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PM10 EMISSION FACTORS FOR TWO TRANSFER POINTS AT A GRANITE STONE CRUSHING PLANT

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1.0 SUMMARY

1.1 TEST PROCEDURES AND RESULTS

The U.S. Environmental Protection Agency (EPA), Emission Measurement Branch (EMB) issued a work assignment to Entropy, Inc. to develop and conduct a set of emission tests at a granite crushing plant to determine the PM10 emission factors. The specific sources tested were two conveyor transfer points. The plant selected by the EPA Task Manager was the Wake Stone Corporation, Knightdale, North Carolina Plant.

The primary objective of the test was to determine the PM10 emissions from the specific processes with the maximum degree of accuracy. The EPA Reference Method used to quantify the PM10 emissions was Method 201A. This procedure utilizes an extractive sampling train consisting of a cyclonic precollector to remove the greater than 10 micron particles, followed by a filter. To use Method 201A, it was necessary to design a fugitive emission capture system to collect the PM10 particle laden gas stream.
Wake Stone Corporation sponsored this emission test program in order to determine PM10 emission factors applicable to transfer points at stone crushing plants.

A Quasi-stack system was used to conduct emission tests on the transfer point. Small enclosures were installed at both the inlet and outlet of the transfer point. Using this testing approach, all of the PM10 emissions from the transfer point were efficiently captured and adjacent sources of PM10 emissions did not significantly affect the results.

The PM10 emissions were tested using EPA Method 201A. The tests were divided into two target criteria sets: stone moisture levels greater than 1.5% (wet), and stone moisture levels less than 1.5% (dry). However the stone moisture levels were consistently lower than this criteria see Section 3, Table 3-1. The results of the PM10 emission tests are presented in Table 1-1. The emission rates determined during both series of tests were low. The very low wet stone emission factor results are entirely consistent with the zero visible emissions observed during all of the tests. Stone samples obtained during the tests were also analyzed and found to have very low levels of material below less than 10 microns.

TABLE 1-1. TRANSFER POINT PM10 EMISSIONS

Transfer Point	Stone Moisture (% Weight)	PM10 Emissions (Pounds of Emissions/ Ton of Stone)
Transfer Point C1	($\leq$ 1.5%)	0.000282
	($>$ 1.5%)	0.000092
Transfer Point J2	($\leq$ 1.5%)	0.001049
	($>$ 1.5%)	0.000030

2.0 PLANT AND SAMPLING LOCATION DESCRIPTION

2.1 PROCESS DESCRIPTION AND OPERATION

The Knightdale North Carolina plant produces crushed granite used for construction and road paving. Figure 2-1 is a flowchart of the portion of the Wake Stone plant which is relevant in this project. This has been copied from a drawing labelled "Knightdale Quarry New Secondary Crushing Plant" provided by Wake Stone Corp. The transfer points tested are circled and join conveyor C and J to conveyor D.

Rock blasted from various locations in the quarry is trucked to a primary jaw type crusher located near the quarry pit. A large surge pile created by the flow of stone from the jaw crusher is used to provide a steady flow of stone to the plant processing equipment located adjacent to the quarry (STATION 4). Conveyor B is used to deliver the stone to the vibrating screen above the 5.5 foot Symons Cone Crusher. The vibrating screen serving the 5.5 foot Symons crusher removes fine material produced during blasting or during primary crushing. These fines are conveyed to a separate storage pile and are sold as product. The rock that remains is crushed and conveyed via conveyor C to conveyor D to the sizing screens (STATION 5). The rock that is still too large to be sold as product is conveyed via conveyor I to a Model 1560 Omnicone crusher (STATION 6), the crushed rock is then conveyed via conveyor J to conveyor D to the sizing screen again. This loop continues until the rock is crushed to the current screen sizes. The transfer points from conveyor C to D and from conveyor J to D are the locations that were tested. They have been denoted as C1 and J2 respectively for the test.

2.2 FUGITIVE DUST CONTROL

Wet suppression is used for fugitive dust control of the transfer point. There are water spray nozzles located on the exit conveyor underneath the transfer point. There are also spray nozzles located at the inlet and outlet of the conetype crushers. Spray nozzles area also located at the top of the conveyor above the vibrating screens, and on the discharge chute near the top of the vibrating screens. Not all of these spray nozzles are necessary to maintain wet conditions. Over wetting of the rock can cause blinding of the lower screen or blockage of the fines discharge chute underneath the vibrating screen[4,5]. During these emission tests, the plant experienced no significant screen blinding conditions.

