

CONTINUED ON VEO FORM NUMBER:

VISIBLE EMISSION OBSERVATION FORM

No.

COMPANY NAME FL. CRUSHED STONE

STREET ADDRESS

CITY BROOKSVILLE

STATE FL

ZIP

PHONE (KEY CONTACT)

SOURCE ID NUMBER

PROCESS EQUIPMENT WWT

OPERATING MODE

CONTROL EQUIPMENT BAGHOUSE

OPERATING MODE

DESCRIBE EMISSION POINT CEMENT STACK

HEIGHT ABOVE GROUND LEVEL 300'

HEIGHT RELATIVE TO OBSERVER Start 300' End SAME

DISTANCE FROM OBSERVER Start 600' End

DIRECTION FROM OBSERVER Start W End SAME

DESCRIBE EMISSIONS Start CLEAR End SAME

EMISSION COLOR Start WHITE End

IF WATER DROPLET PLUME Attached ☐ NA Detached ☐

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start 1 STACK DIA. ABOVE TOP End SAME

DESCRIBE PLUME BACKGROUND Start CLEAR End SAME

BACKGROUND COLOR Start BLUE End

SKY CONDITIONS Start CLEAR End PTLY. CLDY

WIND SPEED Start 4-5 End 8-10

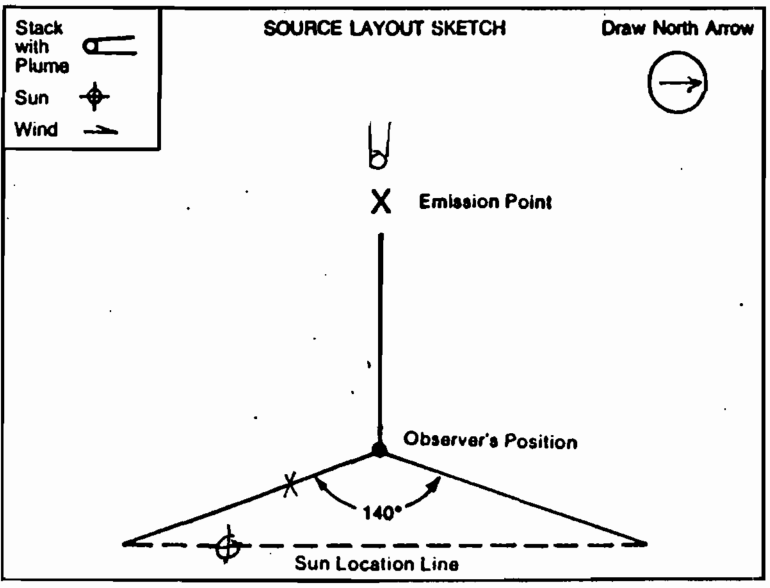
WIND DIRECTION Start W End

AMBIENT TEMP Start 76°F End

WET BULB TEMP

RH, percent 41%

SOURCE LAYOUT SKETCH



ADDITIONAL INFORMATION

OBSERVATION DATE 10-31-90

START TIME 1428

END TIME 1458

SEC / MIN	0	15	30	45	COMMENTS
1	0	5	5	5	
2	5	5	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	5	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	5	5	5	
12	5	5	5	5	
13	0	0	0	0	
14	0	0	5	5	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	5	5	
18	5	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	5	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

OBSERVER'S NAME (PRINT) N. MASON JOYE

OBSERVER'S SIGNATURE N. Mason Joye

DATE 10-31-90

ORGANIZATION KOOGLER & ASSOCIATES

CERTIFIED BY ETA

DATE 6-6-90

CONTINUED ON VEO FORM NUMBER

Ka KOOGLER & ASSOCIATES, *Environmental Services*

4014 N.W. 13th Street • Gainesville, Florida 32609 • 904/377-5822

SOURCE SAMPLING FIELD DATA SHEET

Plant FCS - Sludge
Sampling Location STACK
Type of Control Bag House
Type of Samples VOST
Date 10-31-90 Run No. 1
Time Start 11:00 Time End 11:20
Sample Time 5 min/pt 20 Total min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. ____ "Hg, Stack Press. ____ "Hg
Moisture 8 %, FDA ____, Gas Density Factor ____
Temp. ____ °F, W/D ____, W/S ____
Weather ____ Thermocouple Readout ____
Sample Box No: VOST Meter Box No. VOST #2
Meter ΔH@ ____ Pitot Corr. Factor ____
Nozzle Dia. ____ in., Probe Length ____ ft
Probe Heater Setting ____ Nomograph C_f ____
Stack Dimensions ____ in
Stack Area ____ ft^2
Effective Stack Area ____ ft^2
Stack Height ____ ft

Stack Dimensions

Umbilical Cord ____
Thermocouple Probe No. ____
Pitot Tube No. ____

Mat'l Processing Rate ____
Final Gas Meter Reading ____ ft^3
Initial Gas Meter Reading ____ ft^3
Condensate Increase in Impingers ____ ml
Moisture in Silica Gel ____ gm
Silica Gel Container No. ____ Filter No. ____

Orsat:				
$\%CO_2$				
$\%O_2$				
%CO				
$\%N_2$				

Test Conducted By: Steve Bell

Stack Test Observers: ____

Leak Check Meter Box
Initial 0.0 cfm @ 24 In H2
Final 0.0 cfm @ 24 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. Stable, Leak
Static 3 In H_2O for 15 sec. Stable, Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Sample Box Temp. (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
1					1.0	1.02	385				6
2					1.0	1.02	385				6
3					1.0	.98	385				7
4					1.0	1.07	385				9

KOOGLER & ASSOCIATES

KOOGLER & ASSOCIATES, *Environmental Services*

4014 N.W. 13th Street • Gainesville, Florida 32609 • 904/377-5822

SOURCE SAMPLING FIELD DATA SHEET

Plant FCS - Sludge

Sampling Location STACK

Type of Control BagHouse

Type of Samples VOST

Date 10-31-90 Run No. 2

Time Start 1200 Time End 1220

Sample Time 5 min/pt 20 Total min

DB °F, WB °F, VP @ DP "Hg

Bar. Press. "Hg, Stack Press. "Hg

Moisture 8 %, FDA , Gas Density Factor

Temp. °F, W/D , W/S

Weather Thermocouple Readout

Sample Box No: VOST meter Box No. VOST #2

Meter ΔH@ Pitot Corr. Factor

Nozzle Dia. in., Probe Length ft

Probe Heater Setting Nomograph C_f

Stack Dimensions in

Stack Area ft^2

Effective Stack Area ft^2

Stack Height ft

Stack Dimensions

Umbilical Cord

Thermocouple Probe No.

Pitot Tube No.

Mat'l Processing Rate

Final Gas Meter Reading ft^3

Initial Gas Meter Reading ft^3

Condensate Increase in Impingers ml

Moisture in Silica Gel gm

Silica Gel Container No. Filter No.

Orsat: $\%CO_2$

$\%O_2$

$\%CO$

$\%N_2$

Test Conducted By:

Stack Test Observers:

Leak Check Meter Box

Initial 0.0 cfm @ 23 In H_2

Final 0.0 cfm @ 23 In Hg

Pitot Tubes

Impact 3 In H_2O for 15 sec. Stable, Leak

Static 3 In H_2O for 15 sec. Stable, Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Sample Box Temp. (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
1					1.0	1.01	383				6
2					1.0	1.00	383				7
3					1.0	.98	383				8
4					1.0	.99	383				8

KOOGLER & ASSOCIATES, *Environmental Services*

4014 N.W. 13th Street • Gainesville, Florida 32609 • 904/377-5822

SOURCE SAMPLING FIELD DATA SHEET

Plant FCS - Sludge
Sampling Location STACK
Type of Control Baghouse
Type of Samples VOST
Date 10-31-90 Run No. 3
Time Start 1415 Time End 1435
Sample Time 5 min/pt 20 Total min
DB ___ °F, WB ___ °F, VP @ DP ___ "Hg
Bar. Press. ___ "Hg, Stack Press. ___ "Hg
Moisture ___ %, FDA ___, Gas Density Factor ___
Temp. ___ °F, W/D ___, W/S ___
Weather ___ Thermocouple Readout ___
Sample Box No: VOST meter Box No. VOST #2
Meter ΔH@ ___ Pitot Corr. Factor ___
Nozzle Dia. ___ in., Probe Length ___ ft
Probe Heater Setting ___ Nomograph C_f ___
Stack Dimensions ___ in
Stack Area ___ ft^2
Effective Stack Area ___ ft^2
Stack Height ___ ft

Stack Dimensions

Umbilical Cord ___
Thermocouple Probe No. ___
Pitot Tube No. ___

Mat'l Processing Rate ___
Final Gas Meter Reading ___ ft^3
Initial Gas Meter Reading ___ ft^3
Condensate Increase in Impingers ___ ml
Moisture in Silica Gel ___ gm
Silica Gel Container No. ___ Filter No. ___

Orsat: $\%CO_2$					
$\%O_2$					
$\%CO$					
$\%N_2$					

Test Conducted By: ___

Stack Test Observers: ___

Leak Check Meter Box
Initial 0.0 cfm @ 23 In H_2
Final 0.0 cfm @ 23 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. Stable, Leak
Static 3 In H_2O for 15 sec. Stable, Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Sample Box Temp. (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual					
1					1.0	1.03	292				6
2					1.0	1.01	292				5
3					1.0	.99	292				6
4					1.0	1.01	292				6

KOOGLER & ASSOCIATES

CHAIN OF CUSTODY RECORD

Project Number 307-90-05 (Sludge)

Project Name Florida Crushed Stone

Sample Location Brooksville, FL
Cement Stack

Sample Identification	Remarks
KA-V1	Vost trap - Run 1
KA-V2	Vost trap - Run 2
KA-V3	Vost trap - Run 3
KA-B	Vost trap - Field Blank

Sampled By: (Signature) Stephen Bell Date: 10-31-90 Time: See DATA Sheets

Relinquished By: (Sign) Stephen Bell Date: 10-31-90 Time: 10:00 AM

Received By: (Sign) Daina Date: 10-31-90 Time: 10:00AM

Relinquished By: (Sign) ______ Date: ______ Time: ______

Received By: (Sign) ______ Date: ______ Time: ______

Relinquished By: (Sign) Daina Date: 11/6/90 Time: 1200 noon

Received By Lab: (Sign) ______ Date: ______ Time: ______

Sample Shipped VIA: ✓ UPS ______ Fed Express ______ Bus

Shipping Bill Number: 06172509Y

KOOGLER & ASSOCIATES

RESEARCH
TRIANGLE
LABORATORIES

VOST GC/MS REPORT

prepared for

KOOGLER & ASSOCIATES

by

RESEARCH TRIANGLE LABORATORIES, INC.

Debra L. Smith

Debra L. Smith
Chemist

Thomas G. Conally

Thomas G. Conally
Laboratory Manager

RTL ID # 01107B

November 8, 1990

INTRODUCTION

Scope:

To analyze (VOST) Tenax/Charcoal cartridges for the target compound list (TCL) only by Desorb-Purge-Trap Desorb Gas Chromatography Mass Spectrometry (DPTD GC/MS).

Method Summary:

Sample cartridges were analyzed by desorb-purge-trap-desorb gas chromatography/mass spectrometry (DPTD GC/MS). Daily analytical checks are performed on cartridge blanks, reagent water and Tenax-Charcoal cartridges. The daily GC/MS performance test required for this method are described in SW 846, Method 8240. The key Abundance Criteria for 4-Bromofluorobenzene (BFB) must be met before any samples are analyzed. All standards, blanks and samples are spiked with a known amount of BFB to maintain a constant check of system performance.

Sample Desorption:

The DPTD GC/MS procedures are those described in SW 846 Method 5040. The spiked sample cartridge is placed in the thermal desorption apparatus (Nutech 8533 or equivalent) and desorbed in the VOST system by heat to 200 °C for 10 minutes. Consideration is given for individual analysis of cartridges. The desorbed components then pass into the bottom of the water column, are purged from the water and collected on the analytical sorbent trap. After the 10-minute desorption period, the analytical trap is dry purged for 2 minutes. The compounds are desorbed from the analytical trap into the GC/MS system according to the procedures described in SW 846, Method 5040.

Calculations:

All compounds detected that coincide with those of the Target Compound List (TCL) were calculated using equation #1 and response factors derived from in-house standards. All tentatively identified compounds were calculated, using equation #2 and an assumed TIC response factor of one (1.0). Compounds quantified by equation #2 are qualified as being estimates.

EQ #1: $$ng = \frac{(Ax)(Is)}{(Ais)(RF)}$$

EQ #2: $$ng = \frac{(Ax)(Is)}{(Ais)(1.0)}$$

where:
Ax = Response for compound
Ais = Response for internal standard
Is = Amount of internal standard in nanograms (ng)
RF = Response factor

ANALYTICAL CONDITIONS

Equipment:

HP 5970 GC/MS/DS tuned to BFB criteria

GC Conditions:

Temp 1 (°C) : 0
Time 1 (minutes) : 4.0
Ramp Rate (°C/min) : 6.0
Temp 2 (°C) : 160
Time 2 (minutes) : 0

Column:

VOCOL (Supelco),
Length 60 m,
Film thickness 1.5 um,
Internal diameter 0.75 mm,
Construction of Borosilicate glass
with fused silica ends

Mass Spectrometer Conditions:

Run Time (minutes) : 35
Scan Range (AMU) : 35 - 260
Scan Delay (minutes) : 1.25
Ion Source Temp (°C) : 200
Electron Multiplier (EV) : 1900 ± 200
Separator Temp (°C) : 250

Sample Chronicle:

Client Koogler & Associates

RTL Project ID 01107B

Analysis Type VOST Pair

Date of Collection 10/31/90

Date Received 11/07/90

Date Authorized 11/07/90

Date Analyzed 11/08/90

Date Reported 11/08/90

Narrative:

The enclosed samples are associated with the Florida Crushed Stone project.

The sample blank (KA-B) was analyzed and found to be clean.

All three samples (Vl, V2, V3) had several target compounds detected. Two compounds Chloromethane and Benzene, had concentrations in each sample that exceeded our standard calibration range of 1000 ng and therefore reported as estimates.

In the sample KA-V2, matrix interference resulted in low recovery of the third internal standard d5-Chlorobenzene. As a result, the compounds quantitated using this internal standard had questionable concentrations. To achieve the best estimates, the concentrations for these compounds were derived using d5-Chlorobenzene from the Method Blank.

REFERENCES

Federal Register, 44, 69464, December 3, 1979

Protocol for the Collection and Analysis of Volatile POHCs Using VOST, EPA-600/8-84-007 available from ORD Publications, Center for Environmental Research Information, Cincinnati, Ohio 45268

NIOSH Manual of Analytical Methods, HEW Publication No. (NIOSH) 75-121, available from Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402

Supelco Bulletin 769, "Determination of Organic Vapors in the Industrial Atmosphere", 1977: Supelco, Inc., Bellefonte, PA 16823

Test Methods for Evaluation of Solid Waste, SW 846 Methods 0030, 8240, 5040, 5030

Compendium of Methods for the Determination of Toxic Organic Compounds in Air, PB87-168688, Battelle Columbus Laboratories, Columbus, Ohio

SAMPLE RESULTS

RESEARCH TRIANGLE LABORATORIES, INC.

Client:	Florida Crushed Stone	Received:	11/07/90
RTL ID:	01107B-4	Analyzed:	11/08/90
File ID:	T6882	Reported:	11/08/90
Sample ID:	KA-B	Description:	VOST Pair

Surrogate Percent Recovery	
1,2-Dichloroethane-d4	87
Toluene-d8	100
4-Bromofluorobenzene	86

CAS Number	Target Compound	Results (ng)	Quantitation Limit (ng)
74-87-3	Chloromethane	BQL	20
75-01-4	Vinyl Chloride	BQL	20
74-83-9	Bromomethane	BQL	20
75-00-3	Chloroethane	BQL	20
75-35-4	1,1-Dichloroethene	BQL	20
67-64-1	Acetone	BQL	20
75-15-0	Carbon Disulfide	BQL	20
75-09-2	Methylene Chloride	BQL	20
540-59-0	1,2-Dichloroethene	BQL	20
75-34-3	1,1-Dichloroethane	BQL	20
78-93-3	2-Butanone	BQL	20
67-66-3	Chloroform	BQL	20
107-06-2	1,2-Dichloroethane	BQL	20
71-55-6	1,1,1-Trichloroethane	BQL	20
56-23-5	Carbon Tetrachloride	BQL	20
108-05-4	Vinyl Acetate	BQL	20
71-43-2	Benzene	BQL	20
79-01-6	Trichloroethene	BQL	20
78-87-5	1,2-Dichloropropane	BQL	20
75-27-4	Bromodichloromethane	BQL	20
10061-01-5	cis-1,3-Dichloropropene	BQL	20
10061-02-6	trans-1,3-Dichloropropene	BQL	20
79-00-5	1,1,2-Trichloroethane	BQL	20
124-48-1	Dibromochloromethane	BQL	20
75-25-2	Bromoform	BQL	20
108-10-1	4-Methyl-2-pentanone	BQL	20
108-88-3	Toluene	BQL	20
591-78-6	2-Hexanone	BQL	20
127-18-4	Tetrachloroethene	BQL	20
108-90-7	Chlorobenzene	BQL	20
100-41-4	Ethylbenzene	BQL	20
1330-20-7	Xylene (total)	BQL	20
100-42-5	Styrene	BQL	20
79-34-5	1,1,2,2-Tetrachloroethane	BQL	20

BQL: Below Quantitation Limit ►: Denotes Value In Quantifiable Range

RESEARCH TRIANGLE LABORATORIES, INC.

Client:	Florida Crushed Stone	Received:	11/07/90
RTL ID:	01107B-1	Analyzed:	11/08/90
File ID:	T6883	Reported:	11/08/90
Sample ID:	KA-V1	Description:	VOST Pair

Surrogate Percent Recovery	
1,2-Dichloroethane-d4	91
Toluene-d8	83
4-Bromofluorobenzene	88

CAS Number	Target Compound	Results (ng)	Quantitation Limit (ng)
74-87-3	Chloromethane	► 1500 *	20
75-01-4	Vinyl Chloride	► 54	20
74-83-9	Bromomethane	► 240	20
75-00-3	Chloroethane	► 88	20
75-35-4	1,1-Dichloroethene	BQL	20
75-69-4	Trichlorofluoromethane	► 27	20
67-64-1	Acetone	► 460	20
75-15-0	Carbon Disulfide	► 130	20
75-09-2	Methylene Chloride	BQL	20
540-59-0	1,2-Dichloroethene	BQL	20
75-34-3	1,1-Dichloroethane	BQL	20
78-93-3	2-Butanone	BQL	20
67-66-3	Chloroform	BQL	20
107-06-2	1,2-Dichloroethane	BQL	20
71-55-6	1,1,1-Trichloroethane	BQL	20
56-23-5	Carbon Tetrachloride	BQL	20
108-05-4	Vinyl Acetate	BQL	20
71-43-2	Benzene	► 3500 *	20
79-01-6	Trichloroethene	BQL	20
78-87-5	1,2-Dichloropropane	BQL	20
75-27-4	Bromodichloromethane	BQL	20
10061-01-5	cis-1,3-Dichloropropene	BQL	20
10061-02-6	trans-1,3-Dichloropropene	BQL	20
79-00-5	1,1,2-Trichloroethane	BQL	20
124-48-1	Dibromochloromethane	BQL	20
75-25-2	Bromoform	BQL	20
108-10-1	4-Methyl-2-pentanone	BQL	20
108-88-3	Toluene	► 400	20
591-78-6	2-Hexanone	BQL	20
127-18-4	Tetrachloroethene	BQL	20
108-90-7	Chlorobenzene	► 210	20
100-41-4	Ethylbenzene	► 80	20
1330-20-7	Xylene (total)	► 300	20
100-42-5	Styrene	► 300	20
79-34-5	1,1,2,2-Tetrachloroethane	BQL	20

BQL: Below Quantitation Limit ►: Denotes Value In Quantifiable Range

* Outside standard calibration range - reported as estimates.

RESEARCH TRIANGLE LABORATORIES, INC.

Client:	Florida Crushed Stone	Received:	11/07/90
RTL ID:	01107B-2	Analyzed:	11/08/90
File ID:	T6884	Reported:	11/08/90
Sample ID:	KA-V2	Description:	VOST Pair

Surrogate Percent Recovery	
1,2-Dichloroethane-d4	91
Toluene-d8	80 **
4-Bromofluorobenzene	108 **

CAS Number	Target Compound	Results (ng)	Quantitation Limit (ng)
74-87-3	Chloromethane	► 2100 *	20
75-01-4	Vinyl Chloride	► 110	20
74-83-9	Bromomethane	► 280	20
75-00-3	Chloroethane	► 94	20
75-35-4	1,1-Dichloroethene	BQL	20
75-69-4	Trichlorofluoromethane	► 24	20
67-64-1	Acetone	► 70	20
75-15-0	Carbon Disulfide	► 130	20
75-09-2	Methylene Chloride	BQL	20
540-59-0	1,2-Dichloroethene	BQL	20
75-34-3	1,1-Dichloroethane	BQL	20
78-93-3	2-Butanone	BQL	20
67-66-3	Chloroform	BQL	20
107-06-2	1,2-Dichloroethane	BQL	20
71-55-6	1,1,1-Trichloroethane	BQL	20
56-23-5	Carbon Tetrachloride	BQL	20
108-05-4	Vinyl Acetate	BQL	20
71-43-2	Benzene	► 4800 *	20
79-01-6	Trichloroethene	BQL	20
78-87-5	1,2-Dichloropropane	BQL	20
75-27-4	Bromodichloromethane	BQL	20
10061-01-5	cis-1,3-Dichloropropene	BQL	20
10061-02-6	trans-1,3-Dichloropropene	BQL	20
79-00-5	1,1,2-Trichloroethane	BQL	20
124-48-1	Dibromochloromethane	BQL	20
75-25-2	Bromoform	BQL	20
108-10-1	4-Methyl-2-pentanone	BQL	20
108-88-3	Toluene	► 550 **	20
591-78-6	2-Hexanone	BQL	20
127-18-4	Tetrachloroethene	BQL	20
108-90-7	Chlorobenzene	► 190 **	20
100-41-4	Ethylbenzene	► 43 **	20
1330-20-7	Xylene (total)	► 240 **	20
100-42-5	Styrene	► 720 **	20
79-34-5	1,1,2,2-Tetrachloroethane	BQL	20

BQL: Below Quantitation Limit ►: Denotes Value In Quantifiable Range

* Outside standard calibration range - reported as estimates.

** Matrix interference with the internal standard associated with these compounds. Therefore, the concentrations were derived using the internal standard from the Method Blank and are reported as estimates.

RESEARCH TRIANGLE LABORATORIES, INC.

Client: Florida Crushed Stone
RTL ID: 01107B-3
File ID: T6885
Sample ID: KA-V3

Received: 11/07/90
Analyzed: 11/08/90
Reported: 11/08/90
Description: VOST Pair

Surrogate Percent Recovery	
1,2-Dichloroethane-d4	90
Toluene-d8	100
4-Bromofluorobenzene	84

CAS Number	Target Compound	Results (ng)	Quantitation Limit (ng)
74-87-3	Chloromethane	► 1700 *	20
75-01-4	Vinyl Chloride	► 60	20
74-83-9	Bromomethane	► 250	20
75-00-3	Chloroethane	► 76	20
75-35-4	1,1-Dichloroethene	BQL	20
75-69-4	Trichlorofluoromethane	► 87	
67-64-1	Acetone	► 190	20
75-15-0	Carbon Disulfide	► 150	20
75-09-2	Methylene Chloride	BQL	20
540-59-0	1,2-Dichloroethene	BQL	20
75-34-3	1,1-Dichloroethane	BQL	20
78-93-3	2-Butanone	BQL	20
67-66-3	Chloroform	BQL	20
107-06-2	1,2-Dichloroethane	BQL	20
71-55-6	1,1,1-Trichloroethane	BQL	20
56-23-5	Carbon Tetrachloride	BQL	20
108-05-4	Vinyl Acetate	BQL	20
71-43-2	Benzene	► 4800 *	20
79-01-6	Trichloroethene	BQL	20
78-87-5	1,2-Dichloropropane	BQL	20
75-27-4	Bromodichloromethane	BQL	20
10061-01-5	cis-1,3-Dichloropropene	BQL	20
10061-02-6	trans-1,3-Dichloropropene	BQL	20
79-00-5	1,1,2-Trichloroethane	BQL	20
124-48-1	Dibromochloromethane	BQL	20
75-25-2	Bromoform	BQL	20
108-10-1	4-Methyl-2-pentanone	BQL	20
108-88-3	Toluene	► 670	20
591-78-6	2-Hexanone	BQL	20
127-18-4	Tetrachloroethene	BQL	20
108-90-7	Chlorobenzene	► 170	20
100-41-4	Ethylbenzene	► 86	20
1330-20-7	Xylene (total)	► 220	20
100-42-5	Styrene	► 570	20
79-34-5	1,1,2,2-Tetrachloroethane	BQL	20

BQL: Below Quantitation Limit ►: Denotes Value In Quantifiable Range

* Outside standard calibration range - reported as estimates.

Ka KOOGLER & ASSOCIATES, *Environmental Services*

4014 N.W. 13th Street • Gainesville, Florida 32609 • 904/377-5822

SOURCE SAMPLING FIELD DATA SHEET

Plant Fla Crushed Stone
Sampling Location stack - Sludge
Type of Control Baghouse
Type of Samples MM5
Date 10-2-90 Run No. 1
Time Start 0931 Time End 1044
Sample Time 4 min/pt 64 Total min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. 30.17 "Hg, Stack Press. 30.10 "Hg
Moisture 7 %, FDA ____, Gas Density Factor ____
Temp. 80 °F, W/D E, W/S 5-15
Weather Clear Thermocouple Readout KA-1
Sample Box No: KA-1 meter Box No. KA-1
Meter ΔH@ 1.7 Pitot Corr. Factor 0.84
Nozzle Dia. 0.267 in., Probe Length 7 glass ft
Probe Heater Setting 4 Nomograph C_f 2.67
Stack Dimensions 18.65' in
Stack Area 273.2 ft^2
Effective Stack Area 273.2 ft^2
Stack Height 300' ft

PS = -0.90
Y = 1.006

Stack Dimensions

Umbilical Cord 100'
Thermocouple Probe No. KA-77
Pitot Tube No. KA-SI

Mat'l Processing Rate ____
Final Gas Meter Reading 60.435 ft^3 43,635
Initial Gas Meter Reading 16.800 ft^3
Condensate Increase in Impingers 82 ml
Moisture in Silica Gel 5.0 gm
Silica Gel Container No. ____ Filter No. ____

Orsat:				
$\%CO_2$				
$\%O_2$				
%CO				
$\%N_2$				

Test Conducted By: R Paul - S Bell

Stack Test Observers: ____

Leak Check Meter Box
Initial 0.00 cfm @ 10 In H_2
Final 0.00 cfm @ 11 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. [✓ Stable], Leak
Static 3 In H_2O for 15 sec. [✓ Stable], Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O") 0.852	Meter Orifice Press. Diff. ("H_2O") 1.70		Stack Gas Temp. (°F) 367	Sample Box Temp. (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F) 80	Vacuum on Sample Train ("Hg)	10.14 O_2 %
					Calc.	Actual						
1-1		269	~~0.94~~	0.94	2.51	2.51	366	249	69	79	8	10.5
2		20.7	~~0.90~~	0.90	2.4	2.4	367	243	56	80	8	10.4
3		23.8	~~0.94~~	0.94	2.51	2.0	368	248	57	80	10	10.4
4		26.9	~~0.80~~	0.80	2.1	1.8	367	257	58	81	10	10.4
2-1			29.8	0.87	2.32	1.7	367	268	63	81	10	10.0
2			32.2	0.90	2.4	2.85	369	255	60	81	11	
3			34.5	0.85	2.27	1.2	368	262	60	80	11	
4			36.9	0.76	2.03	1.1	368	257	61	80	11	

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Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft³)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Sample Box Temp (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)	O_2 %
					Calc.	Actual						
3-1			39.2	0.86	2.3	1.6	367	251	69	80	11	10.1
2			40.8	0.92	2.46	1.6	365	255	63	80	10	10.1
3			43.6	0.92	2.46	1.6	367	254	62	80	10	10.1
4			46.5	0.76	203	1.7	365	251	63	80	10	10.0
4-1			49.4	0.90	2.4	1.6	367	252	69	79	10	10.0
2			52.2	0.87	2.32	1.5	366	251	65	79	11	10.0
3			55.0	0.87	2.32	1.5	366	248	66	79	11	10.0
4			57.7	0.78	208	1.5	365	246	67	79	11	10.0

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SOURCE SAMPLING FIELD DATA SHEET

Plant Fla Crushed Stone
Sampling Location Stack - Sludge
Type of Control Baghouse
Type of Samples MM 5
Date 10-2-90 Run No. 2
Time Start 1115 Time End 1231
Sample Time 4 min/pt 64 Total min
DB ____ °F, WB ____ °F, VP @ DP ____ "Hg
Bar. Press. 30.12 "Hg, Stack Press. 30.16 "Hg
Moisture 7 %, FDA ____, Gas Density Factor ____
Temp. 80 °F, W/D E, W/S 5-15
Weather Clear Thermocouple Readout KA-1
Sample Box No: KA-1 meter Box No. KA-1
Meter ΔH@ 1.7 Pitot Corr. Factor 0.84
Nozzle Dia. 0.2607 in., Probe Length 7 glass ft
Probe Heater Setting 4 Nomograph C_f 2.67
Stack Dimensions 18.65" in
Stack Area 273.2 ft^2
Effective Stack Area 273.2 ft^2
Stack Height 300' ft

Stack Dimensions

Umbilical Cord 100'
Thermocouple Probe No. KA-77
Pitot Tube No. KA-8I

Mat'l Processing Rate ____
Final Gas Meter Reading 110.711 ft^3 49.711
Initial Gas Meter Reading 60.500 ft^3
Condensate Increase in Impingers 86 ml
Moisture in Silica Gel 13.5 gm
Silica Gel Container No. ____ Filter No. ____

Orsat:					
$\%CO_2$					
$\%O_2$					
$\%CO$					
$\%N_2$					

Test Conducted By: R Paul - S Bell

Stack Test Observers: ____

Leak Check Meter Box
Initial 0.006 cfm @ 10 In H_2
Final 0.00 cfm @ 10 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. [✓ Stable], ~~Leak~~
Static 3 In H_2O for 15 sec. [✓ Stable], Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O")	Meter Orifice Press. Diff. ("H_2O") 2.00		Stack Gas Temp. (°F)	Sample Box Temp. (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)	
				0.873	Calc.	Actual	369			80.5		10.4 O_2 %
1-1			60.6	0.91	2.43	2.43	366	258	73	80	8	10.5
2			64.2	0.93	2.48	2.48	370	250	61	80	8	10.5
3			67.6	0.90	2.4	2.4	366	246	60	80	8	10.5
4			71.0	0.80	2.14	2.14	365	242	61	80	9	10.4
2-1			73.8	0.87	2.32	1.7	365	246	70	80	10	10.4
2			76.6	0.90	2.4	1.7	372	246	65	80	10	10.4
3			79.6	0.87	2.32	2.08	371	245	64	80	9	
4			82.6	0.79	2.1	2.0	370	242	65	80	9	

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Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Sample Box Temp (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)	O_2 %
					Calc.	Actual						
3-1			85.8	0.94	2.51	2.0	370	251	71	81	10	10.4
2			89.0	0.88	2.35	2.1	370	242	66	81	9	10.1
3			92.2	0.88	2.35	1.9	370	245	66	81	9	10.5
4			95.2	0.75	2.0	1.8	369	245	65	81	10	10.5
4-1			98.2	0.90	2.4	1.8	370	252	71	81	10	10.4
2			101.1	0.93	2.48	1.7	370	252	67	81	10	10.5
3			4.1	0.90	2.4	1.9	371	243	66	81	9	10.5
4			7.1	0.83	2.22	1.9	369	244	66	81	10	10.4

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SOURCE SAMPLING FIELD DATA SHEET

Plant Fla Crushed Stone
Sampling Location stack Sludge
Type of Control Baghouse
Type of Samples MM5
Date 10-2-90 Run No. 3
Time Start 1304 Time End
Sample Time 4 min/pt 64 Total min
DB °F, WB °F, VP @ DP "Hg
Bar. Press. 30.17 "Hg, Stack Press. "Hg
Moisture 7 %, FDA , Gas Density Factor
Temp. 80 °F, W/D E , W/S 15-20
Weather Clear. Thermocouple Readout KA-1
Sample Box No: KA-1 meter Box No. KA-1
Meter ΔH@ 1.7 Pitot Corr. Factor 0.84
Nozzle Dia 0.260 in., Probe Length 7 Glass ft
Probe Heater Setting 4 Nomograph C_f 2.67
Stack Dimensions 18.65' in
Stack Area 273.2 ft^2
Effective Stack Area 273.2 ft^2
Stack Height 300' ft

Stack Dimensions

Umbilical Cord 100'
Thermocouple Probe No. KA-77
Pitot Tube No. KA-SI

Mat'l Processing Rate
Final Gas Meter Reading 163.708 ft^3 53.408
Initial Gas Meter Reading 110.300 ft^3
Condensate Increase in Impingers 83 ml
Moisture in Silica Gel 9.0 gm
Silica Gel Container No. 1 Filter No.

Orsat:				
$\%CO_2$				
$\%O_2$				
%CO				
$\%N_2$				

Test Conducted By: R Paul - S Bell

Stack Test Observers:

Leak Check Meter Box
Initial 0.00 cfm @ 10 In H_2
Final 0.00 cfm @ 9 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. [✓ Stable], Leak
Static 3 In H_2O for 15 sec. [✓ Stable], Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O")	Meter Orifice Press. Diff. ("H_2O")		Stack Gas Temp. (°F)	Sample Box Temp. (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)
				0.822	Calc.	Actual 2.1763	383			81.5	
1-1			10.3	0.99	2.64	2.64	377	246	72	81	7
2			14.0	0.~~98~~85	2.3	2.3	376	243	62	81	7
3			17.5	0.93	2.48	2.48	380	247	63	81	8
4			21.0	0.73	1.95	1.95	380	241	64	81	7
2-1			24.1	0.85	2.27	2.1	382	248	69	82	9
2			27.5	0.82	2.19	2.19	381	250	65	82	8
3			30.9	0.85	2.3	2.3	381	242	65	82	8
4			34.3	0.76	2.03	2.03	383	236	65	82	8

10.28
O_2 %
10.1
10.1
10.4
10.4
10.4

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Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Sample Box Temp (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)	
					Calc.	Actual						O_2%
3-1			37.6	0.82	2.19	2.19	385	241	70	81	9	10.4
2			41.0	0.82	2.19	2.19	385	245	66	81	9	10.4
3			44.1	0.80	2.14	2.14	384	247	65	81	9	10.5
4			47.4	0.71	1.9	1.9	385	236	64	81	8	10.5
4-1			50.8	0.88	2.35	2.15	387	236	69	82	9	9.5
2			53.8	0.78	2.08	2.08	385	244	67	82	9	10.3
3			56.9	0.83	2.22	2.15	387	239	65	82	9	10.3
4			60.4	0.76	2.03	2.03	389	249	64	82	8	10.1

48 30.12

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CHAIN OF CUSTODY RECORD

Project Number 307-90-05

Project Name FLORIDA CRUSHED STONE

Sample Location BROOKSVILLE, FL.
WWT-SLUDGE

Sample Identification	Remarks
RUN 1, FILTER	
RUN 1, WASH	FURANS AND DIOXINS
RUN 1, XAD TRAP	
RUN 2, FILTER	
RUN 2, WASH	" "
RUN 2, XAD TRAP	
RUN 3, FILTER	
RUN 3, WASH	" "
RUN 3, XAD TRAP	
XAD TRAP-BLANK	" "

Sampled By: (Signature) A.M. Joye Date: 10-31/11-2 ~~11-6/7-90~~ Time: see data sheets

Relinquished By: (Sign) A.M. Joye Date: 11-12-90 Time: 1100 HRS.

Received By: (Sign) ________ Date: ________ Time: ________

Relinquished By: (Sign) ________ Date: ________ Time: ________

Received By: (Sign) ________ Date: ________ Time: ________

Relinquished By: (Sign) ________ Date: ________ Time: ________

Received By Lab: (Sign) ________ Date: ________ Time: ________

Sample Shipped VIA: ______ UPS ✓ Fed Express ______ Bus

Shipping Bill Number: ________

KOOGLER & ASSOCIATES

TRIANGLE LABORATORIES, INC
801-10 CAPITOLA DRIVE
RESEARCH TRIANGLE PARK, NC 27713
PHONE: (919) 544-5729
FAX: (919) 544-5491

[✓ DIOXIN DEPT] ORGANICS DEPT

THIS REPORT IS PROVIDED TO ACKNOWLEDGE RECEIPT OF YOUR SAMPLE(S), AND TO ADVISE YOU OF THE STATUS OF YOUR ORDER.

CUSTOMER INFORMATION

TECH CONTACT Mason Joye

CLIENT ID Koogler & Associates

PROJECT NAME #307-90-05/Florida Crushed Stone

PURCHASE ORDER NO. 23606

REFERENCE NO. —

TYPE & NUMBER OF SAMPLES

___ SOIL ___ WATER ___ SLUDGE ___ PULP

___ MILK ___ FISH ___ ADIPOSE ___ PUF

___ ASH 3 MM5 ___ VOST ___ CARDBOARD

OTHER +1 XAD TRAP blank

TRIANGLE LABORATORIES INFORMATION

DATE SAMPLES RECEIVED: 11 / 13 / 1990

CONDITION OF CONTAINER: [✓ GOOD] WET LEAK DAMAGED (CIRCLE)

ID OF DAMAGED CONTAINER: ____________

UPON RECEPTION, A TLI PROJECT WAS INITIATED TO PROCESS YOUR SAMPLES. PLEASE REFER TO THE TLI PROJECT NUMBER GIVEN BELOW WHEN INQUIRING ABOUT THE STATUS OF YOUR SAMPLES:

TLI PROJECT NUMBER: 16933

ANTICIPATED DUE DATE ....DIOXINS 12 / 18 / 1990
OF ANALYSIS: ....ORGANICS ___ / ___ / 1990

PARAMETERS TO BE ANALYZED:

DIOXIN DEPT

DD/DF
2378 TCDF ONLY ___
2378 TCDD ONLY ___
TETRA-OCTA ✓
MONO-OCTA ___
CONFIRMATION ✓
TCDD/DF ___
OTHERS: ___

ORGANICS DEPT

VOLATILES ___
SEMIVOLATILES ___
PESTICIDES ___
PCB'S ___
CBCP'S ___
PAH'S ___
OTHERS: ___

ADDITIONAL INFORMATION ON OTHER SIDE

Custody Seal	[✓ Present] / Absent // [✓ Intact] / Not Intact	TLI Project Number	16933
Chain of Custody	[✓ Present] / Absent	Client	KOOGLER & ASSOCIATES
Sample Tags	[✓ Present] / Absent	Date Received at TLI	11/13/90 By Bisthurst
Sample Tag Numbers	[✓ Listed] / Not listed on Chain of Custody	Carrier and Number	U.P.S. 1234 0643547
SMO Forms	Present / [✓ Absent]		
Packaging	Styro Cooler Ice Present [✓ Yes] / No		

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Sample ID TLI	Client	Matrix	Storage Location	To Lab Date/	Initial	To Storage Date/	Initial	To Lab Date/	Initial	To Storage Date/	Initial	To Lab Date/	Initial	To Archive Date/	Initial
38.61.1A	Run 1	Filter	cooler #2												
38.61.1B	↓	WASH	↓												
38.61.1C	↓	XAD	↓												
38.61.2A	Run 2	Filter	↓												
38.61.2B	↓	WASH	↓												
38.61.2C	↓	XAD	↓												
38.61.3A	Run 3	FILTER	↓												
38.61.3B	↓	WASH	↓												
38.61.3C	↓	XAD	↓												
38.61.4	BLANK	XAD	↓												

Receiving Remarks: Received ③ MM5 TRAIN Samples (COUNTS) In good Condition

Archive Remarks:

TRIANGLE LABORATORIES, INC.
801-10 CAPITOLA DRIVE
RESEARCH TRIANGLE PARK, NC 27713

Phone: (919) 544-5729
Fax: (919) 544-5491

DATE : * 30 NOVEMBER 1990

CLIENT ID : * KOOGLER & ASSOCIATES

P.O. NUMBER : * 23606

TLI PROJECT No. : * 16933

CASE NARRATIVE
MODEL 8290X

ANALYSIS OF SAMPLES FOR THE PRESENCE OF

POLYCHLORINATED DIBENZO-p-DIOXINS

AND

DIBENZOFURANS

BY

HIGH-RESOLUTION GAS CHROMATOGRAPHY / HIGH-RESOLUTION MASS SPECTROMETRY

Fullscreen Analyses

TRIANGLE LABORATORIES, INC.

SAMPLE DATA

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                          TRIANGLE LABORATORIES, INC.                  Page 1 of 2
                          PCDD/PCDF 2378X ANALYSIS (a)                    11/30/90


FILE NAME....: S904515    CLIENT ID....: KOOGLER      TLI NUMBER....: n/a
CONCAL (VER).: S904512    SAMPLE ID....: TLI BLANK
PROJECT NUMBER: 16933     ICAL DATE....: 10/16/90
ANALYST......: MTB        ANALYSIS DATE: 11/24/90
SAMPLE SIZE..:   1.000    SAMPLE MATRIX: n/a          SAMPLE ORIGIN: n/a
DATE RECEIVED.:   /  /    DATE COLLECTED:    /  /
SPIKE FILE...: SPX23710                               SHIPMENT NO...: n/a
==============================================================================
NAME               AMT(ng )  NUMBER       DL     EMPC      RATIO     RT    FLAGS
------------------------------------------------------------------------------
2378-TCDD             ND                0.02                               ___
12378-PeCDD           ND                0.03                               ___
123478-HxCDD          ND                0.03                               ___
123678-HxCDD          ND                0.03                               ___
123789-HxCDD          ND                0.03                               ___
1234678-HpCDD        EMPC                        0.07                      ___
OCDD                 EMPC                        0.21                      ___

2378-TCDF             ND                0.01                               ___
12378-PeCDF           ND                0.02                               ___
23478-PeCDF           ND                0.02                               ___
123478-HxCDF          ND                0.02                               ___
123678-HxCDF          ND                0.02                               ___
234678-HxCDF          ND                0.02                               ___
123789-HxCDF          ND                0.03                               ___
1234678-HpCDF         ND                0.02                               ___
1234789-HpCDF         ND                0.04                               ___
OCDF                  ND                0.09                               ___

TOTAL TCDD            ND                0.02                               ___
TOTAL PeCDD           ND                0.03                               ___
TOTAL HxCDD           ND                0.03                               ___
TOTAL HpCDD          EMPC                        0.07                      ___

TOTAL TCDF            ND                0.01                               ___
TOTAL PeCDF           ND                0.02                               ___
TOTAL HxCDF           ND                0.02                               ___
TOTAL HpCDF           ND                0.03                               ___
------------------------------------------------------------------------------
!_____MTB_______     11/30/90!                              X237_RPT rev:3.03
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TRIANGLE LABORATORIES, INC.
PCDD/PCDF 2378X ANALYSIS (a)

Page 1 of 2
11/30/90

FILE NAME....: S904519
CONCAL (VER).: S904512
PROJECT NUMBER: 16933
ANALYST......: MTB
SAMPLE SIZE..: 1.000
DATE RECEIVED.: 11/13/90
SPIKE FILE...: SPX23710

CLIENT ID....: KOOGLER
SAMPLE ID....: BLANK
ICAL DATE....: 10/16/90
ANALYSIS DATE: 11/24/90
SAMPLE MATRIX: MM5
DATE COLLECTED: / /

TLI NUMBER....: 38-61-4
SAMPLE ORIGIN: BROOKSVIL
SHIPMENT NO...: #307-90

NAME	AMT(ng)	NUMBER	DL	EMPC	RATIO	RT	FLAGS
2378-TCDD	ND		0.01				
12378-PeCDD	ND		0.02				
123478-HxCDD	ND		0.03				
123678-HxCDD	ND		0.03				
123789-HxCDD	ND		0.03				
1234678-HpCDD	ND		0.06				
OCDD	ND		0.2				
2378-TCDF	ND		0.008				
12378-PeCDF	ND		0.01				
23478-PeCDF	ND		0.02				
123478-HxCDF	ND		0.02				
123678-HxCDF	ND		0.02				
234678-HxCDF	ND		0.02				
123789-HxCDF	ND		0.03				
1234678-HpCDF	ND		0.03				
1234789-HpCDF	ND		0.04				
OCDF	ND		0.1				
TOTAL TCDD	ND		0.01				
TOTAL PeCDD	ND		0.02				
TOTAL HxCDD	ND		0.03				
TOTAL HpCDD	ND		0.06				
TOTAL TCDF	ND		0.008				
TOTAL PeCDF	ND		0.01				
TOTAL HxCDF	ND		0.02				
TOTAL HpCDF	ND		0.03				

11/30/90

X237_RPT rev:3.03

TRIANGLE LABORATORIES, INC.
PCDD/PCDF 2378X ANALYSIS (a)

Page 1 of 2
11/30/90

FILE NAME....: S904516
CONCAL (VER).: S904512
PROJECT NUMBER: 16933
ANALYST......: MTB
SAMPLE SIZE..: 1.000
DATE RECEIVED.: 11/13/90
SPIKE FILE...: SPX23710

CLIENT ID....: KOOGLER
SAMPLE ID....: RUN 1
ICAL DATE....: 10/16/90
ANALYSIS DATE: 11/24/90
SAMPLE MATRIX: MM5
DATE COLLECTED: / /

TLI NUMBER....: 38-61-1A-C
SAMPLE ORIGIN: BROOKSVIL
SHIPMENT NO...: #307-90

NAME	AMT(ng)	NUMBER	DL	EMPC	RATIO	RT	FLAGS
2378-TCDD	ND		0.005				
12378-PeCDD	ND		0.01				
123478-HxCDD	ND		0.01				
123678-HxCDD	0.03				1.32	41:44	
123789-HxCDD	0.04				1.59	42:11	
1234678-HpCDD	EMPC			0.35			B
OCDD	1.1				0.86	52:02	B
2378-TCDF	0.10				0.70	30:38	
12378-PeCDF	0.03				1.59	35:22	
23478-PeCDF	0.05				1.68	36:19	
123478-HxCDF	0.09				1.11	40:25	
123678-HxCDF	0.04				1.22	40:37	
234678-HxCDF	0.08				1.15	41:24	
123789-HxCDF	ND		0.01				
1234678-HpCDF	0.14				0.92	45:03	
1234789-HpCDF	ND		0.02				
OCDF	ND		0.05				
TOTAL TCDD	0.15	4		0.24	0.75		
TOTAL PeCDD	0.09	3		0.24	1.56		
TOTAL HxCDD	0.39	6			1.33		
TOTAL HpCDD	0.49	1		0.84	1.17		
TOTAL TCDF	0.71	12		0.75	0.77		
TOTAL PeCDF	0.35	8		0.49	1.56		
TOTAL HxCDF	0.47	6			1.16		
TOTAL HpCDF	0.19	2		0.23	0.93		

11/30/90

X237_RPT rev:3.03

TRIANGLE LABORATORIES, INC.
PCDD/PCDF 2378X ANALYSIS (a)

FILE NAME....: S904517 CLIENT ID....: KOOGLER TLI NUMBER....: 38-61-2A-C
CONCAL (VER).: S904512 SAMPLE ID....: RUN 2
PROJECT NUMBER: 16933 ICAL DATE....: 10/16/90
ANALYST......: MTB ANALYSIS DATE: 11/24/90
SAMPLE SIZE..: 1.000 SAMPLE MATRIX: MM5 SAMPLE ORIGIN: BROOKSVIL
DATE RECEIVED.: 11/13/90 DATE COLLECTED: / /
SPIKE FILE...: SPX23710 SHIPMENT NO...: #307-90

NAME	AMT(ng)	NUMBER	DL	EMPC	RATIO	RT	FLAGS
2378-TCDD	ND		0.008				
12378-PeCDD	0.02				1.43	36:48	
123478-HxCDD	EMPC			0.02			
123678-HxCDD	0.04				1.26	41:44	
123789-HxCDD	0.04				1.32	42:10	
1234678-HpCDD	0.45				0.89	46:35	B
OCDD	1.6				0.91	52:01	B
2378-TCDF	EMPC			0.10			
12378-PeCDF	0.02				1.33	35:21	
23478-PeCDF	0.02				1.34	36:18	
123478-HxCDF	EMPC			0.03			
123678-HxCDF	EMPC			0.02			
234678-HxCDF	0.03				1.33	41:23	
123789-HxCDF	ND		0.01				
1234678-HpCDF	0.05				0.90	45:03	
1234789-HpCDF	ND		0.02				
OCDF	ND		0.04				
TOTAL TCDD	0.13	4		0.30	0.72		
TOTAL PeCDD	0.05	2		0.31	1.61		
TOTAL HxCDD	0.38	5		0.47	1.26		
TOTAL HpCDD	1.0	2			0.95		
TOTAL TCDF	0.35	8		0.57	0.77		
TOTAL PeCDF	0.17	5		0.29	1.42		
TOTAL HxCDF	0.15	4		0.20	1.31		
TOTAL HpCDF	0.07	1		0.10	0.90		

MJS 11/30/90

TRIANGLE LABORATORIES, INC.
PCDD/PCDF 2378X ANALYSIS (a)

FILE NAME....: S904518
CONCAL (VER).: S904512
PROJECT NUMBER: 16933
ANALYST......: MTB
SAMPLE SIZE..: 1.000
DATE RECEIVED.: 11/13/90
SPIKE FILE...: SPX23710

CLIENT ID....: KOOGLER
SAMPLE ID....: RUN 3
ICAL DATE....: 10/16/90
ANALYSIS DATE: 11/24/90
SAMPLE MATRIX: MM5
DATE COLLECTED: / /

TLI NUMBER....: 38-61-3A-C
SAMPLE ORIGIN: BROOKSVIL
SHIPMENT NO...: #307-90

NAME	AMT(ng)	NUMBER	DL	EMPC	RATIO	RT	FLAGS
2378-TCDD	ND		0.008				
12378-PeCDD	0.009				1.47	36:48	
123478-HxCDD	ND		0.01				
123678-HxCDD	0.03				1.09	41:43	
123789-HxCDD	0.04				1.43	42:10	
1234678-HpCDD	0.30				1.20	46:35	B
OCDD	0.96				0.76	52:01	B
2378-TCDF	0.09				0.65	30:37	
12378-PeCDF	0.01				1.70	35:21	
23478-PeCDF	0.02				1.61	36:18	
123478-HxCDF	EMPC			0.01			
123678-HxCDF	EMPC			0.007			
234678-HxCDF	0.02				1.05	41:23	
123789-HxCDF	ND		0.01				
1234678-HpCDF	EMPC			0.02			
1234789-HpCDF	ND		0.02				
OCDF	ND		0.04				
TOTAL TCDD	0.33	4		0.38	0.78		
TOTAL PeCDD	0.10	4		0.29	1.58		
TOTAL HxCDD	0.37	6			1.27		
TOTAL HpCDD	0.74	2			1.06		
TOTAL TCDF	0.62	11		0.65	0.75		
TOTAL PeCDF	0.11	4		0.23	1.57		
TOTAL HxCDF	0.05	2		0.09	1.24		
TOTAL HpCDF	0.01	1		0.04	1.04		

MMS 11/30/90

X237_RPT rev:3.03

ppb
ENVIRONMENTAL LABORATORIES, INC.