2.3 SAMPLING AND EMISSION TESTING PROCEDURES

2.3.1 Fugitive Emission Test Approach

Since there is no air pollution control devices on the transfer point, fugitive emission testing procedures were needed to capture and measure the PM10 particulate emissions. The quasi-stack method appeared to be the most accurate and practical approach for capturing the fugitive emissions from the inlet and outlet areas of the transfer point. This approach allowed isolation of the transfer point from the other fugitive dust sources in the immediate

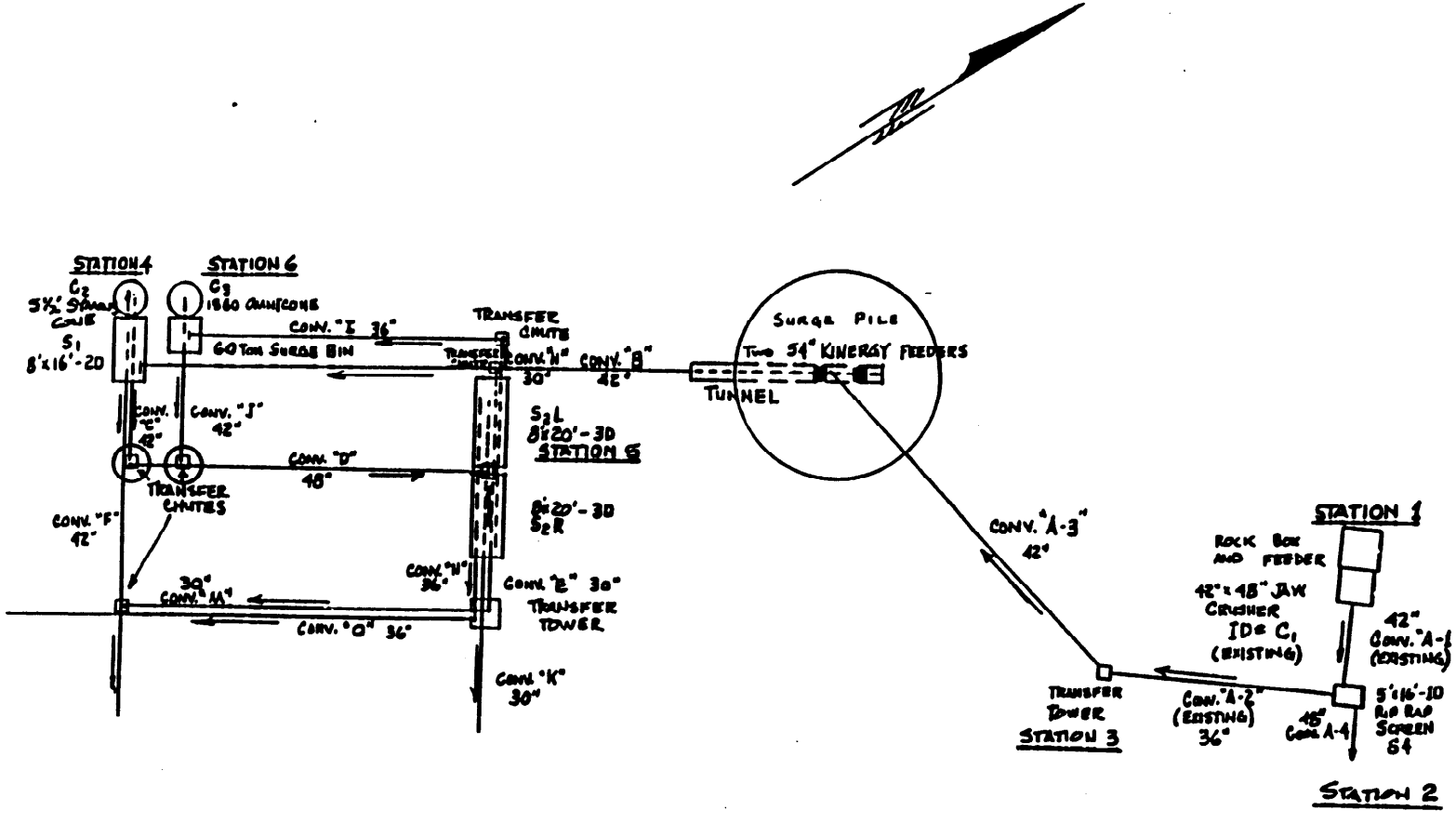

Figure 2-1. Wake Stone Corp. Knightdale Quarry Flow Diagram

vicinity. The quasi-stack method required the construction of temporary enclosures around the inlet and outlet of the transfer point and the installation of a duct and fan system for gas handling. Since the PM10 emissions are generated primarily by stone-to-stone attrition in the transfer point and during falling, the use of an enclosure does not significantly influence the rate of PM10 emissions.

2.3.2 Emission Testing Procedure

The enclosures built around transfer points C1 and J2 and the gas handling system were identical with the exception of the length of duct work used to convey the gas sample to the ground. The inlet to the transfer points C1 and J2 have an area of approximately 3 feet high, by 4 feet wide by 4 feet long it were enclosed with plywood to allow capture of the emissions caused by the stone-to-stone attrition during movement of the stone. The discharge point of the transfer points are the lower conveyor leading to the vibrating screens. The actual transfer points were completely enclosed in a steel chute. The discharge points were enclosed approximately 3 feet downstream of the transfer points. Figure 2-2. shows a view of the transfer point.

The enclosures both had a one foot diameter outlet duct which ran to the ground, approximately 10 feet for C1 and 20 feet for J2 feet. This outlet duct was used as a combined sample point for both the inlet and outlet of the respective transfer point. The outlet duct upon reaching the ground turned 90^0 via an elbow then proceeded approximately 10 feet to the sample point. The duct was then increased to a two foot diameter duct, to allow use of a two foot diameter SCR driven tubeaxial fan. The air flows from the combined inlet and outlet enclosures were set by adjusting the variable speed DC motors of the tubeaxial fans installed on the outlet ducts. Figures 2-2. and 2-3. show views of the inlet and outlet of the transfer points prior to the construction of enclosures. Figure 2-4 and 2-5. show views of the transfer point inlet and outlet after the installation of the enclosure. The combined gas flows from the inlet and outlet enclosures were controlled by a Dayton Model 3C411 24 inch, 2 HP direct current (DC) driven tubeaxial fan. This variable speed fan was set at the gas flow rate necessary to maintain a slightly negative static pressure within the enclosure. Negative pressures were required to ensure that there was no loss of PM10 emissions from the enclosure. Highly negative static pressures were undesirable since there could be high velocity ambient air streams entering the enclosure which could increase the PM10 emissions.

2.3.3 Sampling Equipment

EPA Reference Method 201A was used to monitor the PM10 particulate emissions, from each transfer point. The Method 201A complete sampling system consists of: (1) a sampling nozzle, (2) a PM10 sampler, (3) a probe and umbilical cord, (4) an impinger train, and (5) flow control system. Due to the relatively small ducts and the constant sample gas flow rates set using the DC-driven tubeaxial fans, the "S"-type pitot tube was not mounted on the PM10 sample probe. Gas velocities were determined prior to the emission tests. The Method 5 complete sampling system consists of: (1) a sampling nozzle, (2) a probe and umbilical cord, (3) a Method 5 filter, (4) an impinger train, and (5) flow control system.