December 13, 1990

Mr. Mason Joye
Koogler and Associates
4014 N.W. 13th Street
Gainesville, Florida 32609

Dear Mason:

Enclosed are the results of our analysis of the samples that we received December 3, 1990.

All data were determined in accordance with published procedures (EPA-600/4-79-020, Methods for Chemical Analysis of Water and Wastes, Revised March 1983). PPB is certified by the Florida DHRS (Lab Nos. 82282 and E82001).

If you have any questions concerning this report, please do not hesitate to give me a call.

Sincerely,

Tom Park
Tom Park
Project Manager

TP/ea

Enclosure

PPB-BILL90.8{WP}INV90679

ppb
ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

KOOGLER AND ASSOCIATES,INC.
4014 NW 13TH STREET
GAINESVILLE, FL 32609-

DATE: 12/14/90
DHRS # 82282, E82001
YOUR REF/P.O.: FL CR STONE

Attn: MR. MASON JOYE

KOOGLER SAMPLES RECEIVED DECEMBER 3, 1990. (Page 1 of 4)

CLIENT STATION ID	LAB NUMBER	%SOLIDS %	AL/S/ICP ug/g	AS/S/AA ug/g	BA/S/ICP ug/g	CD/S/ICP ug/g	CR/S/ICP ug/g
BL BAG DUST	44509	99.6	9340	4.6	41	2.8	30
BL KILN FEED	44510	99.8	7590	3.2	49	2.6	28
TDF BAG DUST	44511	99.7	8870	4.7	40	3.5	33
TDF KILN FEED	44512	99.8	7710	3.7	48	2.4	27
WWT BAG DUST	44513	99.7	10900	5.4	88	3.0	36
WWT KILN FEED	44514	99.8	7900	3.2	53	3.0	29
WWT SLUDGE	44515	75.3	29900	4.8	172	11	188

ALL METALS REPORTED ON DRY WEIGHT BASIS.

PROJECT MANAGER Tom Park

REPORT OF ANALYSES

KOOGLER AND ASSOCIATES,INC.
4014 NW 13TH STREET
GAINESVILLE, FL 32609-

DATE: 12/14/90
DHRS # 82282, E82001
YOUR REF/P.O.: FL CR STONE

Attn: MR. MASON JOYE

KOOGLER SAMPLES RECEIVED DECEMBER 3, 1990. (Page 2 of 4)

CLIENT STATION ID	LAB NUMBER	CO/S/AA ug/g	CU/S/ICP ug/g	FE/S/ICP ug/g	PB/S/ICP ug/g	MG/S/ICP ug/g	HG/S/CVAA ug/g
BL BAG DUST	44509	<1.7	23	8130	75	2600	2.1
BL KILN FEED	44510	2.5	16	9230	60	2460	0.4
TDF BAG DUST	44511	1.9	23	9660	89	2640	2.1
TDF KILN FEED	44512	2.5	15	8920	60	2420	0.4
WWT BAG DUST	44513	3.6	28	7770	80	2850	2.1
WWT KILN FEED	44514	2.2	26	11400	51	2270	0.5
WWT SLUDGE	44515	82	395	59100	103	37800	0.4

ALL METALS REPORTED ON DRY WEIGHT BASIS.

PROJECT MANAGER Tom Park

REPORT OF ANALYSES

KOOGLER AND ASSOCIATES,INC.
4014 NW 13TH STREET
GAINESVILLE, FL 32609-

DATE: 12/14/90
DHRS # 82282, E82001
YOUR REF/P.O.: FL CR STONE

Attn: MR. MASON JOYE

KOOGLER SAMPLES RECEIVED DECEMBER 3, 1990. (Page 3 of 4)

CLIENT STATION ID	LAB NUMBER	MO/S/ICP ug/g	NI/S/ICP ug/g	SE/S/AA ug/g	AG/S/ICP ug/g	TI/S/ICP ug/g	V/S/ICP ug/g
BL BAG DUST	44509	13	20	0.9	<13	5.5	72
BL KILN FEED	44510	11	24	0.2	<13	12	79
TDF BAG DUST	44511	15	22	1.0	<13	9.6	76
TDF KILN FEED	44512	12	24	0.1	<13	22	77
WWT BAG DUST	44513	12	11	1.5	<13	153	62
WWT KILN FEED	44514	9.1	12	0.7	<13	65	40
WWT SLUDGE	44515	100	2790	1.0	<13	70	4280

ALL METALS REPORTED ON DRY WEIGHT BASIS.

PROJECT MANAGER Tom Park

ppb
ENVIRONMENTAL LABORATORIES, INC.

REPORT OF ANALYSES

KOOGLER AND ASSOCIATES,INC.
4014 NW 13TH STREET
GAINESVILLE, FL 32609-

DATE: 12/14/90
DHRS # 82282, E82001
YOUR REF/P.O.: FL CR STONE

Attn: MR. MASON JOYE

KOOGLER SAMPLES RECEIVED DECEMBER 3, 1990. (Page 4 of 4)

CLIENT STATION ID	LAB NUMBER	ZN/S/ICP ug/g
BL BAG DUST	44509	18
BL KILN FEED	44510	15
TDF BAG DUST	44511	21
TDF KILN FEED	44512	15
WWT BAG DUST	44513	22
WWT KILN FEED	44514	13
WWT SLUDGE	44515	313

ALL METALS REPORTED ON DRY WEIGHT BASIS.

PROJECT MANAGER Tom Park

FLOWERS
CHEMICAL LABORATORIES
INCORPORATED

Received From:
Koogler Assoc.
4014 NW 13th St.
Gainsville,FL 32609

Date Reported: Nov27 1990
PO Number: Fla.CrushedSt
PO Number 307-90-05
FDHRS Lab# : 83139
FDER Lab# : E83018
NCDEHNR Lab# : 296
SCDHEC Lab# : 96019

For: 8100 8080 PCB
Date Received: Nov15 1990 Lab Num: 3928-3930

REPORT OF ANALYSIS

Parameter	Unit	Method Detection Limit	%ACC	%PRC	3928 WWT SLUDGE	3929 BAG HOUSE DUST	3930 KILN FEED
Acenaphthylene	ug/Kg	5	99.2	1.21	<5	<5	<5
Acenaphthene	ug/Kg	5	99.2	1.16	<5	<5	<5
Anthracene	ug/Kg	5	99.1	1.32	<5	<5	<5
Benzo(a)anthracene	ug/Kg	5	101	0.96	<5	<5	<5
Benzo(a)pyrene	ug/Kg	5	99.8	0.29	<5	<5	<5
Benzo(b)fluoranthene	ug/Kg	5	99.3	0.99	<5	<5	<5
Benzo(g,h,i)perylene	ug/Kg	5	98.0	2.96	<5	<5	<5
Benzo(K)fluoranthene	ug/Kg	5	99.3	0.99	<5	<5	<5
Chrysene	ug/Kg	5	101	0.96	<5	<5	<5
Dibnz(a,h)anthracene	ug/Kg	5	97.2	4.10	<5	<5	<5
Fluoranthene	ug/Kg	5	99.5	0.76	<5	<5	<5
Fluorene	ug/Kg	5	98.8	1.77	<5	<5	<5
Indn(1,2,3-cd)pyrene	ug/Kg	5	97.6	3.50	<5	<5	<5
Naphthalene	ug/Kg	5	99.0	1.41	<5	<5	<5
1-methyl-Naphthalene	ug/Kg	5	98.8	1.66	<5	<5	<5
2-methyl-Naphthalene	ug/Kg	5	98.6	2.06	<5	<5	<5
Phenanthrene	ug/Kg	5	99.8	0.33	<5	<5	<5
Pyrene	ug/Kg	5	99.1	1.34	<5	<5	<5
Intl_QA_Spike(2FBP)	%Rec	1	98.8	1.72	79.0	49	66
Arochlor_1260	ppm	0.01	96.4	2.19	<.010	<.010	<.010
Arochlor_1242	ppm	0.01	102	1.22	<.010	<.010	<.010
Arochlor_1254	ppm	0.01	101	1.67	<.010	<.010	<.010
Total_Arochlor	ppm	0.01	99.9	1.69	<.010	<.010	<.010
4,4'-DDD	ug/L	0.01	102	1.18	<.010	<.010	<.010
4,4'-DDE	ug/L	.006	94.5	3.32	<.0060	<.0060	<.0060
4,4'-DDT	ug/L	.016	103	1.70	<.0016	<.0016	<.0016

Data Release Authorization

Sample integrity and reliability certified by Lab personnel prior to analysis. Methods of analysis in accordance with FCL QA and EPA approved methodology.

Jefferson S. Flowers, Ph.D.
Technical Director

Jefferson L. Flowers, Ph.D.
Jefferson S. Flowers, Ph.D.
481 NEWBURYPORT
P. O. BOX 150-597
ALTAMONTE SPRINGS
FLORIDA 32715-0597
BUS: (407) 339-5984
FAX: (407) 260-6110

FLOWERS
CHEMICAL LABORATORIES
INCORPORATED

Received From:
Koogler Assoc.
4014 NW 13th St.
Gainsville,FL 32609

Date Reported: Nov27 1990
PO Number: Fla.CrushedSt
PO Number 307-90-05
FDHRS Lab# : 83139
FDER Lab# : E83018
NCDEHNR Lab# : 296
SCDHEC Lab# : 96019

For: 8100 8080 PCB
Date Received: Nov15 1990
Lab Num: 3928-3930

REPORT OF ANALYSIS

Parameter	Unit	Method Detection Limit	%ACC	%PRC	3928 WWT SLUDGE	3929 BAG HOUSE DUST	3930 KILN FEED
a-BHC	ug/L	.002	108	4.86	<.0020	<.0020	<.0020
Aldrin	ug/L	.003	91.4	5.25	<.0030	<.0030	<.0030
b-BHC	ug/L	.004	99.5	0.31	<.0040	<.0040	<.0040
Chlordane	ug/L	0.04	101	2.38	<.040	<.040	<.040
d-BHC	ug/L	.004	94.5	3.28	<.0040	<.0040	<.0040
Dieldrin	ug/L	.006	105	3.04	<.0060	<.0060	<.0060
Endosulfan_I	ug/L	.004	96.2	2.29	<.0040	<.0040	<.0040
Endosulfan_II	ug/L	.004	96.5	2.08	<.0040	<.0040	<.0040
Endosulfan_sulfate	ug/L	.004	107	4.23	<.0040	<.0040	<.0040
Endrin	ug/L	.001	104	2.48	<.0010	<.0010	<.0010
Endrin_Aldehyde	ug/L	.001	96.9	1.86	<.0010	<.0010	<.0010
g-BHC	ug/L	.0005	94.7	3.21	<.0005	<.0005	<.0005
Heptachlor	ug/L	.002	107	4.21	<.0020	<.0020	<.0020
Heptachlor_Epoxide	ug/L	.004	108	4.84	<.0040	<.0040	<.0040
Kelthane(Dicofal)	ug/L	0.05	106	3.22	<.050	<.050	<.050
o,p-DDD	ug/L	0.01	102	1.18	<.010	<.010	<.010
o,p-DDE	ug/L	.006	94.5	3.32	<.0060	<.0060	<.0060
o,p-DDT	ug/L	.016	103	1.70	<.0016	<.0016	<.0016
PCB_1016	ug/L	0.05	102	1.44	<.050	<.050	<.050
PCB_1221	ug/L	0.05	99.2	1.70	<.050	<.050	<.050
PCB_1232	ug/L	0.05	102	1.80	<.050	<.050	<.050
PCB_1242	ug/L	0.05	102	1.22	<.050	<.050	<.050
PCB_1248	ug/L	0.05	98.8	1.93	<.050	<.050	<.050
PCB_1254	ug/L	0.05	101	1.67	<.050	<.050	<.050
PCB_1260	ug/L	0.05	96.4	2.19	<.050	<.050	<.050
Toxaphene	ug/L	0.1	96.2	2.48	<0.10	<0.10	<0.10

Data Release Authorization

Sample integrity and reliability certified by Lab personnel prior to analysis. Methods of analysis in accordance with FCL QA and EPA approved methodology.

Jefferson S. Flowers, Ph.D.
Technical Director

Jefferson L. Flowers, Ph.D.
Jefferson S. Flowers, Ph.D.
481 NEWBURYPORT
P. O. BOX 150-597
ALTAMONTE SPRINGS
FLORIDA 32715-0597
BUS: (407) 339-5984
FAX: (407) 260-6110

FLOWERS
CHEMICAL LABORATORIES
INCORPORATED

Received From:

Koogler Assoc.
4014 NW 13th St.
Gainsville,FL 32609

Date Reported: Nov27 1990
PO Number: Fla.CrushedSt
PO Number 307-90-05
FDHRS Lab# : 83139
FDER Lab# : E83018
NCDEHNR Lab# : 296
SCDHEC Lab# : 96019

For: 8100 8080 PCB
Date Received: Nov15 1990 Lab Num: 3928-3930

REPORT OF ANALYSIS

Parameter	Unit	Method Detection Limit	%ACC	%PRC	3928 WWT SLUDGE	3929 BAG HOUSE DUST	3930 KILN FEED
Intl_QA_Spike(DBC)	%Rec	0.1	103	1.49	113	119	93

Data Release Authorization

Sample integrity and reliability certified by Lab personnel prior to analysis. Methods of analysis in accordance with FCL QA and EPA approved methodology.

Jefferson S. Flowers, Ph.D.
Technical Director

Jefferson L. Flowers, Ph.D.
Jefferson S. Flowers, Ph.D.
481 NEWBURYPORT
P. O. BOX 150-597
ALTAMONTE SPRINGS
FLORIDA 32715-0597
BUS: (407) 339-5984
FAX: (407) 260-6110

Koogler & Assoc.

CHAIN OF CUSTODY RECORD

Project Number 307-90-05

Project Name FLORIDA CRUSHED STONE

Sample Location BROOKSVILLE, FL.
WWT - SLUDGE

Lab#	Sample Identification	Remarks
3928	WWT-SLUDGE, NOV. 2, 1990	METHOD 608 - ORGANOCHLORINE PESTICIDES AND PCBs AND METHOD 610 FOR POLYNUCLEAR AROMATIC HYDROCARBONS
3929	BAGHOUSE DUST, NOV. 2, 1990	" "
3930	KILN FEED, NOV. 2, 1990	" "

Sampled By: (Signature) A.M. Joya Date: 10/31 - 11/2 Time: see data sheets

Relinquished By: (Sign) A.M. Joya Date: 11/14/90 Time: 1100 HRS

Received By: (Sign) Date: 11/15/90 Time: 1:20

Relinquished By: (Sign) Date: Time:

Received By: (Sign) Date: Time:

Relinquished By: (Sign) Date: Time:

Received By Lab: (Sign) Date: Time:

Sample Shipped VIA: ☑ UPS ☐ Fed Express ☐ Bus

Shipping Bill Number:

KOOGLER & ASSOCIATES

EQUIPMENT CALIBRATIONS

KOOGLER & ASSOCIATES

NOZZLE CALIBRATION

DATE 10-31-90

PLANT NAME FCS

LOCATION Brooksville

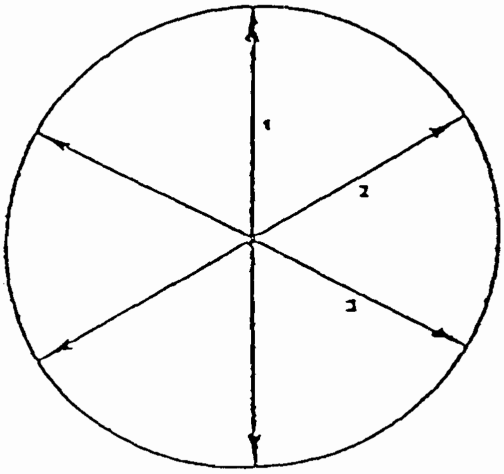
SOURCE stack-Sludge

Measurement No.	Inside Diameter (inches)
1	0.259
2	0.261
3	0.262

Average 0.2607

Area of Nozzle 0.00037 ft²

Calibrated by: RC Paul



Nozzle X-Section

KOOGLER & ASSOCIATES

BEST AVAILABLE COPY

NOZZLE CALIBRATION

DATE 8-20-90

PLANT NAME FCS

LOCATION Brooksville, Fla

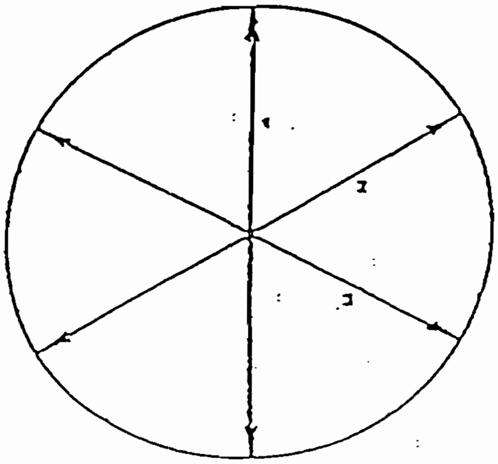
SOURCE Cement Kiln

Measurement No.	Inside Diameter (inches)
1	0.313
2	0.311
3	0.312

Average 0.312

Area of Nozzle 0.000531 ft^2

Calibrated by: RC Paul



Nozzle X-Section

KOOGLER & ASSOCIATES

NOZZLE CALIBRATION

DATE 9-18-90

PLANT NAME FCS

LOCATION Brooksville

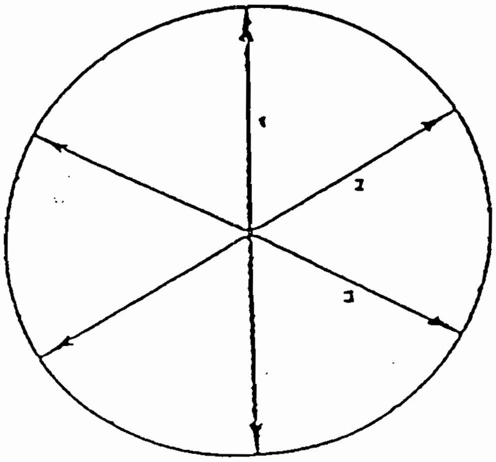
SOURCE Stack

Measurement No.	Inside Diameter (inches)
1	0.248
2	0.247
3	0.249

Average 0.248

Area of Nozzle ______ ft²

Calibrated by: RC Paul



Nozzle X-Section

KOOGLER & ASSOCIATES

POST TEST THERMOCOUPLE
CALIBRATION

DATE 8-20-90

PLANT NAME FCS

LOCATION Brooksville, Fla

SOURCE Cement Kiln

Thermocouple Readout # KA-2

Umbilical Cord # 100'

Switch Box # KA-2

Thermocouple # KA-77

Average Stack Temperature °F

*Observed Mercury in Glass (ASTM) °F 263

Observed Thermocouple Reading °F 261

Percent Difference $\frac{(\text{ASTM} + 460) - (\text{Thermo} + 460)}{(\text{ASTM} + 460)} \times 100 =$ ______

Tolerance $\leq$ 1.5%

* Observed temperature must be within ten percent of the average stack temperature.

RC Paul

Signature

KOOGLER & ASSOCIATES

KOOGLER & ASSOCIATES, ENVIRONMENTAL SERVICES
ANNUAL THERMOCOUPLE CALIBRATIONS

Umbilical Cord No 100 FT TC No. 63	BOX 1						BOX 2					
	STACK		BOX		IMP		STACK		BOX		IMP	
	TC[1]	ASTM[1]	TC	ASTM	TC	ASTM	TC	ASTM	TC	ASTM	TC	ASTM
Ice Bath	32	32	32	32	33	32	32	32	33	32	33	32
Ambient	83	84	82	84	83	84	81	84	81	84	82	84
212°	211	212	210	212	211	212	211	212	210	212	211	212
400°	412	414	413	414	413	413	413	414	414	414	413	414

Thermocouple Readout No. KA-1	UMBILICAL CORD NO. 100 FT						UMBILICAL CORD NO. 200 FT					
	STACK		BOX		IMP		STACK		BOX		IMP	
	TC	ASTM	TC	ASTM	TC	ASTM	TC	ASTM	TC	ASTM	TC	ASTM
Ice Bath	32	32	33	32	32	32	32	32	33	32	32	32
Ambient	83	84	82	84	83	84	84	84	83	84	83	84
212°	211	212	212	212	211	212	211	212	211	212	210	212
400°	413	414	414	414	414	414	412	413	413	414	414	414

Thermocouple Probe No.	TEMPERATURE							
	ICE BATH		AMBIENT		212°		400°	
	TC	ASTM	TC	ASTM	TC	ASTM	TC	ASTM
61	32	32	84	84	211	212	409	409
62	32	32	84	84	211	212	410	412
63	32	32	84	84	211	212	412	414
64	33	32	82	84	210	212	413	414
126	32	32	83	84	212	212	404	407
50	33	32	82	84	211	212	404	406
90	33	32	82	84	211	212	401	402
70	32	32	81	84	210	212	404	406
108	33	32	83	84	210	212	400	401

Signature Steve Bell

Date 9-28-90

[1] Thermocouple reading (°F)

[2] American Society of Testing Materials Mercury in glass thermometer (°F)

DRY GAS METER AND ORIFICE CALIBRATION

CONTROL BOX NO. KA-2 BAROMETRIC PRESS. 30.24 IN. HG.

DATE 04/25/90 PERFORMED BY EARLEY MCFARLAND

	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5
VACUUM ("Hg)	0.0	0.0	0.0	0.0	0.0
dHw ("H2O)	0.23	0.25	0.26	0.32	0.35
dHd ("H2O)	0.55	1.10	1.50	2.50	3.50
INITIAL WTM	384.782	390.196	366.151	396.794	373.603
FINAL WTM	390.196	396.794	373.603	406.337	384.782
INITIAL DGM	555.026	560.455	536.485	567.082	543.871
FINAL DGM	560.455	567.082	543.871	576.679	555.026
TEMP. WTM (F)	71.0	71.0	71.0	72.0	71.0
TEMP. DGM (F)	71.0	72.0	69.0	73.0	69.0
TEST TIME (MIN.)	12.0	10.0	10.0	10.0	10.0

****

NET VOLUME WTM	5.414	6.598	7.452	9.543	11.179
NET VOLUME DGM	5.429	6.627	7.386	9.597	11.155
Y	0.995	0.994	1.001	0.989	0.989
dH@	1.504	1.404	1.509	1.528	1.565

****

AVERAGE Y = 0.994

ACCEPTABLE Y RANGE = 0.974 TO 1.014

AVERAGE dH@ = 1.502

Y = (Vw (Pb - (dHw / 13.6)) x (Td + 460)) / (Vd (Pb + (dHd / 13.6)) x
(Tw + 460)

dH@ = 0.0317 x dHd / (Pb (Td + 460)) x ((Tw + 460) x time) / Vw)^2

PITOT TUBE CALIBRATION MEASUREMENTS

PITOT TUBE IDENTIFICATION NO. KA-5II

DATE CALIBRATED 8-2-89

PITOT TUBE ASSEMBLY LEVEL ? [✓ YES] ____ NO

PITOT TUBE OPENINGS DAMAGED ? ____ YES (EXPLAIN BELOW) [✓ NO]

α_1= 1.0 ° (<10°) α_2= 1.5 ° (<10°)

β_1= 1.5 ° (<5°) β_2= 0.5 ° (<5°)

Y= 0.5 °, 0= 1.5 °, A= 0.925 IN. = (PA+PB)

Z = A SIN Y = 0.0081 IN. (<0.125 IN.)

W = A SIN θ = 0.0242 IN. (<0.031 IN.)

P_A 0.462 IN. P_b 0.463 IN.

D_t 0.373 IN. (≥ 0.1875 IN. ≤ 0.3750 IN.)

COMMENTS: ____

CALIBRATION REQUIRED? ____ YES [✓ NO]

CALIBRATED BY: Galy McFalal

PTCMFORM 1/8/87

KOOGLER & ASSOCIATES

POST-TEST DRY GAS METER CALIBRATION FORM

Date: 10-1-90 Meter Box No.: KA-2 Plant: F.C.S.

Barometric Pressure, P_b = 30.09 in Hg Test Meter No.: KA-1 Pretest Y: ~~1.00~~ .994

Orifice Manometer Setting, (ΔH) in. H_2O	Gas Volume		Dry Gas Meter Temperature				Time (θ), Min.	Vacuum Setting In. Hg.	Y_i	Y_i $\frac{Y_T P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_T + 460)}$
	Test Meter (Y_{T_3}), Ft.	Dry Gas Meter (V_{d_3}), Ft.	Test Meter (t_T), °F	Inlet (t_{d_i}), °F	Outlet (t_{d_o}), °F	Average (t_d), a °F				
.6	6.05	5.984	84°	77	77	77	12.5	10	1.023	
.6	6.048	5.980	84°	78	78	78	12.5	10	1.021	
.6	6.055	5.989	84°	79	79	79	12.5	10	1.019	
									Y=1.021	

[a] If there is only one thermometer on the day gas meter, record the temperature under t_d

where:

Y_T = Gas volume passing through the test meter, ft^3.

Y_d = Gas volume passing through the dry gas meter, ft^3.

t_T = Temperature of the gas in the test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O

Y_i = Ratio of accuracy of test meter to dry gas meter for each run.

Y = Average ratio of accuracy of test meter to dry gas meter for all three runs; tolerance = pretest Y $\pm$0.05Y.

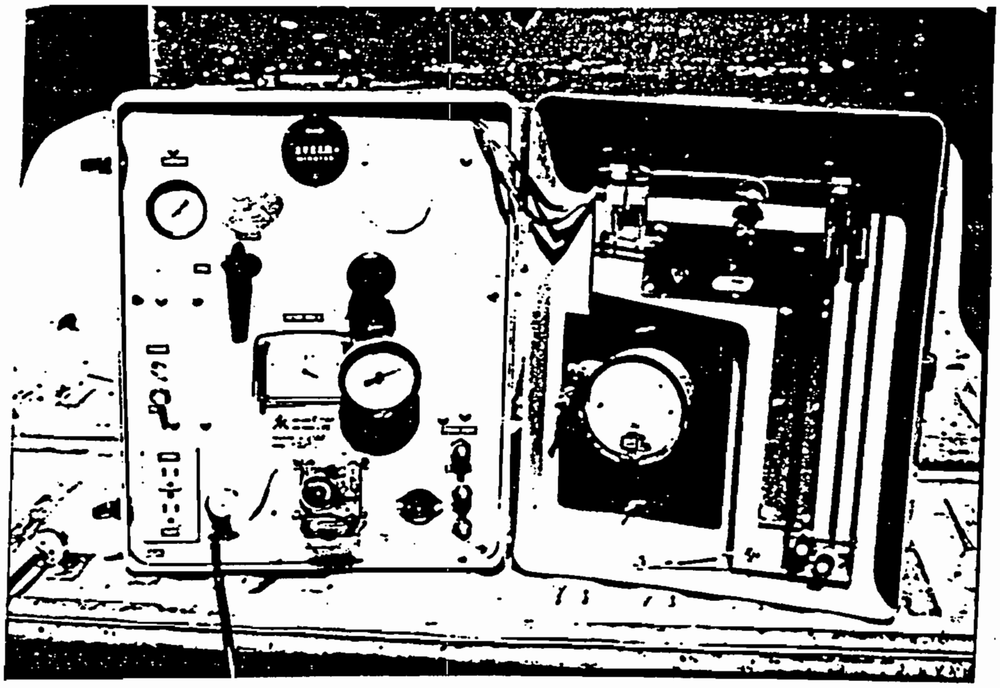
P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

KOOGLER & ASSOCIATES

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES

SOURCE SAMPLING EQUIPMENT



METER BOX

Equipment used in Source Sampling is either manufactured by or assembled by Koogler & Associates. The guidelines followed are A.P.T.D. 0581, Details of Isokinetic Source Sampling Equipment, and A.P.T.D. 0576, Maintenance, Calibration and Operation of Isokinetic Source Sampling Equipment.

PROJECT PARTICIPANTS

PROJECT PARTICIPANTS

John B. Koogler, Ph.D., P.E.	Project Advisor
N. Mason Joye, Jr.	Project Supervisor
Rodney C. Paul	Field Test Crew
Stephen S. Bell	Field Test Crew
Jose Garcia	Field Test Crew

BEST AVAILABLE COPY

1-14-91
2:45 - 3:23

Radian | Austin, Texas

Val Harris → Dan Davis
512-454-4797 [5768]
John Koogler }

1-14-91
@3:20-:33

Paul Reinerman - FCS - ~~with [illegible]~~
(test results)
Greg Worley
(PSD)

FL has got to receive the app + fee for continuous usage; ∴, 30 days

Call Brian Beals on EPA's position

For Routing To Other Than The Addressee

To: ______________ Location: ______________
To: ______________ Location: ______________
To: ______________ Location: ______________
From: ______________ Date: ______________

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

TO: Steve Smallwood

FROM: C.S. Lee

DATE: November 6, 1990

RE: Florida Crushed Stone, C P & L Tire-derived Fuel Tests and Wastewater Treatment Sediment Tests at Cement Kiln

Enclosed please find the copies of the subject tests observation reports for your reference. If you want copies of the complete stack test reports, please let me know (Extension 417).

CSL/js

Encl

Department of Environmental Regulation

Routing and Transmittal Slip

To: (Name, Office, Location)

1. ~~Steve Smallwood~~ YAR 11/16
2. DARM
3. TT
4. Clair - Fyi + handling

Remarks:

Bruce

RECEIVED

NOV 13 1990

DER - BAQM

From C. S. Lee

Date 11/7/90

Phone

MEMORANDUM

TO: File

THRU: Bill Thomas

FROM: Scott Sheplak, C. S. Lee, and Jason Gorrie

DATE: November 2, 1990

RE: Florida Crushed Stone, C P & L
Wastewater Treatment Sediment Tests at Cement Kiln

On October 31, 1990, Scott, Lee and Jason visited Florida Crushed Stone to witness compliance testing of the cement kiln using wastewater treatment sediment from the Jacksonville's Northside Generating Station as a raw feed material to the dry process. Koogler & Associates performed the testing. Test team members were Mason Joye, Rodney Paul, Steve Bell and Andrew Bass. Plant contacts were Tom Mountain, Curtis Lauer, and Andy Hollingshead.

Koogler & Associates conducted a modified Method 5 for PCDDs and PCDFs and PAHs, a VOST for VOC and benzene, and a multi-metals test on October 31, 1990. Koogler & Associates also collected a wastewater sediment sample for analysis using EPA Method 608 (Organochlorine pesticides and PCBs) and EPA Method 610 (PAHs). Department personnel witnessed the sediment feeding and multi-metals sample recovery for Run #1. Florida Crushed Stone agreed to and completed testing for dioxins and furans on November 1, 1990. Florida Crushed Stone plans to submit the test results together with the tire derived fuel results. The laboratory analysis, according to Mason Joye, takes 45 days.

The wastewater treatment sediment was transferred from a rail car into a septic tank and taken to the grinding mill location. The sediment was kept in solution by the addition of pressurized water and pumped via hose into the duct between the grinding mill and grit separator. Approximately 6 gpm (1.62 TPH) of sediment was fed into the dry feed. Curtis Lauer measured the flow rate at 30 minute intervals. Florida Crushed Stone intends to mix dry sediment with dry raw materials prior to the grinding mill. No source modifications would be necessary to accomplish this. The sediment feed comprised roughly 1% of the total raw materials fed to the kiln. The cement production rate was approximately 125 TPH and clinker 80 TPH. Continuous emission monitors indicated 10% opacity 7.5% oxygen, 187 ppm SO_2, and stack temperature of 440° F.

During the multi-metals sample recovery for Run #1, the probe line acid wash and DI water were spilled. Koogler has been informed that the Department can not accept the results for Run #1.

MEMORANDUM

TO: File

THRU: Bill Thomas

FROM: Scott Sheplak, C.S. Lee, Jason Gorrie

DATE: September 25, 1990

SUBJECT: Florida Crushed Stone, C P & L
Tire-derived Fuel Tests at Cement Kiln

On September 21, 1990, Scott, Lee, & Jason visited Florida Crushed Stone to witness compliance testing of the cement kiln using tire-derived fuel. Koogler & Associates performed the testing. Test team members were Rodney Paul, Mason Joye, and Jose Garcia. Plant contacts were Tom Mountain and Curtis Lauer.

Koogler & Associates performed baseline tests prior to the compliance tests. On September 20, 1990, Koogler conducted two multi-metals tests. On September 21, Koogler conducted one multi-metals test, one VOST, a modified Method 5 for semi-volatiles, a modified Method 5 for furans and dioxans, an SO_2 test and a NOX test. Department personnel split up and witnessed the multi-metals testing on September 21. Lee and Jason audited the testing crew and Scott monitored tire loading. Tire-derived fuel was loaded to the kiln through a chute. Workers loaded one bucket of tires, approximately 19 pounds/bucket, every 30 seconds. Approximately 1.14 tons per hour of tires were fed to the kiln during the test. It was noted that the tire feed rate may need to be adjusted for dirt. Maybe 1 or 2 pounds of dirt was present in a bucket. Coal was fed to the kiln at approximately 7.8 TPH. Tire-derived fuel provided 15% of the total heat input to the cement kiln. Cement production during the test was 115 TPH and clinker 75 TPH. The power plant produced 87.3 MW of electricity. Continuous emission monitors indicated 10% opacity, 10% oxygen, 220 ppm of sulfur dioxide and stack temperature of 380° F. Jason performed a VE during the test. The 6 minute average was approximately 11% opacity.

Department personnel noted a potential buildup of tire residual inside the refractory lined chute which fed the cement kiln. Pictures were taken of the inside of the chute and of the tire loading operation.

SMS/js

Board of County Commissioners

Hernando County

20 North Main Street, Room 460
Brooksville, FL 34601
(904)-754-4000
(904)-754-4002

RECEIVED
NOV 13 1990
DER - BAQM

November 1, 1990

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

Dear Mr. Fancy:

Mr. Segundo Fernandez of Oertel, Hoffman, Fernandez & Cole, P.A. is acting as the County's representative for air sources in Hernando County as related to Florida Mining and Materials and Florida Crushed Stone. Mr. Fernandez' firm will review all permitting documents to ensure that the County's interests are protected. Please forward all correspondence relating to these facilities to the attention of Mr. Segundo Fernandez, P.A. at the following address:

Oertel, Hoffman, Fernandez, and Cole, P.A.
2700 Blair Stone Road
Post Office Box 6507
Tallahassee, FL 32314-6507

Mr. Bruce Mitchell of your staff indicated that DER is required to copy the County but is not required to copy the County's legal representative. The County is requesting that you forward the County's official notification to Mr. Fernandez.

If you should need any additional information, please contact me.

Sincerely,

Hernando County Board of
County Commissioners

Henry D Ledbetter

Henry D. Ledbetter
Chairman

KPL/mre

cc: Richard Garrity, DER (Tampa Office)
Charles B. Hetrick, County Administrator
R. Bruce Snow, County Attorney
Segundo Fernandez, P.A., OHF&C
Larry Jennings, Planning Department Manager
B. Mitchell
J. Reynolds
CHF/BA

BEST AVAILABLE COPY

P 280 742 405

RECEIPT FOR CERTIFIED MAIL

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

Sent to Herb Shapiro
Street and No. PO Box 1685
P.O., State and ZIP Code Brooksville, Fl

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 11-5-90
FCS

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

● **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:
Herb Shapiro
P.O. BOX 1685
Brooksville, Fl
34605

4\. Article Number
P280 742 405

Type of Service:
☐ Registered ☐ Insured
☑ Certified ☐ COD
☐ Express Mail ☐ Return Receipt for Merchandise

Always obtain signature of addressee or agent and DATE DELIVERED.

5\. Signature — Addressee
X

6\. Signature — Agent
X

7\. Date of Delivery
12-13-90

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

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

Florida Department of Environmental Regulation

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

Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary

November 5, 1990

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Herb Shapiro
P. O. Box 1685
Brooksville, Florida 34605

Dear Mr. Shapiro:

Re: Response to Letters on Florida Crushed Stone

The Department has reviewed your letters (FAX) regarding Florida Crushed Stone's (FCS) test project to utilize wastewater sludge in their clinker kiln. As a response to these letters, the Department offers the following comments:

o the material, which is to be used as an additive to the clinker, is essentially innocuous, based on analyses of the material;

o the material has been determined to be nonhazardous in accordance with RCRA's EP toxicity and TCLP test criteria;

o of the samples analyzed for total organics, only one has been found to contain a detectable level (0.2 weight percent);

o the material is being used as an additive to the clinker, not as a fuel, because the material is not burnable;

o even though exempted to mass test for dioxin and furans due to the lack of the constituents in the sludge to form these compounds, FCS has agreed to perform these tests;

o a public hearing is not required pursuant to section 403.061, Florida Statutes, which is the regulation used to authorize the testing program; also, the nature and short duration of the project is such that it does not require a SIP revision, which would require a public hearing;

o the rules and regulations contain pollutant allowable levels that, if applied for, are permittable unless the proposed levels violate increment or standards;

- the clinker kiln is subject to the federal new source performance standards, 40 CFR 60, Subpart F;

- the testing period is of short duration and the test data will be evaluated to determine if the kiln and its associated control system can accommodate the sludge without any physical modification(s), such as a retrofit of additional controls, etc.; and,

- if FCS desires to continually use this material, it will have to be permitted to do so through the Department's permitting procedures.

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.
Chief
Bureau of Air Regulation

Attachments

CHF/BM/plm

FROM: HERB SHAPIRO 904-799-7955

TO: MR C.H. FANCY
FLORIDA DER
TALLAHASSEE FL.
(COPY FOR BRUCE MITCHELL, ALSO)

A LETTER STATING SOME OF MY OBJECTIONS TO THE PROPOSED WASTE DISPOSAL TEST BURN AT THE F.C.S. KILN IN HERNANDO COUNTY.

I ALSO ATTACH A SECOND LETTER REGARDING THE PRESENT INDUSTRIAL HAZE PROBLEM IN HERNANDO.

3 PAGES TOTAL INCLUDING THIS ONE

For whom it may concern

I understand DER intends to let Florida Crushed Stone attempt to dispose of 400 tons of toxic industrial sludge in its kiln in Hernando County, and this attempted disposal, which is referred to as a test, is supposed to be allowed in spite of the fact that;

1. No public hearing was held
2. Results of a recent tire burn test are not yet in hand
3. Although this new proposed 'test' burn is supposed to be an emissions test, FCS has asked for and received an exemption from testing the actual emissions for dioxins and furans, which are potentially the most toxic and dangerous emissions of all.

Considering that this kiln equipment is more than Forty years old [the plant being a previously condemned coal burner from Indiana] if DER had the test results from the tire burn in hand, this new test probably wouldn't be allowed anyway.

Please hold off on this new test, at least until competent professionals have an opportunity to study the proposed test protocol in its new form, and can assure the public safety.

Herb Shapiro
Box 1685
Brooksville, Florida
34605

For whom it may concern;

During the last few seasons, here in Hernando County, there have been days when the sky is filled with what seems to be an industrialhaze.

Years ago, the sky was crystal blue most of the time, unless of course it was raining.

What is it that has changed to create this industrial haze?

The answer is smokestacks, coal burning smoke stacks-several of them.

When the FM&M company first proposed building a kiln, just north of town, about twelve years ago, the mining company promised to use oil, and for a year or two, they did use oil.

But then, with no local notice or apology, they switched to dirty coal, and thousands of tons a year of it, too.

So much for mining company promises.

And to make things worse, when the kiln repeatedly failed its emission tests, instead of being closed, or forced to comply, the DER increased the kilns allowed level of toxic emissions by ten times.

Thats one thousand percent.

It must be nice to have friends in high places.

The previously condemned smoke stacks used by FCS here in Hernando County have received temporary permission to test burn old tires.

And an ocala asphalt company runs a brown smoke spitting kiln near Highway 98, in an attempt to de-contaminate gasoline and lead tainted soil.

For a county which basically had no smoke stacks at all ten years ago, that's quite a cumulative increase and environmental burden.

Now, to save what clean air and whater we have left, I propose that the County Commissioners draft a resolution declaring Hernando County a non-attainment area for any new or additional sources of industrial emissions or pollution until studies can be done to protect the health of the citizens.

It's obvious that in the past, the DER has not protected us.

WE must do it for our selves, while we can.

Lets protect the county from any additional despoilment of our air and water.

Herb Shapiro
BROOKSVILLE, FLORIDA
904-799-7955

COPY FOR:

REPLY, IF ANY, TO:

H. SHAPIRO
BOX 1685
BROOKSVILLE, FLORIDA
34605

OERTEL, HOFFMAN, FERNANDEZ & COLE, P.A.
ATTORNEYS AT LAW

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R. L. CALEEN, JR.
C. ANTHONY CLEVELAND
TERRY COLE
ROBERT C. DOWNIE, II
MARTHA J. EDENFIELD
SEGUNDO J. FERNANDEZ
KENNETH F. HOFFMAN
KENNETH G. OERTEL
HAROLD F. X. PURNELL
PATRICIA A. RENOVITCH
SCOTT SHIRLEY
THOMAS G. TOMASELLO
W. DAVID WATKINS

SUITE C
2700 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301

MAILING ADDRESS:
POST OFFICE BOX 6507
TALLAHASSEE, FLORIDA 32314-6507

TELEPHONE (904) 877-0099
FACSIMILE (904) 877-0981

JOHN H. MILLICAN
ENVIRONMENTAL CONSULTANT
(NOT A MEMBER OF THE FLORIDA BAR)

J. P. SUBRAMANI, PH. D., P. E.
ENVIRONMENTAL CONSULTANT
(NOT A MEMBER OF THE FLORIDA BAR)

November 1, 1990

HAND DELIVERY

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

RE: (1) Florida Crushed Stone Company; Amendment to AC 27-118674; and

(2) Florida Mining and Materials Company; Amendments to AC 27-169616 and AC 27-173474.

Dear Mr. Fancy:

Our law firm has been retained by Hernando County to evaluate the proposals by the Florida Crushed Stone Company and Florida Mining and Materials to respectively burn industrial sludge, and tires and used oil, in their cement manufacturing operations. We respectfully request that the Department reconsider the permit authorization granted to Florida Crushed Stone Company to burn industrial sludge. We also request the Department not to allow the burning of the tires in the cement kilns owned by the Florida Mining and Materials Company. Our reasons are stated below.

1. Proposal by Florida Crushed Stone Company to burn industrial sludge (AC 27-118674)

Our evaluation of this proposal clearly indicates that the Department approval was granted based on an inadequate and inappropriate review of the EP and TCLP toxicity characterization of the industrial sludge from the Jacksonville Electric Authority (JEA). The EP and TCLP procedures evaluate the solubility characteristics of the metals in the water medium and have no direct relationship to air pollution evaluation factors.The EP and TCLP characterization, while indicative of heavy metals content, is primarily appropriate for evaluating the threat to groundwater and surface water contamination.

Secondly, the Department authorization appears to have been based on the test results of the Gifford-Hill Cement Company in Harleyville, South Carolina. That test report indicates that the metals content of the industrial sludge are much lower than those of the JEA sludge. A comparison of the concentration of certain metals is listed below.

PARAMETER	SOUTH CAROLINA SLUDGE (ppm)	JEA SLUDGE (ppm)
Arsenic	40	6,500
Molybdenum	910	16,000
Nickel	8,200	20,000
Vanadium	26,800	64,000
Selenium	24	330

Additionally, the JEA sludge contains 170,000 ppm iron, 41,000 ppm magnesium, 66,000 ppm sulfates and 5,800 ppm chlorides. No information is available as to the Department's evaluation of air pollution effects due to high contents of these components in the sludge. We also note that the Department has relaxed the requirement of emission testing for dioxins and furons. The chemistry for dioxin formation is not clearly understood and therefore testing for the precursors may not yield reliable information.

2. Proposal by Florida Mining and Materials Company to burn tires and used oil

The company's proposal is to burn as much as 70 percent supplementary fuel consisting of tires and used oil. We believe there will be increases in the emissions of many air pollutants, especially, fine particulate matter, and heavy metals such as arsenic, cadmium, chromium, lead and zinc. We also believe that there will be significant increase in the emissions of sulfur dioxide, acid mist and polynuclear aromatic compounds. We learned that the Department had earlier authorized Florida Crushed Stone to test burn tires in its Brooksville facility. We would appreciate receiving copies of the stack test emissions for the above pollutants. We would also appreciate receiving test reports for the Modesto Energy facility located in Westley, California.

Please feel free to contact me if you have any questions.

Sincerely,

JP Subramani

J. P. Subramani

JPS:gg

cc: Bruce Snow, Esq.
Kathy Liles

BEST AVAILABLE COPY

10-10-90 p.m.

Clair,

The below was sent Fed Ex.

Department of Environmental Regulation

Routing and Transmittal Slip

To: (Name, Office, Location)

1. Representative Chuck Smith
2. 610 West Jefferson Street
3. Brooksville, Florida 34601
4.

Remarks:

Dear Sir:

Per your request, I have enclosed the following:

① FL Crushed Stone: Tire Derived Fuel Issue
  a. Technical Evaluation & Preliminary Determination
  b. Final Determination
  c. Attachments are included with the packages

② FL Crushed Stone: JEA wastewater treatment sludge issue
  a. TE & PD
  b. FD
  c. Associated attachments

If there are any questions or if we can be of further service, please give me a call at (904)488-1344.

Sincerely,

C. H. Fancy

From R Bruce Mitchell for
C. H. Fancy, Chief
Bureau of Air Regulation

Date
10-10-90

Phone
(904) 488-1344

[illegible] Bruce's Copy - F & B

REPORT OF CONTACT WITH ELECTED OR APPOINTED OFFICIAL OR STAFF

TO: Jim Lewis

FROM: Clair Fancy DATE: 10/10/90

(Person who called) Rep. Chuck Smith was from the office of

(name) (phone no.) SC 663 6775

Summary of conversation:

Asked about Bureau permit recently issued to Florida Crushed Stone to do a test burn of wastewater treatment sludge from Jacksonville Electric Authority. We told him it had been public noticed and that there were no requests for administrative hearings. We sent him a copy of several documents (see attachment).

He was told that we received an application from Florida mining and materials to burn waste fuels in their cement kiln on Friday, October 6.

He seemed interested and satisfied with our response

SENDER'S COPY

FEDERAL EXPRESS

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Sender's Federal Express Account Number: 1063-1506-2
Date: 12/10/90

1 From (Your Name) Please Print: Clair Fancy
Your Phone Number (Very Important): 904-487-3922
Company: DEPT OF ENVIR REG/STATE OF FLA
Department/Floor No.:
Street Address: 2600 BLAIR STONE RD RM 105
City: TALLAHASSEE
State: FL
ZIP Required: 32399

2 To (Recipient's Name) Please Print: Rep. Chuck Smith
Recipient's Phone Number (Very Important): ( )
Company:
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip® Codes.): 610 West Jefferson St
City: Brooksville
State: FL
ZIP Required: 34601

YOUR INTERNAL BILLING REFERENCE INFORMATION (First 24 characters will appear on invoice.): ~~565002~~ 500202-2051

IF HOLD FOR PICK-UP, Print FEDEX Address Here
Street Address:
City:
State:
ZIP Required:

3 PAYMENT 1 ☒ Bill Sender 2 ☐ Bill Recipient's FedEx Acct. No. 3 ☐ Bill 3rd Party FedEx Acct. No. 4 ☐ Bill Credit Card
5 ☐ Cash/Check
Acct./Credit Card No.
Exp. Date

4 **SERVICES** (Check only one box)

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- 11 ☐ YOUR PACKAGING
- 16 ☐ FEDEX LETTER *
- 12 ☒ FEDEX PAK *
- 13 ☐ FEDEX BOX
- 14 ☐ FEDEX TUBE

Standard Overnight Service (Delivery by next business afternoon†)
- 51 ☐
- 56 ☐ FEDEX LETTER *
- 52 ☐ FEDEX PAK *
- 53 ☐ FEDEX BOX
- 54 ☐ FEDEX TUBE

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- 30 ☐ ECONOMY TWO-DAY SVC.

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- 80 ☐ DEFERRED HEAVYWEIGHT **

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*Declared Value Limit $100.
**Call for delivery schedule.

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- 1 ☐ HOLD FOR PICK-UP (Fill in Box H)
- 2 ☒ DELIVER WEEKDAY
- 3 DELIVER SATURDAY (Extra charge) (Not available to all locations) ☐
- 4 ☐ DANGEROUS GOODS (Extra charge)
- 5 ☐
- 6 ☐ DRY ICE ____ Lbs.
- 7 ☐ OTHER SPECIAL SERVICE
- 8 ☐
- 9 ☐ SATURDAY PICK-UP (Extra charge)
- 10 ☐
- 11 ☐ DESCRIPTION
- 12 ☐ HOLIDAY DELIVERY (If offered) (Extra charge)

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1	1	
Total 1	Total 1	Total

DIM SHIPMENT (Chargeable Weight) ☐ ____ lbs.

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1 ☐ Regular Stop 3 ☐ Drop Box
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FORMAT #041

041

CC: HEILMAN FM&M
HARVEY
RHODES
SMALLWOOD

Bruce Mitchell

COMMUNICATION MEMORANDUM

RECEIVED
OCT 9 1990
DER-BAQM

DATE: 10/10 MEMO BY: Coram

DISCUSSION WITH: Rep. Chuck Smith PHONE #: SC 663-6775

REPRESENTING:

SUBJECT: Fla. Crushed Stone's approval to Test Burn Power Plant Industrial Waste Sludge.

MESSAGE:

Rep. Smith called concerning newspaper article on DER's approval of a test burn by Florida Crushed Stone in Brooksville, to burn in it's kilns sludge from Jacksonville Electric's Authority Northside power plant. Rep Smith wants briefing from DER.

Called Richard Breitmoser w/ JEA (632-6253). Sludge is from old perc ponds used to dispose of low volume wastes (boiler blowdown, boiler cleaning, and demineralizer regeneration). ~~[illegible]~~ Sludge is considered non-hazardous based on EP toxicity and TCLP tests. Contains levels of iron and silica which make it useful as Portland cement feedstock.

Called Harry Kerns in SW district air program. Said Test Burn approval given by BAQM in Tallahassee.

over →

Richard Horvey contacted
Clare Forcey w/ CAP. Richard
asked Clare to call Rep. Smith
this morning to discuss situation.

PM: 9-28-90
Leesburg, FL

File Copy
General

FCS
FLORIDA CRUSHED STONE COMPANY

RECEIVED
OCT 1 1990
DER - BAQM

September 28, 1990

Mr. C. H. Fancy, P. E.
BUREAU OF AIR REGULATION
DEPARTMENT OF ENVIRONMENTAL
REGULATION
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Mr. Fancy:

After Mr. Crabill's departure from Florida Crushed Stone Company, somehow Mr. Randy Thompson, our General Manager of Geotech Industries (one of our subsidiaries) started receiving correspondence from your office.

Mr. Don A. Stone is our new Corporate Environmental and Safety Manager and all correspondence regarding permitting and compliance should be addressed to him at our Leesburg office. Thank you for making this correction and we apologize for this confusion in our personnel transition.

Should you have any questions, please do not hesitate to call.

Sincerely,

Linda Fairbanks

Linda Fairbanks
Environmental Department Secretary

lf:60
fderchg.9wp

cc: Don A. Stone
Bruce Mitchell 10-1-90

RECEIVED

SEP 24 1990

DER - BAQM

THE TAMPA TRIBUNE

Published Daily
Tampa, Hillsborough County, Florida

State of Florida
County of Hillsborough } ss.

Before the undersigned authority personally appeared R. Putney, who on oath says that he is Accounting Manager of The Tampa Tribune, a daily newspaper published at Tampa in Hillsborough County, Florida; that the attached copy of advertisement being a

LEGAL NOTICE HERNANDO EDITION

in the matter of

CEMENT KILN

was published in said newspaper in the issues of

August 31, 1990

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

R Putney

Sworn to and subscribed before me, this 19 *day of* September, *A.D. 19* 90

Debra Lynne Bouchard

(SEAL)

Notary Public, State of Florida
My Commission Expires Jan. 6, 1993
Bonded Thru Troy Fain - Insurance Inc.

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

The Department of Environmental Regulation gives notice of its intent to issue a permit amendment to FCSC (Florida Crushed Stone Company), Environmental Department, P. O. Box 490300, Leesburg, Florida 34749-0300, to conduct a performance test on the cement kiln while processing wastewater treatment sediment from the Jacksonville Electric Authority's (JEA) Northside Generating Station up to a maximum of 1.4 percent of the total raw material feed rate on a dry weight basis (equivolent to 1.8 tons per hour). The existing cement kiln was permitted under construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091. Even though the claim is that there will be no actual pollutont emission increase, which will have to be verified, the source is not permitted to process wastewater treatment sediment in accordance with referenced permits. The purpose of this amendment is to allow FCSC to obtain the data necessary to determine whether the cement kiln is capable of accomdating/processing the wastewater treatment sediment from JEA's Northside Generating Station under the cement kiln's present physical configuration and what regulations the cement kiln will be subject to if it is to be permitted to process the wastewater treatment sediment from JEA's Northside Generating Station. The proposed project will occur at the applicant's existing facility located approximately 3.5 miles NW of Brooksville; Hernando County, Florida. The Department is issuing this intent to issue for the reasons stated in the proposed letter amendment to the construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091.

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

The Petition shall contain the following information:

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed; (b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

(d) A statement of material facts disputed by Petitioner if any;

(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;

(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and

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

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

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

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

Department of Environmental Regulation
Southwest District Office
4520 Oak Fair Boulevard
Tampa, Florida 33610-7347

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

4201 8/31/90

FCS

FLORIDA CRUSHED STONE COMPANY
CEMENT / POWER / LIME PLANT

RECEIVED
SEP 18 1990
DER - BAQM

TELECOMMUNICATION TRANSMITTAL

TO: Bruce Mitchell

ADDRESS: FDER

PHONE: 904-488-1344

FROM:

TOTAL NUMBER OF PAGES 3 INCLUDING THIS COVER SHEET

DATE: Sept. 19, 1990

CANON FAX 330 - (904) 796-6281

IF YOU DO NOT RECEIVE ALL PAGES, PLEASE CALL BACK AS SOON AS POSSIBLE AT THE TELEPHONE NUMBER LISTED BELOW.

PHONE: (904) 799-7881 EXT. 211

TELECOMMUNICATOR: Sheryl

REMARKS The original will follow via Federal Express. I will notify you when to expect delivery

Thanks

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ■ FAX 377-7158

FAX TRANSMITTAL FORM

TO: BRUCE MITCHELL
FDER TALLAHASSEE
FAX 904/922-6579
307-90-05

FROM: JOHN KOOGLER

SENT BY: JK

DATE: 9/20/90

FAX PHONE: 904-377-7158

The text being transmitted consists of 2 pages PLUS this one.

REMARKS: PROOF OF PUBLICATION
FCS - WASTEWATER SEDIMENT

RECEIVED
SEP 14 1990
DER - BAQM

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

KA 307-90-05

September 12, 1990

VIA FAX

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

Subject: Florida Crushed Stone CPL Plant
Amendment to AC27-118674 and
PSD-FL-091
Use of Wastewater Treatment Sediment
as Cement Plant Feed Material

Dear Mr. Fancy:

By letter dated August 22, 1990, the Department expressed its intent to grant the Florida Crushed Stone Company approval to conduct tests to determine the feasibility of using a wastewater treatment sediment as a raw feed material to the dry process Portland cement plant operated by the company in Hernando County, Florida. The public notice of the Department's intent was published by Florida Crushed Stone on August 31, 1990. As Engineer of Record for the proposed test, I discussed certain test conditions and the restrictions on the utilization of wastewater treatment sediment contained in the Department's letter of August 22, 1990, with Mr. Bruce Mitchell of your staff. I offered the following comments on these matters.

Emission Test Requirements

Air pollutant emission measurements were proposed for particulate matter, sulfur dioxide and several metals in my letter of June 25, 1990, to the Department requesting approval for the subject test. In the Department's letter of intent dated August 22, 1990, emission measurements for additional metals and various organic compounds are proposed. Specifically, the Department suggests emission measurements for the following organic compounds:

Dioxins and Furans,
Polynuclear aromatic hydrocarbons,

Benzene, and
Volatile organic compounds.

In discussing the organic compound emission measurements with Mr. Bruce Mitchell, it appears the purpose of these tests is to demonstrate that organic compounds in the wastewater treatment sediment will not increase organic compounds emissions during the processing of the sediments.

Analyses of a typical wastewater treatment sediment from the Jacksonville Electric Authority (JEA) Northside Generating Station showed no organic material in most of the samples analyzed and only trace amounts of organic carbon in one or two of the samples. The analyses that I have cited were presented to the Department, along with other materials, when requesting approval for the subject test.

As no significant quantities of organic compounds are expected in the wastewater treatment sediment, it is proposed that tests be conducted on the sediment to demonstrate the absence of organic compounds. These tests would be conducted in lieu of the more costly and manpower intensive emission measurements to demonstrate the absence of organic compounds.

Mr. Mitchell stated that his reason for suggesting emission measurements for dioxins and furans was the potential presence of polychlorinated biphenols (PCBs) or other chlorinated organic compounds in the sediment. Similarly, Mr. Mitchell's reason for suggesting emission measurements for polynuclear aromatic hydrocarbons was the potential presence of these types of compounds in the sediment. In lieu of conducting emission measurements for dioxins, furans and polynuclear aromatic hydrocarbons, it is proposed that the wastewater treatment sediment be analyzed for chlorinated organic compounds using test Method 608 (Organochlorine Pesticides and PCBs) and for polynuclear aromatic hydrocarbons using test Method 610 (Polynuclear Aromatic Hydrocarbons). The elimination of the emission measurements for dioxins, furans and polynuclear aromatic hydrocarbons will reduce the level of effort required for the emission measurements by approximately 60 percent and the proposed tests for chlorinated organics and polynuclear aromatic hydrocarbons in the sediment will provide the Department with the assurance that there will be no potential for chlorinated compounds or polynuclear aromatic hydrocarbons in the stack gas.

We have no objection to conducting the proposed emission measurements for volatile organic compounds and benzene; however, I am requesting that the Volatile Organic Sampling Train (VOST) method be permitted for making the measurements for both benzene and volatile organic compounds. The VOST method is equivalent to the EPA Method 18 alternative allowing a packed column for sample collection. Additionally, the VOST samples can be analyzed for all volatile organic compounds; not just benzene. The total emission rate of volatile organic compounds will be obtained from the VOST samples by totalling the emission rates of individual volatile organic compounds. The use of the VOST method will provide the Department with the benzene emission rate, the emission rate of individual volatile organic compounds and the emission rate of total volatile organic compounds, and it will reduce the level of effort required in the field for conducting the emission measurements.

As stated previously, we have no objection to the required emission measurements for metals, including mercury. I would suggest, however, that the test method for metals be the EPA multi-metals train rather than EPA test Method 5. The EPA multi-metals train is a modification of Method 5 and was developed specifically by EPA for measuring the emission rates of metals.

Limitations on the Use of Wastewater Treatment Sediment

The test requested by Florida Crushed Stone and approved by the Department will be conducted with wastewater treatment sediment from the JEA Northside Generating Station. If the test proves successful, which we have every reason to believe it will, Florida Crushed Stone would like to have the option to utilize similar wastewater treatment sediment from other utilities. I can understand the Department's reservation to a blanket approval to process sediment from other utilities but, on the other hand, I don't feel that it is necessary or justified to require Florida Crushed Stone to perform a compliance test similar to that outlined in the Department's letter of August 22, 1990, for each sediment proposed for processing.

I would propose that aoproval to process wastewater treatment sediment from other utilities be considered by the Department on a case-by-case basis. It is suggested that Florida Crushed Stone would request approval to process wastewater treatment sediment from utility "X". Along with the request, Florida Crushed Stone would provide the Department with an organic and inorganic analyses of the sediment. If Florida Crushed Stone can demonstrate that the proposed sediment from utility "X" is predominantly inorganic in nature and contains no significant quantities of polynuclear aromatic hydrocarbons, chlorinated hydrocarbons or other hydrocarbon compounds, the Department will approve the request for the processing of that sediment.

The approval to process wastewater treatment sediments from JEA, as well as other utilities, would be contingent on the routine sampling of all sediment delivered to Florida Crushed Stone for purposes of demonstrating a continued consistency in sediment composition and to assure the

Department that none of the sediment contains significant quantities of organic compounds nor abnormal quantities of specific inorganic compounds.

It is recognized that the Department's approval for Florida Crushed Stone to continue processing sediment from JEA and the possibility of processing sediment from other utilities is contingent upon the subject tests showing no increase in air pollutant emissions or upon Florida Crushed Stone amending the subject permits if increased emissions should result from the processing of sediment.

In summary, Florida Crushed Stone is requesting approval to process wastewater treatment sediment from utilities other than JEA:

1. if the subject compliance tests are successful and show no increase in air pollutant emissions (or if Florida Crushed Stone amends existing permits to account for increased emissions), and

2. if Florida Crushed Stone applies for Department approval to process sediments from other utilities on a case-by-case basis and can demonstrate that the sediments are predominantly inorganic in nature and contain no significant quantities of certain organic compounds.

I appreciate your consideration of these two matters. As we are anticipating the beginning of compliance tests next week (week of September 17, 1990) for the tire derived fuel and possibly, the wastewater sediments (if final approval is forthcoming), I would appreciate your early comment.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:wa

cc: Mr. Tom Mountain, FCS
Mr. Dan Davis, Radian

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

FAX TRANSMITTAL FORM

TO: Bruce Mitchell

FROM: John Koogler

SENT BY: Windy

DATE: 9/12/90

FAX PHONE: 904-377-7158

The text being transmitted consists of 4 pages PLUS this one.

REMARKS:

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

KA 307-90-05

September 12, 1990

VIA FAX

9-13-90
~~BA~~ ~~BA~~ Cbs
CHF,
FYI. Initial;
forward. Return to
Betty. Hanson
Bruce

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

Subject: Florida Crushed Stone CPL Plant
Amendment to AC27-118674 and
PSD-FL-091
Use of Wastewater Treatment Sediment
as Cement Plant Feed Material

Dear Mr. Fancy:

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Dioxins and Furans,
Polynuclear aromatic hydrocarbons,

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

RECEIVED
SEP 4 1990
DER - BAQM

AUG 29 1990

4APT-AE

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

RE: Florida Crushed Stone (PSD-FL-091)

Dear Mr. Fancy:

This is to acknowledge receipt of your Notice of Intent to Issue a permit for the above referenced source's request to process wastewater treatment sediment in their existing cement kiln for the purposes of emissions testing, dated August 22, 1990.

We have reviewed the package as requested. Based on the lack of emission factors for this material, your plan of testing pollutant emissions before and after the modification should be sufficient to determine applicability of new source review.

Thank you for the opportunity to review and comment on this package. If you have any questions on these comments, please contact Mr. Gregg Worley of my staff at (404) 347-2904.

Sincerely yours,

Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides, and Toxics
Management Division

cc: B. Mitchell
B. Thomas, SW Dist
CHF/BA

BEST AVAILABLE COPY

Department of Environmental Regulation

Routing and Transmittal Slip

To: (Name, Office, Location)

1. Dr. John B. Koogler, P.E.
2. Koogler's Associates, Environmental Services
3. 4014 N.W. 13th Street
4. Gainesville, Florida 32609

Remarks:

Dear Dr. Koogler,

Please find enclosed the Intent pkg. on the wastewater treatment sludge, the April 4, 1990 EPA letter, and the recently received EPA letter dated August 20, 1990. The original package sent to you has not been returned to us.

If there is anything else that we can do, please let us know.

Sincerely,

From: R Bruce Mitchell

Date: 8-29-90

Phone: (904) 488-1344

ION AGENCY

RECEIVED
AUG 24 1990
DER - BAQM

dated June 27, 1990,
est to process
ng cement kiln. As
staff and Mr. Gregg
the following comments

4, 1990, concerning a
ed facility, the change
not be a "major"
f Significant
d in a "significant"
ssions would be tested
der to correctly

process wastewater
major" modification
ollutants. Based on the
your plan of testing
ification should be
source review. Also, a
determination should be made as to whether this project is related to the earlier fuel switch and whether the increases in emissions from both modifications should be considered together in determining applicability.

PM
8-21-90
Atlanta, Ga

File Copy

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

AUG 20 1990

4APT-AE

RECEIVED
AUG 24 1990
DER - BAQM

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

RE: Florida Crushed Stone (PSD-FL-091)

Dear Mr. Fancy:

This is to acknowledge receipt of your letter dated June 27, 1990, concerning the above referenced source's request to process wastewater treatment sediment in their existing cement kiln. As discussed between Mr. Bruce Mitchell of your staff and Mr. Gregg Worley of my staff on July 26, 1990, we have the following comments to offer.

As presented in my letter to you dated April 4, 1990, concerning a proposed switch in fuel at the above referenced facility, the change in the method of operation of the kiln would not be a "major" modification for the purposes of Prevention of Significant Deterioration (PSD) unless the switch resulted in a "significant" increase in emissions. It was noted that emissions would be tested both prior to and after the fuel switch in order to correctly determine emissions increases.

Similarly, the addition of the capability to process wastewater treatment sediments would not constitute a "major" modification unless there was a significant increase in pollutants. Based on the lack of emission factors for this material, your plan of testing pollutant emissions before and after the modification should be sufficient to determine applicability of new source review. Also, a determination should be made as to whether this project is related to the earlier fuel switch and whether the increases in emissions from both modifications should be considered together in determining applicability.

The cement kiln will be subject to 40 C.F.R. Part 61, Subpart E which regulates stationary sources that incinerate or dry wastewater treatment sludge (sediment). This regulation will apply regardless of the mercury content of the sediment. Approval for processing the sediment by the Florida DER is necessary under 40 C.F.R. § 61.08.

Thank you for the opportunity to review and comment on this package. If you have any questions on these comments, please contact Mr. Gregg Worley of my staff at (404) 347-2904.

Sincerely yours,

Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides, and Toxics
Management Division

BA/CHF
Bruce Mitchell
B. Thomas, SW Dist.
} 8-24-90 RAM

P 256 396 180

RECEIPT FOR CERTIFIED MAIL

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

☆U.S.G.P.O. 1989-234-555

Sent to
Mr. Randy Thompson, FCS

Street and No.
P. O. Box 490300

P.O., State and ZIP Code
Leesburg, FL 34739-0300

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: 8-22-90
Permit: AC 27-118674
PSD-FL-091

PS Form 3800, June 1985

● **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. Randy Thompson
Environmental Dept.
Florida Crushed Stone Company
P. O. Box 490300
Leesburg, FL 34749-0300

4. Article Number
P 255 396 180

Type of Service:
☐ Registered
☐ Insured
☒ Certified
☐ COD
☐ Express Mail
☐ Return Receipt for Merchandise

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature – Addressee
X

6. Signature – Agent
X

7. Date of Delivery 8/24/90

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

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

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 22, 1990

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Randy Thompson
Environmental Department
Florida Crushed Stone Company
Post Office Box 490300
Leesburg, Florida 34749-0300

Dear Mr. Thompson:

Attached is one copy of the proposed letter amendment to air construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091 for Florida Crushed Stone Company (FCSC) to performance test the cement kiln while processing wastewater treatment sediment from the Jacksonville Electric Authority's (JEA) Northside Generating Station up to a maximum of 1.4 percent of the total raw material feed rate on a dry weight basis (equivalent to 1.8 tons per hour). The existing cement kiln was permitted under construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091. Even though the claim is that there will be no actual pollutant emission increase, which will have to be verified, the source is not permitted to process wastewater treatment sediment in accordance with the referenced permits. The purpose of this letter amendment is to allow FCSC to obtain the data necessary to determine whether the cement kiln is capable of accommodating/processing wastewater treatment sediment from JEA's Northside Generating Station under the cement kiln's present physical configuration and what regulations the cement kiln will be subject to if it is to be permitted to process wastewater treatment sediment from JEA's Northside Generating Station.

Please submit any written comments you wish to have considered concerning the Department's proposed action to me.

Sincerely,

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

CHF/BM/plm

Attachments

c: B. Thomas, SW Dist. | C. Shaver, NPS-Air
J. Koogler, P.E., K&A | B. Beals, EPA

F. Koogler again on 8/29/90
+ 4/4/90 & 8/20/90 EPA letters
Readily File

BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

In the Matter of
Application for Amendment by:

FCSC
P. O. Box 490300
Leesburg, Florida 34749-0300

DER File No. AC 27-118674
PSD-FL-091

INTENT TO ISSUE

The Department of Environmental Regulation hereby gives notice of its intent to issue an amendment (copy attached) for the proposed project as detailed in the application for an amendment specified above. The Department is issuing this Intent to Issue for the reasons stated in the attached letter amendment.

The applicant, FCSC (Florida Crushed Stone Company), requested on June 26, 1990, to the Department of Environmental Regulation for authorization to performance test the cement kiln while processing wastewater treatment sediment from the Jacksonville Electric Authority's (JEA) Northside Generating Station up to a maximum of 1.4 percent of the total raw material feed rate on a dry weight basis (equivalent to 1.8 tons per hour). The existing cement kiln was permitted under construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091. Even though the claim is that there will be no actual pollutant emission increase, which will have to be verified, the source is not permitted to process wastewater treatment sediment in accordance with the referenced permits. The purpose of this amendment is to allow FCSC to obtain the data necessary to determine whether the cement kiln is capable of accommodating/processing the wastewater treatment sediment from JEA's Northside Generating Station under the cement kiln's present physical configuration and what regulations the cement kiln will be subject to if it is to be permitted to process the wastewater treatment sediment from JEA's Northside Generating Station. The proposed project will occur at the applicant's existing facility located approximately 3.5 miles NW of Brooksville, Hernando County, Florida.

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

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

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

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

The Petition shall contain the following information;

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;

(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

(d) A statement of the material facts disputed by Petitioner, if any;

(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;

(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and

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

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

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

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

Copies furnished to:

B. Thomas, SW Dist.
J. Koogler, P.E., K&A
C. Shaver, NPS-Air
B. Beals, EPA

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this NOTICE OF INTENT TO ISSUE and all copies were mailed before the close of business on 8-22-90.

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.

Clerk

8-22-90
Date

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

The Department of Environmental Regulation hereby gives notice of its intent to issue a permit amendment to FCSC (Florida Crushed Stone Company), Environmental Department, P. O. Box 490300, Leesburg, Florida 34749-0300, to conduct a performance test on the cement kiln while processing wastewater treatment sediment from the Jacksonville Electric Authority's (JEA) Northside Generating Station up to a maximum of 1.4 percent of the total raw material feed rate on a dry weight basis (equivalent to 1.8 tons per hour). The existing cement kiln was permitted under construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091. Even though the claim is that there will be no actual pollutant emission increase, which will have to be verified, the source is not permitted to process wastewater treatment sediment in accordance with the referenced permits. The purpose of this amendment is to allow FCSC to obtain the data necessary to determine whether the cement kiln is capable of accommodating/processing the wastewater treatment sediment from JEA's Northside Generating Station under the cement kiln's present physical configuration and what regulations the cement kiln will be subject to if it is to be permitted to process the wastewater treatment sediment from JEA's Northside Generating Station. The proposed project will occur at the applicant's existing facility located approximately 3.5 miles NW of Brooksville, Hernando County, Florida. The Department is issuing this Intent to Issue for the reasons stated in the proposed letter amendment to the construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091.

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

The Petition shall contain the following information:

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;

(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

(d) A statement of the material facts disputed by Petitioner, if any;

(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;

(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and

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

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

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

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

Department of Environmental Regulation
Southwest District Office
4520 Oak Fair Boulevard
Tampa, Florida 33610-7347

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

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 22, 1990

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Randy Thompson
Environmental Department
Florida Crushed Stone Company
Post Office Box 490300
Leesburg, Florida 34749-0300

Dear Mr. Thompson:

Re: Amendment to Construction Permit No. AC 27-118674 and PSD Permit No. PSD-FL-091 to Conduct Performance Test(s) on the Cement Kiln While Processing Wastewater Treatment Sediment from JEA's Northside Generating Station.

The Department has reviewed the request that you provided on June 26, 1990. We have also considered the Department's legal authority to allow you to conduct the requested performance test(s). Paragraph 403.061(15), Florida Statutes (F.S.) authorizes the Department to consult with any person proposing to construct, install, or otherwise acquire a pollution control device or system concerning the efficacy of such device or system, or the pollution problem which may be related to the source, device, or system. Paragraph 403.061(16), F.S., authorizes the Department to encourage voluntary cooperation by persons in order to achieve the purposes of the state environmental control act. Paragraph 403.061(18), F.S., authorizes the Department to encourage and conduct studies, investigations, and research relating to the causes and control of pollution. Florida Administrative Code (F.A.C.) Rule 17-2.250(5) authorizes the Department to consider variations in industrial equipment and make allowances for excess emissions that provide practical regulatory controls consistent with the public interest.

In accordance with the provisions of Paragraphs 403.061(15), (16), and (18), F.S., and F.A.C. Rule 17-2.250(5), you are hereby authorized to performance test the cement kiln while processing wastewater treatment sediment from the Jacksonville Electric Authority's (JEA) Northside Generating Station up to a maximum of 1.4 percent of the total raw material feed rate on a dry weight basis (equivalent to 1.8 tons per hour). The existing cement kiln was permitted under construction permit No. AC 27-118674 and

PSD permit No. PSD-FL-091. Even though the claim is that there will be no actual pollutant emission increase, which will have to be verified, the source is not permitted to process wastewater treatment sediment in accordance with the referenced permits. The purpose of this activity is to obtain the data necessary to determine whether the cement kiln is capable of accommodating/processing wastewater treatment sediment from JEA's Northside Generating Station under the cement kiln's present physical configuration and what regulations the cement kiln will be subject to if it is to be permitted to process wastewater treatment sediment from JEA's Northside Generating Station.

The performance test(s) shall be subject to the following conditions:

1. The permittee shall notify, in writing, the Department's Southwest District and Bureau of Air Regulation (BAR) offices at least 15 days prior to commencement of the performance test(s). A written report shall be submitted to these offices within 45 days upon completion of the last test run.

2. Prior to or after conducting tests while processing wastewater treatment sediment from JEA's Northside Generating Station (Post-tests), performance tests (Pre-tests) shall be conducted while not processing wastewater treatment sediment for all of the identified pollutants and pollutant categories in order to establish background levels, unless performance tests have already been conducted and the results can be provided to the Department. These tests, "Pre-tests", shall be compared to the post-tests to determine if:

    a) PSD review is required, which includes a construction permit application package and appropriate processing fee; or,

    b) the current construction and PSD permits can be amended to allow the processing of wastewater treatment sediment from JEA's Northside Generating Station.

3. All post-test results shall be compared to "actual emissions" for PSD review purposes (see Region IV, U.S. EPA's letter dated April 4, 1990).

4. The contents of Dr. John B. Koogler's letter received June 26, 1990, are adopted by reference, with exceptions to paragraph 3 on page 3, of which the following pollutants/pollutant categories will also be tested for:

Pollutant/Pollutant Category	Test Method
o Metals (continued)	EPA Method 5
Titanium	
Aluminum	
Magnesium	
Silver	
Cobalt	
Iron	
o PCDDs and PCDFs	EPA Method 23
o PAHs (polynuclear aromatic hydrocarbons)	Modified Method 5
o Benzene	EPA Method 18
o Mercury	EPA Method 101 or 101A
o Volatile Organic Compounds	EPA Method 25A

5. An ultimate analysis of the particulate filter(s) shall be required. Also, an ultimate analysis of a representative sample(s) from the baghouse hopper shall be required.

6. This authorized performance test(s) shall not result in the release of objectionable odors pursuant to F.A.C. Rule 17-2.620(2).

7. Performance testing shall immediately cease upon the occurrence of a valid environmental complaint by a citizen or other party, or a nuisance or danger to public health or welfare. Performance testing shall not resume until appropriate measures to correct the problem have been implemented.

8. The performance test(s) shall be conducted under the direct supervision and responsible charge of a professional engineer registered in Florida.

9. This Department action is just to authorize the performance tests on the cement kiln while processing wastewater treatment sediment from JEA's Northside Generating Station. The processing of any wastewater treatment sediment after the last performance test run is completed will be deemed a violation of the current permits, AC 27-118674 and PSD-FL-091.

10. Complete documentation of any processing of wastewater treatment sediment from JEA's Northside Generating Station in the cement kiln shall be required (i.e., testing results; materials processed, by weight (both wet and dry); etc.).

11. The Department shall be notified in writing on the date of the last test run completion.

12. From the initial date of processing the wastewater treatment sediment from JEA's Northside Generating Station, which shall be documented in writing to the Department, the permittee shall be limited to 8 days to process the wastewater treatment sediment in the cement kiln. If additional time is needed, the permittee shall provide the Department with documentation of the progress accomplished to date and shall identify what is left to be done to complete the performance tests.

13. Based on conversation with Mr. Paul Reinermann, with the U.S. EPA, Region IV, the cement kiln will be subject to 40 CFR 61, Subpart E, National Emission Standard for Mercury, if wastewater treatment sediment is incinerated or dried in the source. Emissions to the atmosphere from sludge incineration plants, sludge drying plants, or a combination of these that process wastewater treatment plant sludges shall not exceed 3200 grams of mercury per 24-hour period.

14. Stack sampling for mercury shall be in accordance with 40 CFR 61.53.

15. A representative sludge sample shall be taken and analyzed from each delivery vehicle (i.e., rail tank car, etc.) prior to delivery. The sludge sampling shall be in accordance with 40 CFR 61.54. The sampling results shall be completed and available prior to processing and testing.

16. The contents of Mr. Daniel S. Davis' request document received May 21, 1990, are adopted by reference, with exceptions to Section 3.2, Sludge Analysis, of which the following pollutant(s) will also be required to be analyzed for:

    o Mercury
    o Aluminum
    o Silver
    o Magnesium
    o Titanium
    o Cobalt
    o Iron
    o Sulfur

17. The maximum sludge utilization rate shall not exceed 2.1 wet tons/hour (1.8 TPH dry), 50 wet tons per day, and shall not exceed a total of 400 wet tons for the performance testing period.

18. Attachments (See Attachment Section) are incorporated.

The Department has relied on the information referenced in the attachments and conversations with representatives of the FCSC, U.S. EPA-Region IV, and Department of Interior's National Park Service in authorizing this permit letter amendment to the construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091.

A copy of this letter and its attachments shall be attached to the construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091.

Sincerely,

Dale Twachtmann
Secretary

DT/plm

Attachments

c: B. Thomas, SW Dist.
J. Koogler, P.E., K&A
C. Shaver, NPS-Air
J. Harper, EPA

Attachment Section

1. Mr. Daniel S. Davis' submittal received May 21, 1990.
2. Dr. John B. Koogler's letter received June 26, 1990.
3. Mr. C. H. Fancy's letters dated June 27, 1990.
4. Table 147: Typical Fuel Oil Ash Analysis; AP-40, page 539; 2nd ed.; May, 1973.
5. 40 CFR 61 (July, 1989 version).
6. Intent to Issue Package dated August 22, 1990.

Attachment 4

AIR POLLUTION ENGINEERING MANUAL

SECOND EDITION

Compiled and Edited
by
John A. Danielson

AIR POLLUTION CONTROL DISTRICT
COUNTY OF LOS ANGELES

ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Water Programs
Office of Air Quality Planning and Standards
Research Triangle Park, N.C. 27711

May 1973

CHAPTER 9

COMBUSTION EQUIPMENT

GASEOUS AND LIQUID FUELS

ROBERT T. WALSH, Senior Air Pollution Engineer*
NORMAN R. SHAFFER, Senior Air Pollution Engineer

GAS AND OIL BURNERS

ROBERT T. WALSH, Senior Air Pollution Engineer*
JOHN A. DANIELSON, Senior Air Pollution Engineer

BOILERS, HEATERS, AND STEAM GENERATORS

ROBERT T. WALSH, Senior Air Pollution Engineer*
JOHN A. DANIELSON, Senior Air Pollution Engineer

*Now with U. S. Environmental Protection Agency, Research Triangle Park, North Carolina.

The quantity of inorganic solid particulates in exhaust gases is entirely dependent upon the characteristics of the fuel. There is no measurable inorganic ash in exhaust gases from the combustion of natural gas or other clean gaseous hydrocarbons, except for that small quantity attributable to the dust usually present to some degree in all air used for combustion. Low-sulfur fuel oils are known to contain very small amounts of ash. Table 145, which gives typical analyses of straight-run low-sulfur residual fuel oils, indicates variations from 0.007 to 0.020 percent by weight. In residual oils, however, inorganic ash-forming materials are found in quantities up to 0.1 percent by weight. Most of this material is held in long-chain organo-metallic compounds. The strong oxidation conditions present in most fireboxes convert these materials to metallic oxides, sulfates, and chlorides. As would be expected, the compounds show up as finely divided particulates in exhaust gases. Table 147 provides a spectrographic analysis of the inorganic fuel oil ash collected at a large power plant boiler.

The combined ash and unburned particulates in exhaust gases from gaseous or liquid fuel combustion are not likely to exceed local air pollution control statutes. For instance, the efficient burning of a common heavy residual oil of 0.1 percent ash results in a stack gas concentration of only 0.030 grain per scf at 12 percent carbon dioxide.

Sulfur in Fuels

In liquid hydrocarbon fuels, sulfur occurs in concentrations ranging from a trace to more than 5 percent by weight. Much of this sulfur is present as malodorous sulfides and mercaptans. Natural gas fuels contain very little sulfur as marketed, usually only enough to impart a detectable odor to the gas. Some by-product gases, however, contain appreciable sulfides and mercaptans. Distillate oils may contain as much as 1 percent sulfur, though most distillates have less than 0.3 percent.

There is normally much more sulfur in heavy residual oils than in gaseous fuels and distillate oils. Most of these oils contain more than 1 percent sulfur by weight. In the Los Angeles area, cracked residual oils were commonly burned in power plant boilers prior to 1968 when natural gas was not available. These oils contained about 1.6 percent sulfur. In November 1968, Rule 62.2, limiting sulfur content of fuels to less than 0.5 percent by weight, was enacted. In essentially all cases, previous users of residual fuels are now burning straight-run low-sulfur residual fuel oils when natural gas is not available.

Table 147. TYPICAL FUEL OIL ASH ANALYSIS

Constituent	Weight %
Iron	22.99
Aluminum	21.90
Vanadium	19.60
Silicon	16.42
Nickel	11.86
Magnesium	1.78
Chromium	1.37
Calcium	1.14
Sodium	1
Cobalt	0.91
Titanium	0.55
Molybdenum	0.23
Lead	0.17
Copper	0.05
Silver	0.03
Total	100

Sulfur Oxides

Most of the sulfur present in fuels is converted to sulfur dioxide on combustion. A typical residual fuel oil of 1.6 percent sulfur yields a concentration of 1,000 ppm sulfur dioxide when burned with the theoretical amount of combustion air. As shown in the sample calculations, this is equivalent to 832 ppm at 20 percent excess combustion air, a point at which many industrial boilers are operated. By comparison, fuels containing 0.5 percent sulfur will yield a concentration of 310 ppm of sulfur dioxide when burned with a theoretical amount of combustion air or 260 ppm with 20 percent excess combustion air.

In some combustion processes, a small portion of the sulfur--usually no more than 5 percent of the total--is converted to sulfur trioxide, the anhydride of sulfuric acid. Sulfur trioxide is highly reactive and extremely hygroscopic as compared with sulfur dioxide. It is considered a chief cause of the visible plume created by burning high-sulfur fuel oils in large power plant boilers. Besides obscuring visibility, these contaminants can result in acid damage to vegetation and property in downwind areas. The factors governing firebox formation of sulfur trioxide are not fully understood, but it is recognized to occur principally in large combustion installations operated at high firebox temperatures.

Oxides of Nitrogen

In every combustion process the high temperatures at the burner result in the fixation of some oxides of nitrogen. These compounds are found in stack gases mainly as nitric oxide (NO) with lesser amounts of nitrogen dioxide (NO_2) and only traces of other oxides. Since NO continues to oxidize to

Attachment 5
Available Upon Request

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

BEST AVAILABLE COPY

FAX TRANSMITTAL LETTER

DATE: 8-22-90 @ 11:23 a.m.

TO:

NAME Dr. John Koogler

AGENCY Koogler & Associates

TELEPHONE (904) 377-7158

NUMBER OF PAGES (INCLUDING COVER SHEET) 3

FROM:

NAME Bruce Mitchell

AGENCY DER/DARM/BAR

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

SENDER'S NAME R Bruce Mitchell

8-22-90
@ 11:25-:30

COMMENTS: Spoke w Dr. Koogler. Requested that the PN not be publicized until the 28th to provide adequate time for mailing and receipt of the pkg. RA

MESSAGE CONFIRMATION

AUG-22-'90 WED 11:22
TERM ID: DIV OF AIR RES MGMT
TEL NO: 904-[illegible]

NO.	DATE	ST. TIME	TOTAL TIME	ID	DEPT CODE	OK	NG
131	08-22	11:20	00°02'20	904 377 7158		03	00

BEST AVAILABLE COPY

To Bruce Mitchell
Date 7/24 Time 10:31

WHILE YOU WERE OUT

M Dave Zell
of Burea of Air Prog. SW
Phone SC 552-7612-416
Area Code Number Extension

☐	TELEPHONED	☐	PLEASE CALL
☐	CALLED TO SEE YOU	☐	WILL CALL AGAIN
☐	WANTS TO SEE YOU	☐	URGENT
		☐	RETURNED YOUR CALL

Message RE: FL Creststone cement kiln.
@2:40-:45 No comments.

Operator

To Bruce Mitchell
Date 8/9 Time 8:39

WHILE YOU WERE OUT

M Paul R
of
Phone 347 2904
Area Code Number Extension

☐	TELEPHONED	☐	PLEASE CALL
☐	CALLED TO SEE YOU	☐	WILL CALL AGAIN
☐	WANTS TO SEE YOU	☐	URGENT
		☐	RETURNED YOUR CALL

Message Fl Crushed Stone

Operator

8-9-90
1:22-:26

Greg Worley

40 CFR 61 Subpart E

61.08

Will transfer

Paul Rhikerman
EPA
(404) 107-2904

BEST AVAILABLE COPY

7-26-90

@ 4:08

Spoke w/ Greg Worley @
EPA ; concern w/
Mercury - Subpart E NESHAPs
Paul Reinemann

told him of IM (exhibit/attach #12)
on mercury -

try to handle as TDF amendmt

Greg will be sending me a memo/letter

@ 4:41 7-24-90
F/ Crushed Stone -
John Bunyak @ NPS
Sludge Burning
Heavy Metals

6-13-90
@ 2:42 - :53

Dan Davis
@ Radian

← phone conversation ↗

FL Crushed Stone
wastesludge test
firing in the
cement
kiln

① must be authorized from the Dept to
conduct test burns for mass trust
data collection

② PM required (14 days min.)

③ 2 copies of support data ; request
Radian ↑ ↑ (Ziegler)

④ Any testing prior to auth. would be
deemed criminal [redacted] [redacted]

⑤ a. Need ultimate analysis of JEA waste-
sludge to be tested

b. Need test results from any similar
type of operation

RADIAN CORPORATION
8501 Mo-Pac Blvd.
P.O. Box 201088
Austin, TX 78720-1088
(512) 454-4797

SHIPPING # AUS 012402

SHIPPING REQUEST/PACKING LIST

Requested by: Judy McClennan Employee #: 1569 Ext #: 5294 Date: 6/19/90

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P.O. Box 201088
Austin, TX 78720-1088
(512) 454-4797

Ship to:

Mr. R. Bruce Mitchell
Engineer
Bureau of Air Regulation
State of Florida
Department of Environmental Regulation
2600 Blair Stone Road
ATTN: Tallahassee, Florida 32301

Phone # ( ) –

Must be at destination by: Date 6/20 Time Noon

Method of shipment:

Surface
- ☐ Mail
- ☐ UPS
- ☐ Motor Freight
- ☐ Bus

Air
- Air Express
- ☒ Overnight
- ☐ 2nd Day Service
- ☐ Air Mail
- ☐ Air Freight

Other
- ☐ Hand Carry
- ☐ Messenger Service
- ☐ ____________

- ☐ Collect
- ☐ Prepaid
- ☐ Insured

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			213-776-9008	
	Weight			

Item #	Qty. Shipped	Part Number (if applicable)	Description (printed materials, samples, etc.)
1			21 printed documents

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Date Received: 6/19/90

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Via: FedX P-1

Signature of Shipping Clerk:

Bill of Lading Number:

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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

June 27, 1990

Mrs. Chris Shaver
Chief, Permit Review and Technical
Support Branch
National Park Service
Air Quality Division
P. O. Box 25287
Denver, Colorado 80255

Dear Mrs. Shaver:

Re: Request to Process Wastewater Treatment Sediment
Florida Crushed Stone - Cement Kiln

The enclosed information is being forwarded to you for completeness review.

Florida Crushed Stone has requested to process wastewater treatment sediment from the Jacksonville Electric Authority's (JEA) Northside Generating Station up to a maximum of 1.4 percent of the total raw material feed rate on a dry weight basis (equivalent to 1.8 tons per hour) in their existing cement kiln, which was permitted under construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091. Even though the claim is that there will be no actual pollutant emission increase, which will have to be verified, the source is not permitted to process wastewater treatment sediment in accordance with the referenced permits.

Due to the potential controversy with this operational change, the Department will require public notice of the company's intent to process JEA's wastewater treatment sediment in their existing cement kiln prior to amending the above referenced construction permits.

If you have any questions, please call Bruce Mitchell at (904)488-1344 or write to me at the above address. All comments, written or oral, should be received by July 23, 1990. If it is convenient to FAX a response to us, the FAX number to use is (904)922-6979.

Sincerely,

Barry D. Andrews
for C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/plm

Attachments

c: B. Mitchell, BAR
Reading File 6-28-90 pm

File Copy

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

June 27, 1990

Mr. Bill Thomas
Administrator, Air Programs
Southwest District
4520 Oak Fair Blvd.
Tampa, Florida 33610-7347

Dear Mr. Thomas:

Re: Request to Process Wastewater Treatment Sediment
Florida Crushed Stone - Cement Kiln

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Sincerely,

Barry D. Andrews

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

CHF/plm

Attachments

c: B. Mitchell, BAR

Reading File 6-28-90

File [illegible]

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

June 27, 1990

Ms. Jewell A. Harper, Chief
Air Enforcement Branch
U.S. EPA, Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Dear Ms. Harper:

Re: Request to Process Wastewater Treatment Sediment
Florida Crushed Stone - Cement Kiln

The enclosed information is being forwarded to you for completeness review.

Florida Crushed Stone has requested to process wastewater treatment sediment from the Jacksonville Electric Authority's (JEA) Northside Generating Station up to a maximum of 1.4 percent of the total raw material feed rate on a dry weight basis (equivalent to 1.8 tons per hour) in their existing cement kiln, which was permitted under construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091. Even though the claim is that there will be no actual pollutant emission increase, which will have to be verified, the source is not permitted to process wastewater treatment sediment in accordance with the referenced permits.

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Sincerely,

Barry D. Andrews

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

CHF/plm

Attachments

c: B. Mitchell, BAR
Reading File 6-28-90

File Copy

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ■ FAX 377-7158

KA 307-86-04

June 25, 1990

RECEIVED
JUN 26 1990
DER - BAQM

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

Subject: Florida Crushed Stone Company
CPL Plant
Brooksville, Florida
Permit AC27-118674
Request to Use Sediment from Electric Utility Non-process Water Treatment as a Raw Material Substitute

Dear Mr. Fancy:

On May 21, 1990, Mr. Dan Davis of the Radian Corporation and I met with Bruce Mitchell to discuss the use of non-process water treatment sediment produced by electric utility companies as a raw material substitute for the production of Portland cement. The site being considered for this project is the Florida Crushed Stone Company CPL plant at Brooksville, Florida. Additionally, I discussed this matter philosophically with you on June 18, 1990.

The sediment being considered is produced in primary and secondary sedimentation basins where non-process wastewater is treated. The sediment is virtually all inorganic matter containing from five to 30 percent solids. It will be delivered to the Florida Crushed Stone plant in rail tank cars. The sediment will be mixed with raw materials that are to be fed to the kiln in the raw material blending and grinding process. The sediment will substitute for approximately 1.4 percent of the mineral matter fed to the kiln.

By this letter, I would like to request on behalf of the Florida Crushed Stone Company a modification or amendment to permit AC27-118674 that will allow the use of the wastewater treatment sediment as an alternative raw material used in the production of Portland cement. As stated in the previous paragraph, the wastewater treatment sediment will provide

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[redacted]

Date 1/25/90

RECIPIENT'S COPY

1 From (Your Name) Please Print: John Kogler
Your Phone Number (Very Important): 704-377-5822
Company: JOGLER & ASSOC
Department/Floor No:
Street Address: 14 NW 13TH ST
City: INSVILLE
State: FL
ZIP Required: 3 2 6 0 9

2 To (Recipient's Name) Please Print: Mr. Bruce Mitchell
Recipient's Phone Number (Very Important): ( )
Company: FDER
Department/Floor No.
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. ® Zip Codes.): 2600 Blair Stone Rd
City: Tallahassee
State: FL
ZIP Required: 32399

3 YOUR BILLING REFERENCE INFORMATION (First 24 characters will appear on invoice.): 5?1-36-04

PAYMENT 1 ☒ Bill Sender 2 ☐ Bill Recipient's FedEx Acct. No. 3 ☐ Bill 3rd Party FedEx Acct. No. 4 ☐ Bill Credit Card
5 ☐ Cash

[redacted]

H IF HOLD FOR PICK-UP, Print FEDEX Address Here
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State
ZIP Required

4 SERVICES (Check only one box)

Priority Overnight Service (Delivery by next business morning†)
- 11 ☐ YOUR PACKAGING
- 16 ☑ FEDEX LETTER*
- 12 ☐ FEDEX PAK*
- 13 ☐ FEDEX BOX
- 14 ☐ FEDEX TUBE

Standard Overnight Service (Delivery by next business afternoon†)
- 51 ☐
- 56 ☐ FEDEX LETTER*
- 52 ☐ FEDEX PAK*
- 53 ☐ FEDEX BOX
- 54 ☐ FEDEX TUBE

Economy Service (formerly Standard Air) (Delivery by second business day†)
- 30 ☐ ECONOMY SERVICE

Heavyweight Service (for Extra Large or any package over 150 lbs.)
- 70 ☐ HEAVYWEIGHT**
- 80 ☐ DEFERRED HEAVYWEIGHT**

† Delivery commitment may be later in some areas.
*Declared Value Limit $100.
**Call for delivery schedule.

DELIVERY AND SPECIAL HANDLING
- 1 ☐ HOLD FOR PICK-UP (Fill in Box H)
- 2 ☑ DELIVER WEEKDAY
- 3 DELIVER SATURDAY (Extra charge) ☐
- 4 ☐ DANGEROUS GOODS (Extra charge)
- 5 ☐ CONSTANT SURVEILLANCE SVC. (CSS) (Extra charge) (Release Signature Not Applicable)
- 6 ☐ DRY ICE ______ Lbs
- 7 ☐ OTHER SPECIAL SERVICE
- 8 ☐
- 9 ☐ SATURDAY PICK-UP (Extra charge)
- 10 ☐
- 11 ☐
- 12 ☐ HOLIDAY DELIVERY (If offered) (Extra charge)

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☐ Third Party ☐ Chg. To Del. ☐ Chg. To Hold
Street Address
City State Zip
Received By
X
Date/Time Received FedEx Employee Number

5 Release Signature:
Date/Time 656

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 8/89
PART #119501 FXEM 8/89
FORMAT #014

014

approximately 1.4 percent of the mineral matter presently fed to the cement kiln. The use of this material is not expected to result in an increase in any of the air pollutants presently emitted from the cement kiln and clinker cooler nor is it expected to result in the discharge of any air pollutants that are not currently emitted from the kiln or cooler. In the following paragraphs, additional information is provided on the characteristics of the sediment and on the test procedures that are proposed to demonstrate that there will be no increase in air pollutant emission rates.

Much of the information related to the utilization of the wastewater treatment system has been provided to the Department by Dan Davis of Radian. During our meeting with Bruce Mitchell on May 21, 1990, Mr Davis provided a copy of a report entitled, Operational Test to Demonstrate Beneficial Reuse of a Nonhazardous Wastewater Treatment Sludge at Florida Crushed Stone Company's Brooksville Plant. This report is dated May 21, 1990. In the Radian report, it stated that the use of the wastewater treatment sediment has already been tested at the Gifford-Hill cement plant in Harleyville, South Carolina. The sediment in question is produced during the treatment of various wastewater treatment streams generated at electric utility companies. The sediment that is being considered for the initial test is produced at the Jacksonville Electric Authority Northside Generating Station in Jacksonville, Florida. For permitting purposes, Florida Crushed Stone requests that the permit amendment be written in a manner than will allow the acceptance of comparable wastewater treatment sediment from any electric utility company.

The sediment is produced in a primary sedimentary basin where solids contained in the wastewater treatment streams settle by gravity and in a secondary sedimentary basin where sedimentation is enhanced by the use of lime. The Radian report provides an analysis of the two sediments for 31 metals and for carbonates, chlorides and sulfates. The cations and anions account for approximately 35-45 percent of the composition of the sediment on a dry weight basis. The remainder of the sediments are expected to be the hydroxide ion. In only one of the tests conducted by Radian did any organic carbon appear. In this instance, total organic carbon accounted for 0.2 percent by weight of the sediment. In all likelihood, the carbon resulted from organic sediment in the wastewater.

Several tests have been conducted on the sediments and, in all cases, the sediments were determined to be nonhazardous by both the EP toxicity test and the TCLP test. The results of these test data are also presented in the Radian report. The other information included in the Radian report are the results of emission measurements conducted at the Gifford-Hill cement plant during a baseline test and during a time when the wastewater treatment sediment was being used as a supplemental raw material. The results of these tests demonstrate that there is no increase in metals emissions. It is my understanding that Dan Davis submitted complete copies of these test reports to Bruce Mitchell.

To demonstrate that there are benefits to the use of the wastewater treatment sediment as a substitute raw material and to demonstrate that there will be no increases in air pollutant emission rates during the use of the material, Florida Crushed Stone is requesting initial approval to conduct the test using approximately 400 tons (wet basis) of the wastewater treatment sediment produced at the Jacksonville Electric Company Northside Generating Station in Jacksonville. During the test period, Florida Crushed Stone will evaluate procedures for handling the sediment and for adding the sediment to the raw materials and will evaluate the performance of the cement plant and the quality of the clinker produced. During the test period, the sediment will be added at a rate equivalent to approximately 1.4 percent of the total raw material feed rate to the kiln on a dry weight basis; or at a rate of approximately 1.8 tons per hour.

During the test period, baseline emission measurements will be conducted for particulate matter, sulfur dioxide and the following metals:

arsenic
barium
cadmium
chromium
copper
lead
molybdenum
nickel
selenium
vanadium

The particulate matter and metals will be sampled with the EPA multi-metals sampling train and sulfur dioxide emissions will be measured using EPA Method 6. A similar series of emission measurements will be conducted while the wastewater treatment sediment is being used as a substitute raw material and the results of the two series of tests will be compared to demonstrate that there will be no increase in air pollutant emissions.

If there should be an increase in the emission rate of one or more of the contaminants, Florida Crushed Stone will submit an alternative permitting strategy to the Department or will submit a plan and schedule to install control measures and/or process modifications to reduce the emission rate increases to zero. It is understood that an air operating permit will not be issued for the cement plant until compliance with the existing permit conditions and emission limits are demonstrated or until an alternative permitting strategy is implemented by Florida Crushed Stone.

Based upon the expected operation of the cement plant, the nature of wastewater treatment sediment, and the amount of wastewater treatment sediment that will be substituted for raw materials, Florida Crushed Stone will commit that there will be no increase in emissions from the plant or changes in the operation of the plant that will effect air pollutant emissions. This commitment, along with the fact that the cement plant is equipped with continuous emission monitors for opacity, sulfur dioxide and nitrogen oxides that monitor the overall performance of the plant, should provide the Department with reasonable assurance that the proposed project can be successfully carried out.

I appreciate your consideration of this matter and would appreciate whatever effort you can make to expedite the review of this request. If there are any questions regarding this matter or if further information is required, please do not hesitate to contact me.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler wa

John B. Koogler, Ph.D., P.E.

JBK:wa

cc: Mr. Bruce Mitchell, FDER-Tallahassee
Mr. Steve Rowley, FCS, Brooksville
Mr. Tom Mountain, FCS, Brooksville
Mr. Charles Bush, FCS, Leesburg
Mr. Dan Davis, Radian Corporation
B. Thomas, SW District
J. Harper, EPA
C. Shaver, NPS
CHF/BA

} 6/28/90 Ran

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20th ☆☆☆☆ Anniversary

RADIAN
CORPORATION

8501 Mo-Pac Blvd.
P.O. Box 201088
Austin, TX 78720-1088
(512)454-4797

June 19, 1990

RECE[illegible]

JUN 20 1990

DER - BAQM

Mr. R. Bruce Mitchell
Engineer
Bureau of Air Regulation
State of Florida Department of Environmental Regulation
2600 Blair Stone Rd.
Tallahassee, Florida 32301

Dear Bruce:

Enclosed you will find seven copies of three documents that should help with your department's evaluation of the proposed nonhazardous sludge utilization program at Florida Crushed Stone. Two of the reports contain stack test data collected at Gifford-Hill Cement Company's plant in Harleyville, South Carolina. One of these reports contains the results of a baseline stack test and the second a stack test conducted while sludge was utilized. These data are summarized in the background document I prepared for our initial meeting on May 18, 1990. The third document contains a more detailed analysis of the sludge to be utilized in this program. The report contains analysis of a variety of nonhazardous materials; the sludge to be utilized in this program is called the Northside Surge Basin Sludge.

I hope you find these reports useful as you evaluate this program. I believe they confirm that no adverse environmental impact should result from the utilization of this material at Florida Crushed Stone. Please call me at (512)454-4797 if I can be of additional assistance.

Sincerely,

Dan

Dan Davis
Project Manager

cc: James Kamas (Radian)
Earl Bouse (Pacific Basin Resources)
John Koogler (Koogler & Associates)

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20th★★★★ Anniversary

RADIAN
CORPORATION

8501 Mo-Pac Blvd.
P.O. Box 201088
Austin, TX 78720-1088
(512) 454-4797

June 19, 1990

RECE ED
JUN 20 1990
DER - BAQM

Mr. R. Bruce Mitchell
Engineer
Bureau of Air Regulation
State of Florida Department of Environmental Regulation
2600 Blair Stone Rd.
Tallahassee, Florida 32301

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Sincerely,

Dan

Dan Davis
Project Manager

cc: James Kamas (Radian)
Earl Bouse (Pacific Basin Resources)
John Koogler (Koogler & Associates)

cc: 213-116 (misc)
DSDavis

EMISSION EVALUATION OF THE KILN EXHAUST STACK AND THE CLINKER COOLER EXHAUST AT GIFFORD-HILL CEMENT COMPANY OF SOUTH CAROLINA
HARLEYVILLE, SOUTH CAROLINA

RECEIVED

JUN 20 1990

DER - BAQM

DAVIS & FLOYD, INC.

EMISSION EVALUATION OF THE KILN EXHAUST STACK AND THE CLINKER COOLER EXHAUST AT GIFFORD-HILL CEMENT COMPANY OF SOUTH CAROLINA

HARLEYVILLE, SOUTH CAROLINA

APRIL 1989

JOB NUMBER 6747

PREPARED BY

DAVIS & FLOYD, INC.

GREENWOOD, SOUTH CAROLINA

TABLE OF CONTENTS

APPENDICES

1.0 BACKGROUND

On April 18 & 19, 1989, stack gas emission studies were conducted at the Gifford-Hill Cement Company, Harleyville, South Carolina on the kiln exhaust stack and the clinker cooler exhaust stack.

Gifford-Hill Cement Company of South Carolina manufacturers portland cement by the "dry process method". The raw materials (marl, clay and iron ore) are crushed and dried to less than 1% moisture. It is proportioned and fed to a rotary ball mill which grinds it into raw feed. the raw feed enters a preheater and is then fed to an inclined rotating kiln which completes the calcining and clinkers the feed. The gases are drawn through the kiln and preheater by a fan, then pass through a rotary dryer, a multiclone system and finally, a baghouse before existing through a stack. The cement clinker is immediately cooled in the clinker cooler by passing ambient air through the clinker bed. The air then passes through a heat exchanger and dust collector before existing through a stack. The clinker is combined with 7% gypsum and ground in rotary ball mills.

Their emission evaluation was conducted by Davis & Floyd, Inc., Greenwood, South Carolina. For this evaluation, the Research Appliance Company's and/or Nutech Corporation's stack sampling train was used. This equipment, as well as the sampling procedures was in compliance with the latest Federal Regulations as printed in the Federal Register, dated July 1, 1985, as amended. EPA Method 1 was used in determining the sampling point locations. Particulate testing and analyses were performed in accordance with EPA Method 5.

Metals analysis were determined on emissions from the kiln exhaust using EPA Appendix A " Methology For The Determination Of Metals Emissions In Exhaust Gases From Stationary Source Combustion Processes". Metals analysis was also determined on clinker, kiln baghouse dust, and raw feed. The results of these analysis are found in tables 4.1 to 4.5. These tests were observed by Mr. Don O'Gorman, a representative of The South Carolina Department of Health and Environmental Control.

2.0 DISCUSSION

2.1 Testing Procedures

2.1.1 Clinker Cooler Stack

The clinker cooler stack is equipped with a vertical stack 7.5 feet in diameter and 54.5 feet high with the dust collector duct entering the stack 40 feet downstream from the top of the stack. For this sampling, two 3 inch diameter sampling ports were located at 90 degrees of each other along the circumference of the stack at a point 29.5 feet from the dust collector duct (see Figure 3). Thirty-two equal areas were selected for sampling; sixteen along each sampling traverse (see Figure 4).

2.1.2 Kiln Exhaust Stack

This kiln is equipped with a vertical stack 10 feet in diameter, 80 feet high with the baghouse collector duct entering the stack 53 feet downstream from the top of the stack. For this sampling, four 3 inch diameter sampling ports were located at 90 degrees of each other along the circumference of the stack at a point 42 feet from the baghouse duct (see Figure 1). Thirty-two equal areas were selected for sampling, eight along each sampling traverse (see Figure 2).

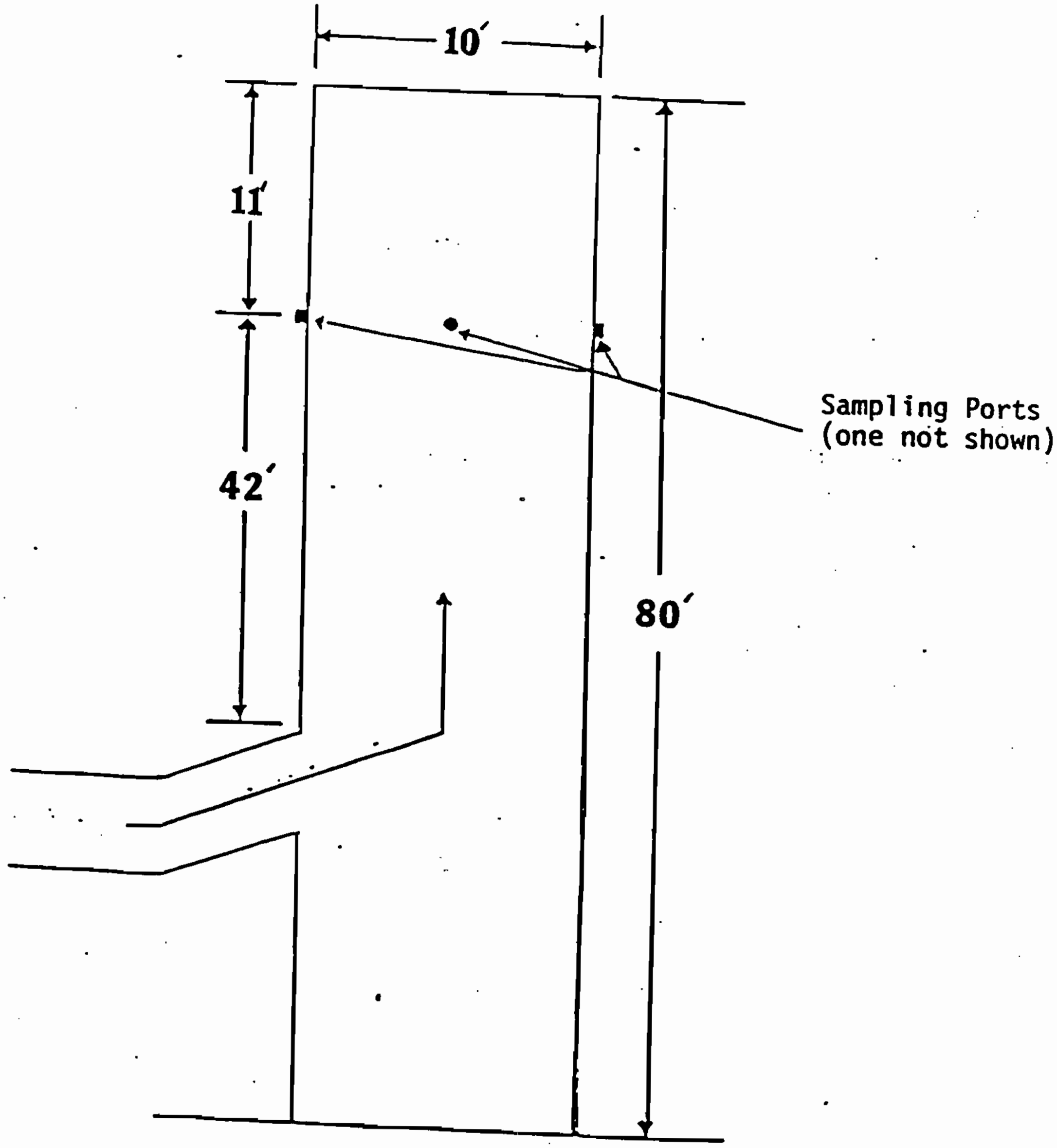
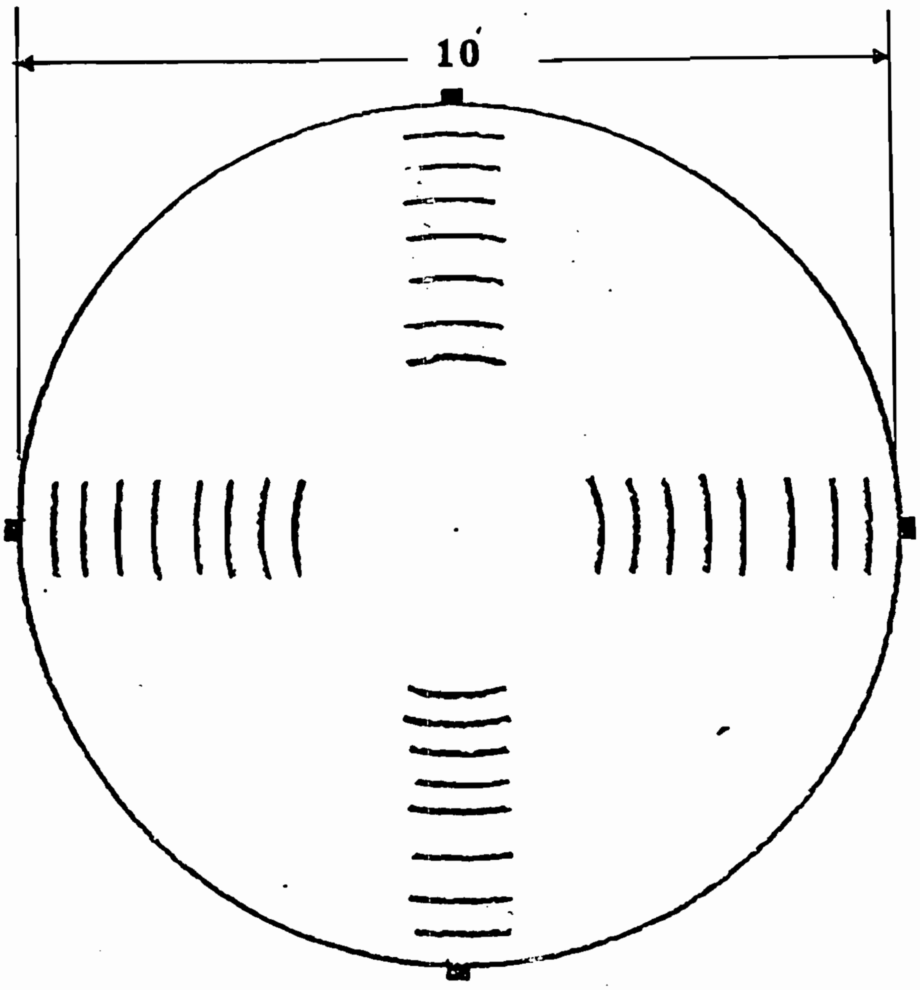


FIGURE 1

Sampling Port Locations
Kiln Stack
Gifford-Hill Cement Company
of South Carolina
Harleyville, South Carolina



Sampling Point	Distance (Inches)
1	1.94
2	5.88
3	10.20
4	15.00
5	20.28
6	26.40
7	33.96
8	45.00

FIGURE 2

Sample Point Locations
Kiln Stack
Gifford-Hill Cement
Company of SC
Harleyville, SC

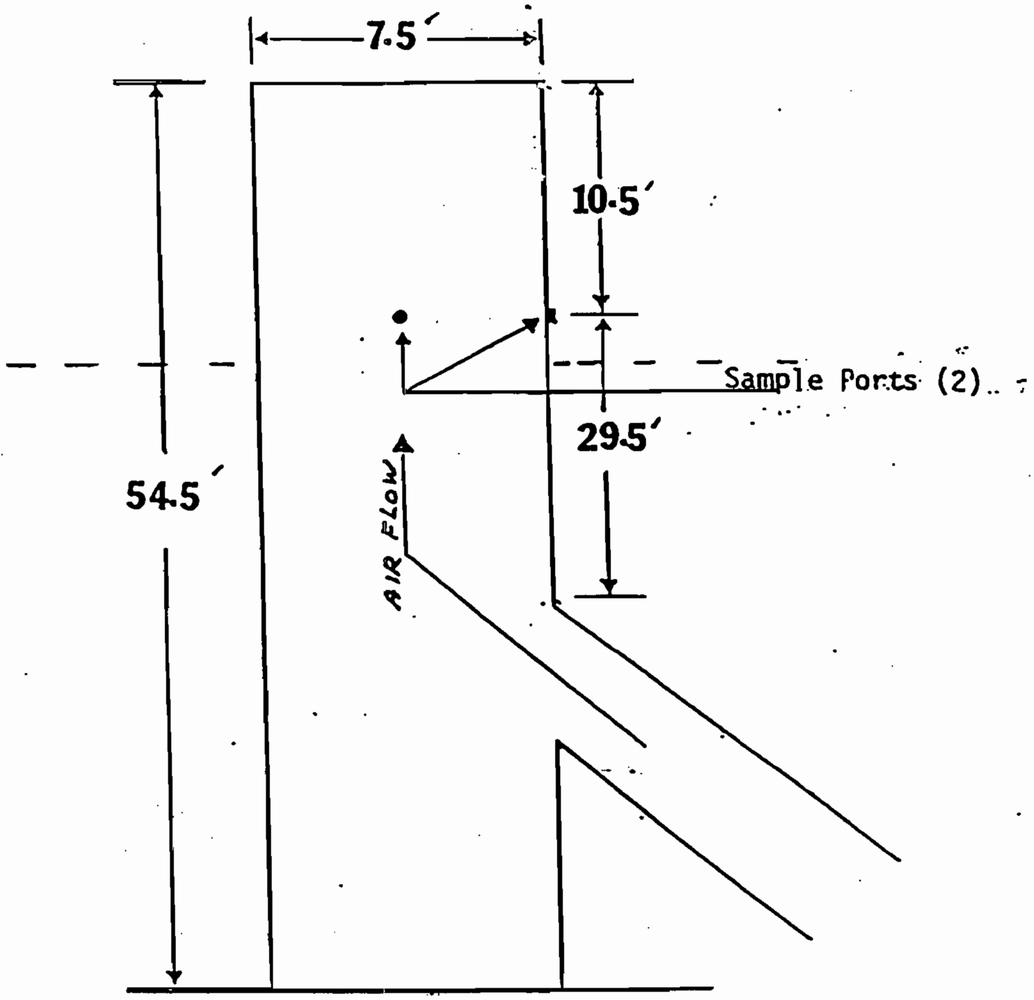
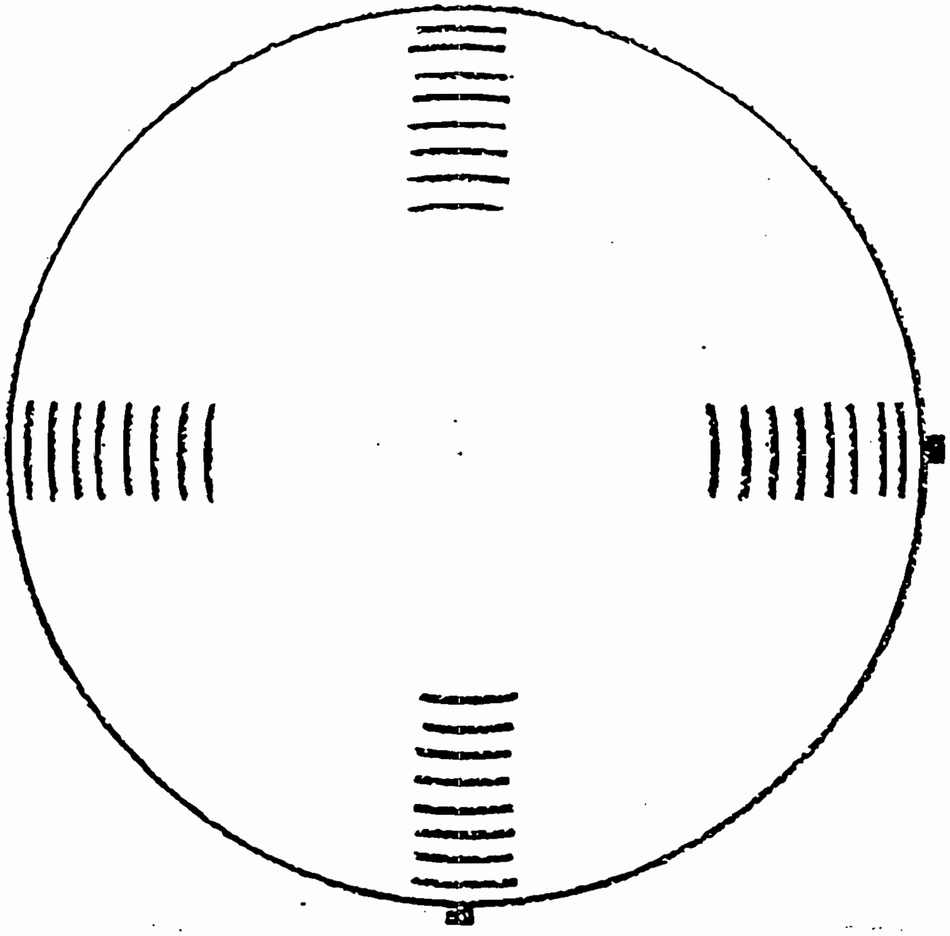


FIGURE 3

Sampling Port Locations
Clinker Cooler Stack
Gifford-Hill Cement Company
of South Carolina
Harleyville, South Carolina



Sampling Point	Distance (Inches)
1	1.44
2	4.41
3	7.65
4	11.25
5	15.21
6	19.80
7	25.47
8	33.75
9	56.25
10	64.53
11	70.2
12	74.79
13	78.75
14	82.35
15	85.59
16	88.56

FIGURE 4

Sample Point Locations
Clinker Cooler Stack
Gifford-Hill Cement
Company of SC
Harleyville, SC

2.2 Observations

At the time of sampling, the clinker cooler stack was emitting no visible plume with a production rate of 146.1 tons per hour. The kiln was operating with an average production rate of [illegible] tons per hour kiln feed during sampling.

2.3.2 Kiln Exhaust Stack

Test 1 - The average stack gas velocity was calculated to be 57.3564 feet per second, containing a particulate concentration of 0.0157 grain per standard cubic foot. The stack gas average temperature was 222.5 degrees F. The stack gas pressure was 30.2457 inches of mercury. The total emissions were calculated to be 23.7178 pounds per hour. This test was conducted at 97.4058% isokinetic conditions.

Test 2 - The average stack gas velocity was calculated to be 58.0105 feet per second, containing a particulate concentration of 0.0127 grain per standard cubic foot. The stack gas average temperature was 223.2 degrees F. The stack gas pressure was 30.2457 inches of mercury. The total emissions were calculated to be 18.7343 pounds per hour. This test was conducted at 100.8249% isokinetic conditions.

Test 3 - The average stack gas velocity was calculated to be 56.5519 feet per second, containing a particulate concentration of 0.0167 grain per standard cubic foot. The stack gas average temperature was 225.2 degrees F. The stack gas pressure was 30.2457 inches of mercury. The total emissions were calculated to be 24.0044 pounds per hour. This test was conducted at 99.1954% isokinetic conditions.

2.4 Test Acceptance

The validity of air sampling and reporting is determined by the percent of isokinetic conditions under which the sampling occurred. As stated in the Federal Guidelines, stack sampling data is acceptable if it is 100% plus or minus 10% isokinetic conditions.

The isokinetics of these tests are as follows:

1. Clinker Cooler Stack

Test 1	96.8705%
Test 2	99.9820%
Test 3	99.9243%

2. Kiln Exhaust Stack

Test 1	97.4058%
Test 2	100.8289%
Test 3	99.1954%

3.2 Kiln Exhaust Stack

The current Federal Air Regulation on the Standards of Performance for New Stationary Sources as amended on October 1, 1977, in part 60, Subpart F, 60.62, (A), states: "on and after the date on which the performance test required to be conducted by 60.8 is completed, no owner or operator subject to the provisions of this Subpart shall cause to be discharged into the atmosphere from any kiln any gases which: (1) contain particulate matter in excess of 0.15 kg per metric ton of feed (dry basis) to the kiln (0.30.1b. per ton), (2) exhibit greater 20 percent opacity."

The average particulate emission rate for the kiln exhaust stack Tests 1,2 and 3 was 22.1522 pounds per hour with an average production rate of 145.07 tons per hour. This calculates to 0.1526 pounds per ton of kiln feed. Therefore, it is concluded that the particulate emission rate from the kiln stack at the Gifford-Hill Cement Company, Harleyville, South Carolina cement plant is in compliance with the latest Federal Air Regulations.

4.0 SAMPLING RESULTS METALS EMISSIONS KILN EXHAUST

On April 18, 1989, emissions test for metals emissions were conducted on the kiln exhaust at Gifford Hill Cement Company of South Carolina, Harleyville, South Carolina. The results of this evaluation are found in Tables 4.1 to 4.5.

TABLE 4.1

SAMPLING RESULTS METALS ANALYSIS
FOR GIFFORD-HILL CEMENT COMPANY
HARLEYVILLE, SOUTH CAROLINA
ON KILN EXHAUST
SAMPLES TAKEN 4-18-89

TEST 1

ANALYSIS	FRONT HALF SAMPLE TRAIN (micrograms)	BACK HALF SAMPLE TRAIN (micrograms)	TOTAL TRAIN (micrograms)
Silver	< 6	< 2	-
Arsenic	< 1.5	< 0.5	-
Barium	< 30	< 10	-
Cadmium	2.1	1	3.1
Cobalt	< 15	< 5	-
Chromium	60	< 2	60
Copper	18	20	38
Molybedium	< 30	< 10	-
Nickel	171	< 4	171
Lead	1.8	1.2	3
Selenium	< 1.5	< 40	-
Vanadium	15	< 2	1.5

Note:

For analyses having the less than (<) notation the value presented is the lower limit of detection for the method and/or instrument.

TABLE 4.2

SAMPLING RESULTS METALS ANALYSIS
FOR GIFFORD-HILL CEMENT COMPANY
HARLEYVILLE, SOUTH CAROLINA
ON KILN EXHAUST
SAMPLES TAKEN 4-18-89

TEST 2

ANALYSIS	FRONT HALF SAMPLE TRAIN (micrograms)	BACK HALF SAMPLE TRAIN (micrograms)	TOTAL TRAIN (micrograms)
Silver	< 6	< 2	-
Arsenic	< 1.5	< 0.5	-
Barium	< 30	< 10	-
Cadmium	2.4	3.6	6
Cobalt	< 15	< 5	-
Chromium	48	< 2	48
Copper	18	13	31
Molybedium	< 30	< 10	-
Nickel	30	< 4	30
Lead	1.8	19	20.8
Selenium	< 1.5	< 40	-
Vanadium	18	< 2	18

Note:

For analyses having the less than (<) notation the value presented is the lower limit of detection for the method and/or instrument.

TABLE 4.3

SAMPLING RESULTS METALS ANALYSIS
FOR GIFFORD-HILL CEMENT COMPANY
HARLEYVILLE, SOUTH CAROLINA
ON KILN EXHAUST
SAMPLES TAKEN 4-18-89

TEST 3

ANALYSIS	FRONT HALF SAMPLE TRAIN (micrograms)	BACK HALF SAMPLE TRAIN (micrograms)	TOTAL TRAIN (micrograms)
Silver	< 6	< 2	-
Arsenic	< 1.5	< 0.5	-
Barium	< 30	< 10	-
Cadmium	1.5	1.3	2.8
Cobalt	< 15	< 5	-
Chromium	60	< 2	60
Copper	18	16	34
Molybedium	< 30	< 10	-
Nickel	33	< 4	33
Lead	1.8	4.5	6.3
Selenium	< 1.5	< 40	-
Vanadium	18	< 2	18

Note:

For analyses the less than (<) notation the value presented is the lower limit of detection for the method and/or instrument.

TABLE 4.5

SAMPLING RESULTS METALS ANALYSIS
FOR GIFFORD-HILL CEMENT COMPANY
HARLEYVILLE, SOUTH CAROLINA
ON KILN EXHAUST
SAMPLES TAKEN 4-18-89
SAMPLE BLANKS - FILTER BLANK, ACETONE BLANK, NITRIC ACID HYDROGEN PEROXIDE BLANK.

ANALYSIS	
Silver	< 6
Arsenic	< 1.5
Barium	< 30
Cadmium	< 1.5
Cobalt	< 15
Chromium	< 6
Copper	< 6
Molybedium	< 30
Nickel	< 12
Lead	< 1.5
Selenium	< 1.5
Vanadium	12

Note:

For analyses having the less than (<) notation the value presented is the lower limit of detection for the method and/or instrument.

APPENDIX I

Computer Printouts of Test Results

DAVIS & FLOYD INC.

POST OFFICE DRAWER 428
GREENWOOD, SOUTH CAROLINA 29646

****

*** SOURCE SAMPLING DATA REPORT ***

****

RUN 1

FOR: GIFFORD-HILL CEMENT CO.
LOCATION: HARLEYVILLE, SC
SOURCE: KILN STACK

DAVIS & FLOYD, INC. JOB# 6747.
SAMPLE DATE: 18 APRIL 1989

I T E M	RESULTS	UNITS
CO2 CONCENTRATION	15.5000	PRECENT
O2 CONCENTRATION	5.1000	PRECENT
CO CONCENTRATION	0.0000	PRECENT
N2 CONCENTRATION	79.4000	PRECENT
DRY MOLECULAR WEIGHT OF GAS	30.6840	POUND/POUND-MOLE
FINAL IMPINGER WATER VOLUME	379.0000	MILLILITERS
INITIAL IMPINGER WATER VOLUME	200.0000	MILLILITERS
SILICA GEL VOLUME INCREASE	19.8000	MILLILITERS
TOTAL MOISTURE COLLECTED	198.8000	MILLILITERS
TOTAL MOISTURE COLLECTED	9.3834	STANDARD CUBIC FEET
MOISTURE CONTENT OF STACK GAS	16.6771	PERCENT
MEASURED DRY GAS VOLUME THROUGH METER	49.5016	CUBIC FEET
BAROMETERIC PRESSURE	30.2200	INCHES OF MERCURY
AVERAGE GAS TEMPERATURE THROUGH METER	565.6875	DEGREES RANKIN
AVERAGE GAS DELTA H	2.0553	INCHES OF WATER
DRY GAS VOLUME THROUGH METER	46.8816	STANDARD CUBIC FEET
MOISTURE CONTENT OF STACK	0.1668	DIMENSIONLESS
WET MOLECULAR WEIGHT OF GAS	28.5687	POUND/POUND-MOLE
PITOT TUBE COEFFICIENT	0.8400	DIMENSIONLESS
AVERAGE STACK GAS TEMPERATURE	682.5313	DEGREES RANKIN
AVERAGE SQUARE ROOT OF DELTA P	0.8987	INCHES OF WATER
STATIC STACK PRESSURE	0.3500	INCHES OF WATER
PRESSURE OF STACK	30.2457	INCHES OF MERCURY
STACK GAS VELOCITY	57.3564	FEET PER SECOND
CROSS-SECTIONAL AREA OF STACK	78.5398	SQUARE FEET
STACK GAS VOLUMETRIC FLOW RATE	176117.1811	STD. CFM (68 & 29.92)
STACK GAS VOLUMETRIC FLOW RATE	270285.8448	ACFM
WET BULB STACK GAS TEMPERATURE	127.0000	DEGREES FAHRENHEIT
TOTAL PARTICULATE COLLECTED	47.8300	MILLIGRAMS
PARTICULATE CONCENTRATION	0.0157	GRAINS PER SCF
PARTICULATE CONCENTRATION @ %12 CO2	0.0122	GRAINS PER SCF
PARTICULATE EMISSION RATE	23.7178	POUNDS PER HOUR
TOTAL SAMPLING TIME	64.0000	MINUTES
DIAMETER OF SAMPLING NOZZLE	0.2480	INCHES
CROSS-SECTIONAL AREA OF SAMPLING NOZZLE	3.3545E-04	SQUARE FEET
PERCENT OF ISOKENTIC SAMPLING	97.4058	PERCENT

DAVIS & FLOYD INC.

POST OFFICE DRAWER 428
GREENWOOD, SOUTH CAROLINA 29646

****
*** SOURCE SAMPLING DATA REPORT ***
****

RUN 2

FOR: GIFFORD-HILL CEMENT CO. DAVIS & FLOYD, INC. JOB#: 6747.
LOCATION: HARLEYVILLE, SC SAMPLE DATE: 18 APRIL 1989
SOURCE: KILN STACK

I T E M	RESULTS	UNITS
CO2 CONCENTRATION	14.9000	PRECENT
O2 CONCENTRATION	6.0000	PRECENT
CO CONCENTRATION	0.0000	PRECENT
N2 CONCENTRATION	79.1000	PRECENT
DRY MOLECULAR WEIGHT OF GAS	30.6240	POUND/POUND-MOLE
FINAL IMPINGER WATER VOLUME	421.0000	MILLILITERS
INITIAL IMPINGER WATER VOLUME	200.0000	MILLILITERS
SILICA GEL VOLUME INCREASE	17.3000	MILLILITERS
TOTAL MOSTURE COLLECTED	238.3000	MILLILITERS
TOTAL MOSTURE COLLECTED	11.2478	STANDARD CUBIC FEET
MOISTURE CONTENT OF STACK GAS	19.1108	PERCENT
MEASURED DRY GAS VOLUME THROUGH METER	- 50.7696	CUBIC FEET
BAROMETRIC PRESSURE	30.2200	INCHES OF MERCURY
AVERAGE GAS TEMPERATURE THROUGH METER	571.4375	DEGREES RANKIN
AVERAGE GAS DELTA H	2.1350	INCHES OF WATER
DRY GAS VOLUME THROUGH METER	47.6078	STANDARD CUBIC FEET
MOISTURE CONTENT OF GAS	0.1911	DIMENSIONLESS
WET MOLECULAR WEIGHT OF GAS	28.2115	POUND/POUND-MOLE
PITOT TUBE COEFFICIENT	0.8400	DIMENSIONLESS
AVERAGE STACK GAS TEMPERATURE	683.1563	DEGREES RANKIN
AVERAGE SQUARE ROOT OF DELTA P	0.9028	INCHES OF WATER
STATIC STACK PRESSURE	0.3500	INCHES OF WATER
PRESSURE OF STACK	30.2457	INCHES OF MERCURY
STACK GAS VELOCITY	58.0105	FEET PER SECOND
CROSS-SECTIONAL AREA OF STACK	78.5398	SQUARE FEET
STACK GAS VOLUMETRIC FLOW RATE	172764.7004	STD. CFM (68 & 29.92)
STACK GAS VOLUMETRIC FLOW RATE	273368.0846	ACFM
WET BULB STACK GAS TEMPERATURE	127.0000	DEGREES FAHRENHEIT
TOTAL PARTICULATE COLLECTED	39.1100	MILLIGRAMS
PARTICULATE CONCENTRATION	0.0127	GRAINS PER SCF
PARTICULATE CONCENTRATION @ %12 CO2	0.0102	GRAINS PER SCF
PARTICULATE EMISSION RATE	18.7343	POUNDS PER HOUR
TOTAL SAMPLING TIME	64.0000	MINUTES
DIAMETER OF SAMPLING NOZZLE	0.2480	INCHES
CROSS-SECTIONAL AREA OF SAMPLING NOZZLE	3.3545E-04	SQUARE FEET
PERCENT OF ISOKINETIC SAMPLING	100.8289	PERCENT

DAVIS & FLOYD INC.

POST OFFICE DRAWER 428
GREENWOOD, SOUTH CAROLINA 29646

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************************************
***  SOURCE SAMPLING DATA REPORT  ***
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RUN 3

FOR: GIFFORD-HILL CEMENT CO. DAVIS & FLOYD , INC. JOB#: 6747
LOCATION: HARLEYVILLE, SC SAMPLE DATE: 18 APRIL 1989
SOURCE: KILN STACK

I T E M	RESULTS	UNITS
CO2 CONCENTRATION	15.5000	PRECENT
O2 CONCENTRATION	5.1000	PRECENT
CO CONCENTRATION	0.0000	PRECENT
N2 CONCENTRATION	79.4000	PRECENT
DRY MOLECULAR WEIGHT OF GAS	30.6840	POUND/POUND-MOLE
FINAL IMPINGER WATER VOLUME	408.0000	MILLILITERS
INITIAL IMPINGER WATER VOLUME	200.0000	MILLILITERS
SILICA GEL VOLUME INCREASE	19.2000	MILLILITERS
TOTAL MOSTURE COLLECTED	227.2000	MILLILITERS
TOTAL MOSTURE COLLECTED	10.7238	STANDARD CUBIC FEET
MOISTURE CONTENT OF STACK GAS	19.0557	PERCENT
MEASURED DRY GAS VOLUME THROUGH METER	48.0155	CUBIC FEET
BAROMETRIC PRESSURE	30.2200	INCHES OF MERCURY
AVERAGE GAS TEMPERATURE THROUGH METER	564.5938	DEGREES RANKIN
AVERAGE GAS DELTA H	1.9663	INCHES OF WATER
DRY GAS VOLUME THROUGH METER	45.5524	STANDARD CUBIC FEET
MOISTURE CONTENT OF GAS	0.1906	DIMENSIONLESS
WET MOLECULAR WEIGHT OF GAS	28.2670	POUND/POUND-MOLE
PITOT TUBE COEFFICIENT	0.8400	DIMENSIONLESS
AVERAGE STACK GAS TEMPERATURE	685.2188	DEGREES RANKIN
AVERAGE SQUARE ROOT OF DELTA P	0.8796	INCHES OF WATER
STATIC STACK PRESSURE	0.3500	INCHES OF WATER
PRESSURE OF STACK	30.2457	INCHES OF MERCURY
STACK GAS VELOCITY	56.5519	FEET PER SECOND
CROSS-SECTIONAL AREA OF STACK	78.5398	SQUARE FEET
STACK GAS VOLUMETRIC FLOW RATE	168028.1049	STD. CFM (68 & 29.92)
STACK GAS VOLUMETRIC FLOW RATE	266494.5821	ACFM
WET BULB STACK GAS TEMPERATURE	127.0000	DEGREES FAHRENHEIT
TOTAL PARTICULATE COLLECTED	49.3000	MILLIGRAMS
PARTICULATE CONCENTRATION	0.0167	GRAINS PER SCF
PARTICULATE CONCENTRATION @ %12 CO2	0.0129	GRAINS PER SCF
PARTICULATE EMISSION RATE	24.0044	POUNDS PER HOUR
TOTAL SAMPLING TIME	64.0000	MINUTES
DIAMETER OF SAMPLING NOZZLE	0.2480	INCHES
CROSS-SECTIONAL AREA OF SAMPLING NOZZLE	3.3545E-04	SQUARE FEET
PERCENT OF ISOKINETIC SAMPLING	99.1954	PERCENT

APPENDIX II

Source Sampling Data Summary Calculations

BEST AVAILABLE COPY

DAVIS & FLOYD INC.

POST OFFICE DRAWER 428
GREENWOOD, SOUTH CAROLINA 29646

****
*** SOURCE SAMPLING DATA SUMMARY ***
****

FOR: GIFFORD-HILL CEMENT CO.
LOCATION: HARLEYVILLE, SC
SOURCE: KILN STACK

DAVIS & FLOYD, INC. JOB# 6747
SAMPLE DATE: 18 APRIL 1989

TEST	TEST 1	TEST 2	TEST 3
CO2	15.5000	14.9000	15.5000
O2	5.1000	6.0000	5.1000
CO	0.0000	0.0000	0.0000
N2	79.4000	79.1000	79.4000
MD	30.6840	30.6240	30.6840
VF	379.0000	421.0000	408.0000
VI	200.0000	200.0000	200.0000
VS GEL	19.8000	17.3000	19.2000
VIC	198.8000	238.3000	227.2000
VM STD	9.3834	11.2478	10.7238
B WO	16.6771	19.1108	19.0557
VM	49.5016	50.7696	48.0155
P BAR	30.2200	30.2200	30.2200
TM	565.6875	571.4375	564.5938
DELTA H	2.0553	2.1350	1.9663
VM STD	46.8816	47.6078	45.5524
B WO/D	0.1668	0.1911	0.1906
MS	28.5687	28.2115	28.2670
CP	0.8400	0.8400	0.8400
TS AVG	682.5313	683.1563	685.2188
AVG SQ/R DELTA P	0.8987	0.9028	0.8796
STATIC P	0.3500	0.3500	0.3500
PS	30.2457	30.2457	30.2457
VS	57.3564	58.0105	56.5519
A	78.5398	78.5398	78.5398
QS STD CFM	176117.1811	172764.7004	168028.1049
QS ACFM	270285.8448	273368.0846	266494.5821
WB/T	127.0000	127.0000	127.0000
MN	47.8300	39.1100	49.3000
C/S	0.0157	0.0127	0.0167
C/S @ %12 CO2	0.0122	0.0102	0.0129
CS	23.7178	18.7343	24.0044
TIME	64.0000	64.0000	64.0000
DN	0.2480	0.2480	0.2480
AN	3.3545E-04	3.3545E-04	3.3545E-04
I	97.4058	100.8289	99.1954

CALCULATIONS

I. Determination of Molecular Weight (Dry) Orsat Analysis

$Md = 0.44\ (\%CO_2) + 0.32\ (\%\ O_2) + 0.28\ (\%\ N_2 + \%\ CO)$ (eq.1)

Md = Molecular weight of stack gas (dry basis), lb/lb-mole

II.. Determination of Stack Gas Moisture

Vi = Initial volume of impinger contents in ml.

Vf = Final volume of impinger content in ml.

Vs_{gel} = Moisture collected in silica gel in ml.

Vi_c = Total volume of liquid collected in impingers and silica gel in ml.

$Vi_c = (Vf - Vi) + Vs_{gel}$ (eq.2)

$Vw_{std} = (0.0472\ ft.^3/ml)\ (Vi_c)$ (eq.3)

Vw_{std} = Volume of water vapor in the gas sample (standard conditions), cu. ft.

$$Vm_{std} = (17.64\ °R/in.\ Hg)\ (Vm)(y) \left(\frac{Pbar + \frac{\Delta H}{13.6}}{Tm} \right) \quad \text{(eq.4)}$$

y = Calibration Factor

Vm_{std} = Volume of gas sample through dry gas meter (standard conditions), cu. ft.

Vm = Volume of gas sample through dry gas meter (meter conditions), cu. ft.

P bar = Barometer pressure at the dry gas meter, in.Hg.

Tm = Absolute temperature at meter, °R (°F + 460)

ΔH = Average pressure drop across the orifice, inches H_2O.

$$B_{wo} = \frac{Vw\ std}{Vw\ std + Vm\ std} \quad \text{(eq.5)}$$

B_{wo} = Proportion by volume of water vapor in the gas stream, dimensionless.

$$Ms = Md\ (1 - B_{wo}) + 18\ (B_{wo}) \qquad \text{(eq.6)}$$

Ms = Molecular weight of stack gas (wet basis) lb/lb-mole.

III. Determination of Stack Gas Velocity

$$Vs_{avg.} = Kp\ Cp \left(\sqrt{\Delta p}\right) avg. \sqrt{\frac{Ts\ avg.}{(Ps)(Ms)}} \qquad \text{(eq.7)}$$

$Kp = 85.49$ ft./sec. $(\text{lb/lb - mole °R})^{(0.5)}$

Cp = Pitot tube coefficient, dimensionless

$Ts_{avg.}$ = Average absolute stack gas temperature, °R

Ps = Absolute stack gas pressure, inches Hg

$\sqrt{\Delta p}$ = Average velocity head of stack gas, (inches H_2O)

$Vs_{avg.}$ = Stack gas velocity, feet per second.

IV. Determination of Stack Gas Volumetric Flow Rate (std. cond. - dry)

$$Qs = 60\ (1-B_{wo})\ (V_s\ avg.)\ (A) \left(\frac{T_{std}}{Ts_{avg.}}\right)\left(\frac{Ps}{P_{std}}\right) \qquad \text{(eq.8)}$$

$T_{std} = 528°R$

$P_{std} = 29.92$ inch Hg

A = Cross - sectional area of stack, ft.^{2}

Qs = Volumetric flow rate, dry basis, standard condtions, ft.^{3}/min.

V. Determination of Particulate Concentration

$$C's = 0.0154\ \text{grains/mg.} \left(\frac{Mn}{Vm_{std}}\right) \qquad \text{(eq.9)}$$

Mn = Total amount of particulate matter collected, mg.

C's = Concentration of particulate matter in stack gas, gr./s.c.f., dry basis.

VI. Determination of Particulate Emission Rate

$$Cs = \frac{(60\ \text{min/hr.})\ (Qs)\ (C's)}{7{,}000} \qquad \text{(eq.10)}$$

Cs = Particulate emission rate, lbs/hr., dry basis.

VII. Determination of Acceptability of Sampling Results

$$I = \frac{Ts \left[\left(\frac{0.00267 \text{ in Hg-cu.ft.}}{\text{ml.} \quad {}^\circ R} \right) Vi_c + \frac{Vm}{Tm} \left(Pbar + \frac{\Delta H}{13.6} \right) \right] \left(1.667 \; \frac{\text{min.}}{\text{sec.}} \right)}{(\theta) \quad (Vs_{avg.}) \quad (Ps) \quad (An)} \qquad \text{(eq.11)}$$

θ = Total sampling time, minute

An = Cross-sectional area of nozzle, sq. ft.

I = Percent of isokinetic sampling

APPENDIX III

Process Input Rate
Particulate Field Data Sheets
Test Equipment Calibration Calculations
Test Equipment Calibrations

DAVIS & FLOYD INC.
ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

GIFFK

PARTICULATE FIELD DATA SHEETS

PLANT GIFFORD-HILL CEMENT CO.
OPERATOR ANDERSON

LOCATION HARLEYVILLE, SC
SAMPLE BOX NO. 6 (FILTER 2)

SOURCE KILN STACK
METER BOX NO. 6

RUN NO. 1
METER ΔHa 1.729

SAMPLE DATE 4 – 18 – 89
ASSUMED MOISTURE, % 18.5%

JOB NO. 6747
HEATER BOX SETTING, °F 250

NUMBER OF Δp READINGS 32
PROBE LENGTH 5 FT # 1 (GLASS)

NUMBER OF INLET & OUTLET TEMPS. 32
PROBE HEATER SETTING 4

Cp FACTOR .84
AVERAGE $\sqrt{\Delta p}$

STATIC PRESSURE IN H_2O + .35
AVERAGE ΔH

% CO_2 15.5
SILICA GEL FINAL WEIGHT, GRAMS 219.8

% O_2 5.1
SILICA GEL INITIAL WEIGHT, GRAMS 200

% CO 0.0
METER BOX γ 0.965

WET BULB TEMPERATURE 127°F
DRY BULB TEMPERATURE 224°F

DIAMETER OF CIRCULAR STACK 10'
SAMPLE PORT LOCATED 69 FEET UP STACK

DIMENSION OF RECTANGULAR STACK — x —
STACK HEIGHT 80 FT.

VOLUME OF GAS MEASURED x γ 49.5016
OBSERVER DON O'GORMAN DHEC

BAROMETRIC PRESSURE 30.22
AMBIENT TEMPERATURE 80°F

PARTICULATE CATCH, mg. 47.83
PLUME DESCRIPTION LIGHT BROWN DISCHARGE.

FINAL IMPINGER VOLUME 379 ml

INITIAL IMPINGER VOLUME 200 ml
"C" FACTOR 0.78

SILICA GEL VOLUME 19.8 ml
PROCESS RATE TONS/hr.

TIME OF TEST, MINUTES 64
STEAM PRODUCTION —

SAMPLING NOZZLE DIAMETER, INCHES .248

NOZZLE NO. 1

PITOBE LEAK CHECK ✓

TEMPERATURE CALIBRATION
MERCURY IN GLASS THERMOMETER 80°F
THERMOCOUPLE READ OUT 79°F

REMARKS:

PAGE _____ OF _____

06

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant GIFFORD HILL CEMENT Run No. 1

Sample Location KILN EXHAUST

Sample Type	Sample Identifiable	Liquid Level Marked and/or container sealed
Acetone rinse	✓	✓
filter(s)	✓	✓

Acetone blank container No. 12

Acetone rinse volume (V) 117 ml

*50 ml acetone blank weight:

Date and time of wt. 4-26-89 1201 AKA Gross wt. 44490.0 mg

Date and time of wt. 5-2-89 0932 AKA Gross wt. 44490.2 mg

Average Gross wt. 44490.1 mg

Date and time of wt. 4-25-89 1354 AKA Tare wt. 44489.9 mg

50 ml blank wt. 0.2 mg

*Total blank wt. (Bw) = $\frac{\text{50ml blank wt. X V}}{50}$ = 0.47 mg

*Weight of Particulate in acetone rinse(PW):

Date and time of wt. 4-26-89 1127 AKA Gross wt. 103455.0 mg

Date and time of wt. 4-27-89 1345 AKA Gross wt. 103455.5 mg

Average Gross wt. 103455.3 mg

Date and time of wt. 4-25-89 1709 AKA Tare wt. 103422.8 mg

Weight of Particulate in acetone rinse(Pw) 32.5 mg

*Weight of Particulate on filters(Fw): Filter No.

Date and time of wt. 4-26-89 0819 AKA Gross wt. 361.0 mg

Date and time of wt. 4-27-89 0832 AKA Gross wt. 360.6 mg

Average Gross wt. 360.8 mg

Date and time of wt. 4-5-89 1441 GA Tare wt. 345.0 mg

Weight of Particulate on Filter(Fw) 15.8 mg

Total Weight of Particulate(Tw):

TW = (Pw + Fw) - Bw = 47.83 mg

Date Sampled 4-18-89

Date of Laboratory Custody 4-20-89

Laboratory Personnel Taking Custody KIRK ALEXANDER

Remarks VERY LIGHT GRAY DISCHARGE

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ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

TEST 1 PORT A KILN EXHAUST FIELD DATA SHEET

TRAVERSE POINT NO.	CLOCK TIME	SAMPLING TIME	DRY GAS METER, CU. FT.	PITOBE MANOMETER ΔP IN H_2O	ORIFICE MANOMETER ΔH IN H_2O	STACK TEMP. °F	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg.	FILTER TEMP. °F	TEMP. GAS LEAVING LAST IMPINGER °F
1	12:34	0	36.31 ~~35.90~~	.55	1.4	225	96		1	212	70
2		2	37.9	.6	1.52	226	97		2	226	68
3		4	39.0	.8	2.0	224	98		2	229	67
4		6	41.2	.9	2.25	224	99		3	239	66
5		8	42.2	.9	2.25	225	100		3	240	66
6		10	43.9	.95	2.35	226	100		3	242	66
7		12	46.6	.9	2.25	227	101		3	246	65
8		14	47.7	.8	2.0	226	101		3	244	64
	12:50	16	48.8								
					B						
1	12:57	0	48.8	.55	1.4	218	101		2	246	68
2		2	50.3	.55	1.4	224	101		2	250	62
3		4	51.8	.65	1.7	226	102		2	242	62
4		6	53.0	.75	1.85	226	103		2	250	62
5		8	54.7	.7	1.75	225	103		3	246	62
6		10	56.0	.8	2.0	223	104		3	250	65
7		12	57.6	.7	1.75	225	104		3	250	66
8		14	59.0	.7	1.75	225	106		3	241	66
	1:07	16	60.5								

REMARKS: ______________________

BEGINNING LEAK RATE 0.011 C.F.M. @ 12 in. Hg

FINAL LEAK RATE ________ C.F.M. @ ________ in. Hg

OC

PAGE ______ OF ______

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GREENWOOD, SOUTH CAROLINA

TEST 1 PORT C KILN EXHAUST FIELD DATA SHEET

TRAVERSE POINT NO.	CLOCK TIME	SAMPLING TIME	DRY GAS METER, CU. FT.	PITOBE MANOMETER ΔP IN H_2O	ORIFICE MANOMETER ΔH IN H_2O	STACK TEMP. °F	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg.	FILTER TEMP. °F	TEMP. GAS LEAVING LAST IMPINGER °F
1	1:09	0	60.5	.55	1.4	216	106		2	242	70
2		2	61.6	.65	1.7	221	106		3	244	68
3		4	63.3	.9	2.25	220	107		3	245	67
4		6	65.2	1.0	2.55	222	108		3	245	66
5		8	66.8	.9	2.25	224	109		3	243	66
6		10	68.9	.9	2.25	222	110		3	244	66
7		12	70.6	.85	2.1	223	110		3	247	67
8		14	72.0	.85	2.1	220	111		3	248	67
	1:25	16	73.5								
					D						
1	1:27	0	73.5	0.7	1.75	215	110		3	242	69
2		2	74.9	1.0	2.55	219	111		3.5	260	67
3		4	76.6	1.0	2.55	221	112		3.5	247	66
4		6	78.6	1.0	2.55	222	112		3.5	246	66
5		8	80.3	1.1	2.8	224	113		4	246	66
6		10	82.1	1.0	2.55	221	113		4	250	66
7		12	83.9	1.0	2.55	218	114		3.5	239	66
8		14	85.8	.9	2.25	218	114		3.5	243	66
	1:43	16	87.607								

REMARKS:

BEGINNING LEAK RATE ______ C.F.M. @ ______ in. Hg

FINAL LEAK RATE 0.006 C.F.M. @ 7 in. Hg

OG

PAGE ______ OF ______

DAVIS & FLOYD INC.
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GREENWOOD, SOUTH CAROLINA

PARTICULATE FIELD DATA SHEETS

PLANT GIFFORD-HILL CEMENT CO. OPERATOR ANDERSON
LOCATION HARLEYVILLE, SC SAMPLE BOX NO. 4
SOURCE KILN STACK METER BOX NO. 6
RUN NO. 2 METER ΔHa 1.779
SAMPLE DATE 12 - 18 - 88 ASSUMED MOISTURE, % 18.5
JOB NO. 6747 HEATER BOX SETTING, °F 250
NUMBER OF Δp READINGS 32 PROBE LENGTH 5 FT # 4
NUMBER OF INLET & OUTLET TEMPS. 32 PROBE HEATER SETTING
Cp FACTOR .84 AVERAGE $\sqrt{\Delta p}$
STATIC PRESSURE IN H_2O +.35 AVERAGE ΔH
% CO_2 14.9 SILICA GEL FINAL WEIGHT, GRAMS 217.3
% O_2 6.0 SILICA GEL INITIAL WEIGHT, GRAMS 200
% CO 0.0 METER BOX γ 0.965
WET BULB TEMPERATURE 127°F DRY BULB TEMPERATURE 225
DIAMETER OF CIRCULAR STACK 10' SAMPLE PORT LOCATED 69 FEET UP STACK
DIMENSION OF RECTANGULAR STACK x STACK HEIGHT 80 FT.
VOLUME OF GAS MEASURED x γ 50.7696 OBSERVER DON O'GORMAN DHEC
BAROMETRIC PRESSURE 30.22 AMBIENT TEMPERATURE 85°F
PARTICULATE CATCH, mg. 39.11 PLUME DESCRIPTION VERY LIGHT
FINAL IMPINGER VOLUME 421 ml DISCHARGE.
INITIAL IMPINGER VOLUME 200 ml "C" FACTOR 0.8
SILICA GEL VOLUME 17.3 ml PROCESS RATE TONS/hr.
TIME OF TEST, MINUTES 64 STEAM PRODUCTION —
SAMPLING NOZZLE DIAMETER, INCHES .248
NOZZLE NO. 2
PITOBE LEAK CHECK

TEMPERATURE CALIBRATION
MERCURY IN GLASS THERMOMETER
THERMOCOUPLE READ OUT

REMARKS:

06

PAGE ____ OF ____

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METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant GIFFORD HILL CEMENT Run No. 2

Sample Location KILN EXHAUST

Sample Type	Sample Identifiable	Liquid Level Marked and/or container sealed
Acetone rinse	✓	✓
filter(s)	✓	✓

Acetone blank container No. 12

Acetone rinse volume (V) 94 ml

*50 ml acetone blank weight:
Date and time of wt. 4-26-89 1201 AKA Gross wt. 44490.0 mg
Date and time of wt. 5-2-89 0932 AKA Gross wt. 44490.2 mg
Average Gross wt. 44490.1 mg
Date and time of wt. 4-25-89 1354 AKA Tare wt. 44489.9 mg
50 ml blank wt. 0.2 mg

*Total blank wt.(Bw) = $\frac{\text{50ml blank wt. X V}}{50}$ = 0.39 mg

*Weight of Particulate in acetone rinse(PW):
Date and time of wt. 4-26-89 1124 AKA Gross wt. 126722.3 mg
Date and time of wt. 4-27-89 1352 AKA Gross wt. 126722.8 mg
Average Gross wt. 126722.6 mg
Date and time of wt. 4-25-89 1455 AKA Tare wt. 126698.6 mg
Weight of Particulate in acetone rinse(Pw) 24.0 mg

*Weight of Particulate on filters(Fw): Filter No.
Date and time of wt. 4-26-89 0822 AKA Gross wt. 360.3 mg
Date and time of wt. 4-27-89 0830 AKA Gross wt. 360.3 mg
Average Gross wt. 360.3 mg
Date and time of wt. 4-5-89 1446 G.A. Tare wt. 344.8 mg
Weight of Particulate on Filter(Fw) 15.5 mg

Total Weight of Particulate(Tw):
TW = (Pw + Fw) - Bw = 39.11 mg

Date Sampled 4-18-89

Date of Laboratory Custody 4-20-89

Laboratory Personnel Taking Custody KIRK ALEXANDER

Remarks

Page ______ of ______

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ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

TEST 2 PORT A KILN EXHAUST FIELD DATA SHEET

TRAVERSE POINT NO.	CLOCK TIME	SAMPLING TIME	DRY GAS METER, CU. FT.	PITOBE MANOMETER ΔP IN H_2O	ORIFICE MANOMETER ΔH IN H_2O	STACK TEMP. °F	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg.	FILTER TEMP. °F	TEMP. GAS LEAVING LAST IMPINGER °F
1	2:03	0	87.749	.5	1.3	224	104		3	242	72
2		2	89.0	.8	2.1	226	105		3	250	69
3		4	90.2	.8	2.1	226	105		3	257	68
4		6	91.8	.9	2.3	224	106		3	250	67
5		8	93.2	.9	2.3	225	106		3	242	66
6		10	95.6	.9	2.3	221	107		3	225	66
7		12	97.4	.8	2.1	220	108		2	229	67
8		14	99.3	.75	1.9	222	108		2	237	66
	2:19	16	100.8								
					B						
1	2:21	0	100.8	.45	1.15	214	109		2	242	71
2		2	102.0	.6	1.52	223	109		2	226	72
3		4	103.5	.65	1.65	221	109		2	239	68
4		6	104.8	.75	1.9	226	110		2	246	68
5		8	106.7	.75	1.9	227	111		3	244	67
6		10	107.9	.7	1.85	226	111		3	246	67
7		12	109.6	.7	1.85	223	112		3	250	67
8		14	111.1	.7	1.85	224	113		3	250	66
	2:37	16	112.5								

REMARKS:

BEGINNING LEAK RATE 0.007 C.F.M. @ 12 in. Hg

FINAL LEAK RATE ________ C.F.M. @ ________ in. Hg

OG

PAGE ______ OF ______

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ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

TEST 2 PORT C KILN EXHAUST FIELD DATA SHEET

TRAVERSE POINT NO.	CLOCK TIME	SAMPLING TIME	DRY GAS METER, CU. FT.	PITOBE MANOMETER ΔP IN H_2O	ORIFICE MANOMETER ΔH IN H_2O	STACK TEMP. °F	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg.	FILTER TEMP. °F	TEMP. GAS LEAVING LAST IMPINGER °F
1	2:39	0	112.5	.65	1.65	212	112		3	240	71
2		2	113.9	.7	1.85	214	112		3	246	69
3		4	115.4	.85	2.2	219	113		4	251	67
4		6	117.0	.9	2.35	223	114		4	254	67
5		8	118.7	.95	2.5	224	114		5	246	66
6		10	120.6	.95	2.5	224	114		5	244	66
7		12	122.3	.85	2.2	226	114		4	246	67
8		14	124.5	.85	2.2	224	115		4	250	67
	2:54	16	125.76								
					D						
1	2:57	0	125.76	.8	2.1	220	114		4	236	69
2		2	127.9	1.0	2.6	227	114		4.5	244	67
3		4	129.5	1.1	2.85	224	115		4.5	247	67
4		6	131.2	1.1	2.85	220	116		5	251	66
5		8	133.4	1.1	2.85	226	116		5	246	67
6		10	135.3	1.1	2.85	227	116		5	248	67
7		12	136.8	.9	2.35	229	117		4.5	250	66
8		14	138.8	.9	2.35	230	117		4	242	66
	3:13	16	140.360								

REMARKS: ____________________

BEGINNING LEAK RATE ________ C.F.M. @ ________ in. Hg

FINAL LEAK RATE 0.00 C.F.M. @ 6 in. Hg

OC

PAGE ______ OF ______

DAVIS & FLOYD ENGINEERS

DAVIS & FLOYD INC.
ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

PARTICULATE FIELD DATA SHEETS

PLANT GIFFORD-HILL CEMENT CO. OPERATOR ANDERSON
LOCATION HARLEYVILLE, SC SAMPLE BOX NO. 5
SOURCE KILN STACK METER BOX NO. 6
RUN NO. ~~2~~ 3 METER ΔHa 1.729
SAMPLE DATE ~~12~~ 4 - 18 - 88 ASSUMED MOISTURE, % 18.5%
JOB NO. 6747- HEATER BOX SETTING, °F 250
NUMBER OF Δp READINGS 32 PROBE LENGTH 5 FT #2 GLASS
NUMBER OF INLET & OUTLET TEMPS. 32 PROBE HEATER SETTING 4
Cp FACTOR .84 AVERAGE √Δp
STATIC PRESSURE IN H_2O +.35 AVERAGE ΔH
% CO_2 15.5 SILICA GEL FINAL WEIGHT, GRAMS 219.2
% O_2 5.1 SILICA GEL INITIAL WEIGHT, GRAMS 200
% CO 0.0 METER BOX γ 0.965
WET BULB TEMPERATURE 127°F DRY BULB TEMPERATURE 225°F
DIAMETER OF CIRCULAR STACK 10' SAMPLE PORT LOCATED 69 FEET UP STACK
DIMENSION OF RECTANGULAR STACK — x — STACK HEIGHT 80
VOLUME OF GAS MEASURED x γ 48.0155 OBSERVER DON O'GORMAN DHEC
BAROMETRIC PRESSURE 30.22 AMBIENT TEMPERATURE 82°F
PARTICULATE CATCH, mg. 49.3 PLUME DESCRIPTION SLIGHT DISCHARGE
FINAL IMPINGER VOLUME 408 ml
INITIAL IMPINGER VOLUME 200 ml "C" FACTOR 0.8
SILICA GEL VOLUME 19.2 ml PROCESS RATE Tons/hr.
TIME OF TEST, MINUTES 64 STEAM PRODUCTION NA.
SAMPLING NOZZLE DIAMETER, INCHES .248
NOZZLE NO. 4
PITOBE LEAK CHECK

TEMPERATURE CALIBRATION
MERCURY IN GLASS THERMOMETER
THERMOCOUPLE READ OUT

REMARKS:

PAGE ___ OF ___

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METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant GIFFORD HILL CEMENT Run No. 3

Sample Location KILN EXHAUST

Sample Type	Sample Identifiable	Liquid Level Marked and/or container sealed
Acetone rinse	✓	✓
filter(s)	✓	✓

Acetone blank container No. 12

Acetone rinse volume (V) 126 ml

*50 ml acetone blank weight:

Date and time of wt. 4-26-89 1201 AKA Gross wt. 44490.0mg

Date and time of wt. 5-2-89 0932 AKA Gross wt. 44490.2mg

Average Gross wt. 44490.1 mg

Date and time of wt. 4-25-89 1354 AKA Tare wt. 44489.9 mg

50 ml blank wt. 0.2 mg

*Total blank wt.(Bw) = $\frac{\text{50ml blank wt. X V}}{50}$ = 0.50 mg

*Weight of Particulate in acetone rinse(PW):

Date and time of wt. 4-26-89 1130 AKA Gross wt. 112384.3mg

Date and time of wt. 4-27-89 1100 AKA Gross wt. 112384.7mg

Average Gross wt. 112384.5 mg

Date and time of wt. 4-25-89 1717 AKA Tare wt. 112350.0 mg

Weight of Particulate in acetone rinse(Pw) 34.5 mg

*Weight of Particulate on filters(Fw): Filter No.

Date and time of wt. 4-26-89 0817 AKA Gross wt. 361.0 m

Date and time of wt. 4-27-89 0836 AKA Gross wt. 360.8 m

Average Gross wt. 360.9 m

Date and time of wt. 4-5-89 1445 GA Tare wt. 345.6 m

Weight of Particulate on Filter(Fw) 15.3 m

Total Weight of Particulate(Tw):

TW = (Pw + Fw) - Bw = 49.3 m

Date Sampled 4-18-89

Date of Laboratory Custody 4-20-89

Laboratory Personnel Taking Custody Kirk Alexander

Remarks

Page ______ of ______

DAVIS & FLOYD INC.
ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

TEST 3 PORT A KILN EXHAUST FIELD DATA SHEET

TRAVERSE POINT NO.	CLOCK TIME	SAMPLING TIME	DRY GAS METER, CU. FT.	PITOBE MANOMETER ΔP IN H_2O	ORIFICE MANOMETER ΔH IN H_2O	STACK TEMP. °F	DRY GAS TEMP. °F		PUMP VACUUM IN. Hg.	FILTER TEMP. °F	TEMP. GAS LEAVING LAST IMPINGER °F
							INLET	OUTLET			
1	3:44	0	140.451	-5	1.25	212	100		2	224	71
2		2	142.0	.7	1.75	223	100		2	247	68
3		4	143.3	.8	2.0	224	100		2	242	67
4		6	144.7	.8	2.0	227	101		2	236	67
5		8	146.3	-9	2.22	230	101		2	240	67
6		10	147.8	.85	2.15	228	102		2	243	67
7		12	149.4	.85	2.15	227	102		2	250	67
8		14	151.1	.85	2.15	227	102		2	246	67
	4:00	16	152.66								
					B						
1	4:02	0	152.66	.4	1.0	213	102		2	232	70
2		2	153.7	.5	1.25	219	102		2	239	68
3		4	155.1	.65	1.6	229	102		2	246	67
4		6	156.5	.7	1.75	230	103		2	248	66
5		8	157.9	.7	1.76	232	104		2	252	66
6		10	159.3	.7	1.75	230	104		3	240	66
7		12	160.9	.65	1.6	226	105		2	230	67
8		14	162.5	.65	1.6	225	105		2	236	66
	4:18	16	163.9								

REMARKS:

BEGINNING LEAK RATE 0.00 C.F.M. @ 12 in. Hg

FINAL LEAK RATE ________ C.F.M. @ ________ in. Hg

OG

PAGE ______ OF ______

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ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

TEST 3 PORT C KILN EXHAUST FIELD DATA SHEET

TRAVERSE POINT NO.	CLOCK TIME	SAMPLING TIME	DRY GAS METER, CU. FT.	PITOBE MANOMETER ΔP IN H_2O	ORIFICE MANOMETER ΔH IN H_2O	STACK TEMP. °F	DRY GAS TEMP. °F		PUMP VACUUM IN. Hg.	FILTER TEMP. °F	TEMP. GAS LEAVING LAST IMPINGER °F
							INLET	OUTLET			
1	4:19	0	163.9	.6	1.5	209	105		2	239	69
2		2	165.3	.6	1.5	226	105		2	246	68
3		4	166.7	.8	2.0	231	105		2	242	67
4		6	168.6	.9	2.25	227	106		3	250	66
5		8	169.9	.95	2.4	234	106		3	246	68
6		10	172.2	.95	2.4	231	106		3	240	66
7		12	173.3	.9	2.25	228	107		3	241	65
8		14	175.0	.85	2.15	228	107		3	246	66
	4:35	16	176.7								
					D						
1	4:37	0	176.7	.5	1.25	216	107		2	241	70
2		2	178.4	.8	2.0	219	107		3	246	68
3		4	179.5	1.0	2.5	224	108		3.5	249	67
4		6	181.5	1.0	2.5	226	108		3.5	234	66
5		8	183.0	1.1	2.8	227	108		3.5	239	65
6		10	185.0	1.1	2.8	229	109		4	250	64
7		12	186.6	1.0	2.6	230	109		4	246	64
8		14	188.6	.85	2.15	220	109		3	248	66
	4:53	16	190.218								

REMARKS: ______

BEGINNING LEAK RATE ______ C.F.M. @ ______ in. Hg

FINAL LEAK RATE 0.00 C.F.M. @ 7 in. Hg

OG

PAGE ______ OF ______

TEST EQUIPMENT CALIBRATION CALCULATIONS

WHERE

Q = Flow Rate (C.F.M.)
Vs = Wet Meter Gas Volume (ft^3)
Vds = Dry Gas Meter Volume (ft^3)(calibration meter)
T = Time-seconds
Pb - Barometric Pressure (In. H_g)
Ts = Wet Meter Temperature (°F)
ΔP = Dry Gas Meter Inlet Differential pressure (in H_2O)
Yd = Meter Box Meter coefficient, dimensionless
Yds = Dry Gas Meter coefficient, dimensionless
Vd = Meter Box Meter Gas Volume (Cu. Ft.)
Tds = Calibration Meter Average Temperature (Dry Gas Meter)
Td = Meter Box Avg. Temp. (°F)
ΔH = Orifice Pressure Differential
ΔHa = Orifice pressure differential that gives 0.75 C.F.M. of air at 70°F + 29.92 inches of mercury, in H_2O
Tolerance = ±0.15
Ysa = Average of Ydsa Values (from the calibration of dry gas meter to be used as a standard) in the working range of 0.40 C.F.M. to 1.0 C.F.M.
Yda = Meter Box Meter coefficient, dimensionless (Post Test)

I. Calibration of dry gas meter against wet test meter to be used as a standard.

Wet test meter I.D. = South Carolina Department of Health and Environmental Control (Serial No. P-460)

$$Q = (17.65)\ \frac{Vs}{T}\ \frac{Pb}{(Ts+460)} \qquad \text{(Eq. 1)}$$

$$Yds = \frac{Vs}{Vds}\ \frac{(Tds+460)}{(Ts+460)}\ \frac{Pb}{Pb + \frac{\Delta P}{13.6}} \qquad \text{(Eq. 2)}$$

II. Calibration of a meter box gas meter against a calibration dry gas meter.

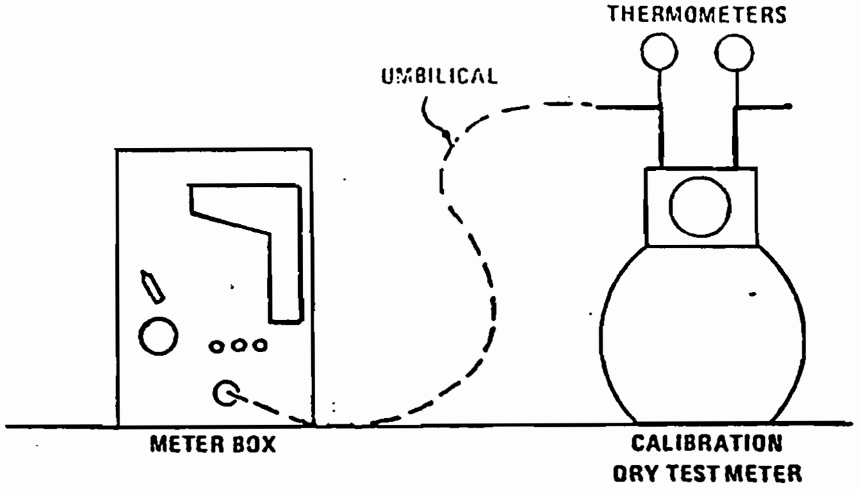
$$Q = (17.65)\ \frac{Pb}{(Tds+460)}\ \frac{Vds}{T} \qquad \text{(Eq. 3)}$$

$$Yd = (Yds)\ \frac{Vds}{Vd}\ \frac{(Td+460)}{(Tds+460)}\ \frac{Pb}{Pb+ \frac{\Delta H}{13.6}} \qquad \text{(Eq. 4)}$$

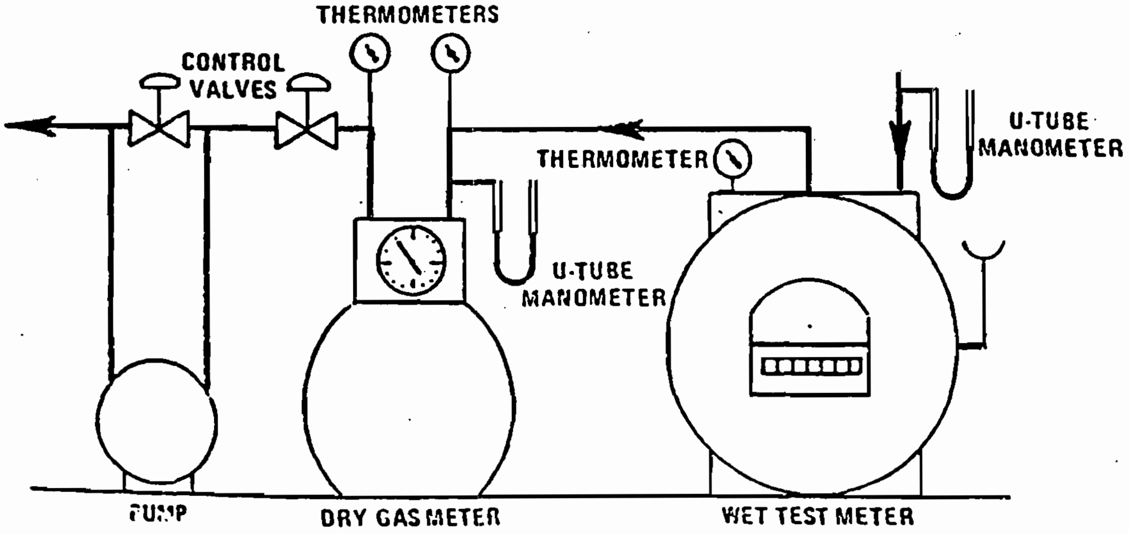
$$\Delta Ha = \frac{0.0317\ \Delta H}{Pb(Td+460)} \left[\frac{(Tds+460)T}{(Vds)(Ysa)}\right]^2 \qquad \text{(Eq. 5)}$$

III. Post test meter calibration of meter box gas meter against a calibration dry gas meter.

$$Yda = (Ysa)\ \frac{Vds}{Vd}\ \frac{(Td+460)}{(Tds+460)}\ \frac{Pb}{Pb+ \frac{\Delta H}{13.6}} \qquad \text{(Eq. 6)}$$



Meter box calibration set-up.



Equipment arrangement for dry-gas meter calibration.

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CALIBRATION OF A DRY GAS METER TO BE USED AS A STANDARD

DATE: 12-14-88
DRY GAS METER ID: 689808
BAROMETRIC PRESSURE: 29.980
WET TEST METER ID: SCDHEC NO.P-460
CALIBRATOR: ALEXANDER

			TEMPERATURES (DEG F)								
APPROXIMATE FLOW RATE (Q)	WET METER GAS VOLUME (VS)	DRY GAS METER VOLUME (VDS)	WET METER	INLET	DRY GAS METER OUTLET	AVE.	DRY GAS METER PRESSURE (P)	TIME (T)	FLOW RATE (Q)	METER METER COEFFICIENT	AVERAGE METER COEFFICIENT
CFM	CU. FT.	CU. FT.	TS	TDSI	TDSO	TDS	IN. H20	SEC.		(YDS)	(YDSa)
.40	5.0	5.034	77.0	73.5	73.5	73.5	.4	835.0	.3540	.9858	
.40	5.0	5.044	77.0	74.0	74.0	74.0	.4	834.0	.3545	.9848	
.40	5.0	5.031	77.0	74.3	74.3	74.3	.4	835.0	.3540	.9879	.9862
.60	5.0	5.095	77.0	74.0	74.0	74.0	1.5	557.0	.5307	.9723	
.60	5.0	5.096	77.0	75.0	75.0	75.0	1.5	557.0	.5307	.9739	
.60	5.0	5.098	77.0	75.0	75.0	75.0	1.5	557.0	.5307	.9735	.9733
.80	5.0	5.100	76.0	75.0	75.0	75.0	1.0	391.0	.7575	.9762	
.80	5.0	5.097	76.0	75.0	75.0	75.0	1.0	390.0	.7594	.9767	
.80	5.0	5.107	76.0	75.0	75.0	75.0	1.0	392.0	.7555	.9748	.9759
1.00	10.0	10.261	76.0	75.0	75.0	75.0	1.7	601.0	.9856	.9687	
1.00	10.0	10.276	76.0	75.0	75.0	75.0	1.7	601.0	.9856	.9673	
1.00	10.0	10.267	76.0	75.0	75.0	75.0	1.7	602.0	.9839	.9681	.9680
1.20	10.0	10.314	76.0	75.0	75.0	75.0	2.2	523.0	1.1326	.9626	
1.20	10.0	10.321	76.0	75.0	75.0	75.0	2.2	524.0	1.1304	.9619	
1.20	10.0	10.324	76.0	75.0	75.0	75.0	2.2	524.0	1.1304	.9616	.9620
										AVERAGE	.9731

CHECKED BY: H. Gary Anderson

DAVIS & FLOYD

DAVIS AND FLOYD, INC.
ENVIRONMENTAL SERVICES DIVISION
P. O. DRAWER 428
GREENWOOD, SOUTH CAROLINA 29646

CALIBRATION OF METER BOX DRY GAS METER AGAINST A CALIBRATION DRY GAS METER

DATE:—— 3-23-89
CALIBRATION METER IDENTIFICATION:—— 689808
METER BOX IDENTIFICATION:—— BOX 6
CALIBRATOR:——A.J. POLLARD
BAROMETRIC PRESSURE (PB):—— 29.63 in. Hg
Ysa——0.9758

APPROX. FLOW RATE Q CFM	ORIFICE READING DELTA H in. H20	CALIBRATION METER GAS VOLUME Vds ft3	METER BOX METER GAS VOLUME Vd ft3	TEMPERATURE						TIME SEC	METER BOX METER COEFFICIENT Yd	H@
				CALIBRATION METER			METER BOX METER					
				INLET Tdsi F	OUTLET Tdso F	AVERAGE Tds F	INLET Tdi F	OUTLET Tdo F	AVERAGE Td F			
0.41	0.50	5.001	5.129	64.0	65.0	64.5	72.0	72.0	72.0	735.2	0.9639	1.74
0.57	1.00	4.998	5.194	64.0	65.0	64.5	78.0	78.0	78.0	525.3	0.9608	1.76
0.69	1.50	5.003	5.198	64.0	66.0	65.0	84.0	84.0	84.0	434.6	0.9696	1.79
0.80	2.00	5.005	5.238	64.0	66.0	65.0	88.0	88.0	88.0	375.3	0.9684	1.76
0.95	3.00	10.002	10.621	64.0	66.0	65.0	91.0	91.0	91.0	629.4	0.9632	1.85
1.13	4.00	10.003	10.514	64.0	66.0	65.0	96.0	96.0	96.0	533.4	0.9735	1.76
									AVERAGES =	538.9	0.9666	1.77

CHECKED BY: H. Gary Anderson Jr.

DAVIS AND FLOYD, INC.
ENVIRONMENTAL SERVICES DIVISION
P. O. DRAWER 428
GREENWOOD, SOUTH CAROLINA 29646

POST-TEST DRY GAS METER CALIBRATION CHECK

DATE:------ 4-24-89
CALIBRATION METER IDENTIFICATION:------ 689808
METER BOX IDENTIFICATION:---------#6
CALIBRATOR:--------G. FLACK
BAROMETRIC PRESSURE (PB):---------- 29.47 in. Hg
Yds------ 0.9758

				TEMPERATURE							
				CALIBRATION METER			METER BOX METER				
APPROXIMATE FLOW RATE Q CFM	ORIFICE READING DELTA H in. H20	CALIBRATION METER GAS VOLUME Vds ft3	METER BOX METER GAS VOLUME Vd ft3	INLET Tdsi F	OUTLET Tdso F	AVERAGE Tds F	INLET Tdi F	OUTLET Tdo F	AVERAGE Td F	TIME	METER BOX METER COEFFICIENT Yd
0.61	1.20	4.900	4.965	74.0	75.0	74.5	78.0	84.0	81.0	484.70	0.9718
0.61	1.20	5.000	5.130	75.0	75.0	75.0	84.0	92.0	88.0	495.50	0.9713
0.60	1.20	5.000	5.210	75.0	75.0	75.0	93.0	100.0	96.5	500.18	0.9712

AVERAGE = 0.9714

CHECKED BY: H. Gary Anderson

TYPE S PITOT TUBE INSPECTION DATA FORM
AS FOUND IN METHOD 2, 40 CFR, PART 60, APPENDIX A

Pitot tube assembly level? ✓ yes ______ no

Pitot tube openings damaged? ______ yes (explain below) ✓ no

α_1 = 2 ° (<10°), α_2 = 3 ° (<10°), β_1 = 2 ° (<5°),
β_2 = 3 ° (<5°)

γ = 0 °, θ = 1 °, A = 1.02 cm (in.)

$z = A \sin \gamma$ = 0 cm (in.); <0.32 cm (<1/8 in.),
$w = A \sin \theta$ = 0.018 cm (in.); <.08 cm (<1/32 in.)

P_A 0.50 cm (in.) P_b 0.49 cm (in.)

D_t = .375 cm (in.)

Comments: 7 FT. PROBE NO V 1-11-89

Calibration required? ______ yes ✓ no

TYPE S PITOT TUBE INSPECTION DATA FORM
AS FOUND IN METHOD 2, 40 CFR, PART 60, APPENDIX A

Pitot tube assembly level? [✓ yes] ______ no

Pitot tube openings damaged? ______ yes (explain below) [✓ no]

α_1 = 3 ° (<10°), α_2 = 1 ° (<10°), β_1 = 2 ° (<5°),

β_2 = 2 ° (<5°)

γ = 0 °, θ = 0 °, A = 0.935 cm (in.)

$z = A \sin \gamma$ = 0 cm (in.); <0.32 cm (<1/8 in.),

$w = A \sin \theta$ = 0 cm (in.); <.08 cm (<1/32 in.)

P_A 0.47 cm (in.) P_b 0.49 cm (in.)

D_t = 0.375 cm (in.)

Comments: 7 FT. PROBE NO. IV (1-12-89)

Calibration required? ______ yes [✓ no]

TYPE S PITOT TUBE INSPECTION DATA FORM
AS FOUND IN METHOD 2, 40 CFR, PART 60, APPENDIX A

Pitot tube assembly level? ✓ yes ______ no

Pitot tube openings damaged? ______ yes (explain below) ✓ no

α_1 = 2° (<10°), α_2 = 1° (<10°), β_1 = 2° (<5°),
β_2 = 2° (<5°)

γ = 0°, θ = 0.5°, A = 1.02 cm (in.)

$z = A \sin \gamma$ = 0 cm (in.); <0.32 cm (<1/8 in.),
$w = A \sin \theta$ = 0.008 cm (in.); <.08 cm (<1/32 in.)

P_A 0.49 cm (in.) P_b 0.52 cm (in.)

D_t = 0.375 cm (in.)

Comments: 7 FT. PROBE NO. III 1-11-89

Calibration required? ______ yes ✓ no

TYPE S PITOT TUBE INSPECTION DATA FORM
AS FOUND IN METHOD 2, 40 CFR, PART 60, APPENDIX A

Pitot tube assembly level? [✓ yes] ______ no

Pitot tube openings damaged? ______ yes (explain below) [✓ no]

α_1 = 6 ° (<10°), α_2 = 3 ° (<10°), β_1 = 4 ° (<5°),
β_2 = 3 ° (<5°)

γ = 1 °, θ = 1 °, A = 0.972 cm (in.)

z = A sin γ = 0.017 cm (in.); <0.32 cm (<1/8 in.),
w = A sin θ = 0.017 cm (in.); <.08 cm (<1/32 in.)

P_A 0.490 cm (in.) P_b 0.50 cm (in.)

D_t = 0.376 cm (in.)

Comments: 5FT PROBE NO. I 1-12-89

Calibration required? ______ yes [✓ no]

TYPE S PITOT TUBE INSPECTION DATA FORM
AS FOUND IN METHOD 2, 40 CFR, PART 60, APPENDIX A

Pitot tube assembly level? ✓ yes ____ no

Pitot tube openings damaged? ____ yes (explain below) ✓ no

α_1 = 2 ° (<10°), α_2 = 4 ° (<10°), β_1 = 3 ° (<5°), β_2 = 1 ° (<5°)

γ = 2 °, θ = 1.5 °, A = 1.02 cm (in.)

$z = A \sin \gamma$ = 0.035 cm (in.); <0.32 cm (<1/8 in.),

$w = A \sin \theta$ = 0.026 cm (in.); <.08 cm (<1/32 in.)

P_A 0.522 cm (in.) P_b 0.493 cm (in.)

D_t = 0.376 cm (in.)

Comments: 5 FT PROBE NO II RB 1-12-89

Calibration required? ____ yes ✓ no

TYPE S PITOT TUBE INSPECTION DATA FORM
AS FOUND IN METHOD 2, 40 CFR, PART 60, APPENDIX A

Pitot tube assembly level? ✓ yes ____ no

Pitot tube openings damaged? ____ yes (explain below) ✓ no

α_1 = 0 ° (<10°), α_2 = 3 ° (<10°), β_1 = 1 ° (<5°),
β_2 = 4 ° (<5°)

γ = 1 °, θ = 1 °, A = 0.945 cm (in.)

z = A sin γ = 0.016 cm (in.); <0.32 cm (<1/8 in.),
w = A sin θ = 0.016 cm (in.); <.08 cm (<1/32 in.)

P_A 0.493 cm (in.) P_b 0.498 cm (in.)

D_t = 0.375 cm (in.)

Comments: 5 FT PROBE NO TV 1-12-89

Calibration required? ____ yes ✓ no

ANALYTICAL BALANCE CALIBRATION

Balance Name Sartorius Type 2402

Classification of Standard Weights Type S

Date	0.500 g	1.0000 g	10.0000 g	50.0000 g	100.0000 g	Analyst
5-2-89	0.500 G.	1.0000 G.	10.0000 G.	50.0001 G	100.0000 G	

NOZZLE CALIBRATION DATA CLINKER COOLER EXHAUST

Date 4-19-89 Calibrated by

Nozzle Identification Number	Nozzle Diameter[a]					ΔD,[b] (in.)	D_{avg}[c]
	D_1, (in.)	D_2, (in.)	D_3, (in.)	D_4, (in.)	D_5, (in.)		
Test No. 1 Nozzle No. 2	.311	.311	.312	.311	.311	.001	.311
Test No. 2 Nozzle No. 6	.297	.296	.297	.297	.297	.001	.297
Test No. 3 Nozzle No. 8	.300	.301	.299	.300	.300	.002	.300

Where:

[a] $D_{1, 2, 3, 4, 5}$ = five different nozzle diameters, (in.); each diameter must be within 0.001 in.

[b] ΔD = maximum difference between any two diameters, (in.), $\Delta D \leq 0.004$ in.

[c] D_{avg} = average of D_1, D_2, D_3, D_4 and D_5.

ANALYTICAL BALANCE CALIBRATION

Balance Name Sartorius Type 2402

Classification of Standard Weights Type S

Date	0.500 g	1.0000 g	10.0000 g	50.0000 g	100.0000 g	Analyst
4-27-89	0.500 G.	1.0000 G.	10.0000 G.	50.0000G	100.0000G	

NOZZLE CALIBRATION DATA KILN EXHAUST

Date 4-18-89 Calibrated by

Nozzle Identification Number	Nozzle Diameter^a					ΔD,^{b} (in.)	D_{avg} ^{c}
	D_1, (in.)	D_2, (in.)	D_3, (in.)	D_4, (in.)	D_5, (in.)		
Test No. 1 Nozzle No. 1	.248	.248	.247	.248	.248	.001	.248
Test No. 2 Nozzle No. 2	.248	.249	.247	.248	.248	.002	.248
Test No. 3 Nozzle No. 4	.247	.248	.248	.248	.248	.001	.248

Where:

$^aD_{1, 2, 3, 4, 5}$ = five different nozzle diameters, (in.); each diameter must be within 0.001 in.

b ΔD = maximum difference between any two diameters, (in.), ΔD $\leq$0.004 in.

c D_{avg} = average of D_1, D_2, D_3, D_4 and D_5.

EMISSION EVALUATION DURING SLUDGE ADDITION TO THE PROCESS AT GIFFORD-HILL CEMENT COMPANY OF SOUTH CAROLINA

HARLEYVILLE, SOUTH CAROLINA

RECEIVED
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DAVIS & FLOYD, INC.

EMISSION EVALUATION DURING SLUDGE ADDITION TO THE PROCESS AT GIFFORD-HILL CEMENT COMPANY OF SOUTH CAROLINA

HARLEYVILLE, SOUTH CAROLINA

OCTOBER, 1989

JOB NO. 6747

PREPARED BY

DAVIS & FLOYD, INC.

GREENWOOD, SOUTH CAROLINA

TABLE OF CONTENTS

APPENDICES

1.0 BACKGROUND

On July 27, 1989, gas emission studies were conducted at the Gifford-Hill Cement Company, Harleyville, South Carolina during addition of sludge to the process.

Gifford-Hill Cement Company of South Carolina, manufacturers portland cement by the "dry process method". The raw materials (marl, clay and iron ore) are crushed and dried to less than 1% moisture. It is proportioned and fed to a rotary ball mill which grinds it into raw feed. The raw feed enters a preheater and is then fed to an inclined rotating kiln which completes the calcining and clinkers the feed. The gases are drawn through the kiln and preheater by a fan, then pass through a rotary dryer, a multiclone system and finally, a baghouse before existing through a stack. The cement clinker is immediately cooled in the clinker cooler by passing ambient air through the clinker bed. The air then passes through a heat exchanger and dust collector before existing through a stack. The clinker is combined with 7% gypsum and ground in rotary ball mills.

This emission evaluation was conducted by Davis & Floyd, Inc., Greenwood, South Carolina. For this evaluation, the Research Appliance Company Nutech Corporation and SKC Corporation Sampling Equipment was used.

2.0 DISCUSSION

2.1 Testing Procedures

The kiln exhaust is equipped with a vertical stack 10 feet in diameter, 80 feet high with the baghouse collector duct entering the stack 53 feet downstream from the top of the stack. For this sampling, four 3 inch diameter sampling ports were located at 90 degrees of each other along the circumference of the stack at a point 42 feet from the baghouse duct (See Figure 1). Thirty-two equal areas were selected for sampling, eight along each sampling traverse (See Figure 2).

Particulate testing was performed in accordance with EPA Method 5. The composition of the flue gas and molecular weight was determined in accordance with EPA Method 3. EPA Method 1 was used in determining the sampling point locations.

Metals analysis was determined on Emissions from the kiln exhaust using EPA Appendix A "Methodology for the Determination of Metals Emissions in Exhaust Gases from Stationary Source Combustion Processes". (See Tables 4.1 to 4.4) This procedure calls for the sampling to be accomplished with glass probe nozzles and glass liners. Since the first test series of tests (w/o sludge) was conducted with metal probe nozzles it was agreed by the Department of Health and Environment Control and Radian that metal nozzles be used for this series of test.

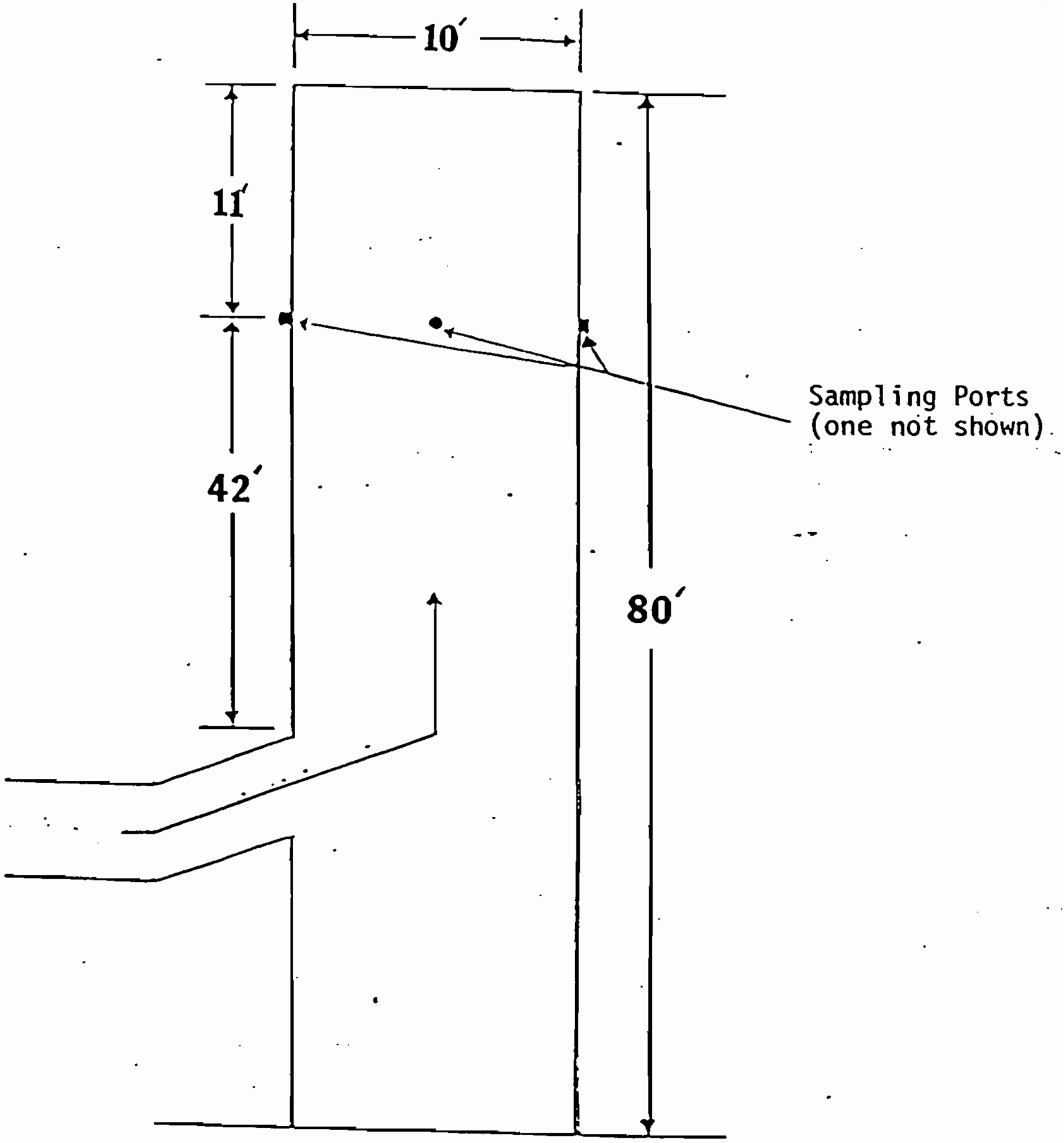
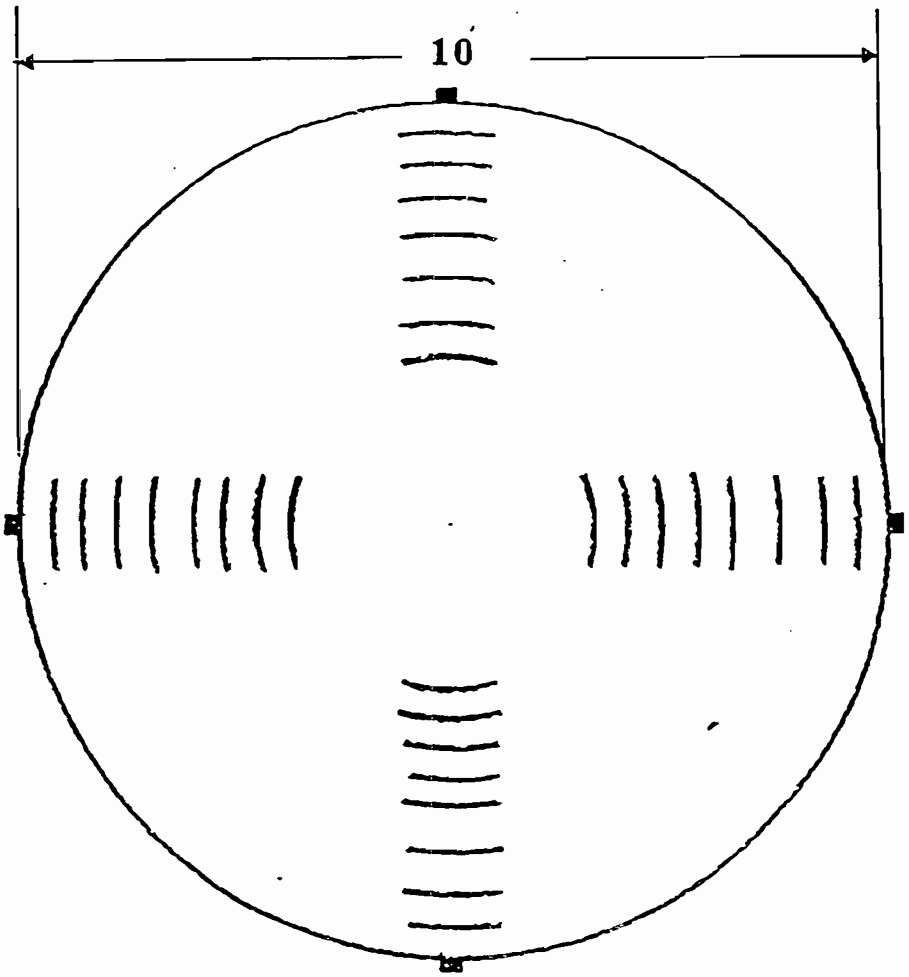


FIGURE 1

Sampling Port Locations
Kiln Stack
Gifford-Hill Cement Company
of South Carolina
Harleyville, South Carolina



Sampling Point	Distance (Inches)
1	1.94
2	5.88
3	10.20
4	15.00
5	20.28
6	26.40
7	33.96
8	45.00

FIGURE 2

Sample Point Locations
Kiln Stack
Gifford-Hill Cement
Company of SC
Harleyville, SC

2.2 Observations

The kiln was operating with an average production rate of tons per hour kiln feed during sampling, with no visible emissions being discharged.

2.3 Sampling Results Particulate Emissions

2.3.1 Kiln Exhaust

Test 1 - The average stack gas velocity was calculated 59.3643 feet per second, containing a particulate concentration of 0.0129 grain per standard cubic foot. The stack gas average temperature was 249.5 degrees F. The stack gas pressure was 30.2480% inches of mercury. The total emissions were calculated to be 18.9080 pounds per hour. This test conducted at 101.5087% isokinetic conditions.

Test 2 - The average stack gas velocity was calculated to be 59.2964 feet per second, containing a particulate concentration of 0.0162 grain per standard cubic foot. The stack gas temperature was 250.4 degrees F. The stack gas pressure was 30.2480 inches of mercury. The total emissions were calculated to be 23.4370 pounds per hour. This test was conducted at 102.0908% isokinetic conditions.

Test 3 - The average stack gas velocity was calculated to be 60.6425 feet per second, containing a particulate concentration of 0.0138 grain per standard cubic foot. The stack gas average temperature was 244.8 degrees F. The stack gas pressure was 30.2480 inches of mercury. The total emissions were calculated to be 20.9560 pounds per hour. The test was conducted at 100.0517% isokinetic conditions.

2.4 Test Acceptance

The validity of air sampling and reporting is determined by the percent of isokinetic conditions under which the sampling occurred. As stated in the Federal Guidelines, stack sampling data is acceptable if it is 100% plus or minus 10% isokinetic conditions.

The isokinetics of these particulate tests are as follows

Kiln Exhaust Stack

Test 1	101.5087%
Test 2	102.0908%
Test 3	100.0517%

3.0 CONCLUSIONS PARTICULATE EMISSIONS

3.1 Kiln Exhaust Stack

The current Federal Air Regulations on the Standards of Performance for New Stationary Sources as amended on October 1, 1977, in part 60, Subpart F, 60.62, (A), states: "on and after the date on which the performance test required to be conducted by 60.8 is completed, no owner or operator subject to the provisions of this Subpart shall cause to be discharged into the atmosphere from any kiln any gases which: (1) contain particulate matter in excess of 0.15 kg per metric ton of feed (dry basis) to the kiln (0.30.lb. per ton), (2) exhibit greater 20 percent opacity."

The average particulate emission rate for the kiln exhaust stack Tests 1, 2 and 3 was 21.1003 pounds per hour with an average production rate of 143.2 tons per hour. This calulates to 0.1473 pounds per ton of kiln feed. Therefore, it is concluded that the particulate emission rate from the kiln stack at the Gifford-Hill Cement Company, Harleyville, South Carolina cement plant is in compliance with the latest Federal Air Regulations.

4.0 SAMPLING RESULTS METALS EMISSIONS DURING SLUDGE ADDITION

On July 27, 1989, tests were conducted for metals emissions during sludge addition to the process at Gifford Hill Cement Company of South Carolina, Harleyville, South Carolina. The results of this evaluation are found in Tables 4.1 to 4.8.

TABLE 4.1
SAMPLING RESULTS METALS ANALYSIS
FOR GIFFORD-HILL CEMENT COMPANY
HARLEYVILLE, SOUTH CAROLINA
ON KILN EXHAUST
SAMPLES TAKEN 7-27-89
TEST 1

ANALYSIS	FRONT HALF SAMPLE TRAIN (MICROGRAMS)	BACK HALF SAMPLE TRAIN (MICROGRAMS)	TOTAL TRAIN (MICROGRAMS)
Silver	< 2	< 2	< 2
Arsenic	< 1.5	< 2x	< 1.5
Barium	< 10	< 10	< 10
Cadmium	1.3	3.7	5.0
Cobalt	< 5	< 5	< 5
Chromium	8	< 2	8
Copper	< 2	16	16
Molybdenum	< 10	< 10	< 10
Nickel	< 4	< 4	< 4
Lead	< 1.5	2.5	2.5
Selenium	1.5	7.6	9.1
Vanadium	4	< 2	4

NOTE:

1. For analyses having the less than (<) notation, the value presented is the lower limit of detection for the method and/or instrument.

2. An "x" indicates a dilution due to a matrix interference.

3. Test time - 1016 - 1143

4. The acetone rinse of the probe was not included in the total rinse due to a break in the probe liner during transport and there was a possibility of contamination.

TABLE 4.2
SAMPLING RESULTS METALS ANALYSIS FOR GIFFORD-HILL CEMENT COMPANY
HARLEYVILLE, SOUTH CAROLINA
ON KILN EXHAUST
SAMPLES TAKEN 7-27-89
TEST 2

ANALYSIS	FRONT HALF SAMPLE TRAIN (MICROGRAMS)	BACK HALF SAMPLE TRAIN (MICROGRAMS)	TOTAL TRAIN (MICROGRAMS)
Silver	< 2	< 2	< 2
Arsenic	2.1	< 0.5	2.1
Barium	< 10	< 10	< 10
Cadmium	3.6	2.2	5.8
Cobalt	< 5	< 5	< 5
Chromium	7	< 2	7
Copper	2	11	13
Molybdenum	< 10	< 10	< 10
Nickel	41	< 4	41
Lead	< 1.5	1.6	1.6
Selenium	< 1.5	28	28
Vanadium	6	< 2	6

NOTE:

1. For analyses having the less than (<) notation, the value presented is the lower limit of detection for the method and/or instrument.

2. Test time - 1158 - 1309

TABLE 4.3
SAMPLING RESULTS METALS ANALYSIS FOR GIFFORD-HILL CEMENT COMPANY HARLEYVILLE, SOUTH CAROLINA ON KILN EXHAUST
SAMPLES TAKEN 7-27-89
TEST 3

ANALYSIS	FRONT HALF SAMPLE TRAIN (MICROGRAMS)	BACK HALF SAMPLE TRAIN (MICROGRAMS)	TOTAL TRAIN (MICROGRAMS)
Silver	6	< 2	6
Arsenic	< 1.5	< 0.5	< 1.5
Barium	< 10	< 10	< 10
Cadmium	1.7	0.7	2.4
Cobalt	< 5	< 5	< 5
Chromium	15	< 2	15
Copper	< 2	8	8
Molybdenum	< 10	< 10	< 10
Nickel	36	< 4	36
Lead	< 1.5	2.6	< 1.5
Selenium	< 1.5	0.7	0.7
Vanadium	6	< 2	6

NOTE:

1. For analyses having the less than (<) notation, the value presented is the lower limit of detection for the method and/or instrument.

2. Test time - 1446 - 1554

TABLE 4.4
SAMPLING RESULTS METALS ANALYSIS FOR GIFFORD-HILL CEMENT COMPANY HARLEYVILLE, SOUTH CAROLINA ON KILN EXHAUST
SAMPLES TAKEN 7-27-89
SAMPLE BLANKS

ANALYSIS (In ug)	H_2O_2/HNO_3 BLANK	DEIONIZED H_2O BLANK	0.IN HNO_3 BLANK	ACETONE & FILTER BLANK
Silver	< 4	< 4	< 4	< 2
Arsenic	< 1	< 1	< 1	< 1.5
Barium	< 20	< 20	< 20	< 10
Cadmium	< 1	< 1	< 1	< 0.5
Cobalt	< 10	< 10	< 10	< 5
Chromium	< 4	< 4	< 4	< 2
Copper	< 4	< 4	< 4	18
Molybdenum	< 20	< 20	< 20	< 10
Nickel	< 8	< 8	< 8	17
Lead	< 1	< 1	< 1	9.9
Selenium	< 1	< 1	< 1	< 1.5
Vanadium	< 4	< 4	< 4	18

NOTE:

1. For analyses having the less than (<) notation, the value presented is the lower limit of detection for the method and/or instrument.
2. ug = Micrograms

TABLE 4.5
SAMPLING RESULTS METALS ANALYSIS DURING SLUDGE ADDITION TO THE PROCESS FOR GIFFORD-HILL CEMENT COMPANY HARLEYVILLE, SOUTH CAROLINA
PROCESS MATERIALS
SAMPLES TAKEN 7-27-89

PARAMETER	SLUDGE SP. TEST 1 (COMP.) Mg/Kg	SLUDGE SP. TEST 2 (COMP.) Mg/Kg	SLUDGE SP. TEST # (COMP) Mg/Kg	RAW FEED (COMP.) Mg/Kg
Aluminum	5,950	6,440	7,750	1,980
Silver	< 3	< 3	< 3	< 2
Barium	640	630	660	< 10
Cadmium	1.2	2.0	3.9	0.5
Cobalt	260	260	270	< 5
Chromium	1,700	1,900	1,800	15
Copper	920	910	940	5
Molybdenum	910	960	1,020	< 10
Nickel	8,200	7,900	8,000	8
Vanadium	26,800	27,400	27,400	22
Arsenic	40	38	49	< 3 x
Lead	337	381	380	< 5
Selenium	24	22	24	< 6 x
% Moisture	7.51%	7.51%	7.45%	--

NOTE:

1. For analyses having the less than (<) notation, the value presented is the lower limit of detection for the method and/or instrument.

2. An "x" indicates a dilution due to a matrix interference.

APPENDIX 1

Computer Printouts of Particulate Test Results

DAVIS & FLOYD INC.

POST OFFICE DRAWER 428
GREENWOOD, SOUTH CAROLINA 29646

****
*** SOURCE SAMPLING DATA REPORT ***
****

RUN 1

FOR: GIFFORD- HILL CEMENT COMPANY — DAVIS & FLOYD, INC. JOB#6747
LOCATION: HARLEYVILLE, SOUTH CAROLINA — SAMPLE DATE: JULY 27,1989
SOURCE:KIL EXHAUST(DURING SLUDGE ADDITION)

I T E M	RESULTS	UNITS
CO2 CONCENTRATION	17.0000	PERCENT
O2 CONCENTRATION	7.0000	PERCENT
CO CONCENTRATION	0.0000	PERCENT
N2 CONCENTRATION	76.0000	PERCENT
DRY MOLECULAR WEIGHT OF GAS	31.0000	POUND/POUND-MOLE
FINAL IMPINGER WATER VOLUME	414.0000	MILLILITERS
INITIAL IMPINGER WATER VOLUME	200.0000	MILLILITERS
SILICA GEL VOLUME INCREASE	15.9000	MILLILITERS
TOTAL MOISTURE COLLECTED	229.9000	MILLILITERS
TOTAL MOISTURE COLLECTED	10.8513	STANDARD CUBIC FEET
MOISTURE CONTENT OF STACK GAS	18.8908	PERCENT
MEASURED DRY GAS VOLUME THROUGH METER	48.7232	CUBIC FEET
BAROMETERIC PRESSURE	30.2200	INCHES OF MERCURY
AVERAGE GAS TEMPERATURE THROUGH METER	560.1875	DEGREES RANKIN
AVERAGE GAS DELTA H	1.9975	INCHES OF WATER
DRY GAS VOLUME THROUGH METER	46.5909	STANDARD CUBIC FEET
MOISTURE CONTENT OF STACK	0.1889	DIMENSIONLESS
WET MOLECULAR WEIGHT OF GAS	28.5442	POUND/POUND-MOLE
PITOT TUBE COEFFICIENT	0.8400	DIMENSIONLESS
AVERAGE STACK GAS TEMPERATURE	709.5938	DEGREES RANKIN
AVERAGE SQUARE ROOT OF DELTA P	0.9119	INCHES OF WATER
STATIC STACK PRESSURE	0.3800	INCHES OF WATER
PRESSURE OF STACK	30.2480	INCHES OF MERCURY
STACK GAS VELOCITY	59.3643	FEET PER SECOND
CROSS-SECTIONAL AREA OF STACK	78.5398	SQUARE FEET
STACK GAS VOLUMETRIC FLOW RATE	170684.8043	STD. CFM (68 & 29.92)
STACK GAS VOLUMETRIC FLOW RATE	279747.4730	ACFM
WET BULB STACK GAS TEMPERATURE	130.0000	DEGREES FAHRENHEIT
TOTAL PARTICULATE COLLECTED	39.1000	MILLIGRAMS
PARTICULATE CONCENTRATION	0.0129	GRAINS PER SCF
PARTICULATE CONCENTRATION @ %12 CO2	0.0091	GRAINS PER SCF
PARTICULATE EMISSION RATE	18.9080	POUNDS PER HOUR
TOTAL SAMPLING TIME	64.0000	MINUTES
DIAMETER OF SAMPLING NOZZLE	0.2460	INCHES
CROSS-SECTIONAL AREA OF SAMPLING NOZZLE	3.3006E-04	SQUARE FEET
PERCENT OF ISOKENTIC SAMPLING	101.5087	PERCENT

DAVIS & FLOYD INC.

POST OFFICE DRAWER 428
GREENWOOD, SOUTH CAROLINA 29646

****
*** SOURCE SAMPLING DATA REPORT ***
****

RUN 2

FOR: GIFFORD-HILL CEMENT COMPANY DAVIS & FLOYD, INC. JOB#6747
LOCATION:HARLEYVILLE , SOUTH CAROLINA SAMPLE DATE: JULY 27,1989
SOURCE:KILN EXHAUST(DURING SLUDGE ADDITION)

ITEM	RESULTS	UNITS
CO2 CONCENTRATION	17.0000	PERCENT
O2 CONCENTRATION	7.0000	PERCENT
CO CONCENTRATION	0.0000	PERCENT
N2 CONCENTRATION	76.0000	PERCENT
DRY MOLECULAR WEIGHT OF GAS	31.0000	POUND/POUND-MOLE
FINAL IMPINGER WATER VOLUME	425.0000	MILLILITERS
INITIAL IMPINGER WATER VOLUME	200.0000	MILLILITERS
SILICA GEL VOLUME INCREASE	17.2000	MILLILITERS
TOTAL MOSTURE COLLECTED	242.2000	MILLILITERS
TOTAL MOSTURE COLLECTED	11.4318	STANDARD CUBIC FEET
MOISTURE CONTENT OF STACK GAS	19.5162	PERCENT
MEASURED DRY GAS VOLUME THROUGH METER	50.7946	CUBIC FEET
BAROMETRIC PRESSURE	30.2200	INCHES OF MERCURY
AVERAGE GAS TEMPERATURE THROUGH METER	577.3125	DEGREES RANKIN
AVERAGE GAS DELTA H	2.1159	INCHES OF WATER
DRY GAS VOLUME THROUGH METER	47.1444	STANDARD CUBIC FEET
MOISTURE CONTENT OF GAS	0.1952	DIMENSIONLESS
WET MOLECULAR WEIGHT OF GAS	28.4629	POUND/POUND-MOLE
PITOT TUBE COEFFICIENT	0.8400	DIMENSIONLESS
AVERAGE STACK GAS TEMPERATURE	710.4688	DEGREES RANKIN
AVERAGE SQUARE ROOT OF DELTA P	0.9090	INCHES OF WATER
STATIC STACK PRESSURE	0.3800	INCHES OF WATER
PRESSURE OF STACK	30.2480	INCHES OF MERCURY
STACK GAS VELOCITY	59.2964	FEET PER SECOND
CROSS-SECTIONAL AREA OF STACK	78.5398	SQUARE FEET
STACK GAS VOLUMETRIC FLOW RATE	168966.6467	STD. CFM (68 & 29.92)
STACK GAS VOLUMETRIC FLOW RATE	279427.4828	ACFM
WET BULB STACK GAS TEMPERATURE	130.0000	DEGREES FAHRENHEIT
TOTAL PARTICULATE COLLECTED	49.5400	MILLIGRAMS
PARTICULATE CONCENTRATION	0.0162	GRAINS PER SCF
PARTICULATE CONCENTRATION @ %12 CO2	0.0114	GRAINS PER SCF
PARTICULATE EMISSION RATE	23.4370	POUNDS PER HOUR
TOTAL SAMPLING TIME	64.0000	MINUTES
DIAMETER OF SAMPLING NOZZLE	0.2480	INCHES
CROSS-SECTIONAL AREA OF SAMPLING NOZZLE	3.3545E-04	SQUARE FEET
PERCENT OF ISOKINETIC SAMPLING	102.0908	PERCENT

DAVIS & FLOYD INC.

POST OFFICE DRAWER 428
GREENWOOD, SOUTH CAROLINA 29646

****
*** SOURCE SAMPLING DATA REPORT ***
****

RUN 3

FOR:GIFFORD-HILL CEMENT COMPANY DAVIS & FLOYD, INC.JOB#6747
LOCATION:HARLEYVILLE SOUTH CAROLINA SAMPLE DATE: JULY 27, 1989
SOURCE:KILN EXHAUST(DURING SLUDGE ADDITION)

ITEM	RESULTS	UNITS
CO2 CONCENTRATION	17.0000	PERCENT
O2 CONCENTRATION	7.0000	PERCENT
CO CONCENTRATION	0.0000	PERCENT
N2 CONCENTRATION	76.0000	PERCENT
DRY MOLECULAR WEIGHT OF GAS	31.0000	POUND/POUND-MOLE
FINAL IMPINGER WATER VOLUME	411.0000	MILLILITERS
INITIAL IMPINGER WATER VOLUME	200.0000	MILLILITERS
SILICA GEL VOLUME INCREASE	20.0000	MILLILITERS
TOTAL MOSTURE COLLECTED	231.0000	MILLILITERS
TOTAL MOSTURE COLLECTED	10.9032	STANDARD CUBIC FEET
MOISTURE CONTENT OF STACK GAS	18.4232	PERCENT
MEASURED DRY GAS VOLUME THROUGH METER	52.0513	CUBIC FEET
BAROMETRIC PRESSURE	30.2200	INCHES OF MERCURY
AVERAGE GAS TEMPERATURE THROUGH METER	577.8750	DEGREES RANKIN
AVERAGE GAS DELTA H	2.2438	INCHES OF WATER
DRY GAS VOLUME THROUGH METER	48.2787	STANDARD CUBIC FEET
MOISTURE CONTENT OF GAS	0.1842	DIMENSIONLESS
WET MOLECULAR WEIGHT OF GAS	28.6050	POUND/POUND-MOLE
PITOT TUBE COEFFICIENT	0.8400	DIMENSIONLESS
AVERAGE STACK GAS TEMPERATURE	704.7813	DEGREES RANKIN
AVERAGE SQUARE ROOT OF DELTA P	0.9357	INCHES OF WATER
STATIC STACK PRESSURE	0.3800	INCHES OF WATER
PRESSURE OF STACK	30.2480	INCHES OF MERCURY
STACK GAS VELOCITY	60.6425	FEET PER SECOND
CROSS-SECTIONAL AREA OF STACK	78.5398	SQUARE FEET
STACK GAS VOLUMETRIC FLOW RATE	176562.6881	STD. CFM (68 & 29.92)
STACK GAS VOLUMETRIC FLOW RATE	285771.1517	ACFM
WET BULB STACK GAS TEMPERATURE	130.0000	DEGREES FAHRENHEIT
TOTAL PARTICULATE COLLECTED	43.4100	MILLIGRAMS
PARTICULATE CONCENTRATION	0.0138	GRAINS PER SCF
PARTICULATE CONCENTRATION @ %12 CO2	0.0098	GRAINS PER SCF
PARTICULATE EMISSION RATE	20.9560	POUNDS PER HOUR
TOTAL SAMPLING TIME	64.0000	MINUTES
DIAMETER OF SAMPLING NOZZLE	0.2480	INCHES
CROSS-SECTIONAL AREA OF SAMPLING NOZZLE	3.3545E-04	SQUARE FEET
PERCENT OF ISOKINETIC SAMPLING	100.0517	PERCENT

APPENDIX II

Source Samplings Data Summary Calculations

BEST AVAILABLE COPY

DAVIS & FLOYD INC.

POST OFFICE DRAWER 428
GREENWOOD, SOUTH CAROLINA 29646

****

*** SOURCE SAMPLING DATA SUMMARY ***

****

FOR:GIFFORD-HILL CEMENT COMPANY DAVIS & FLOYD, INC. JOB# 6747
LOCATION: HARLEYVILLE, SOUTH CAROLINA SAMPLE DATE: JULY 27,1989
SOURCE:EMISSION TEST KILN EXHAUST(SLUDGE ADDITION)

TEST	TEST 1	TEST 2	TEST 3
CO2	17.0000	17.0000	17.0000
O2	7.0000	7.0000	7.0000
CO	0.0000	0.0000	0.0000
N2	76.0000	76.0000	76.0000
MD	31.0000	0.0000	31.0000
VF	414.0000	425.0000	411.0000
VI	200.0000	200.0000	200.0000
VS GEL	15.9000	17.2000	20.0000
VIC	229.9000	242.2000	231.000
VM STD	10.8513	11.4318	10.903
B WO	18.8908	19.5162	18.423
VM	48.7232	50.7946	52.051
P BAR	30.2200	30.2200	30.220
TM	560.1875	577.3125	577.875
DELTA H	1.9975	2.1159	2.2438
VM STD	46.5909	47.1444	48.2787
B WO/D	0.1889	0.1952	0.1842
MS	28.5442	28.4629	28.6050
CP	0.8400	0.8400	0.8400
TS AVG	709.5938	710.4688	704.7813
AVG SQ/R DELTA P	0.9119	0.9090	0.9357
STATIC P	0.3800	0.3800	0.3800
PS	30.2480	30.2480	30.2480
VS	59.3643	59.2964	60.6425
A	78.5398	78.5398	78.5398
QS STD CFM	170684.8043	168966.6467	176562.6981
QS ACFM	279747.4730	279427.4828	285771.1517
WB/T	130.0000	130.0000	130.0000
MN	39.1000	49.5400	43.4100
C/S	0.0129	0.0162	0.0138
C/S @ %12 CO2	0.0091	0.0114	0.0098
CS	18.9080	23.4370	20.9560
TIME	64.0000	64.0000	64.0000
DN	0.2460	0.2480	0.2480
AN	3.3006E-04	3.3545E-04	3.3545E-04
I	101.5087	102.0908	100.0517

CALCULATIONS

I. Determination of Molecular Weight (Dry) Orsat Analysis

$Md = 0.44\ (\%CO_2) + 0.32\ (\%\ O_2) + 0.28\ (\%\ N_2 + \%\ CO)$ (eq.1)

Md = Molecular weight of stack gas (dry basis), lb/lb-mole

II. Determination of Stack Gas Moisture

Vi = Initial volume of impinger contents in ml.

Vf = Final volume of impinger content in ml.

Vs_{gel} = Moisture collected in silica gel in ml.

Vi_c = Total volume of liquid collected in impingers and silica gel in ml.

$Vi_c = (Vf - Vi) + Vs_{gel}$ (eq.2)

$Vw_{std} = (0.0472\ ft.^3/ml)\ (Vi_c)$ (eq.3)

Vw_{std} = Volume of water vapor in the gas sample (standard conditions), cu. ft.

$$Vm_{std} = (17.64\ °R/in.\ Hg)\ (Vm)(y) \left(\frac{Pbar + \frac{\Delta H}{13.6}}{Tm} \right) \quad (eq.4)$$

y = Calibration Factor

Vm_{std} = Volume of gas sample through dry gas meter (standard conditions), cu. ft.

Vm = Volume of gas sample through dry gas meter (meter conditions), cu. ft.

P bar = Barometer pressure at the dry gas meter, in.Hg.

Tm = Absolute temperature at meter, °R (°F + 460)

ΔH = Average pressure drop across the orifice, inches H_2O.

$$B_{wo} = \frac{Vw\ std}{Vw\ std + Vm\ std} \quad (eq.5)$$

B_{wo} = Proportion by volume of water vapor in the gas stream, dimensionless.

$$Ms = Md\ (1 - B_{wo}) + 18\ (B_{wo}) \qquad \text{(eq.6)}$$

Ms = Molecular weight of stack gas (wet basis) lb/lb-mole.

III. Determination of Stack Gas Velocity

$$Vs_{avg.} = Kp\ Cp \left(\sqrt{\Delta p}\right)avg. \sqrt{\frac{Ts\ avg.}{(Ps)(Ms)}} \qquad \text{(eq.7)}$$

Kp = 85.49 ft./sec. $(lb/lb - mole\ °R)^{(0.5)}$

Cp = Pitot tube coefficient, dimensionless

$Ts_{avg.}$ = Average absolute stack gas temperature, °R

Ps = Absolute stack gas pressure, inches Hg

$\sqrt{\Delta p}$ = Average velocity head of stack gas, (inches H_2O)

$Vs_{avg.}$ = Stack gas velocity, feet per second.

IV. Determination of Stack Gas Volumetric Flow Rate (std. cond. - dry)

$$Qs = 60\ (1-B_{wo})\ (V_s\ avg.)\ (A) \left(\frac{T_{std}}{Ts_{avg.}}\right)\left(\frac{Ps}{P_{std}}\right) \qquad \text{(eq.8)}$$

T_{std} = 528°R

P_{std} = 29.92 inch Hg

A = Cross - sectional area of stack, $ft.^2$

Qs = Volumetric flow rate, dry basis, standard condtions, $ft.^3/min.$

V. Determination of Particulate Concentration

$$C's = 0.0154\ grains/mg. \left(\frac{Mn}{Vm_{std}}\right) \qquad \text{(eq.9)}$$

Mn = Total amount of particulate matter collected, mg.

C's = Concentration of particulate matter in stack gas, gr./s.c.f., dry basis.

VI. Determination of Particulate Emission Rate

$$Cs = \frac{(60\ min/hr.)\ (Qs)\ (C's)}{7,000} \qquad \text{(eq.10)}$$

Cs = Particulate emission rate, lbs/hr., dry basis.

VII. Determination of Acceptability of Sampling Results

$$I = Ts\ \frac{\left[\left(\frac{0.00267\ \text{in Hg-cu.ft.}}{\text{ml.}\quad {}^{\circ}\text{R}}\right) Vi_{c} + \frac{Vm}{Tm}\left(Pbar + \frac{\Delta H}{13.6}\right)\right]\left(1.667\ \frac{\text{min.}}{\text{sec.}}\right)}{(\theta)\quad (Vs_{avg.})\quad (Ps)\quad (An)} \qquad \text{(eq.11)}$$

θ = Total sampling time, minute

An = Cross-sectional area of nozzle, sq. ft.

I = Percent of isokinetic sampling

APPENDIX III

Laboratory Data Sheets

Davis & Floyd, Inc.

Laboratory Analysis Report

Work Order # 89-07-116

Received: 07/28/89

09/21/89 09:45:27

REPORT GIFFORD HILL & CO. INC.
TO P.O. BOX 326
HARLEYVILLE, S. C. 29448

ATTEN VIC FLETCHER

WORK ID JOB NO. 6747
P.O. #
TAKEN DAVIS & FLOYD, INC. (HGA,AKA)
TYPE MISC
NUMBER OF SAMPLES 15

PREPARED DAVIS & FLOYD, INC.
BY Environmental Services Div.
Post Office Drawer 428
Greenwood, S.C. 29648
PHONE (803) 229-5211

CERTIFIED BY

JOHN_MCCORD

Comments:
WE ARE PLEASED TO PROVIDE THIS CERTIFIED REPORT OF ANALYSES. FEEL FREE TO TELEPHONE IF FURTHER EXPLANATION IS REQUIRED. UNLESS OTHER ARRANGEMENTS HAVE BEEN MADE, SAMPLES WILL BE DISPOSED OF 28 DAYS AFTER ISSUANCE OF THIS REPORT.

	SAMPLE IDENTIFICATION	DATE COLLECTED
01	SLUDGE SP. TEST 1	07/27/89
02	SLUDGE SP. TEST 2	07/27/89
03	SLUDGE SP. TEST 3	07/27/89
04	RAW FEED	07/27/89
05	KILN BAGHOUSE DUST	07/27/89
06	4TH. STAGE SOLIDS	07/27/89
07	DUST PUMP	07/27/89
08	CLINKER	07/27/89
09	SP # 1 CASSETTE	07/28/89 09:20:00
10	SP # 1A CASSETTE	07/27/89 09:20:00
11	SP # 2 CASSETTE	07/27/89 09:07:00
12	SP # 2A CASSETTE	07/27/89 09:07:00
13	SP # 3 CASSETTE	07/27/89 08:35:00
14	SP # 3A CASSETTE	07/27/89 08:35:00
15	BLANK CASSETTE	07/27/89

Work Order # 89-07-116

Received: 07/28/89 09/21/89 09:45:27

Test Description	Units	01 SLUDGE SP. TEST 1	02 SLUDGE SP. TEST 2	03 SLUDGE SP. TEST 3	04 RAW FEED
SILVER	mg/kg	<3	<3	<3	<2
ALUMINUM	mg/kg	5950	6440	7750	1980
BARIUM	mg/kg	640	630	660	<10
CADMIUM	mg/kg	1.2	2.0	3.9	<0.5
COBALT	mg/kg	260	260	270	<5
CHROMIUM	mg/kg	1700	1900	1800	15
COPPER	mg/kg	920	910	940	5
MOLYBDENUM	mg/kg	910	960	1020	<10
NICKEL	mg/kg	8200	7900	8000	8
VANADIUM	mg/kg	26800	27400	27400	22
ARSENIC	mg/kg	40	38	49	<3 X
LEAD	mg/kg	337	381	380	<5
SELENIUM	mg/kg	24	22	24	<6 X

GIFFORD HILL & CO. INC.

DEFINITIONS:

1. " X " INDICATES MATRIX INTERFERENCE WHICH MAY REQUIRE A DILUTION OR WHICH PREVENTS THE REPORING OF A RESULT.

2. RESULTS REPORTED mg/kg DRY BASIS.

BEST AVAILABLE COPY

FAX 512-[illegible]

Davis & Floyd, Inc.

Laboratory Analysis Report

Page 1
Received: 08/08/89

Work Order # 89-08-034

10/03/89 17:25:50

REPORT TO GIFFORD HILL & CO. INC.
P.O. BOX 326
HARLEYVILLE, S. C. 29448

ATTEN VIC FLETCHER

PREPARED BY DAVIS & FLOYD, INC.
Environmental Services Div.
Post Office Drawer 428
Greenwood, S.C. 29648
PHONE (803) 229-5211

CERTIFIED BY
JOHN_MCCORD

WORK ID JOB NO. 6747
P.O. #
TAKEN DAVIS & FLOYD, INC. (AKA,HGA)
TYPE AIR SAMPLES
NUMBER OF SAMPLES 13

Comments:
WE ARE PLEASED TO PROVIDE THIS CERTIFIED REPORT OF ANALYSES. FEEL FREE TO TELEPHONE IF FURTHER EXPLANATION IS REQUIRED. UNLESS OTHER ARRANGEMENTS HAVE BEEN MADE, SAMPLES WILL BE DISPOSED OF 28 DAYS AFTER ISSUANCE OF THIS REPORT.

	SAMPLE IDENTIFICATION	DATE COLLECTED
01	TEST 1 FRONT HALF TRAIN	07/26/89
02	TEST 1 BACK HALF TRAIN	07/26/89
03	TEST 1 TOTAL TRAIN	07/26/89
04	TEST 2 FRONT HALF TRAIN	07/26/89
05	TEST 2 BACK HALF TRAIN	07/26/89
06	TEST 2 TOTAL TRAIN	07/26/89
07	TEST 3 FRONT HALF TRAIN	07/26/89
08	TEST 3 BACK HALF TRAIN	07/26/89
09	TEST 3 TOTAL TRAIN	07/26/89
10	H202/HNO3 BLANK	07/26/89
11	DEIONIZED H20 BLANK	07/26/89
12	.1N HNO3 BLANK	07/26/89
13	ACETONE BLANK & FILTER BLK	07/26/89

Test Description	Units	01 TEST 1 FRONT HALF TRAIN	02 TEST 1 BACK HAL TRAIN	03 TEST 1 TOTAL TRAIN	04 TEST 2 FRONT HALF TRAIN
SILVER	ug	<2	<2	<2	<2
ARSENIC	ug	<1.5	<2 X	<1.5	2.1
BARIUM	ug	<10	<10	<10	<10
CADMIUM	ug	1.3	3.7	5.0	3.6
COBALT	ug	<5	<5	<5	<5
CHROMIUM	ug	8	<2	8	7
COPPER	ug	<2	16	16	2
MOLYBDENUM	ug	<10	<10	<10	<10
NICKEL	ug	<4	<4	<4	41
LEAD	ug	<1.5	2.5	2.5	<1.5
SELENIUM	ug	1.5	7.6	9.1	<1.5
VANADIUM	ug	4	<2	4	6

Test Description	Units	05 TEST 2 BACK HAL TRAIN	06 TEST 2 TOTAL TRAIN	07 TEST 3 FRONT HALF TRAIN	08 TEST 3 BACK HAL TRAIN
SILVER	ug	<2	<2	6	<2
ARSENIC	ug	<0.5	2.1	<1.5	<0.5

Work Order # 89-08-034

Received: 08/08/89 10/03/89 17:25:50 Continued From Above

Test Description	Units	05 TEST 2 BACK HAL TRAIN	06 TEST 2 TOTAL TRAIN	07 TEST 3 FRONT HALF TRAIN	08 TEST 3 BACK HAL TRAIN
BARIUM	ug	<10	<10	<10	<10
CADMIUM	ug	2.2	5.8	1.7	0.7
COBALT	ug	<5	<5	<5	<5
CHROMIUM	ug	<2	7	15	<2
COPPER	ug	11	13	<2	8
MOLYBDENUM	ug	<10	<10	<10	<10
NICKEL	ug	<4	41	36	<4
LEAD	ug	1.6	1.6	<1.5	2.6
SELENIUM	ug	28	28	<1.5	0.7
VANADIUM	ug	<2	6	6	<2

Test Description	Units	09 TEST 3 TOTAL TRAIN	10 H202/HNO3 BLA-NK	11 DEIONIZED H20 BLANK	12 .1N HNO3 BLANK
SILVER	ug	6	<4	<4	<4
ARSENIC	ug	<1.5	<1	<1	<1
BARIUM	ug	<10	<20	<20	<20

Received: 08/08/89 10/03/89 17:25:50 Work Order # 89-08-034

Continued From Above

Test Description	Units	09 TEST 3 TOTAL TRAIN	10 H202/HNO3 BLANK	11 DEIONIZED H20 BLANK	12 .1N HNO3 BLANK
CADMIUM	ug	2.4	<1	<1	<1
COBALT	ug	<5	<10	<10	<10
CHROMIUM	ug	15	<4	<4	<4
COPPER	ug	8	<4	<4	<4
MOLYBDENUM	ug	<10	<20	<20	<2
NICKEL	ug	36	<8	<8	<8
LEAD	ug	<1.5	<1	<1	<1
SELENIUM	ug	0.7	<1	<1	<1
VANADIUM	ug	6	<4	<4	<4

Test Description	Units	13 ACETONE BLANK & FILTER BLK
SILVER	ug	<2
ARSENIC	ug	<1.5
BARIUM	ug	<10
CADMIUM	ug	<0.5

Received: 08/08/89 10/03/89 17:25:50 Continued From Above

Test Description	Units	13 ACETONE BLANK & FILTER BLK
COBALT	ug	<5
CHROMIUM	ug	<2
COPPER	ug	18
MOLYBDENUM	ug	<10
NICKEL	ug	17
LEAD	ug	9.9
SELENIUM	ug	<1.5
VANADIUM	ug	18

DEFINITIONS AND EXPLANATIONS :

1. AN " X " INDICATES A DILUTION DUE TO MATRIX INTERFERENCE.

APPENDIX IV

Process Input Data

Particulate Data Sheets

Test Equipment Calibration Calculations

Test Equipment Calibrations

GIFFKS

DAVIS & FLOYD INC.
ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

PARTICULATE FIELD DATA SHEETS

PLANT GIFFORD-HILL CEMENT CO

LOCATION HARLEYVILLE, S.C.

SOURCE ~~KILN EXHAUST~~ METALS RUN SLUDGE

RUN NO. 1

SAMPLE DATE 7-27-89

JOB NO. 6747

NUMBER OF Δp READINGS 32

NUMBER OF INLET & OUTLET TEMPS. 32

Cp FACTOR .84

STATIC PRESSURE IN H_2O +.38

% CO_2 17.0

% O_2 7.0

% CO 0.0

WET BULB TEMPERATURE 130°F

DIAMETER OF CIRCULAR STACK 10'

DIMENSION OF RECTANGULAR STACK — x —

VOLUME OF GAS MEASURED x γ 48.7232

BAROMETRIC PRESSURE 30.22

PARTICULATE CATCH, mg. 39.1

FINAL IMPINGER VOLUME 414 ml

INITIAL IMPINGER VOLUME 200 ml

SILICA GEL VOLUME 15.9 ml

TIME OF TEST, MINUTES 64

SAMPLING NOZZLE DIAMETER, INCHES .246

NOZZLE NO. 2

PITOBE LEAK CHECK ✓

OPERATOR ANDERSON

SAMPLE BOX NO. 4

METER BOX NO. 6

METER ΔHa 1.779

ASSUMED MOISTURE, % 18.5%

HEATER BOX SETTING, °F 250

PROBE LENGTH 5FT # 1 GLASS LINED (METAL TIP)

PROBE HEATER SETTING 6

AVERAGE $\sqrt{\Delta p}$

AVERAGE ΔH

SILICA GEL FINAL WEIGHT, GRAMS 215.9

SILICA GEL INITIAL WEIGHT, GRAMS 200

METER BOX γ .9652

DRY BULB TEMPERATURE 250°F

SAMPLE PORT LOCATED 69 FEET UP STACK

STACK HEIGHT 80

OBSERVER BRUCE HENNESY DHEC.

AMBIENT TEMPERATURE 87°F

PLUME DESCRIPTION CLOUDY NOT ABLE TO OBSERVE

"C" FACTOR 0.8

PROCESS RATE SEE DATA SHEETS

STEAM PRODUCTION NA

TEMPERATURE CALIBRATION

MERCURY IN GLASS THERMOMETER 87°F

THERMOCOUPLE READ OUT 87°F

REMARKS:

PAGE ____ OF ____

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant GIFFORD HILL CEMENT Run No. 1

Sample Location KILN STACK EXHAUST

Sample Type	Sample Identifiable	Liquid Level Marked and/or container sealed
Acetone rinse	✓	✓
filter(s)	✓	✓

Acetone blank container No. 12

Acetone rinse volume (V) 200 ml

*50 ml acetone blank weight:
Date and time of wt. 8-7-89 0905 AKA Gross wt. 44492.2 mg
Date and time of wt. 8-7-89 1654 GA. Gross wt. 44492.2 mg
Average Gross wt. 44492.2 mg
Date and time of wt. 7-31-89 0916 AKA Tare wt. 44491.9 mg
50 ml blank wt. 0.3 mg

*Total blank wt.(Bw) = $\frac{\text{50ml blank wt. X V}}{50}$ = 1.2 mg

*Weight of Particulate in acetone rinse(PW):
Date and time of wt. 8-7-89 1101 AKA Gross wt. mg
Date and time of wt. Gross wt. mg
Average Gross wt. mg
Date and time of wt. 7-31-89 9003 AKA Tare wt. 110848.6 mg
Weight of Particulate in acetone rinse(Pw) VOID. mg

*Weight of Particulate on filters(Fw): Filter No. 113-89
Date and time of wt. 8-7-89 0919 AKA Gross wt. 382.0 mg
Date and time of wt. 8-7-89 1646 GA. Gross wt. 382.2 mg
Average Gross wt. 382.1 mg
Date and time of wt. 7-19-89 1802 GA Tare wt. 343.0 mg
Weight of Particulate on Filter(Fw) 39.1 mg

Total Weight of Particulate(Tw):
TW = (Pw + Fw) - Bw = 39.1 mg

Date Sampled 7-27-89

Date of Laboratory Custody 7-28-89

Laboratory Personnel Taking Custody A.K. ALEXANDER

Remarks ACETONE RINSE NOT INCLUDED IN TOTAL CATCH.

Page ____ of ____

DAVIS & FLOYD INC.
ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

TEST 1 PORT A KILN SLUDGE TEST EXHAUST FIELD DATA SHEET

TRAVERSE POINT NO.	CLOCK TIME	SAMPLING TIME	DRY GAS METER, CU. FT.	PITOBE MANOMETER ΔP IN H_2O	ORIFICE MANOMETER ΔH IN H_2O	STACK TEMP. °F	DRY GAS TEMP. °F		PUMP VACUUM IN. Hg.	FILTER TEMP. °F	TEMP. GAS LEAVING LAST IMPINGER °F
							INLET	OUTLET			
1	10:16	0	591.886	.6	1.2	241	84		2	220	70
2		2	593.1	.7	1.7	242	85		2	230	68
3		4	594.7	.7	1.7	244	86		2	242	67
4		6	595.9	.9	2.15	242	86		2	235	67
5	*	8	597.5	.9	2.15	243	86		2	240	67
6	**	10	599.1	.8	1.85	249	87		2	246	67
7		12	601.0	.8	1.85	250	88		2	244	67
8		14	602.3	.9	2.15	260	88		2	250	67
	10:32	16	603.7								
					B						
1	10:46	0	603.7	.5	1.2	241	86		2	240	71
2		2	605.4	.6	1.4	242	87		2	246	68
3		4	606.4	.7	1.7	250	90		2	247	67
4		6	608.0	.75	1.82	254	92		2	250	67
5		8	609.2	.8	1.85	255	95		3	246	67
6		10	610.9	.8	1.85	250	97		3	254	66
7		12	612.2	.75	1.82	252	98		3	229	66
8		14	614.0	.75	1.82	251	101		3	240	66
	11:02	16	615.3								

REMARKS: USED METAL PROBE TIPS DURING TESTING.
** COMPUTER WENT OUT APPROXIMATELY 10:30 RAN TWO MINUTES NO FEED
RESTART @ 10:46

BEGINNING LEAK RATE 0.005 C.F.M. @ 12 in. Hg

FINAL LEAK RATE ______ C.F.M. @ ______ in. Hg

PAGE ______ OF ______

DAVIS & FLOYD INC.
ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

TEST 1 PORT C KILN SLUDGE TESTS EXHAUST FIELD DATA SHEET

TRAVERSE POINT NO.	CLOCK TIME	SAMPLING TIME	DRY GAS METER, CU. FT.	PITOBE MANOMETER ΔP IN H_2O	ORIFICE MANOMETER ΔH IN H_2O	STACK TEMP. °F	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg.	FILTER TEMP. °F	TEMP. GAS LEAVING LAST IMPINGER °F
1	11:07	0	615.3	.75	1.82	247	102		3	250	71
2		2	617.4	.8	1.9	250	104		3	246	67
3		4	618.4	.9	2.15	256	105		3	240	66
4		6	620.1	.95	2.25	257	106		3.5	247	66
5		8	621.7	.95	2.25	257	107		3.5	250	65
6		10	623.4	.95	2.25	254	108		3.5	243	65
7		12	625.1	.8	1.9	255	110		3.0	244	67
8		14	627.0	.8	1.9	258	110		3	246	67
	11:23	16	628.3								
					D						
1	11:27	0	628.3	.9	2.15	239	111		3	240	72
2		2	629.7	1.0	2.42	246	112		3	238	68
3		4	631.8	1.0	2.42	248	113		3.5	246	67
4		6	633.5	1.1	2.64	250	114		4	242	66
5		8	635.5	1.1	2.64	248	116		4	249	66
6		10	637.3	1.0	2.42	251	117		4	250	66
7		12	638.9	.95	2.25	252	117		3.5	246	66
8		14	640.7	.9	2.15	254	118		3	249	66
	11:43	16	642.366								

REMARKS: ______________________

BEGINNING LEAK RATE ________ C.F.M. @ ________ in. Hg

FINAL LEAK RATE 0.00 C.F.M. @ 6 in. Hg

PAGE ______ OF ______

DAVIS & FLOYD INC.
ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

PARTICULATE FIELD DATA SHEETS

PLANT GIFFORD-HILL CEMENT CO
OPERATOR ANDERSON
LOCATION HARLEYVILLE, S.C.
SAMPLE BOX NO. 2
SOURCE KILN EXHAUST METALS RUN ON SLUDGE
METER BOX NO. 6
RUN NO. 2
METER ΔHa 1.779
SAMPLE DATE 7-27-89
ASSUMED MOISTURE, % 18.5%
JOB NO. 6747
HEATER BOX SETTING, °F 250
NUMBER OF Δp READINGS 32
PROBE LENGTH 5FT # 4 GLASS LINED (METAL TIPS)
NUMBER OF INLET & OUTLET TEMPS. 32
PROBE HEATER SETTING 6
Cp FACTOR .84
AVERAGE √Δp
STATIC PRESSURE IN H_2O +.39
AVERAGE ΔH
% CO_2 17.0
SILICA GEL FINAL WEIGHT, GRAMS 217.2
% O_2 7.0
SILICA GEL INITIAL WEIGHT, GRAMS 200
% CO 0.0
METER BOX γ .9652
WET BULB TEMPERATURE 130°F
DRY BULB TEMPERATURE 252°F
DIAMETER OF CIRCULAR STACK 10'
SAMPLE PORT LOCATED 69 FEET UP STACK
DIMENSION OF RECTANGULAR STACK — x —
STACK HEIGHT 80
VOLUME OF GAS MEASURED x γ 50.7946
OBSERVER BRUCE HENNESSY DHEC.
BAROMETRIC PRESSURE 30.22
AMBIENT TEMPERATURE 90°F
PARTICULATE CATCH, mg. 49.54
PLUME DESCRIPTION CLOUDY
FINAL IMPINGER VOLUME 425 ml
INITIAL IMPINGER VOLUME 200 ml
"C" FACTOR .84
SILICA GEL VOLUME 17.2 ml
PROCESS RATE SEE DATA
TIME OF TEST, MINUTES 64
STEAM PRODUCTION NO
SAMPLING NOZZLE DIAMETER, INCHES .248
NOZZLE NO. 4
PITOBE LEAK CHECK

TEMPERATURE CALIBRATION
MERCURY IN GLASS THERMOMETER
THERMOCOUPLE READ OUT

REMARKS:

PAGE ___ OF ___

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant GIFFORD HILL CEMENT Run No. 2

Sample Location KILN STACK EXHAUST

Sample Type	Sample Identifiable	Liquid Level Marked and/or container sealed
Acetone rinse	✓	✓
filter(s)	✓	✓

Acetone blank container No. 12

Acetone rinse volume (V) 277 ml

*50 ml acetone blank weight:

Date and time of wt. 8-7-89 0905 AKA Gross wt. 44492.2 mg

Date and time of wt. 8-7-89 1658 GA. Gross wt. 44492.2 mg

Average Gross wt. 44492.2 mg

Date and time of wt. 7-31-89 0922 AKA Tare wt. 44491.9 mg

50 ml blank wt. 0.3 mg

*Total blank wt.(Bw) = $\frac{\text{50ml blank wt. X V}}{50}$ = 1.66 mg

*Weight of Particulate in acetone rinse(PW):

Date and time of wt. 8-7-89 0911 AKA Gross wt. 104172.0 mg

Date and time of wt. 8-7-89 1651 GA Gross wt. 104172.4 mg

Average Gross wt. 104172.2 mg

Date and time of wt. 7-31-89 0907 AKA Tare wt. 104156.0 mg

Weight of Particulate in acetone rinse(Pw) 16.2 mg

*Weight of Particulate on filters(Fw): Filter No. 112-89

Date and time of wt. 8-7-89 0916 AKA Gross wt. 375.8 mg

Date and time of wt. 8-7-89 1648 GA Gross wt. 376.2 mg

Average Gross wt. 376.0 mg

Date and time of wt. 7-19-89 1801 GA Tare wt. 341.0 mg

Weight of Particulate on Filter(Fw) 35.0 mg

Total Weight of Particulate(Tw):

TW = (Pw + Fw) - Bw = 49.54 mg

Date Sampled 7-27-89

Date of Laboratory Custody 7-28-89

Laboratory Personnel Taking Custody A.K. ALEXANDER

Remarks FILTER CATCH LIGHT BROWN IN COLOR.

Page_____ of_____

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DAVIS & FLOYD INC.
ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

TEST 2 PORT 4 KILN EXHAUST SLUDGE TEST FIELD DATA SHEET

TRAVERSE POINT NO.	CLOCK TIME	SAMPLING TIME	DRY GAS METER, CU. FT.	PITOBE MANOMETER ΔP IN H_2O	ORIFICE MANOMETER ΔH IN H_2O	STACK TEMP. °F	DRY GAS TEMP. °F		PUMP VACUUM IN. Hg.	FILTER TEMP. °F	TEMP. GAS LEAVING LAST IMPINGER °F
							INLET	OUTLET			
1	11:58	0	642.556	.7	1.8	248	108		3	236	71
2		2	644.1	.85	2.17	252	110		3	240	69
3		4	645.6	.9	2.3	256	111		4	246	68
4		6	647.4	.9	2.3	254	112		4	244	67
5		8	649.1	.9	2.3	255	112		4	246	67
6		10	650.8	.85	2.17	257	112		4	250	67
7		12	652.7	.8	2.01	255	113		4	240	67
8		14	654.2	.7	1.8	256	114		4	243	67
	12:14	16	655.7								
					D						
1	12:15	0	655.7	.7	1.8	240	114		4	236	72
2		2	657.2	.85	2.17	245	114		4	247	68
3		4	659.2	1.1	2.8	246	115		4.5	252	67
4		6	660.6	1.1	2.8	257	115		4.5	245	66
5		8	662.6	1.1	2.8	256	116		4.5	254	66
6		10	664.5	1.0	2.6	251	117		4.5	251	66
7		12	666.1	0.9	2.3	250	118		4	240	67
8		14	668.0	0.85	2.17	255	119		4	235	66
	12:31	16	669.7								

REMARKS: METAL PROBE TIP (STAINLESS) USED

BEGINNING LEAK RATE ______ C.F.M. @ ______ in. Hg

FINAL LEAK RATE ______ C.F.M. @ ______ in. Hg

PAGE ______ OF ______

DAVIS & FLOYD INC.
ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

TEST 2 PORT B KILN EXHAUST SLUDGE TEST FIELD DATA SHEET

TRAVERSE POINT NO.	CLOCK TIME	SAMPLING TIME	DRY GAS METER, CU. FT.	PITOBE MANOMETER ΔP IN H_2O	ORIFICE MANOMETER ΔH IN H_2O	STACK TEMP. °F	DRY GAS TEMP. °F		PUMP VACUUM IN. Hg.	FILTER TEMP. °F	TEMP. GAS LEAVING LAST IMPINGER °F
							INLET	OUTLET			
1	12:35	0	669.7	.7	1.8	240	117		4	241	73
2		2	671.2	.8	2.01	248	118		4	247	68
3		4	672.9	.85	2.15	254	119		4	250	67
4		6	674.7	.9	2.3	255	120		4	246	67
5		8	676.2	.95	2.4	255	120		4.5	250	67
6		10	678.3	.9	2.3	251	120		4.5	246	67
7		12	679.8	.85	2.15	247	121		4	251	67
8		14	681.3	.85	2.15	251	122		4	246	67
	12:51	16	683.1								
					B						
1	12:53	0	683.1	.6	1.5	243	121		3	234	69
2		2	684.5	.65	1.65	249	121		3	239	68
3		4	686.3	.75	1.9	250	122		3	242	67
4		6	687.6	.75	1.9	250	123		3	248	66
5		8	688.9	.8	2.01	246	123		4	250	66
6		10	690.5	.75	1.9	248	124		4	242	66
7		12	692.3	.7	1.8	250	122		4	240	67
8		14	693.9	.6	1.5	245	121		3	246	67
	1:09	16	695.182								

REMARKS: ______

BEGINNING LEAK RATE ______ C.F.M. @ ______ in. Hg

FINAL LEAK RATE 0.00 C.F.M. @ 6 in. Hg

PAGE ______ OF ______

DAVIS & FLOYD INC.
ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

PARTICULATE FIELD DATA SHEETS

PLANT GIFFORD-HILL CEMENT CO

OPERATOR ANDERSON

LOCATION HARLEYVILLE, S.C.

SAMPLE BOX NO. 5

SOURCE KILN EXHAUST METALS RUN SLUDGE

METER BOX NO. 6

RUN NO. 3

METER ΔHa 1-7

SAMPLE DATE 7 - 27 - 89

ASSUMED MOISTURE, % 18.5%

JOB NO. 6747

HEATER BOX SETTING, °F 250

NUMBER OF Δp READINGS 32

PROBE LENGTH 5FT # 2 GLASS

NUMBER OF INLET & OUTLET TEMPS. 32

PROBE HEATER SETTING 6

Cp FACTOR .84

AVERAGE √Δp

STATIC PRESSURE IN H_2O +.38

AVERAGE ΔH

% CO_2 17.0

SILICA GEL FINAL WEIGHT, GRAMS 220.0

% O_2 7.0

SILICA GEL INITIAL WEIGHT, GRAMS 200

% CO 0.0

METER BOX γ

WET BULB TEMPERATURE 130°F

DRY BULB TEMPERATURE 240°F

DIAMETER OF CIRCULAR STACK 10'

SAMPLE PORT LOCATED 69 FEET UP STACK

DIMENSION OF RECTANGULAR STACK — x —

STACK HEIGHT 80

VOLUME OF GAS MEASURED x γ 52.0513

OBSERVER NONE DHEC.

BAROMETRIC PRESSURE 30.22

AMBIENT TEMPERATURE 99°F

PARTICULATE CATCH, mg. 43.41

PLUME DESCRIPTION CLOUDY

FINAL IMPINGER VOLUME 411 ml

INITIAL IMPINGER VOLUME 200 ml

"C" FACTOR 0-84

SILICA GEL VOLUME 20.0 ml

PROCESS RATE

TIME OF TEST, MINUTES 64

STEAM PRODUCTION NO

SAMPLING NOZZLE DIAMETER, INCHES .248

NOZZLE NO. 3

PITOBE LEAK CHECK

TEMPERATURE CALIBRATION

MERCURY IN GLASS THERMOMETER

THERMOCOUPLE READ OUT

REMARKS:

PAGE ____ OF ____

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant GIFFORD HILL CEMENT Run No. 3

Sample Location KILN STACK EXHAUST

Sample Type	Sample Identifiable	Liquid Level Marked and/or container sealed
Acetone rinse	✓	✓
filter(s)	✓	✓

Acetone blank container No. 12

Acetone rinse volume (V) 182 ml

*50 ml acetone blank weight:
Date and time of wt. 8-7-89 0905 AKA Gross wt. 44492.2 mg
Date and time of wt. 8-7-89 1654 YA. Gross wt. 44492.2 mg
Average Gross wt. 44492.2 mg
Date and time of wt. 7-31-89 0922 AKA Tare wt. 44491.9 mg
50 ml blank wt. 0.3 mg

*Total blank wt.(Bw) = $\frac{\text{50ml blank wt. X V}}{50}$ = 1.09 mg

*Weight of Particulate in acetone rinse(PW):
Date and time of wt. 8-7-89 0909 AKA Gross wt. 105087.4 mg
Date and time of wt. 8-7-89 1652 YA Gross wt. 105087.6 mg
Average Gross wt. 105087.5 mg
Date and time of wt. 7-31-89 0916 AKA Tare wt. 105077.4 mg
Weight of Particulate in acetone rinse(Pw) 10.1 mg

*Weight of Particulate on filters(Fw): Filter No. 104-89
Date and time of wt. 8-7-89 0922 AKA Gross wt. 377.6 mg
Date and time of wt. 8-7-89 1649 YA. Gross wt. 377.8 mg
Average Gross wt. 377.7 mg
Date and time of wt. 6-23-89 1045 AKA Tare wt. 343.3 mg
Weight of Particulate on Filter(Fw) 34.4 mg

Total Weight of Particulate(Tw):
TW = (Pw + Fw) - Bw = 43.41 mg

Date Sampled 7-27-89

Date of Laboratory Custody 7-28-89

Laboratory Personnel Taking Custody A.K. ALEXANDER

Remarks FILTER CATCH LIGHT BROWN IN COLOR.

DAVIS & FLOYD INC.
ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

TEST 3 PORT A KILN (SLUDGE) EXHAUST TESTS FIELD DATA SHEET

TRAVERSE POINT NO.	CLOCK TIME	SAMPLING TIME	DRY GAS METER, CU. FT.	PITOBE MANOMETER ΔP IN H_2O	ORIFICE MANOMETER ΔH IN H_2O	STACK TEMP. °F	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg.	FILTER TEMP. °F	TEMP. GAS LEAVING LAST IMPINGER °F
1	2:46	0	695.345	.6	1.5	238	110		3	250	72
2		2	696.7	.75	1.9	242	111		3.5	247	68
3		4	698.3	.9	2.3	244	111		4	244	67
4		6	699.9	1.0	2.5	246	112		5	243	64
5		8	701.5	1.0	2.5	249	113		5	248	64
6		10	703.1	1.0	2.5	245	114		4.5	249	64
7		12	705.0	0.95	2.4	243	115		4	252	65
8		14	706.9	.9	2.3	248	116		4.5	236	67
	3:02	16	708.7								
					D						
1	3:04	0	708.7	.9	2.3	239	115		5	241	69
2		2	710.4	.85	2.2	240	116		5	244	68
3		4	712.0	1.2	3.10	244	117		5	253	67
4		6	714.2	1.2	3.10	246	118		6	250	67
5		8	716.0	1.1	2.8	251	119		6	244	68
6		10	718.0	1.1	2.8	250	119		6	246	66
7		12	720.0	1.0	2.5	242	119		5	249	66
8		14	721.7	0.9	2.3	245	119		5	237	66
	3:20	16	723.4								

REMARKS: ______________________

BEGINNING LEAK RATE 0.014 C.F.M. @ 13 in. Hg

FINAL LEAK RATE ________ C.F.M. @ ________ in. Hg

PAGE ______ OF ______

DAVIS & FLOYD INC.
ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA

TEST 3 PORT C

FIELD DATA SHEET

TRAVERSE POINT NO.	CLOCK TIME	SAMPLING TIME	DRY GAS METER, CU. FT.	PITOBE MANOMETER ΔP IN H_2O	ORIFICE MANOMETER ΔH IN H_2O	STACK TEMP. °F	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg.	FILTER TEMP. °F	TEMP. GAS LEAVING LAST IMPINGER °F
1	3:22	0	723.4	.7	1.8	239	117		5	241	73
2		2	724.9	.9	2.3	247	118		5	246	70
3		4	726.6	.95	2.4	246	119		5.5	253	68
4		6	728.4	.95	2.4	246	120		5.5	250	66
5		8	730.3	1.0	2.5	250	120		5.5	250	66
6		10	732.1	1.0	2.5	245	120		6	250	65
7		12	733.8	.9	2.3	244	121		6	238	65
8		14	735.4	.9	2.3	246	121		6	246	65
	3:38	16	737.1								
					B						
1	3:39	0	737.1	.6	1.5	249	119		4	246	70
2		2	739.1	.7	1.8	240	120		4	245	69
3		4	740.1	.7	1.8	241	121		4	242	67
4		6	741.6	.8	2.0	243	122		4	250	68
5		8	743.1	.7	1.8	244	122		4	245	67
6		10	744.7	.7	1.8	250	122		4	246	67
7		12	746.4	.7	1.8	246	123		4	246	67
8		14	747.8	.7	1.8	242	123		4	248	67
	3:54	16	749.273								

REMARKS:

BEGINNING LEAK RATE _____ C.F.M. @ _____ in. Hg

FINAL LEAK RATE 0.01 C.F.M. @ 7 in. Hg

PAGE _____ OF _____

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DAVIS & FLOYD, INC.
ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA 29648

MSA MONITOR RECORD

CLIENT: GIFFORD-HILL CEMENT LOCATION: HARLEYVILLE S.C.

JOB NUMBER: 6747 YEAR: 1989 PAGE _____ of _____

SUBJECT NAME/TITLE (P) LOCATION (S) (METALS)	FILTER NUMBER	TYPE P/S	START time	START date	START flow	SHUT-OFF time	SHUT-OFF date	SHUT-OFF flow	COMMENT
SP#1 NEAR ROTARY DRYER	1	S	~~2.06~~ 9:20	7/27	2.06	4:34	7/27	2.06	1
SP#1A " " "	1A	S	~~2.06~~ 9:20	"	2.06	4:34	7/27	2.06	1
SP#2 NEAR FINISH MILL	2	S	9:07	"	2.06	4:44	7/27	2.06	1
SP#2A " " "	2A	S	9:07	"	2.06	4:44	7/27	2.06	1
SP#3 FISH POND PUMP & REMOTE LOCATION	3	S	8:35	"	2.13	4:52	7/27	2.13	1
SP#3A " "	3A	S	8:35	"	2.13	4:52	7/27	2.13	1

SP#1 & 1A = 894.04 LITERS
SP#2 & 2A = 941.42 LITERS
SP#3 & 3A = 1058.61 LITERS

BAR PRESS 30.22
TEMP. AMB. - 90°F

COMMENT 1: TWO ~~MCA~~ CEM FILTERS AT EACH STATION
COMMENT 2:
COMMENT 3:
COMMENT 4:
COMMENT 5:
COMMENT 6:

P-PERSONAL [✓ S-STATIONARY]

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DAVIS & FLOYD, INC.
ENVIRONMENTAL SERVICES DIVISION
GREENWOOD, SOUTH CAROLINA 29648

MSA MONITOR RECORD

CLIENT: GIFFORD-HILL CEMENT LOCATION: HARLEYVILLE

JOB NUMBER: 6747 YEAR: 1989 PAGE _____ of _____

SUBJECT NAME/TITLE (P) LOCATION (S)	FILTER NUMBER	TYPE P/S	START time	START date	START flow	SHUT-OFF time	SHUT-OFF date	SHUT-OFF flow	COMME
CRYSTALLINE SILICA					L/MIN				
SP#1 NEAR ROTARY DRYER	1	S	9:20	7/27	1.74	4:35	7/27	1.74	
" 1A " " "	1A	S	9:20	"	1.74	4:35	7/27	1.74	
PUMP #6 " 2 NEAR FINISH MILL	2	S	9:00	"	1.80	4:44	7/27	1.80	
W/CYCLONE PUMP #6 " 2A " " "	2A	S	9:00	"	1.80	4:44	7/27	1.80	
FISH POND PUMP 7 " 3 REMOTE LOCATION	3	S	8:37	"	1.68	4:52	7/27	1.68	
FISH POND PUMP 7 " 3A " "	3A	S	8:37	"	1.68	4:52	7/27	1.68	
HI-VOL 200 #4 NEAR FINISH MILL	4	S	9:05	"	9.4	1:30	7/27	9.4	
BAR PRESS 30.22									
TEMP AMB. = 90°F									
SP#1 = 756.9 LITERS, SP# 1A 756.9 L.									
SP# 2 = 835.2 LITERS, SP# 2A 835.2 L.									
SP# 3 = 831.6 LITERS SP#3A 831.6 L.									

SP# 4 = 2491.0 LITERS.

COMMENT 1: TWO CASSETTES WITH PVC FILTERS ON EACH PU

COMMENT 2: ____________________

COMMENT 3: ____________________

COMMENT 4: ____________________

COMMENT 5: ____________________

COMMENT 6: ____________________

P-PERSONAL [✓ S-STATIONARY]

TEST EQUIPMENT CALIBRATION CALCULATIONS

WHERE

Q = Flow Rate (C.F.M.)
Vs = Wet Meter Gas Volume (ft^3)
Vds = Dry Gas Meter Volume (ft^3)(calibration meter)
T = Time-seconds
Pb - Barometric Pressure (In. H_g)
Ts = Wet Meter Temperature (°F)
ΔP = Dry Gas Meter Inlet Differential pressure (in H_2O)
Yd = Meter Box Meter coefficient, dimensionless
Yds = Dry Gas Meter coefficient, dimensionless
Vd = Meter Box Meter Gas Volume (Cu. Ft.)
Tds = Calibration Meter Average Temperature (Dry Gas Meter)
Td = Meter Box Avg. Temp. (°F)
ΔH = Orifice Pressure Differential
ΔHa = Orifice pressure differential that gives 0.75 C.F.M. of air at 70°F + 29.92 inches of mercury, in H_2O
Tolerance = ± 0.15
Ysa = Average of Ydsa Values (from the calibration of dry gas meter to be used as a standard) in the working range of 0.40 C.F.M. to 1.0 C.F.M.
Yda = Meter Box Meter coefficient, dimensionless (Post Test)

I. Calibration of dry gas meter against wet test meter to be used as a standard.

Wet test meter I.D. = South Carolina Department of Health and Environmental Control (Serial No. P-460)

$$Q = (17.65)\ \frac{Vs}{T}\ \frac{Pb}{(Ts+460)} \qquad \text{(Eq. 1)}$$

$$Yds = \frac{Vs}{Vds}\ \frac{(Tds+460)}{(Ts+460)}\ \frac{Pb}{Pb + \frac{\Delta P}{13.6}} \qquad \text{(Eq. 2)}$$

II. Calibration of a meter box gas meter against a calibration dry gas meter.

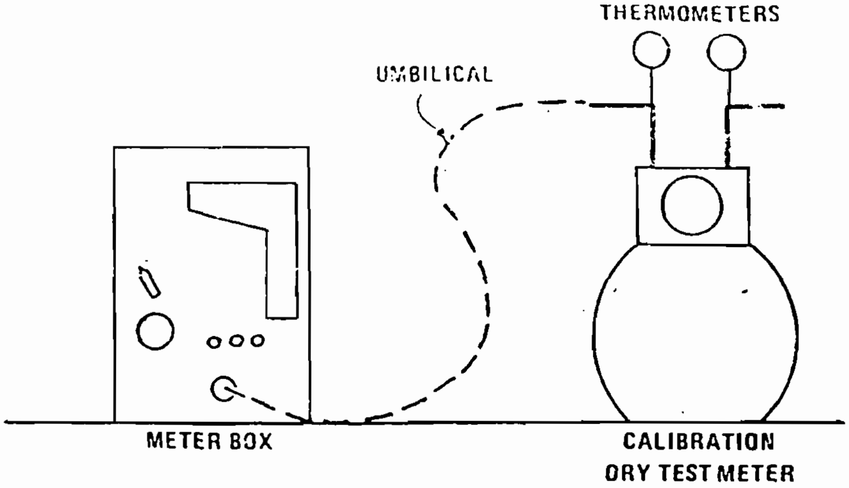
$$Q = (17.65)\ \frac{Pb}{(Tds+460)}\ \frac{Vds}{T} \qquad \text{(Eq. 3)}$$

$$Yd = (Yds)\ \frac{Vds}{Vd}\ \frac{(Td+460)}{(Tds+460)}\ \frac{Pb}{Pb + \frac{\Delta H}{13.6}} \qquad \text{(Eq. 4)}$$

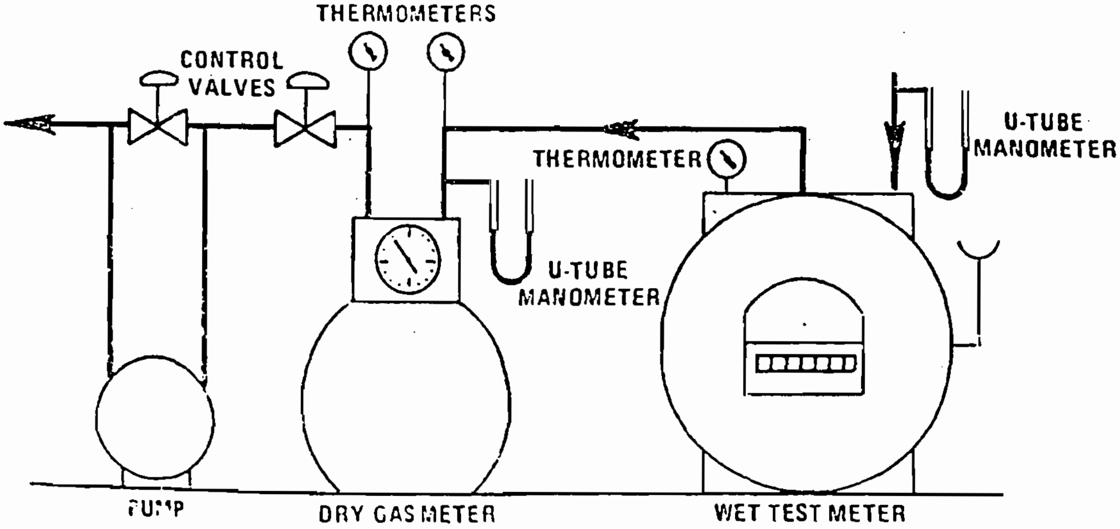
$$\Delta Ha = \frac{0.0317\ \Delta H}{Pb(Td+460)} \left[\frac{(Tds+460)T}{(Vds)(Ysa)}\right]^{2} \qquad \text{(Eq. 5)}$$

III. Post test meter calibration of meter box gas meter against a calibration dry gas meter.

$$Yda = (Ysa)\ \frac{Vds}{Vd}\ \frac{(Td+460)}{(Tds+460)}\ \frac{Pb}{Pb + \frac{\Delta H}{13.6}} \qquad \text{(Eq. 6)}$$



Meter box calibration set-up.



Equipment arrangement for dry-gas meter calibration.

DAVIS & FLOYD INC.

ENVIRONMENTAL SERVICES DIVISION
POST OFFICE DRAWER 428
GREENWOOD, SOUTH CAROLINA 29646

CALIBRATION OF A DRY GAS METER TO BE USED AS A STANDARD

DATE: 12-14-88
DRY GAS METER ID: 689800
BAROMETRIC PRESSURE:29.980

WET TEST METER ID: SCDHEC NO.P-460
CALIBRATOR: ALEXANDER

			TEMPERATURES (DEG F)								
APPROXIMATE FLOW RATE (Q)	WET METER GAS VOLUME (VS)	DRY GAS METER VOLUME (VDS)	WET METER	INLET	DRY GAS METER OUTLET	AVE.	DRY GAS METER PRESSURE (P)	TIME (T)	FLOW RATE (Q)	METER COEFFICIENT	AVERAGE METER COEFFICIENT
CFM	CU. FT.	CU. FT.	TS	TDSI	TDSO	TDS	IN. H20	SEC.		(YDS)	(YDSa)
.40	5.0	5.034	77.0	73.5	73.5	73.5	.4	835.0	.3540	.9858	
.40	5.0	5.044	77.0	74.0	74.0	74.0	.4	834.0	.3545	.9848	
.40	5.0	5.031	77.0	74.3	74.3	74.3	.4	835.0	.3540	.9879	.9862
.60	5.0	5.095	77.0	74.0	74.0	74.0	1.5	557.0	.5307	.9723	
.60	5.0	5.096	77.0	75.0	75.0	75.0	1.5	557.0	.5307	.9739	
.60	5.0	5.098	77.0	75.0	75.0	75.0	1.5	557.0	.5307	.9735	.9733
.80	5.0	5.100	76.0	75.0	75.0	75.0	1.0	391.0	.7575	.9762	
.80	5.0	5.097	76.0	75.0	75.0	75.0	1.0	390.0	.7594	.9767	
.80	5.0	5.107	76.0	75.0	75.0	75.0	1.0	392.0	.7555	.9748	.9759
1.00	10.0	10.261	76.0	75.0	75.0	75.0	1.7	601.0	.9856	.9687	
1.00	10.0	10.276	76.0	75.0	75.0	75.0	1.7	601.0	.9856	.9673	
1.00	10.0	10.267	76.0	75.0	75.0	75.0	1.7	602.0	.9839	.9681	.9680
1.20	10.0	10.314	76.0	75.0	75.0	75.0	2.2	523.0	1.1326	.9626	
1.20	10.0	10.321	76.0	75.0	75.0	75.0	2.2	524.0	1.1304	.9619	
1.20	10.0	10.324	76.0	75.0	75.0	75.0	2.2	524.0	1.1304	.9616	.9620
										AVERAGE	.9731

CHECKED BY: H. Gary Anderson Jr.

DAVIS & FLOYD

DAVIS AND FLOYD, INC.
ENVIRONMENTAL SERVICES DIVISION
P. O. DRAWER 428
GREENWOOD, SOUTH CAROLINA 29646

CALIBRATION OF METER BOX DRY GAS METER AGAINST A CALIBRATION DRY GAS METER

DATE:---- 3-23-89
CALIBRATION METER IDENTIFICATION:------ 689808
METER BOX IDENTIFICATION:------- BOX 6
CALIBRATOR:--------A.J. POLLARD
BAROMETRIC PRESSURE (PB):------- 29.63 in. Hg
Ysa-------0.9758

APPROX. FLOW RATE Q CFM	ORIFICE READING DELTA H in. H20	CALIBRATION METER GAS VOLUME Vds ft3	METER BOX METER GAS VOLUME Vd ft3	TEMPERATURE						TIME SEC	METER BOX METER COEFFICIENT Yd	H@
				CALIBRATION METER			METER BOX METER					
				INLET Tdsi F	OUTLET Tdso F	AVERAGE Tds F	INLET Tdi F	OUTLET Tdo F	AVERAGE Td F			
0.41	0.50	5.001	5.129	64.0	65.0	64.5	72.0	72.0	72.0	735.2	0.9639	1.744
0.57	1.00	4.998	5.194	64.0	65.0	64.5	78.0	78.0	78.0	525.3	0.9608	1.763
0.69	1.50	5.003	5.198	64.0	66.0	65.0	84.0	84.0	84.0	434.6	0.9696	1.790
0.80	2.00	5.005	5.238	64.0	66.0	65.0	88.0	88.0	88.0	375.3	0.9684	1.765
0.95	3.00	10.002	10.621	64.0	66.0	65.0	91.0	91.0	91.0	629.4	0.9632	1.855
1.13	4.00	10.003	10.514	64.0	66.0	65.0	96.0	96.0	96.0	533.4	0.9735	1.760
									AVERAGES =	538.9	0.9666	1.779

CHECKED BY: ______________________

DAVIS AND FLOYD, INC.
ENVIRONMENTAL SERVICES DIVISION
P. O. DRAWER 428
GREENWOOD, SOUTH CAROLINA 29646

POST-TEST DRY GAS METER CALIBRATION CHECK

DATE:------ 8-13-89
CALIBRATION METER IDENTIFICATION:------ 689808
METER BOX IDENTIFICATION:---------#6
CALIBRATOR:--------AKA
BAROMETRIC PRESSURE (PB):---------- 29.56 in. Hg
Yds-------0.9758

APPROXIMATE FLOW RATE Q CFM	ORIFICE READING DELTA H in. H20	CALIBRATION METER GAS VOLUME Vds ft3	METER BOX METER GAS VOLUME Vd ft3	TEMPERATURE						TIME	METER BOX METER COEFFICIENT Yd
				CALIBRATION METER			METER BOX METER				
				INLET Tdsi F	OUTLET Tdso F	AVERAGE Tds F	INLET Tdi F	OUTLET Tdo F	AVERAGE Td F		
0.64	1.20	4.999	5.095	80.0	80.0	80.0	86.5	86.5	86.5	1465.59	0.9661
0.64	1.20	4.999	5.160	80.0	80.5	80.3	91.0	91.0	91.0	1469.31	0.9613
0.64	1.20	5.001	5.202	80.5	81.5	81.0	97.0	97.0	97.0	1471.87	0.9630

AVERAGE = 0.9634

CHECKED BY: ________________

ANALYTICAL BALANCE CALIBRATION

Balance Name Sartorius Type 2402

Classification of Standard Weights Type S

Date	0.500 g	1.0000 g	10.0000 g	50.0000 g	100.0000 g	Analyst
8-7-89	0.500 G.	1.0000 G.	10.0000 G.	50.0000 G.	100.0000 G.	

NOZZLE CALIBRATION DATA

Date 7-27-89 Calibrated by

Nozzle Identification Number	Nozzle Diameter^a					ΔD,^{b} (in.)	D_{avg} ^{c}
	D_1, (in.)	D_2, (in.)	D_3, (in.)	D_4, (in.)	D_5, (in.)		
Test No. 1 Nozzle No. 2	.245	.246	.246	.246	.246	.001	.246
Test No. 2 Nozzle No. 4	.248	.248	.248	.248	.249	.001	.248
Test No. 3 Nozzle No. 3	.248	.247	.249	.248	.248	.002	.248

Where:

$^aD_{1, 2, 3, 4, 5}$ = five different nozzle diameters, (in.); each diameter must be within 0.001 in.

b ΔD = maximum difference between any two diameters, (in.), $\Delta D \leq 0.004$ in.

c D_{avg} = average of D_1, D_2, D_3, D_4 and D_5.

TYPE S PITOT TUBE INSPECTION DATA FORM
AS FOUND IN METHOD 2, 40 CFR, PART 60, APPENDIX A

Pitot tube assembly level? ✓ yes ______ no

Pitot tube openings damaged? ______ yes (explain below) ✓ no

α_1 = 0° (<10°), α_2 = 3° (<10°), β_1 = 1° (<5°),
β_2 = 4° (<5°)

γ = 1°, θ = 1°, A = 0.945 cm (in.)

$z = A \sin \gamma$ = 0.016 cm (in.); <0.32 cm (<1/8 in.),
$w = A \sin \theta$ = 0.016 cm (in.); <.08 cm (<1/32 in.)

P_A 0.493 cm (in.) P_b 0.498 cm (in.)

D_t = 0.375 cm (in.)

Comments: 5 FT PROBE NO IV 1-12-89

Calibration required? ______ yes ✓ no

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TYPE S PITOT TUBE INSPECTION DATA FORM
AS FOUND IN METHOD 2, 40 CFR, PART 60, APPENDIX A

Pitot tube assembly level? ✓ yes ____ no

Pitot tube openings damaged? ____ yes (explain below) ✓ no

α_1 = 2 ° (<10°), α_2 = 4 ° (<10°), β_1 = 3 ° (<5°), β_2 = 1 ° (<5°)

γ = 2 °, θ = 1.5 °, A = 1.02 cm (in.)

$z = A \sin \gamma$ = 0.035 cm (in.); <0.32 cm (<1/8 in.),

$w = A \sin \theta$ = 0.026 cm (in.); <.08 cm (<1/32 in.)

P_A 0.522 cm (in.) P_b 0.493 cm (in.)

D_t = 0.376 cm (in.)

Comments: 5 FT PROBE NO II 1-12-89

Calibration required? ____ yes ✓ no

DAVIS & FLOYD. INC.

TYPE S PITOT TUBE INSPECTION DATA FORM
AS FOUND IN METHOD 2, 40 CFR, PART 60, APPENDIX A

Pitot tube assembly level? [✓ yes] ______ no

Pitot tube openings damaged? ______ yes (explain below) [✓ no]

α_1 = 6 ° (<10°), α_2 = 3 ° (<10°), β_1 = 4 ° (<5°),
β_2 = 3 ° (<5°)

γ = 1 °, θ = 1 °, A = 0.972 cm (in.)

$z = A \sin \gamma$ = 0.017 cm (in.); <0.32 cm (<1/8 in.),
$w = A \sin \theta$ = 0.017 cm (in.); <.08 cm (<1/32 in.)

P_A 0.490 cm (in.) P_b 0.50 cm (in.)

D_t = 0.376 cm (in.)

Comments: SET PROBE NO. I 1-12-89

Calibration required? ______ yes [✓ no]

8707116

DAVIS & FLOYD, INC.
GREENWOOD, S.C.

CHAIN OF CUSTODY RECORD

PROJ. NO. 6747

PROJECT NAME HARLEYVILLE, S.C. GIFFORD-HILL CEMENT

SAMPLERS: (SIGNATURE) Gary Anderson, J.K. [illegible]

PARAMETERS

SAMPLE NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Analysis ** METALS As, Ba, Cd, Cr, Pb, Se, Ag, V, Mo, Cu, Co, Ni	Analysis As, Ba, Cd, Cr, Pb, Se, Ag, V, Mo, Cu, Co, Ni, Fe*	REMARKS	SAMPLE TYPE
01	7/27	0016 1143	✓		SLUDGE SP. TEST 1	1	1		** THESE ARE	SD
02	"	1158 1309	✓		SLUDGE SP. TEST 2	1	1		SOLID PROCESS	SD
03	"	1446 1554	✓		SLUDGE SP. TEST 3	1	1		MATERIALS.	SD
04	"	1016 1554	✓		RAW FEED	1	1			SP
05	"	1016 1554	✓		KILN BAGHOUSE DUST	1	1			SD
06	"	1016 1554	✓		4th. STAGE SOLIDS	1	1			SD
07	"	1016 1554	✓		DUST PUMP	1	1			SD
08	"	1016 1554	✓		CLINKER	1	1			SD
09	"	0820	✓		X SP# 1 CASSETTE	1		1	X THESE ARE	
10	"	0920	✓		SP# 1A "	1		1	CASSETTES	
11	"	0907	✓		SP# 2 "	1		1	WITH FILTER	
12	"	0907	✓		SP# 2A "	1		1	ANALYSIS.	
13	"	0835	✓		SP# 3 "	1		1		
14	"	0835	✓		SP# 3A "	1		1		
15	"		✓		BLANK CASSETTE	1		1		

RELINQUISHED BY: (SIGNATURE) Gary Anderson — DATE / TIME 7/28 — RECEIVED BY: (SIGNATURE)

RELINQUISHED BY: (SIGNATURE) — DATE / TIME — RECEIVED BY: (SIGNATURE)

RELINQUISHED BY: (SIGNATURE) — DATE / TIME — RECEIVED FOR LAB BY: (SIGNATURE) Tammy Kerhak — DATE / TIME 7-28-89 1430

REMARKS

DW-Drinking H2O WW-Waste H2O HW-Hazardous waste SD-Solid
GW-Ground H2O RC-RCRA

RADIAN
CORPORATION

DCN 87-213-116-02

CHARACTERIZATION OF SIX SLUDGES FROM THE JACKSONVILLE ELECTRIC AUTHORITY

Prepared for:
Jacksonville Electric Authority
233 W. Duval
Jacksonville, FL 32202

RECEIVED
JUN 20 1990
DER-BAQM

Prepared by:
Radian Corporation
P. O. Box 201088
Austin, Texas 78720

October 2, 1987

INTRODUCTION

As part of contract 2533 between Radian Corporation and the Jacksonville Electric Authority, six sludge samples have been obtained and analyzed from the Northside, Kennedy, and Southside stations. The Extraction Procedure (EP) and Toxicity Characteristic Leaching Procedure (TCLP) and a total elemental analysis were performed for each sludge.

Table 1 presents the samples obtained from each plant and the analysis conducted. At the Northside station, the untreated sludge was also analyzed for volatile and semivolatile organics. A total extraction procedure was used rather than the TCLP method since it is 1) a more rigorous extraction for organics, 2) final procedures for the TCLP have not been promulgated, and 3) the sludge was expected to have minimal concentration of organics. The methods used (8240/8250) identify the majority of organics proposed for regulation by the TCLP. The 4 pesticides and 3 herbicides listed in the TCLP are not determined by these procedures, but they were not expected to be present.

TABLE 1. SAMPLES AND ANALYSES

Sample	EP	TCLP	Organics		Elemental Analysis
			8240	8250	
Northside					
Untreated basin sludge	x	x	x	x	x
Treated Sludge	x	x			x
Percolation pond sludge	x	x			x
Boiler slag	x	x			x
Southside					
Percolation pond sludge	x	x			x
Kennedy					
Percolation pond sludge	x	x			x

ANALYTICAL RESULTS

Six samples were taken for analysis, one of which was analyzed in duplicate as a quality control. Elemental, EP, and TCLP results are presented below. Laboratory reports are presented in the Appendix.

Elemental Analyses

Table 2 presents the elemental analyses of the six sludge samples obtained from the three plants. All of the samples have high iron and magnesium concentrations. The treated sludge has a high calcium level. The untreated sludges have high levels of aluminum, nickel, and vanadium. The surge basin sludge and the slag from Northside are fairly similar in composition. The old untreated sludges from all three plants have similar compositions, although the Kennedy sludge has somewhat higher metals concentrations. The major component of all the sludges is iron oxides and hydroxides, based on the low levels of sulfate and carbonate present. Duplicate analysis of the treated sludge shows good agreement.

EP Analyses

Table 3 presents the results of the extraction procedure for all six sludges using the current EPA Extraction Procedure (EP). None of the sludges are classified as RCRA hazardous due to toxicity. The boiler slag had a cadmium level of 0.28 mg/L, which is the closest value to a toxic concentration. All other metal levels are at least ten times below the toxic limit. Duplicate analysis of the treated sludge shows good agreement. The duplicate was obtained by performing the extraction on a split of the sludge sample.

TCLP Analyses

Table 4 presents the results of the extraction procedure for all six sludges using the proposed Toxicity Characteristic Leaching Procedure. None of the sludges would currently be classified as RCRA hazardous due to toxicity

TABLE 2. ELEMENTAL ANALYTICAL RESULTS

Plant Sample Description	Northside Surge Basin	Northside Treated Sludge	Northside Trtd Sludge (duplicate)	Northside Slag	Northside Old Sludge	Kennedy Old Sludge	Southside Old Sludge
Elemental Analysis (ug/g)							
Aluminum	4,400	4,400	4,400	3,400	4,900	14,000	6,200
Antimony	200	18	19	110	77	82	160
Arsenic	6,500	600	600	4,100	1,900	2,300	2,300
Barium	570	270	270	400	570	890	700
Beryllium	ND	ND	ND	ND	ND	ND	ND
Bismuth	ND	ND	ND	ND	ND	ND	ND
Boron	ND	ND	ND	ND	ND	ND	ND
Cadmium	56	19	20	39	18	40	35
Calcium	4,200	130,000	130,000	5,800	92,000	26,000	5,300
Chromium	1,600	190	190	260	300	940	1,700
Cobalt	330	120	110	290	70	400	260
Copper	390	620	600	300	910	1,100	880
Gold	120	30	30	50	40	70	90
Indium	ND	ND	ND	ND	ND	ND	ND
Iron	170,000	76,000	74,000	64,000	140,000	170,000	280,000
Lead	500	50	50	300	770	980	690
Lithium	4	2	2	5	4	ND	ND
Magnesium	41,000	85,000	83,000	66,000	16,000	25,000	6,500
Manganese	420	1,100	1,100	310	520	1,000	210
Molybdenum	16,000	480	470	1,100	260	350	9,000
Nickel	20,000	5,200	5,100	16,000	4,300	9,300	3,800
Phosphorous	ND	ND	ND	ND	ND	ND	2,800
Platinum	2,000	390	390	1,100	600	810	1,000
Potassium	290	ND	ND	ND	270	900	2,500
Selenium	330	70	70	110	110	200	500
Silicon	ND	ND	ND	ND	ND	700	600
Silver	20	3.9	6.1	11	10	10	12
Sodium	9,900	7,400	7,300	9,400	1,000	6,800	9,300

(continued)

TABLE 2. (continued)

Plant Sample Description	Northside Surge Basin	Northside Treated Sludge	Northside Trtd Sludge (duplicate)	Northside Slag	Northside Old Sludge	Kennedy Old Sludge	Southside Old Sludge
Strontium	150	320	310	110	320	550	560
Tellurium	1,100	110	100	700	290	400	500
Thallium	300	25	27	100	58	68	72
Tin	ND	ND	ND	ND	ND	ND	ND
Titanium	700	110	110	300	350	870	990
Tungsten	ND	ND	ND	ND	ND	ND	ND
Uranium	ND	ND	ND	ND	ND	ND	ND
Vanadium	64,000	4,800	4,700	40,000	19,000	22,000	22,000
Yttrium	7.4	8.7	8.6	14	7.1	30	4.4
Zinc	350	400	390	520	790	1,500	640
Carbonate	<45	180	150	<50	500	650	495
Chloride	5,800	3,400	3,500	<20	570	1,700	170
Sulfate	66,000	24,000	18,500	20,000	3,600	10,000	28,000
Percent Moisture	83.4	87	-	<1	59.6	72.8	74.9

TABLE 3. EP ANALYTICAL RESULTS

Plant Sample Description		Northside Surge Basin	Northside Treated Sludge	Northside Trtd sludge (duplicate)	Northside Slag	Northside Old Sludge	Kennedy Old Sludge	Southside Old Sludge	Blank* Fluid 1
EP Extract (mg/L)	RCRA Max.								
Arsenic	5	0.024	0.007	0.004	0.022	0.008	0.006	0.002	<0.002
Barium	100	0.11	0.25	0.26	0.036	0.38	0.63	0.027	<0.009
Beryllium		0.001	0.002	0.002	0.006	<0.001	<0.001	<0.001	<0.001
Cadmium	1	0.047	0.03	0.033	0.28	0.021	0.047	0.015	<0.003
Chromium	5	0.024	0.033	0.037	0.029	0.035	0.032	0.02	<0.009
Cobalt		0.52	0.22	0.28	3.1	0.1	0.88	0.57	<0.01
Copper		0.04	0.09	0.12	0.6	0.8	<0.01	0.08	<0.01
Iron		0.14	<0.03	0.19	0.48	<0.02	79	0.04	<0.03
Lead	5	<0.002	0.004	<0.002	<0.004	0.004	0.006	<0.002	0.008
Mercury	0.2	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum		8	0.1	0.1	2.3	<0.05	<0.05	0.11	<0.05
Nickel		26	14	14	150	5.9	1	6.4	<0.02
Selenium	1	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.005
Silver	5	0.014	0.021	0.022	0.026	0.023	<0.009	<0.009	<0.009
Thallium		<0.09	<0.09	<0.09	0.16	<0.09	<0.09	<0.09	<0.09
Vanadium		9.2	<0.02	<0.02	7	2.5	0.08	0.05	<0.02
Zinc		0.45	0.29	0.38	6.7	1.3	4.2	1.9	0.018

* EP Extraction Fluid (0.5N acetic acid)

TABLE 4. TCLP ANALYTICAL RESULTS

Plant Sample Description		Northside Surge Basin	Northside Treated Sludge	Northside Trtd sludge (duplicate)	Northside Slag	Northside Old Sludge	Kennedy Old Sludge	Southside Old Sludge	Blank* Fluid 1	Blank+ Fluid 2
TCLP Extract (mg/L)	RCRA Max.									
Arsenic	5	0.028	0.006	0.003	0.03	0.009	0.008	0.006	0.006	<0.002
Barium	100	0.55	0.37	0.74	0.12	0.72	0.92	0.43	0.61	0.71
Beryllium		0.002	0.001	0.002	0.007	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	1	0.057	0.028	0.033	0.28	<0.003	0.021	0.025	<0.003	<0.003
Chromium	5	0.034	0.034	0.036	0.069	0.02	0.015	0.02	<0.009	<0.009
Cobalt		0.52	0.26	0.26	3.3	<0.01	0.52	0.73	<0.01	<0.01
Copper		0.08	0.09	0.09	0.9	0.02	<0.01	0.3	<0.01	<0.01
Iron		0.88	<0.03	<0.03	0.57	<0.03	78	0.1	<0.03	<0.03
Lead	5	<0.05	<0.05	<0.05	0.15	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	0.2	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum		14	0.15	0.16	5.3	0.16	0.07	0.42	<0.05	<0.05
Nickel		26	15	14	160	0.99	10	8.4	<0.02	<0.02
Selenium	1	0.014	<0.005	<0.005	<0.01	<0.05	<0.005	0.009	<0.005	<0.005
Silver	5	<0.009	0.021	0.021	0.044	0.016	0.012	<0.009	<0.009	<0.009
Thallium		<0.09	<0.09	<0.09	0.21	<0.09	<0.09	<0.09	<0.09	<0.09
Vanadium		12	<0.02	<0.02	16	4.6	0.11	0.15	<0.02	<0.02
Zinc		0.78	0.48	0.53	7.6	0.17	1.1	2.2	0.24	0.35

* TCLP Extraction fluid (sodium acetate buffer)

\+ TCLP Extraction fluid (acetic acid) - used only for Northside treated sludge if the EP toxic metal levels are used as the criteria. The boiler slag had a cadmium level of 0.28 mg/L, which is the closest value to a toxic concentration. All other metal levels are at least ten times below the toxic limit. Duplicate analysis of the treated sludge shows good agreement. The duplicate was obtained by performing the extraction on a split of the sludge sample. Because of the high pH of the treated sludge, it was extracted with leaching fluid 2 (acetic acid). The other samples were extracted with leaching fluid 1 (sodium acetate buffer).

Of particular note is the concentration of nickel in both the EP and TCLP extracts. Although currently not a listed toxic metal, the EPA has stated (Federal Register, June 13, 1986, Vol. 51, No.114, p. 21665) that it intends to propose regulatory levels for nickel and thallium prior to promulgation of the TCLP. Chronic toxicity levels of nickel and thallium are 0.15 and 0.002 mg/L, respectively. Based upon the 100:1 attenuation factor used for the currently regulated eight metals, a toxic level of 15 mg/L for nickel is expected. Many of the sludges exceed or are near this level. This indicates that at some time in the future, the sludges could be classified as RCRA hazardous provided the nickel standard is implemented and the utility ash exemption is withdrawn. Boiler slag and surge basin sludge reported the highest nickel extract levels. Treated and untreated sludge were at or slightly below 15 mg/L nickel. In the event the TCLP is promulgated with a nickel standard, additional sampling and characterization would be warranted to ensure appropriate classification of the sludges.

Table 5 presents a comparison of the TCLP/EP extraction values. Numbers greater than one indicate a higher concentration observed using the TCLP. In general, the TCLP values are slightly higher for each type of sludge. On an elemental basis, barium, molybdenum, and vanadium are higher in the TCLP procedure. Nickel reported somewhat lower in the TCLP tests.

Organic Analyses

A sample of the treated sludge from the Northside station was analyzed for total extractable organics. This type of extraction is more rigorous than that proposed in the TCLP. No organics were identified other

TABLE 5. RATIO OF TCLP/EP RESULTS

Plant Sample Description		Northside Surge Basin	Northside Treated Sludge	Northside Trtd Sludge (duplicate)	Northside Slag	Northside Old Sludge	Kennedy Old Sludge	Southside Old Sludge
TCLP/EP Ratio	Average Ratio							
Arsenic	1.7	1.2	0.9	0.8	1.4	1.1	1.3	3.0
Barium	5.7	5.0	1.5	2.8	3.3	1.9	1.5	15.9
Beryllium	1.2	2.0	0.5	1.0	1.2			
Cadmium	1.0	1.2	0.9	1.0	1.0		0.4	1.7
Chromium	1.1	1.4	1.0	1.0	2.4	0.6	0.5	1.0
Cobalt	1.0	1.0	1.2	0.9	1.1		0.6	1.3
Copper	1.5	2.0	1.0	0.8	1.5	0.0		3.8
Iron	2.7	6.3			1.2		1.0	2.5
Lead								
Mercury								
Molybdenum	2.2	1.8	1.5	1.6	2.3			3.8
Nickel	0.9	1.0	1.1	1.0	1.1	0.2	0.6	1.3
Selenium								
Silver	1.1		1.0	1.0	1.7	0.7		
Thallium	1.3				1.3			
Vanadium	2.0	1.3			2.3	1.8	1.4	3.0
Zinc	1.1	1.7	1.7	1.4	1.1	0.1	0.3	1.2
Average Ratio		2.2	1.1	1.2	1.6	0.8	0.8	3.5

than four compounds which were also present in the sample blanks. Di-n-butyl phthalate and bis(2-ethylhexyl) phthalate were identified in the semivolatile analysis. These are plasticizers and commonly found when samples have been stored in plastic containers. Acetone and methylene chloride were identified in the volatile analysis. The low levels of these contaminants is indicative of the ubiquitous presence of these compounds in the laboratory. It is unrealistic to expect these two highly volatile organics to be present in metal hydroxide sludge which has been dried by sun exposure. Only methylene chloride of these four compounds is included in the TCLP standards. The proposed regulatory level of 8.6 mg/l greatly exceeds the 21 ug/l estimated in the sample. A list of compounds and their detection limits are presented in the Appendix.

APPENDIX

LAB REPORTS

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ed: 06/19/87 07/21/87 14:03:53

RT Radian
TO Bl 4
Austin

TEN Jim Owens

ENT JEA SAMPLES 7
NY Jacksonville Electric
TY

ID solids
EN JO
NS JO
PE
213-116-20-00
ICE under separate cover.

PREPARED Radian Analytical Services
BY 8501 Mo-pac Bl.
PO Box 201088
Austin, TX 78720-1088

ATTEN
PHONE 512-454-4797

CERTIFIED BY

CONTACT DELLENEY

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

PLE IDENTIFICATION

NORTHSIDE SLAG
" TREATED SLUDGE
D " " "
" UNTREATED "
" SURGE BASIN "
KENNEDY UNTREATED "
SOUTHSIDE " "

TEST CODES and NAMES used on this report

CL IC	Chloride, IC
D3050P	Digestion, method 3050, ICP
ICP 39	Complete ICPES analysis
PREP W	Special preparation
SO4 IC	Sulfate, IC
TIC	Total inorganic carbon

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RAS - Austin REPORT Work Order # 87-06-047

ed: 06/19/87

Results By Test

CODE ult units	Sample 01 (entered units)	Sample 02 (entered units)	Sample 03 (entered units)	Sample 04 (entered units)	Sample 05 (entered units)
IC	<20	3400	3500	570	5800
	ug/g	ug/g	ug/g	ug/g	ug/g
OP	07/17/87	07/17/87	07/17/87	07/17/87	07/17/87
complete					
_W	07/07/87	07/07/87	07/07/87	07/07/87	07/07/87
complete					
IC	20,000	24,000 ~~36*~~	18,500	3600	66,000
	ug/g	ug/g	ug/g	ug/g	ug/g
	<10	36*	30*	100	<9
	ug/g	ug/g	ug/g	ug/g	ug/g

CODE ult units	Sample 06 (entered units)	Sample 07 (entered units)
IC	1700	170
	ug/g	ug/g
OP	07/17/87	07/17/87
complete		
_W	07/07/87	07/07/87
complete		
IC	10,000	28,000
	ug/g	ug/g
	130	99
	ug/g	ug/g

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Page 3　　RAS - Austin　　REPORT　　Work Order # 87-06-047

Received: 06/19/87　　Results by Sample

Sample ID 002　　FRACTION 01A　　TEST CODE ICP 39　　NAME Complete ICPES analysis

Date & Time Collected 06/04/87　　Category

VERIFIED MRR

ANALYST RHH

UNITS ug/g

CODE	METAL	RESULT	DET LIMIT	CODE	METAL	RESULT	DET LIMIT
Ag	Silver	11	0.88	K	Potassium	ND	29
Al	Aluminum	3400	490	Li	Lithium	5*	2.0
As	Arsenic	4100	740	Mg	Magnesium	66000	250
Au	Gold	50*	20	Mn	Manganese	310	7.4
B	Boron	ND	59	Mo	Molybdenum	1100	120
Ba	Barium	400	22	Na	Sodium	9400	200
Be	Beryllium	ND	2.5	Ni	Nickel	16000	49
Bi	Bismuth	ND	2000	P	Phosphorous	ND	740
Ca	Calcium	5800	150	Pb	Lead	300*	120
Cd	Cadmium	39	7.4	Pt	Platinum	1100*	490
Co	Cobalt	290	25	S	Sulfur	50000*	12000
Cr	Chromium	260	22	Sb	Antimony	110	5.9
Cu	Copper	300	25	Se	Selenium	110*	29
Fe	Iron	64000	74	Si	Silicon	ND	740
In	Indium	ND	490	Sn	Tin	ND	1200

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[illegible] RAS - Austin REPORT Work Order # 87-06-097
ed: 06/19/87 Results by Sample Continued From Above

[illegible] ID 002 FRACTION 01A TEST CODE ICP 39 NAME Complete ICPES analysis
Date & Time Collected 06/04/87 Category

CODE	METAL	RESULT	DET LIMIT
Sr	Strontium	110	7.4
Te	Tellurium	700*	490
Ti	Titanium	300*	120
Tl	Thallium	100	8.8
U	Uranium	ND	1200
V	Vanadium	40000	49
W	Tungsten	ND	250
Y	Yttrium	14	0.88
Zn	Zinc	520	15

NOTES AND DEFINITIONS FOR THIS REPORT

DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

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RAS - Austin REPORT Work Order # 87-06-047

Received: 06/19/87

Results by Sample

SAMPLE ID 006

FRACTION 02A TEST CODE ICP 39 NAME Complete ICPES analysis

Date & Time Collected 06/04/87 Category

VERIFIED MRR

ANALYST RHH

UNITS ug/g

CODE	METAL	RESULT	DET LIMIT	CODE	METAL	RESULT	DET LIMIT
Ag	Silver	6.9	0.90	K	Potassium	ND	30
Al	Aluminum	4400	200	Li	Lithium	2*	2.0
As	Arsenic	600*	300	Mg	Magnesium	85000	100
Au	Gold	30*	20	Mn	Manganese	1100	3.0
B	Boron	ND	600	Mo	Molybdenum	480	50
Ba	Barium	270	9.0	Na	Sodium	7400	80
Be	Beryllium	ND	0.10	Ni	Nickel	5200	20
Bi	Bismuth	ND	800	P	Phosphorous	ND	300
Ca	Calcium	130000	60	Pb	Lead	50	5.0
Cd	Cadmium	19	3.0	Pt	Platinum	390	20
Co	Cobalt	120	10	S	Sulfur	13000*	5000
Cr	Chromium	190	9.0	Sb	Antimony	18*	6.0
Cu	Copper	620	10	Se	Selenium	70*	30
Fe	Iron	76000	30	Si	Silicon	ND	300
In	Indium	ND	200	Sn	Tin	ND	500

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ed: 06/19/87 Results by Sample Continued From Above

ID 006 FRACTION 02A TEST CODE ICP 39 NAME Complete ICPES analysis

Date & Time Collected 06/04/87 Category

CODE	METAL	RESULT	DET LIMIT
Sr	Strontium	320	3.0
Te	Tellurium	110	20
Ti	Titanium	110*	50
Tl	Thallium	25*	9.0
U	Uranium	ND	500
V	Vanadium	4800	20
W	Tungsten	ND	100
Y	Yttrium	8.7	0.90
Zn	Zinc	400	6.0

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
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NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

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RAS - Austin REPORT Work Order # 87-06-097

ed: 06/19/87 Results by Sample

ID 006D FRACTION 03A TEST CODE ICP 39 NAME Complete ICPES analysis

Date & Time Collected 06/04/87 Category

VERIFIED MRR

ST RHH UNITS ug/g

CODE	METAL	RESULT	DET LIMIT		CODE	METAL	RESULT	DET LIMIT
Ag	Silver	6.1	0.83	¦	K	Potassium	ND	28
Al	Aluminum	4400	190	¦	Li	Lithium	2*	1.9
As	Arsenic	600*	280	¦	Mg	Magnesium	83000	93
Au	Gold	30*	19	¦	Mn	Manganese	1100	2.8
B	Boron	ND	560	¦	Mo	Molybdenum	470	46
Ba	Barium	270	8.3	¦	Na	Sodium	7300	74
Be	Beryllium	ND	0.093	¦	Ni	Nickel	5100	19
Bi	Bismuth	ND	740	¦	P	Phosphorous	ND	280
Ca	Calcium	130000	56	¦	Pb	Lead	50	4.6
Cd	Cadmium	20	2.8	¦	Pt	Platinum	390	19
Co	Cobalt	110	9.3	¦	S	Sulfur	13000*	4600
Cr	Chromium	190	9.3	¦	Sb	Antimony	19*	5.6
Cu	Copper	600	9.3	¦	Se	Selenium	70*	28
Fe	Iron	74000	28	¦	Si	Silicon	ND	280
In	Indium	ND	190	¦	Sn	Tin	ND	460

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Received: 06/19/87 Results by Sample Continued From Above

SAMPLE ID 006D FRACTION 03A TEST CODE ICP 39 NAME Complete ICPES analysis

Date & Time Collected 06/04/87 Category

CODE	METAL	RESULT	DET LIMIT
Sr	Strontium	310	2.8
Te	Tellurium	100	19
Ti	Titanium	110*	46
Tl	Thallium	27*	8.3
U	Uranium	ND	460
V	Vanadium	4700	19
W	Tungsten	ND	93
Y	Yttrium	8.6	0.83
Zn	Zinc	390	5.6

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

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ed: 06/19/87 Results by Sample

SAMPLE ID 010 FRACTION 04A TEST CODE ICP 39 NAME Complete ICPES analysis

Date & Time Collected 06/04/87 Category

VERIFIED MRR

ANALYST RHH UNITS ug/g

CODE	METAL	RESULT	DET LIMIT		CODE	METAL	RESULT	DET LIMIT
Ag	Silver	10	0.86	¦	K	Potassium	270	29
Al	Aluminum	4900	380	¦	Li	Lithium	4*	1.9
As	Arsenic	1900*	570	¦	Mg	Magnesium	16000@	190
Au	Gold	40*	19	¦	Mn	Manganese	520	5.7
B	Boron	ND@	1100	¦	Mo	Molybdenum	260*	95
Ba	Barium	570	17	¦	Na	Sodium	1000	150
Be	Beryllium	ND@	0.095	¦	Ni	Nickel	4300	38
Bi	Bismuth	ND	1500	¦	P	Phosphorous	ND	570
Ca	Calcium	92000@	110	¦	Pb	Lead	770@	95
Cd	Cadmium	18*	5.7	¦	Pt	Platinum	600*	380
Co	Cobalt	70*	19	¦	S	Sulfur	6400	480
Cr	Chromium	300	17	¦	Sb	Antimony	77@	5.7
Cu	Copper	910	19	¦	Se	Selenium	110*@	29
Fe	Iron	140000@	57	¦	Si	Silicon	ND	570
In	Indium	ND	380	¦	Sn	Tin	ND@	950

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[illegible] 10 RAS - Austin REPORT Work Order # 87-06-097
[illegible]ed: 06/19/87 Results by Sample Continued From Above

[illegible] ID 010 FRACTION 04A TEST CODE ICP 39 NAME Complete ICPES analysis
Date & Time Collected 06/04/87 Category

CODE	METAL	RESULT	DET LIMIT
Sr	Strontium	320	5.7
Te	Tellurium	290	19
Ti	Titanium	350*	95
Tl	Thallium	58@	8.6
U	Uranium	ND@	950
V	Vanadium	19000@	38
W	Tungsten	ND	190
Y	Yttrium	7.1	0.86
Zn	Zinc	790@	11

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

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Page 1 | RAS - Austin | REPORT | Work Order # 87-06-097
[illegible]ed: 06/19/87 | Results by Sample

SAMPLE ID 012 FRACTION 05A TEST CODE ICP 39 NAME Complete ICPES analysis
Date & Time Collected 06/04/87 Category

ANALYST RHH

VERIFIED MRR
UNITS ug/g

CODE	METAL	RESULT	DET LIMIT		CODE	METAL	RESULT	DET LIMIT
Ag	Silver	20	0.84	:	K	Potassium	290	28
Al	Aluminum	4400	470	:	Li	Lithium	4*	1.9
As	Arsenic	6500	700	:	Mg	Magnesium	41000	230
Au	Gold	120	19	:	Mn	Manganese	420	7.0
B	Boron	ND	1400	:	Mo	Molybdenum	16000	120
Ba	Barium	570	21	:	Na	Sodium	9900	190
Be	Beryllium	ND	0.093	:	Ni	Nickel	20000	47
Bi	Bismuth	ND	1900	:	P	Phosphorous	ND	700
Ca	Calcium	4200	140	:	Pb	Lead	500	120
Cd	Cadmium	56	7.0	:	Pt	Platinum	2000*	470
Co	Cobalt	330	23	:	S	Sulfur	30000*	12000
Cr	Chromium	1600	21	:	Sb	Antimony	200*	140
Cu	Copper	390	23	:	Se	Selenium	330	28
Fe	Iron	170000	70	:	Si	Silicon	ND	700
In	Indium	ND	470	:	Sn	Tin	ND	1200

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ed: 06/19/87 Results by Sample Continued From Above

ID 012 FRACTION 05A TEST CODE ICP 39 NAME Complete ICPES analysis

Date & Time Collected 06/04/87 Category

CODE	METAL	RESULT	DET LIMIT
Sr	Strontium	150	7.0
Te	Tellurium	1100*	470
Ti	Titanium	700	120
Tl	Thallium	300*	210
U	Uranium	ND	1200
V	Vanadium	64000	47
W	Tungsten	ND	230
Y	Yttrium	7.4	0.84
Zn	Zinc	350	14

NOTES AND DEFINITIONS FOR THIS REPORT

DET LIMIT = DETECTION LIMIT

ND = not detected at detection limit

NA = not analyzed

* = less than 5 times the detection limit

N\A = not available

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13 RAS - Austin REPORT Work Order # 87-06-097
Received: 06/19/87 Results by Sample

Sample ID 017 FRACTION 06A TEST CODE ICP 39 NAME Complete ICPES analysis
Date & Time Collected 06/04/87 Category

VERIFIED MRR
ANALYST RHH UNITS ug/g

CODE	METAL	RESULT	DET LIMIT		CODE	METAL	RESULT	DET LIMIT
Ag	Silver	10	0.86	¦	K	Potassium	900*	570
Al	Aluminum	14000	380	¦	Li	Lithium	ND	38
As	Arsenic	2300*	570	¦	Mg	Magnesium	25000	190
Au	Gold	70*	19	¦	Mn	Manganese	1000	5.7
B	Boron	ND	1100	¦	Mo	Molybdenum	350*	95
Ba	Barium	890	17	¦	Na	Sodium	6800	150
Be	Beryllium	ND	0.095	¦	Ni	Nickel	9300	38
Bi	Bismuth	ND	1500	¦	P	Phosphorous	ND	570
Ca	Calcium	26000	110	¦	Pb	Lead	980	95
Cd	Cadmium	40	5.7	¦	Pt	Platinum	810	19
Co	Cobalt	400	19	¦	S	Sulfur	13000*	9500
Cr	Chromium	940	17	¦	Sb	Antimony	82	5.7
Cu	Copper	1100	19	¦	Se	Selenium	200	29
Fe	Iron	170000	57	¦	Si	Silicon	700*	570
In	Indium	ND	380	¦	Sn	Tin	ND	950

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Received: 06/19/87 Results by Sample Continued From Above

Sample ID 017 FRACTION 06A TEST CODE ICP 39 NAME Complete ICPES analysis
Date & Time Collected 06/04/87 Category

CODE	METAL	RESULT	DET LIMIT
Sr	Strontium	550	5.7
Te	Tellurium	400*	380
Ti	Titanium	870	95
Tl	Thallium	68	8.6
U	Uranium	ND	950
V	Vanadium	22000	38
W	Tungsten	ND	190
Y	Yttrium	30*	17
Zn	Zinc	1500	11

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

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15 RAS - Austin REPORT Work Order # 87-06-097

ed: 06/19/87 Results by Sample

ID 019 FRACTION 07A TEST CODE ICP 39 NAME Complete ICPES analysis

Date & Time Collected 06/04/87 Category

VERIFIED MRR

ST RHH

UNITS ug/g

CODE	METAL	RESULT	DET LIMIT	CODE	METAL	RESULT	DET LIMIT
Ag	Silver	12	0.84	K	Potassium	2500*	560
Al	Aluminum	6200	370	Li	Lithium	ND	1.9
As	Arsenic	2300*	560	Mg	Magnesium	6500	190
Au	Gold	90	19	Mn	Manganese	210	5.6
B	Boron	ND	1100	Mo	Molybdenum	9000	93
Ba	Barium	700	17	Na	Sodium	9300	150
Be	Beryllium	ND	0.093	Ni	Nickel	3800	37
Bi	Bismuth	ND	1500	P	Phosphorous	2800*	560
Ca	Calcium	5300	110	Pb	Lead	690	93
Cd	Cadmium	35	5.6	Pt	Platinum	1000*	370
Co	Cobalt	260	19	S	Sulfur	43000*	9300
Cr	Chromium	1700	17	Sb	Antimony	160	5.6
Cu	Copper	880	19	Se	Selenium	500	28
Fe	Iron	280000	56	Si	Silicon	600*	560
In	Indium	ND	370	Sn	Tin	ND	930

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CORPORATION

Page 16 RAS - Austin REPORT Work Order # 87-06-097
Received: 06/19/87 Results by Sample Continued From Above

Sample ID 019 FRACTION 07A TEST CODE ICP 39 NAME Complete ICPES analysis
Date & Time Collected 06/04/87 Category

CODE	METAL	RESULT	DET LIMIT
Sr	Strontium	560	5.6
Te	Tellurium	500*	370
Ti	Titanium	990	93
Tl	Thallium	72	8.4
U	Uranium	ND	930
V	Vanadium	22000	37
W	Tungsten	ND	190
Y	Yttrium	4.4	0.84
Zn	Zinc	640	11

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

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Page 1 RAS - Austin REPORT Work Order # 87-06-095

Received: 06/19/87 07/20/87 13:58:52 Work Not Complete

REPORT TO Radian
B1. 4
Austin

ATTEN Jim Owens

CLIENT JEA SAMPLES 8
COMPANY Jacksonville Electric
FACILITY

PREPARED BY Radian Analytical Services
8501 Mo-pac Bl.
PO Box 201088
Austin, TX 78720-1088

ATTEN
PHONE 512-454-4797

Mary Riddle
CERTIFIED BY

CONTACT DELLENEY

WORK ID EP
TAKEN JO
TRANS JO
TYPE
P.O. # 213-116-20-00
INVOICE under separate cover

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

SAMPLE IDENTIFICATION

Northside untreated sludge
Northside treated sludge
Northside trt. sludge dup
Northside slag
Northside surge basin sldg
Kennedy untreated sludge
Southside untreated sludge
EP blank

TEST CODES and NAMES used on this report

AG E	Silver, ICPES
AS G	Arsenic, graphite AA
BA E	Barium, ICPES
BE E	Beryllium, ICPES
CD E	Cadmium, ICPES
CO E	Cobalt, ICPES
CR E	Chromium, ICPES
CU E	Copper, ICPES
DG3020	Digestion, method 3020
DG6010	Digestion, method 6010
FE E	Iron, ICPES
HG C	Mercury, cold vapor
MO E	Molybdenum, ICPES
NI E	Nickel, ICPES
PB G	Lead, graphite AA
SE G	Selenium, graphite AA
TL E	Thallium, ICPES
V E	Vanadium, ICPES
ZN E	Zinc, ICPES

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[illegible] 2

Received: 06/19/87

RAS - Austin REPORT Work Order # 87-06-095

Results By Test

TEST CODE result units	Sample 01 (entered units)	Sample 02 (entered units)	Sample 03 (entered units)	Sample 04 (entered units)	Sample 05 (entered units)
[illegible]_E [illegible]ml	0.023*	0.021*	0.022*	0.026*	0.014*
[illegible]_G [illegible]ml	0.008*	0.007*	0.004*	0.022	0.024
[illegible]_E [illegible]ml	0.38	0.25	0.26	0.036*	0.11
[illegible]_E [illegible]ml	<0.001	0.002*	0.002*	0.006	0.001*
[illegible]_E [illegible]ml	0.021	0.030	0.033	0.28	0.047
[illegible]_E [illegible]ml	0.10	0.22	0.28	3.1	0.52
[illegible]_E [illegible]ml	0.035*	0.033*	0.037*	0.029*	0.024*
[illegible]_E [illegible]ml	0.80	0.09	0.12	0.6	0.04*
[illegible]020 date complete	06/30/87	06/30/87	06/30/87	06/30/87	06/30/87
[illegible]10 date complete	07/01/87	07/01/87	07/01/87	07/01/87	07/01/87
[illegible]_E [illegible]ml	<0.03	<0.03	0.19	0.48	0.14*
[illegible]_E [illegible]ml	<0.05	0.10*	0.10*	2.3	8.0
[illegible]_E [illegible]ml	5.9	14	14	150	26
[illegible] [illegible]ml	0.004*	0.004*	<.002	<.004	<.002

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[illegible] 3 | RAS - Austin | REPORT | Work Order # 87-06-095
[illegible]ed: 06/19/87 | Results By Test | Continued From Above

TEST CODE result units	Sample 01 (entered units)	Sample 02 (entered units)	Sample 03 (entered units)	Sample 04 (entered units)	Sample 05 (entered units)
[illegible]_G [illegible]ml	<.05	<.005	<.005	<.005	<.005
[illegible]_E [illegible]ml	<0.09	<0.09	<0.09	0.16*	<0.09
[illegible] [illegible]ml	2.5	<0.02	<0.02	7.0	9.2
[illegible]_E [illegible]ml	1.3	0.29	0.38	6.7	0.45

TEST CODE result units	Sample 06 (entered units)	Sample 07 (entered units)	Sample 08 (entered units)
[illegible]_E [illegible]ml	<0.009	<0.009	<0.009
[illegible]_G [illegible]ml	0.006*	0.002*	<.002
[illegible]_E [illegible]ml	0.63	0.027*	<0.009
[illegible]_E [illegible]ml	<0.001	<0.001	<0.001
[illegible] [illegible]ml	0.047	0.015	<0.003
[illegible] [illegible]ml	0.88	0.57	<0.01
[illegible] [illegible]ml	0.032*	0.020*	<0.009

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Page 4 RAS - Austin REPORT Work Order # 87-06-095

Received: 06/19/87 Results By Test Continued From Above

TEST CODE default units	Sample 06 (entered units)	Sample 07 (entered units)	Sample 08 (entered units)
[illegible]_E [illegible]ml	<0.01	0.08	<0.01
[illegible]3020 date complete	06/30/87	06/30/87	06/30/87
[illegible]6010 date complete	07/01/87	07/01/87	07/01/87
[illegible]_E [illegible]ml	79	0.04*	<0.03
[illegible]_E [illegible]ml	<0.05	0.11*	<0.05
[illegible]_E [illegible]ml	16	6.4	<0.02
[illegible]_G [illegible]l	0.006*	<.002@	0.008*
[illegible]_G [illegible]ml	<.005	<.005	<.005
[illegible]_E [illegible]ml	<0.09	<0.09	<0.09
[illegible]E [illegible]ml	0.08*	0.05*	<0.02
[illegible]_E [illegible]ml	4.2	1.9	0.018*

CORPORATION

Page 5 RAS - Austin REPORT Work Order # 87-06-045
Received: 06/19/87 Results by Sample

SAMPLE ID Northside untreated sludge FRACTION 01A TEST CODE HG C NAME Mercury, cold vapor
Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC
DEPRMT 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.00020

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

SAMPLE ID Northside treated sludge FRACTION 02A TEST CODE HG C NAME Mercury, cold vapor
Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC
DEPRMT 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.00020

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CORPORATION

RAS - Austin REPORT Work Order # 87-06-095

Received: 06/19/87 Results by Sample Continued From Above

SAMPLE ID Northside treated sludge FRACTION 02A TEST CODE HG C NAME Mercury, cold vapor

Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

SAMPLE ID Northside trt. sludge dup FRACTION 03A TEST CODE HG C NAME Mercury, cold vapor

Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC
FMT 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.00020

NOTES AND DEFINITIONS FOR THIS REPORT.

DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

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RAS - Austin REPORT Work Order # 87-06-095

Received: 06/19/87 Results by Sample

SAMPLE ID Northside slag FRACTION 04A TEST CODE HG C NAME Mercury, cold vapor

Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC

INSTRMT 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.00020

NOTES AND DEFINITIONS FOR THIS REPORT.

DET LIMIT = DETECTION LIMIT

ND = not detected at detection limit

NA = not analyzed

* = less than 5 times the detection limit

N\A = not available

SAMPLE ID Northside surge basin sldg FRACTION 05A TEST CODE HG C NAME Mercury, cold vapor

Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC

INSTRMT 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.00020

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SAMPLE ID Northside surge basin sldg FRACTION 05A TEST CODE HG C NAME Mercury, cold vapor
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

SAMPLE ID Kennedy untreated sludge FRACTION 06A TEST CODE HG C NAME Mercury, cold vapor
Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC
INSTRMT 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.00020

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

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Page 9 RAS - Austin REPORT Work Order # 87-06-095

Received: 06/19/87 Results by Sample

SAMPLE ID Southside untreated sludge FRACTION 07A TEST CODE HG C NAME Mercury, cold vapor

Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC

SYSTEM 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.00020

NOTES AND DEFINITIONS FOR THIS REPORT.

DET LIMIT = DETECTION LIMIT

ND = not detected at detection limit

NA = not analyzed

* = less than 5 times the detection limit

N\A = not available

SAMPLE ID EP blank FRACTION 08A TEST CODE HG C NAME Mercury, cold vapor

Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC

SYSTEM 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.00020

Page 10 RAS - Austin REPORT Work Order # 87-06-095
Received: 06/19/87 Results by Sample Continued From Above

SAMPLE ID EP blank FRACTION 08A TEST CODE HG C NAME Mercury, cold vapor
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

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Page 1 RAS - Austin REPORT Work Order # 87-06-096

Received: 06/19/87 07/20/87 14:06:09

REPORT Radian
TO Bl 4
Austin

ATTEN Jim Owens

CLIENT JEA SAMPLES 9
COMPANY Jacksonville Electric
FACILITY

WORK ID TCLP
TAKEN JO
TRANS JO
TYPE
P.O. # 213-116-20-00
INVOICE under separate cover

PREPARED Radian Analytical Services
BY 8501 Mo-pac Bl.
PO Box 201088
Austin, TX 78720-1088
ATTEN
PHONE 512-454-4797

Mary Riddle
CERTIFIED BY

CONTACT DELLENEY

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

SAMPLE IDENTIFICATION

Northside untreated sludge
Northside treated sludge
Northside treat. sludge dup
Northside slag
Northside surge basin
Kennedy untreated sludge
Southside untreated sludge
Ext fluid 1
Ext fluid 2

TEST CODES and NAMES used on this report

AG E	Silver, ICPES
AS G	Arsenic, graphite AA
BA E	Barium, ICPES
BE E	Beryllium, ICPES
CD E	Cadmium, ICPES
CO E	Cobalt, ICPES
CR E	Chromium, ICPES
CU E	Copper, ICPES
DG3020	Digestion, method 3020
DG6010	Digestion, method 6010
FE E	Iron, ICPES
HG C	Mercury, cold vapor
MO E	Molybdenum, ICPES
NI E	Nickel, ICPES
PB E	Lead, ICPES
SE G	Selenium, graphite AA
TL E	Thallium, ICPES
V E	Vanadium, ICPES
ZN E	Zinc, ICPES

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Received: 06/19/87 RAS - Austin REPORT Work Order # 87-06-096

Results By Test

TEST CODE default units	Sample 01 (entered units)	Sample 02 (entered units)	Sample 03 (entered units)	Sample 04 (entered units)	Sample 05 (entered units)
[illegible]_E ug/ml	0.016*	0.021*	0.021*	0.044*	<0.009
[illegible]_G ug/ml	0.009*	0.006*	0.003*	0.03*@	0.028
CA_E ug/ml	0.72	0.37	0.74	0.12	0.55
[illegible]_E ug/ml	<0.001	0.001*	0.002*	0.007	0.002*
[illegible]_E ug/ml	<0.003	0.028	0.033	0.28	0.057
[illegible]_E ug/ml	<0.01	0.26	0.26	3.3	0.52
[illegible]_E ug/ml	0.020*	0.034*	0.036*	0.069	0.034*
[illegible]_E ug/ml	0.02*	0.09	0.09	0.9	0.08
[illegible]3020 date complete	06/30/87	06/30/87	06/30/87	06/30/87	06/30/87
[illegible]6010 date complete	07/02/87	07/02/87	07/02/87	07/02/87	07/02/87
[illegible]_E ug/ml	<0.03	<0.03	<0.03	0.57	0.88
[illegible]_E ug/ml	0.16*	0.15*	0.16*	5.3	14
[illegible]_E ug/ml	0.99	15@	14	160	26
[illegible]_E ug/ml	<0.05	<0.05	<0.05	0.15*	<0.05

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Page 3 RAS - Austin REPORT Work Order # 87-06-096
Received: 06/19/87 Results By Test Continued From Above

TEST CODE default units	Sample 01 (entered units)	Sample 02 (entered units)	Sample 03 (entered units)	Sample 04 (entered units)	Sample 05 (entered units)
SE_G ug/ml	<.05	<.005	<.005	<.01	0.014*
[illegible]L_E ug/ml	<0.09	<0.09	<0.09	0.21*	<0.09
[illegible]_E ug/ml	4.6	<0.02	<0.02	16	12
ZN_E ug/ml	0.17	0.48	0.53	7.6	0.78

TEST CODE default units	Sample 06 (entered units)	Sample 07 (entered units)	Sample 08 (entered units)	Sample 09 (entered units)
[illegible]_E ug/ml	0.012*	<0.009	<0.009	<0.009
[illegible]_Q ug/ml	0.008*	0.006*	0.006*	<.002
[illegible]A_E ug/ml	0.92	0.43	0.61	0.71
[illegible]_E ug/ml	<0.001	<0.001	<0.001	<0.001
[illegible]D_E ug/ml	0.021	0.025	<0.003	<0.003
[illegible]_E ug/ml	0.52	0.73	<0.01	<0.01
[illegible]_E ug/ml	0.015*	0.020*	<0.009	<0.009

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Page 4 RAS - Austin REPORT Work Order # 87-06-096

Received: 06/19/87 Results By Test Continued From Above

TEST CODE default units	Sample 06 (entered units)	Sample 07 (entered units)	Sample 08 (entered units)	Sample 09 (entered units)
[illegible]_E ug/ml	<0.01	0.30	<0.01	<0.01
[illegible]3020 date complete	06/30/87	06/30/87	06/30/87	06/30/87
[illegible]6010 date complete	07/02/87	07/02/87	07/02/87	07/02/87
[illegible]_E ug/ml	78	0.10*	<0.03	<0.03
[illegible]_E ug/ml	0.07*	0.42	<0.05	<0.05
[illegible]_E ug/ml	10.0	8.4	<0.02	<0.02
[illegible]_E ug/ml	<0.05	<0.05	<0.05	<0.05
[illegible]_G ug/ml	<.005	0.009*	<.005	<.005
[illegible]_E ug/ml	<0.09	<0.09	<0.09	<0.09
[illegible]_E ug/ml	0.11	0.15	<0.02	<0.02
[illegible]_E ug/ml	1.1	2.2	0.24	0.35

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Page 5 RAS - Austin REPORT Work Order # 87-06-096
Received: 06/19/87 Results by Sample

SAMPLE ID Northside untreated sludge FRACTION 01A TEST CODE HG C NAME Mercury, cold vapor
Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC
INSTRMT 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.00020

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

SAMPLE ID Northside treated sludge FRACTION 02A TEST CODE HG C NAME Mercury, cold vapor
Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC
INSTRMT 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.00020

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[illegible] RAS - Austin REPORT Work Order # 87-06-096

Received: 06/19/87 Results by Sample Continued From Above

SAMPLE ID Northside treated sludge FRACTION 02A TEST CODE HG C NAME Mercury, cold vapor

Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

SAMPLE ID Northside treat. sludge dup FRACTION 03A TEST CODE HG C NAME Mercury, cold vapor

Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC
INSTRMT 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.00020

NOTES AND DEFINITIONS FOR THIS REPORT.

DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

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RAS - Austin REPORT Work Order # 87-06-046

Received: 06/19/87

Results by Sample

SAMPLE ID Northside slag FRACTION 04A TEST CODE HG C NAME Mercury, cold vapor

Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC

INSTRMT 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.00020

NOTES AND DEFINITIONS FOR THIS REPORT.

DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

SAMPLE ID Northside surge basin FRACTION 05A TEST CODE HG C NAME Mercury, cold vapor

Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC

INSTRMT 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	0.0002*	0.00020

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Page 8 RAS - Austin REPORT Work Order # 87-06-096
Received: 06/19/87 Results by Sample Continued From Above

SAMPLE ID Northside surge basin FRACTION 05A TEST CODE HG C NAME Mercury, cold vapor
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

SAMPLE ID Kennedy untreated sludge FRACTION 06A TEST CODE HG C NAME Mercury, cold vapor
Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC
SUBTRMT 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	0.0002*	0.00020

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

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[illegible]

RAS - Austin REPORT Work Order # 87-06-076

Received: 06/19/87 Results by Sample

SAMPLE ID Southside untreated sludge FRACTION 07A TEST CODE HG C NAME Mercury, cold vapor

Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC

INSTRMT 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.00020

NOTES AND DEFINITIONS FOR THIS REPORT.

DET LIMIT = DETECTION LIMIT

ND = not detected at detection limit

NA = not analyzed

* = less than 5 times the detection limit

N\A = not available

SAMPLE ID ext fluid 1 FRACTION 08A TEST CODE HG C NAME Mercury, cold vapor

Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC

INSTRMT 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.00020

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SAMPLE ID ext fluid 1 FRACTION 08A TEST CODE HG C NAME Mercury, cold vapor
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

SAMPLE ID ext fluid 2 FRACTION 09A TEST CODE HG C NAME Mercury, cold vapor
Date & Time Collected not specified Category

VERIFIED MRR

ANALYST DC
INSTRMT 403 ANALYZED 07/01/87 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.00020

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available

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CORPORATION

Page 1 RAS Sacramento REPORT Work Order # S7-06-027
Received: 06/16/87 06/23/87 15:54:25

REPORT TO Radian Corporation
Bldg. 4-136
Austin, TX

ATTEN Jim Bob Owens

PREPARED BY Radian Analytical Services
8501 Mo-pac Bl
PO Box 9948
Austin, TX 78751
ATTEN
PHONE 512-454-4797

Paul N Gale
CERTIFIED BY

CONTACT BARONS

CLIENT JACKSON ELEC SAMPLES 4
COMPANY Jacksonville Electric
FACILITY Austin

WORK ID 8240/8270
TAKEN 6/4/87
TRANS Federal: 906126303
TYPE Soil
P.O. # 213-116-20-00
INVOICE under separate cover

SAMPLE IDENTIFICATION

01 Northside (BNA)
02 Northside (VOA)
03 Reagent Blank BNA
04 Reagent Blank VOA

TEST CODES and NAMES used on this report

BNA S	Semivolatiles Screen
CL8240	Purgeable Organics - Soil
CL8270	Semivolatile Organics-Soil
DRY WT	Dry weight determination
EX BNA	Semivolatiles extraction

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CORPORATION

Received: 06/16/87

Results By Test

TEST CODE default units	Sample 01 (entered units)	Sample 03 (entered units)
BNA S date completed	06/16/87	
DRY WT % moisture	86	
EX BNA date completed	06/17/87	06/17/87

Received: 06/16/87

Results By Test

SAMPLE Sample Id	Test: BNA S date completed	Test: DRY WT % moisture	Test: EX BNA date completed
01 Northside (BNA)	06/16/87	86	06/17/87
03 Reagent Blank B			06/17/87

SAMPLE ID Northside (BNA) SAMPLE # 01 FRACTIONS: A

Date & Time Collected 06/04/87 Category

BNA_S 06/16/87	DRY_WT 86	EX_BNA 06/17/87
date completed	% moisture	date completed

Page 5 RAS Sacramento REPORT Work Order # S7-06-027
Received: 06/16/87 Results by Sample

SAMPLE ID Northside (BNA) FRACTION 01A TEST CODE CL8270 NAME Semivolatile Organics-Soil
Date & Time Collected 06/04/87 Category ____

ORGANICS ANALYSIS DATA SHEET
SEMIVOLATILE COMPOUNDS

ANALYST SAL EXTRCTD 06/17/87 FILE # 5CU06027C01 VERIFIED LAK
INSTRMT 5100 INJECTD 06/18/87 UNITS ug/kg

SCAN	CAS #	COMPOUND	RESULT	DET LIMIT
	62-75-9	n-nitrosodimethylamine	ND	4800
	108-95-2	phenol	ND	720
	62-53-3	aniline	ND	4800
	111-44-4	bis(2-chloroethyl) ether	ND	2700
	95-57-8	2-chlorophenol	ND	1600
	541-73-1	1,3-dichlorobenzene	ND	910
	106-46-7	1,4-dichlorobenzene	ND	2100
	100-51-6	benzyl alcohol	ND	24000
	95-50-1	1,2-dichlorobenzene	ND	910
	95-48-7	2-methylphenol	ND	4800
	108-60-1	bis(2-chloroisopropyl)ether	ND	2700
	106-44-5	4-methylphenol	ND	4800
	621-64-7	n-nitroso-di-n-propylamine	ND	5700
	67-72-1	hexachloroethane	ND	760
	98-95-3	nitrobenzene	ND	910
	78-59-1	isophorone	ND	1100
	88-75-5	2-nitrophenol	ND	1700
	105-67-9	2,4-dimethylphenol	ND	1300
	65-85-0	benzoic acid	ND	24000
	111-91-1	bis(2-chloroethoxy)methane	ND	2500
	120-83-2	2,4-dichlorophenol	ND	1300
	120-82-1	1,2,4-trichlorobenzene	ND	910
	91-20-3	naphthalene	ND	760
	106-47-8	4-chloroaniline	ND	4800
	87-68-3	hexachlorobutadiene	ND	430
	59-50-7	4-chloro-3-methylphenol	ND	1400
	91-57-6	2-methylnaphthalene	ND	4800

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Received: 06/16/87

RAS Sacramento REPORT

Results by Sample

Work Order # S7-06-027

Continued From Above

SAMPLE ID Northside (BNA) FRACTION 01A TEST CODE CL8270 NAME Semivolatile Organics-Soil

Date & Time Collected 06/04/87 Category

SCAN	CAS #	COMPOUND	RESULT	DET LIMIT
	77-47-4	hexachlorocyclopentadiene	ND	2900
	88-06-2	2,4,6-trichlorophenol	ND	1300
	95-95-4	2,4,5-trichlorophenol	ND	4800
	91-58-7	2-chloronaphthalene	ND	910
	88-74-4	2-nitroaniline	ND	24000
	131-11-3	dimethyl phthalate	ND	760
	208-96-8	acenaphthylene	ND	1700
	99-09-2	3-nitroaniline	ND	24000
	83-32-9	acenaphthene	ND	910
	51-28-5	2,4-dinitrophenol	ND	20000
	100-02-7	4-nitrophenol	ND	1100
	132-64-9	dibenzofuran	ND	4800
	606-20-2	2,6-dinitrotoluene	ND	910
	121-14-2	2,4-dinitrotoluene	ND	2700
	84-66-2	diethylphthalate	ND	910
	7005-72-3	4-chlorophenyl-phenylether	ND	2000
	86-73-7	fluorene	ND	910
	100-01-06	4-nitroaniline	ND	24000
	534-52-1	4,6-dinitro-2-methylphenol	ND	11000
	86-30-6	n-nitrosodiphenylamine	ND	910
	101-55-3	4-bromophenyl-phenylether	ND	910
	118-74-1	hexachlorobenzene	ND	910
	87-86-5	pentachlorophenol	ND	1700
	85-01-8	phenanthrene	ND	2600
	120-12-7	anthracene	ND	910
1285	84-74-2	di-n-butylphthalate	3400 BL	1200
	206-44-0	fluoranthene	ND	1100
	92-87-5	benzidine	ND	21000
	129-00-0	pyrene	ND	910
	85-68-7	butylbenzylphthalate	ND	1200
	91-94-1	3,3'-dichlorobenzidine	ND	7900
	56-55-3	benzo(a)anthracene	ND	3700
1680	117-81-7	bis(2-ethylhexyl)phthalate	270 BL	1200

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Received: 06/16/87

RAS Sacramento REPORT

Results by Sample

Work Order # S7-06-027

Continued From Above

SAMPLE ID Northside (BNA) FRACTION 01A TEST CODE CL8270 NAME Semivolatile Organics-Soil

Date & Time Collected 06/04/87 Category

SCAN	CAS #	COMPOUND	RESULT	DET LIMIT
	218-01-9	chrysene	ND	1200
	117-84-0	di-n-octyl phthalate	ND	1200
	205-99-2	benzo(b)fluoranthene	ND	2300
	207-08-9	benzo(k)fluoranthene	ND	1200
	50-32-8	benzo(a)pyrene	ND	1200
	193-39-5	indeno(1,2,3-cd)pyrene	ND	1800
	53-70-3	dibenz(a,h)anthracene	ND	1200
	191-24-2	benzo(ghi)perylene	ND	2000

SURROGATE RECOVERIES

SCAN	COMPOUND	RECOVERY
316	2-fluorophenol	67 %
444	d5-phenol	68 %
572	d5-nitrobenzene	68 %
847	2-fluorobiphenyl	95 %
1074	2,4,6-tribromophenol	109 %
1438	d14-terphenyl	90 %

NOTES AND DEFINITIONS FOR THIS REPORT.

DET LIMIT = detection limit.

ND = not detected at specified detection limit.

NA = not analyzed.

N\A = not available.

BI = detected in Reagent Blank; background subtraction not performed.

J = estimated value less than detection limit

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Page 8 RAS Sacramento REPORT Work Order # S7-06-027
Received: 06/16/87 Results by Sample

SAMPLE ID Northside (VOA) FRACTION 02A TEST CODE CL8240 NAME Purgeable Organics - Soil
Date & Time Collected 06/04/87 Category

ORGANICS ANALYSIS DATA SHEET
PURGEABLES

VERIFIED LAK

ANALYST REM EXTRCTD FILE # 4CU06027V02
INSTRMT F4 INJECTD 06/17/87 UNITS ug/kg

SCAN	CAS #	COMPOUND	RESULT	DET LIMIT
	74-87-3	chloromethane	ND	5.0
	74-83-9	bromomethane	ND	5.0
	75-01-4	vinyl chloride	ND	5.0
	75-00-3	chloroethane	ND	5.0
96	75-09-2	methylene chloride	21 BL	2.8
108	67-64-1	acetone	14 BL	7.5
	75-15-0	carbon disulfide	ND	1.7
	75-69-4	trichlorofluoromethane	ND	5.0
	75-35-4	1,1-dichloroethene	ND	4.7
	75-34-3	1,1-dichloroethane	ND	2.8
	156-60-5	trans-1,2-dichloroethene	ND	1.6
	67-66-3	chloroform	ND	1.6
	107-06-2	1,2-dichloroethane	ND	2.8
	78-93-3	2-butanone	ND	25
	71-55-6	1,1,1-trichloroethane	ND	3.8
	56-23-5	carbon tetrachloride	ND	2.8
	108-05-4	vinyl acetate	ND	6.9
	75-27-4	bromodichloromethane	ND	2.2
	78-87-5	1,2-dichloropropane	ND	6.0
	10061-01-5	cis-1,3 dichloropropene	ND	5.0
	79-01-6	trichloroethene	ND	1.9
	124-48-1	dibromochloromethane	ND	3.1
	79-00-5	1,1,2 trichloroethane	ND	5.0
	71-43-2	benzene	ND	4.4
	10061-02-6	trans-1,3-dichloropropene	ND	5.0
	110-75-8	2-chloroethylvinyl ether	ND	5.0
	75-25-2	bromoform	ND	4.7
	591-78-6	2-hexanone	ND	36

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Received: 06/16/87 Results by Sample Continued From Above

SAMPLE ID Northside (VOA) FRACTION 02A TEST CODE CL8240 NAME Purgeable Organics - Soil
Date & Time Collected 06/04/87 Category

SCAN	CAS #	COMPOUND	RESULT	DET LIMIT
	108-10-1	4-methyl-2-pentanone	ND	46
	127-18-4	tetrachloroethene	ND	4.1
	79-34-5	1,1,2,2-tetrachloroethane	ND	6.9
	108-88-3	toluene	ND	6.0
	108-90-7	chlorobenzene	ND	6.0
	100-41-4	ethylbenzene	ND	7.2
	100-42-5	styrene	ND	3.0
	95-47-6	total xylenes	ND	4.6

SURROGATE RECOVERIES

SCAN	COMPOUND	RECOVERY
197	d4-1,2-dichloroethane	93 %
375	d8-toluene	108 %
460	p-bromofluorobenzene	95 %

NOTES AND DEFINITIONS FOR THIS REPORT.

DET LIMIT = detection limit.
ND = not detected at specified detection limit
NA = not analyzed.
N\A = not available.
RL = detected in Reagent Blank; background subtraction not performed.
J = estimated value less than minimum detection limit.

Received: 06/16/87

Results by Sample

SAMPLE ID Reagent Blank BNA SAMPLE # 03 FRACTIONS: A

Date & Time Collected not specified Category

EX BNA 06/17/87
date completed

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Page 11 RAS Sacramento REPORT Work Order # S7-06-027
Received: 06/16/87 Results by Sample

SAMPLE ID Reagent Blank BNA FRACTION 03A TEST CODE CL8270 NAME Semivolatile Organics-Soil
Date & Time Collected not specified Category

ORGANICS ANALYSIS DATA SHEET
SEMIVOLATILE COMPOUNDS

ANALYST SAL EXTRCTD 06/17/87 FILE # 5CB06027C03 VERIFIED LAK
INSTRMT 5100 INJECTD 06/18/87 UNITS ug/kg

SCAN	CAS #	COMPOUND	RESULT	DET LIMIT
	62-75-9	n-nitrosodimethylamine	ND	670
	108-95-2	phenol	ND	100
	62-53-3	aniline	ND	670
	111-44-4	bis(2-chloroethyl) ether	ND	380
	95-57-8	2-chlorophenol	ND	220
	541-73-1	1,3-dichlorobenzene	ND	130
	106-46-7	1,4-dichlorobenzene	ND	290
	100-51-6	benzyl alcohol	ND	3400
	95-50-1	1,2-dichlorobenzene	ND	130
	95-48-7	2-methylphenol	ND	670
	108-60-1	bis(2-chloroisopropyl)ether	ND	380
	106-44-5	4-methylphenol	ND	670
	621-64-7	n-nitroso-di-n-propylamine	ND	800
	67-72-1	hexachloroethane	ND	110
	98-95-3	nitrobenzene	ND	130
	78-59-1	isophorone	ND	150
	88-75-5	2-nitrophenol	ND	240
	105-67-9	2,4-dimethylphenol	ND	180
	65-85-0	benzoic acid	ND	3400
	111-91-1	bis(2-chloroethoxy)methane	ND	360
	120-83-2	2,4-dichlorophenol	ND	180
	120-82-1	1,2,4-trichlorobenzene	ND	130
	91-20-3	naphthalene	ND	110
	106-47-8	4-chloroaniline	ND	670
	87-68-3	hexachlorobutadiene	ND	60
	59-50-7	4-chloro-3-methylphenol	ND	200
	91-57-6	2-methylnaphthalene	ND	670

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Page 12 RAS Sacramento REPORT Work Order # S7-06-027
Received: 06/16/87 Results by Sample Continued From Above

SAMPLE ID Reagent Blank BNA FRACTION 03A TEST CODE CL8270 NAME Semivolatile Organics-Soil
Date & Time Collected not specified Category

SCAN	CAS #	COMPOUND	RESULT	DET LIMIT
	77-47-4	hexachlorocyclopentadiene	ND	400
	88-06-2	2,4,6-trichlorophenol	ND	180
	95-95-4	2,4,5-trichlorophenol	ND	670
	91-58-7	2-chloronaphthalene	ND	130
	88-74-4	2-nitroaniline	ND	3400
	131-11-3	dimethyl phthalate	ND	110
	208-96-8	acenaphthylene	ND	230
	99-09-2	3-nitroaniline	ND	3400
	83-32-9	acenaphthene	ND	130
	51-28-5	2,4-dinitrophenol	ND	2800
	100-02-7	4-nitrophenol	ND	160
	132-64-9	dibenzofuran	ND	670
	606-20-2	2,6-dinitrotoluene	ND	130
	121-14-2	2,4-dinitrotoluene	ND	380
	84-66-2	diethylphthalate	ND	130
	7005-72-3	4-chlorophenyl-phenylether	ND	280
	86-73-7	fluorene	ND	130
	100-01-06	4-nitroaniline	ND	3400
	534-52-1	4,6-dinitro-2-methylphenol	ND	1600
	86-30-6	n-nitrosodiphenylamine	ND	130
	101-55-3	4-bromophenyl-phenylether	ND	130
	118-74-1	hexachlorobenzene	ND	130
	87-86-5	pentachlorophenol	ND	240
	85-01-8	phenanthrene	ND	360
	120-12-7	anthracene	ND	130
1207	84-74-2	di-n-butylphthalate	220	170
	206-44-0	fluoranthene	ND	150
	92-87-5	benzidine	ND	2900
	129-00-0	pyrene	ND	130
	85-68-7	butylbenzylphthalate	ND	170
	91-94-1	3,3'-dichlorobenzidine	ND	1100
	56-55-3	benzo(a)anthracene	ND	520
1644	117-81-7	bis(2-ethylhexyl)phthalate	77 J	170

SAMPLE ID Reagent Blank BNA FRACTION 03A TEST CODE CL8270 NAME Semivolatile Organics-Soil
Date & Time Collected not specified Category ______

SCAN	CAS #	COMPOUND	RESULT	DET LIMIT
	218-01-9	chrysene	ND	170
	117-84-0	di-n-octyl phthalate	ND	170
	205-99-2	benzo(b)fluoranthene	ND	320
	207-08-9	benzo(k)fluoranthene	ND	170
	50-32-8	benzo(a)pyrene	ND	170
	193-39-5	indeno(1,2,3-cd)pyrene	ND	250
	53-70-3	dibenz(a,h)anthracene	ND	170
	191-24-2	benzo(ghi)perylene	ND	270

SURROGATE RECOVERIES

SCAN	COMPOUND	RECOVERY
345	2-fluorophenol	80 %
460	d5-phenol	78 %
582	d5-nitrobenzene	75 %
851	2-fluorobiphenyl	102 %
1074	2,4,6-tribromophenol	105 %
1442	d14-terphenyl	89 %

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Page 14 RAS Sacramento REPORT Work Order # S7-06-027
Received: 06/16/87 Results by Sample

SAMPLE ID Reagent Blank VOA FRACTION 04A TEST CODE CL8240 NAME Purgeable Organics - Soil
Date & Time Collected not specified Category

ORGANICS ANALYSIS DATA SHEET
PURGEABLES

VERIFIED LAK

ANALYST REM
INSTRMT 14
EXTRCTD
INJECTD 06/17/87
FILE # 4EB0617V001
UNITS ug/kg

SCAN	CAS #	COMPOUND	RESULT	DET LIMIT
	74-87-3	chloromethane	ND	5.0
	74-83-9	bromomethane	ND	5.0
	75-01-4	vinyl chloride	ND	5.0
	75-00-3	chloroethane	ND	5.0
94	75-09-2	methylene chloride	5.6	2.8
106	67-64-1	acetone	9.1	7.5
	75-15-0	carbon disulfide	ND	1.7
	75-69-4	trichlorofluoromethane	ND	5.0
	75-35-4	1,1-dichloroethene	ND	4.7
	75-34-3	1,1-dichloroethane	ND	2.8
	156-60-5	trans-1,2-dichloroethene	ND	1.6
	67-66-3	chloroform	ND	1.6
	107-06-2	1,2-dichloroethane	ND	2.8
	78-93-3	2-butanone	ND	25
	71-55-6	1,1,1-trichloroethane	ND	3.8
	56-23-5	carbon tetrachloride	ND	2.8
	108-05-4	vinyl acetate	ND	6.9
	75-27-4	bromodichloromethane	ND	2.2
	78-87-5	1,2-dichloropropane	ND	6.0
	10061-01-5	cis-1,3-dichloropropene	ND	5.0
	79-01-6	trichloroethene	ND	1.9
	124-48-1	dibromochloromethane	ND	3.1
	79-00-5	1,1,2-trichloroethane	ND	5.0
	71-43-2	benzene	ND	4.4
	10061-02-6	trans-1,3-dichloropropene	ND	5.0
	110-75-8	2-chloroethylvinyl ether	ND	5.0
	75-25-2	bromoform	ND	4.7
	591-78-6	2-hexanone	ND	36

SAMPLE ID Reagent Blank VOA FRACTION 04A TEST CODE CL8240 NAME Purgeable Organics - Soil
Date & Time Collected not specified Category

SCAN	CAS #	COMPOUND	RESULT	DET LIMIT
	108-10-1	4-methyl-2-pentanone	ND	46
	127-18-4	tetrachloroethene	ND	4.1
	79-34-5	1,1,2,2-tetrachloroethane	ND	6.9
	108-88-3	toluene	ND	6.0
	108-90-7	chlorobenzene	ND	6.0
	100-41-4	ethylbenzene	ND	7.2
	100-42-5	styrene	ND	3.0
	95-47-6	total xylenes	ND	4.6

SURROGATE RECOVERIES

SCAN	COMPOUND	RECOVERY
196	d4-1,2-dichloroethane	96 %
376	d8-toluene	100 %
461	p-bromofluorobenzene	100 %

NOTES AND DEFINITIONS FOR THIS REPORT.

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N\A = not available.
BL = detected in Reagent Blank; background subtraction not performed.
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Daniel S. Davis
Senior Engineer
Process Engineering Department

REQUEST FOR REGULATORY APPROVAL:

OPERATIONAL TEST TO DEMONSTRATE BENEFICIAL REUSE OF A NONHAZARDOUS WASTEWATER TREATMENT SLUDGE AT FLORIDA CRUSHED STONE COMPANY'S BROOKSVILLE PLANT

RECEIVED
MAY 21 1990
DER - BAQM

Prepared for:

The Bureau of Air Quality Management
Florida Department of Environmental Regulation
Tallahassee, Florida

Prepared by:

Radian Corporation, Austin, Texas
on behalf of
Florida Crushed Stone Company, Brooksville, Florida

18 May 1990

TABLE OF CONTENTS

1.0 INTRODUCTION

The purpose of this document is to formally request the state of Florida's approval for an operational test for the beneficial reuse of approximately 400 short tons (wet basis) of electric utility sludge as a raw material supplement at the Florida Crushed Stone Company's Brooksville plant. The operational test is designed to gather all information necessary to demonstrate that the beneficial reuse of utility sludge has no adverse affect on cement quality or process operations, and to assess the feasibility of developing a long-term utilization program at the Brooksville plant.

The utilization of this sludge as a raw material supplement for the production of Portland Cement has already been tested by Radian Corporation at a cement plant in South Carolina (Gifford-Hill cement company in Harleyville). Stack emissions data was collected during this test and showed that the use of the sludge results in no adverse environmental impacts. As a result, no stack emissions will collected during the operations test.

The remaining sections of this document provide: 1) a description and characterization of the sludge; 2) a description of the proposed beneficial reuse concept; and 3) an assessment of the environmental impact that may result from sludge utilization at the Brooksville plant.

2.0 DESCRIPTION AND CHARACTERISTICS OF SLUDGE

The sludge to be beneficially reused as a raw material supplement at Florida Crushed Stone is a sediment/precipitate generated in the wastewater treatment system at the Jacksonville Electric Authority (JEA) in Jacksonville, Florida. For the operational test, sludge from JEA's Northside Station will be used. After the operational test and after the required approvals/permit modifications are gained from the state, Florida Crushed Stone will consider long-term beneficial reuse of additional sludge from the Northside Station, similar sludges from other JEA stations, and similar sludges from other electric utilities.

At the Northside Station a variety of low volume wastewater streams make their way into the wastewater treatment system. Runoff from the washing of equipment, collected rainwater, and other miscellaneous sources are collected and commingled.

The wastewater collected at the Northside Station flows into a sedimentation basin where some solids settle out; the solids collected in this basin are called the surge basin sludge. Next, the effluent flows into a tank where lime is added to raise the pH of the solution and precipitate soluble metals. Any solids generated as a result of lime addition settle out in a second sedimentation basin; these solids are referred to as the treated sludge. Both the surge basin sludge and the treated sludge are proposed for reuse as a Portland cement raw material substitute

2.1 <u>Elemental Analysis</u>

Table 2-1 presents the analytical results from samples of the two Northside Station sludges. However, since the wastewater treatment system does not receive waste of completely uniform composition, the sludge compositions will vary somewhat from sample to sample. The surge basin sludge will contain from 90 to 95+ percent water. The treated sludge will contain 70

TABLE 2-1. COMPOSITION OF SLUDGES BY WEIGHT PERCENT, DRY

ELEMENTAL ANALYSIS	SURGE BASIN	TREATED SLUDGE
ALUMINUM	0.44	0.44
ANTIMONY	0.02	0.00
ARSENIC	0.65	0.06
BARIUM	0.06	0.03
CADMIUM	0.01	0.00
CALCIUM	0.42	13.00
CHROMIUM	0.16	0.02
COBALT	0.03	0.01
COPPER	0.04	0.06
GOLD	0.01	0.00
IRON	17.00	7.50
LEAD	0.05	0.01
LITHIUM	0.00	0.00
MAGNESIUM	4.10	8.40
MANGANESE	0.04	0.11
MOLYBDENUM	1.60	0.05
NICKEL	2.00	0.52
PHOSPHORUS	0.00	0.00
PLATINUM	0.20	0.04
POTASSIUM	0.03	0.00
SELENIUM	0.03	0.01
SILICON	0.00	0.00
SILVER	0.00	0.00
SODIUM	0.99	0.73
STRONTIUM	0.01	0.03
TELLURIUM	0.11	0.01
THALLIUM	0.03	0.00
TITANIUM	0.07	0.01
VANADIUM	6.40	0.47
YTTRIUM	0.00	0.00
ZINC	0.04	0.04
CARBONATE	0.00	0.02
CHLORIDE	0.58	0.34
SULFATE	6.60	2.13
TOTAL	41.73	34.04

to 85 percent water. The samples were evaporated to dryness and were subsequently digested and analyzed for metals and major anions. The results shown in Table 2-1 are on a dry basis as a result.

Several samples of the surge basin sludge were collected and analyzed for selected group of metals in order to demonstrate that range of variability that may be anticipated for the sludges composition. These ranges are shown in Table 2-2.

As shown in Table 2-1, the sum of the metal and anion constituents is less than 100 percent. The analysis was performed for the elemental metals in the sludge and not the metal hydroxides (which is the likely chemical form of the metals). The presence of hydroxides should account for the missing mass.

The results in Table 2-1 do not include mercury. However, there is no obvious potential source of mercury for these sludges. None of the sources of the wastewater should contain any mercury.

2.2 Toxicity Testing

The sludges were determined to be nonhazardous in accordance with RCRA's EP toxicity and TCLP test criteria. In addition, the sludges are not RCRA listed hazardous wastes. All extractable metal levels are at least ten times below the toxic limit. The toxicity results are presented in Table 2-3. Extracted mercury levels were below the detectable limit for all sludges. This supports the conclusion that mercury should not be present in these sludges.

TABLE 2-2. EXAMPLE OF RANGE OF SLUDGE COMPOSITION FOR SELECTED METALS, WEIGHT PERCENT DRY

METAL	RANGE OF CONCENTRATIONS (WEIGHT PERCENT, DRY)
Ag - Silver	0.0001 - 0.002
As - Arsenic	0.005 - 0.07
Ba - Barium	0.02 - 0.06
Cd - Cadmium	0.0002 - 0.01
Co - Cobalt	0.02 - 0.04
Cr - Chromium	0.06 - 0.2
Cu - Copper	0.04 - 0.15
Mo - Molybdenum	0.09 - 1.6
Ni - Nickel	0.4 - 2.0
Pb - Lead	0.01 - 0.05
Se - Selenium	0.004 - 0.03
V - Vanadium	1.2 - 6.4

TABLE 2-3. EP TOX AND TCLP ANALYTICAL RESULTS

		EXTRACTS; (mg/L)						
		SURGE BASIN		TREATED SLUDGE		EP * BLANK FLUID	TCLP ** BLANK FLUID	TCLP+ BLANK FLUID
METAL	RCRA MAX.	EP	TCLP	EP	TCLP			
ARSENIC	5	0.024	0.028	0.0055	0.005	<0.002	0.006	<0.002
BARIUM	100	0.11	0.55	0.255	0.55	<0.009	0.61	0.71
BERYLLIUM		0.001	0.002	0.002	0.002	<0.001	<0.001	<0.001
CADMIUM	1	0.047	0.057	0.031	0.03	<0.003	<0.003	<0.003
CHROMIUM	5	0.024	0.034	0.035	0.035	<0.009	<0.009	<0.009
COBALT		0.52	0.52	0.25	0.26	<0.01	<0.01	<0.01
COPPER		0.04	0.08	0.105	0.09	<0.01	<0.01	<0.01
IRON		0.14	0.88	0.11	<0.03	<0.03	<0.03	<0.03
LEAD	5	<0.002	<0.05	0.003	<0.05	0.008	<0.05	<0.05
MERCURY	0.2	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
MOLYBDENUM		8	14	0.1	0.16	<0.05	<0.05	<0.05
NICKEL		26	26	14	15	<0.02	<0.02	<0.02
SELENIUM	1	<0.005	0.014	<0.005	<0.005	<0.005	<0.005	<0.005
SILVER	5	0.014	<0.009	0.021	0.021	<0.009	<0.009	<0.009
THALLIUM		<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09
VANADIUM		9.2	12	<0.02	<0.02	<0.02	<0.02	<0.02
ZINC		0.45	0.78	0.335	0.51	0.018	0.24	0.35

* EP EXTRACTION FLUID (0.5N ACETIC ACID)
** TCLP EXTRACTION FLUID (SODIUM ACETATE BUFFER)
\+ TCLP EXTRACTION FLUID (ACETIC ACID) - USED ONLY FOR TREATED SLUDGE

2.3 Organic Analysis

These sludges have been analyzed for total organics on several occasions. No organics were detected for most of these analysis. However, on one occasion 0.2 weight percent total organic carbon was detected. There is no obvious source for even this low level of organic content. It is likely that this sample was an anomaly and that for the most part the sludge is free of any organic constituents.

2.4 Physical Properties of the Sludge

The physical properties of the sludges are presented in Table 2-4. Laboratory and field tests show that the sludge will no naturally dewater below the moisture levels indicated. Although the sludges have relatively high viscosities, they have proven to be pumpable during full scale field tests.

TABLE 2-4. SLUDGE PHYSICAL PROPERTIES

Surge Basin Sludge:

Approximate Density = 9 lbs/gallon
Approximate Viscosity = 800 cps

Treated Sludge:

Approximate Density = 9 lbs/gallon
Approximate Viscosity = 3000 - 4000 cps

3.0 DESCRIPTION OF PROPOSED PROJECT

3.1 Sludge Excavation

Four hundred short tons (wet basis) of Northside Station sludge will be used during this operational test. The sludge will be excavated and loaded into rail tankers. Any excess water that is removed during excavation will be allowed to decant in the rail tanker for a minimum of 24 hours. The decant water will be removed from the rail tanker prior to rail shipment and will be returned to JEA's water treatment system.

3.2 Sludge Analysis

The sludge will be delivered to Florida Crushed Stone's Brooksville plant in rail tank cars (approximately 20,000 gallons capacity each). Prior to shipment, a sample will be drawn from each car and sent by courier to a qualified analytical laboratory for sample digestion and ICAPES analysis for the following metals:

- Arsenic,
- Barium,
- Cadmium,
- Cobalt,
- Copper,
- Lead,
- Molybdenum,
- Nickel,
- Selenium,
- Silver and
- Vanadium.

In addition, each sample will be analyzed for total organic content and moisture content. The rail car will be approved for shipment if the sampling results indicate that the composition of the material is not significantly different than expected. The sampling results will be sent to Florida Crushed Stone before the rail car reaches the plant.

In addition to the sampling and analysis, each rail car will be weighed in route to Brooksville to determine the total quantity of sludge shipped with that load.

3.3 Sludge Handling

For the operational test the sludge will be pumped from the rail cars into a vacuum truck. From the vacuum truck the sludge will be pumped directly into the plants raw mill where it will be mixed and ground with the remaining raw materials and subsequently fed into the preheater and rotary kiln where clinker will be produced. No on-site storage vessels for the sludge will be required for the test.

Sludge will be used as a raw material supplement at a rate of approximately 50 tons/day. It will be mixed with approximately 3500 tons/day of raw materials.

4.0 ENVIRONMENTAL IMPACTS

No adverse environmental impacts are expected as a result of the proposed operational test at the Brooksville plant. Stack metals emissions data was collected during a similar test program conducted at a cement plant in South Carolina. The results of this test are shown in Table 4-1. The metals emissions data represents the sum of particulate and vapor phase metals emissions. As shown in this test, stack emissions were not effected by the use of the sludge.

The South Carolina test results were based on the following sludge utilization rate:

Sludge Feed Rate = 1.8 wet tons/hour, (44 tons/day)
Sludge Moisture Content = 94.4 %
Kiln Raw Material Feed Rate = 143 tons/hour
Sludge Substitution Rate = 0.0007 tons sludge solids/ton raw materials

The Brooksville test will be based on the following sludge utilization rate:

Sludge Feed Rate = 2.1 wet tons/hour, (50 tons/day)
Sludge Moisture Content = 94 % (estimate)
Kiln Raw Material Feed Rate = 145 tons/hour
Sludge Substitution Rate = 0.0$\underset{0}{\wedge}$9 tons sludge solids/ton raw materials

The Brooksville operational test will be run at a slightly higher substitution rate than the South Carolina test. However, the rate is still very low, and no impact on stack emissions is expected.

The sludge is not a source of fugitive organic or particulate emissions, and it is used at such a low rate that it will not effect combustion related emissions (CO, NOx), or emission of sulfur dioxide.

Table 4-1. Comparison of Stack Metals Emissions With and Without Sludge Addition

Baseline Stack Test:

	Stack Flow (dscfm)	Sample Vol (dscf)	Metals Analysis (micrograms)											
			Ag	As	Ba	Cd	Co	Cr	Cu	Mo	Ni	Pb	Se	V
Test 1	176,117	49.5016	<8	<2	<40	3.1	<20	60	38	<40	171	3	<41.5	1.5
Test 2	172,765	50.7696	<8	<2	<40	6	<20	48	31	<40	30	20.8	<41.5	18
Test 3	168,028	48.0155	<8	<2	<40	2.8	<20	60	34	<40	33	6.3	<41.5	18
Ave. Mass Flow (lbs/hr)			--	--	--	0.002	--	0.026	0.016	--	0.036	0.005	--	0.006

With Sludge Utilization :

	Stack Flow (dscfm)	Sample Vol (dscf)	Metals Analysis (micrograms)											
			Ag	As	Ba	Cd	Co	Cr	Cu	Mo	Ni	Pb	Se	V
Test 1	170,685	48.7232	2	<1.5	<10	5	<5	8	16	<10	<4	2.5	9.1	4
Test 2	168,967	50.7946	<2	2.1	<10	5.8	<5	7	13	<10	41	1.6	28	6
Test 3	176,563	52.0513	6	<1.5	<10	1.3	<5	8	<2	<10	<4	<1.5	1.5	4
Ave. Mass Flow (lbs/hr)			0.001	0.000	--	0.002	--	0.003	0.004	--	0.006	0.001	0.006	0.002