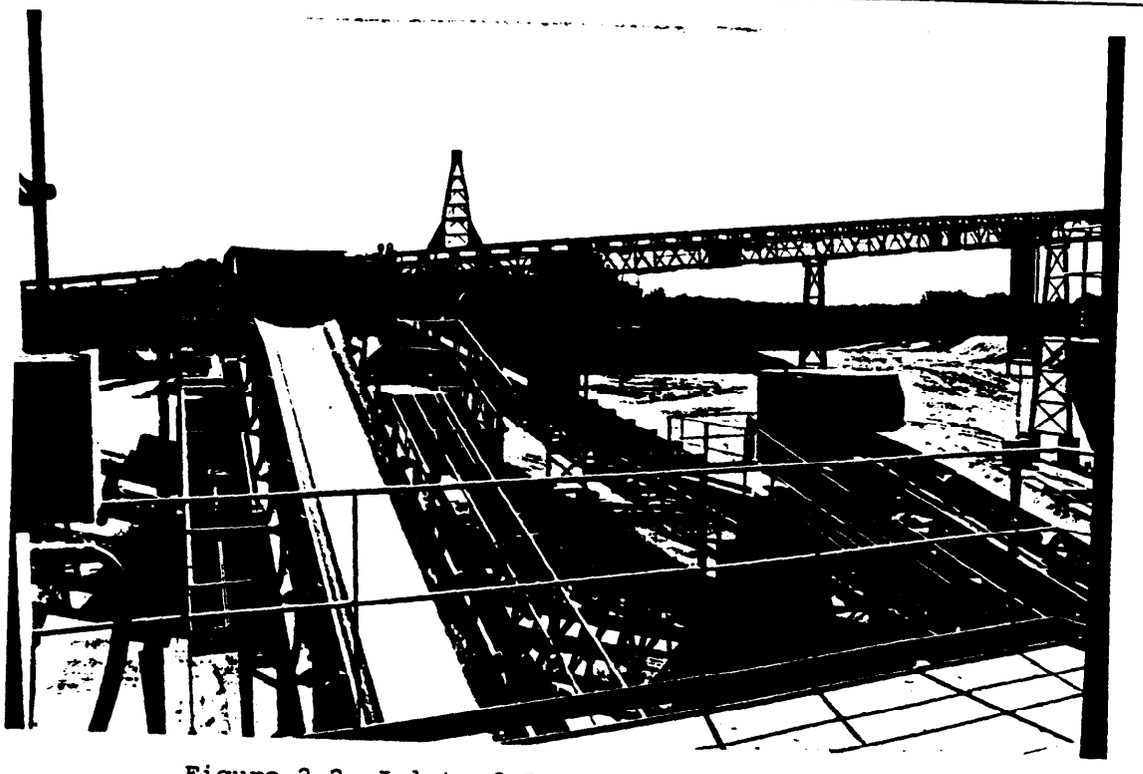

Figure 2-2. Inlet of Transfer Points C1 and J2

Figure 2-3. Outlet of Transfer Points C1 and J2 onto Conveyor D

Figure 2-4. Inlet and Outlet of Transfer Point C1 Enclosure

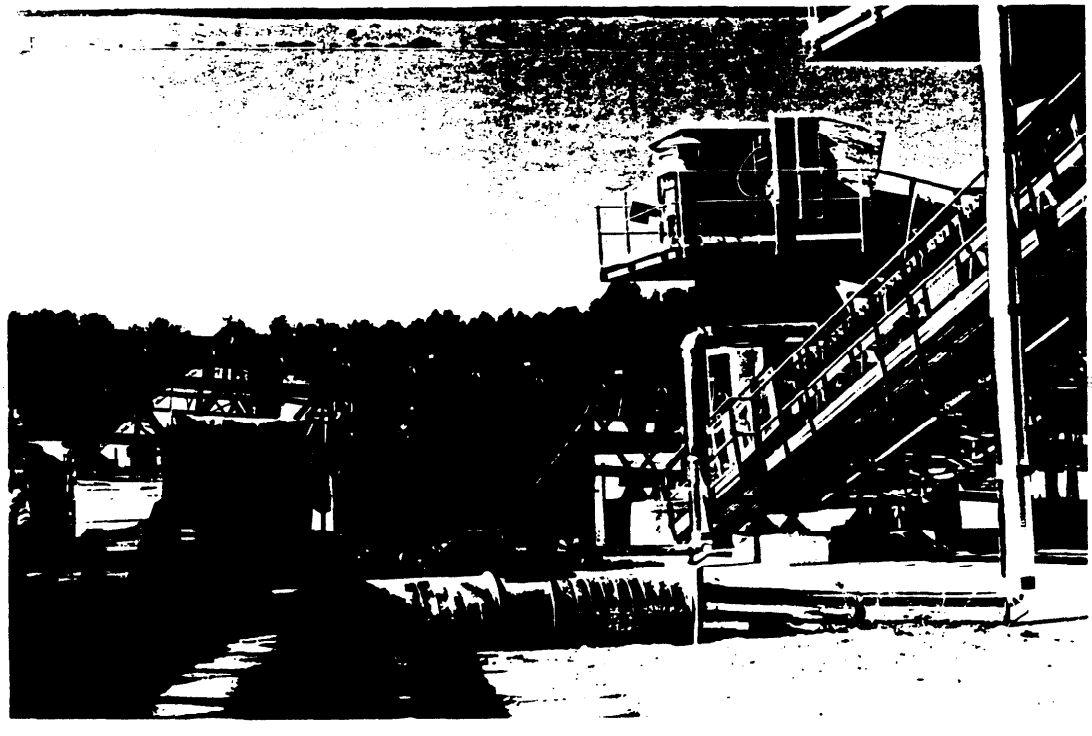

Figure 4-5. Outlet Ducts of Transfer Points C1 and J2.

In the Method 201A sampling train particulate matter larger than 10 microns in diameter is collected in the cyclone located immediately downstream of the sampling nozzle. Particulate smaller than 10 microns is collected on the outlet tube of the cyclone and on the downstream glass-fiber filter. The cyclone and filter system used in this study met the design and sizing requirements of Section 5.2 of Method 201A. The gas flow rate through the cyclone was set based on the orifice pressure head equation provided in Figure 4 of Method 201A. The gas flow rate was kept constant throughout the emission test program.

Sampling was performed in the 1-foot diameter smooth wall duct installed off the enclosures of the transfer point. The 4-inch diameter sampling port was located more than 8 duct diameters downstream of the elbow and more than 2 duct diameters upstream of the expansion duct leading to the 2 foot diameter fan see Figure 2-6 and 2-7. The sampling nozzles were selected to provide 80 to 120% isokinetic conditions as required by Method 201A. The particulate samples were recovered using the procedures specified in Method 201A.

Figure 2-6. Sampling Location of Transfer Point J2.

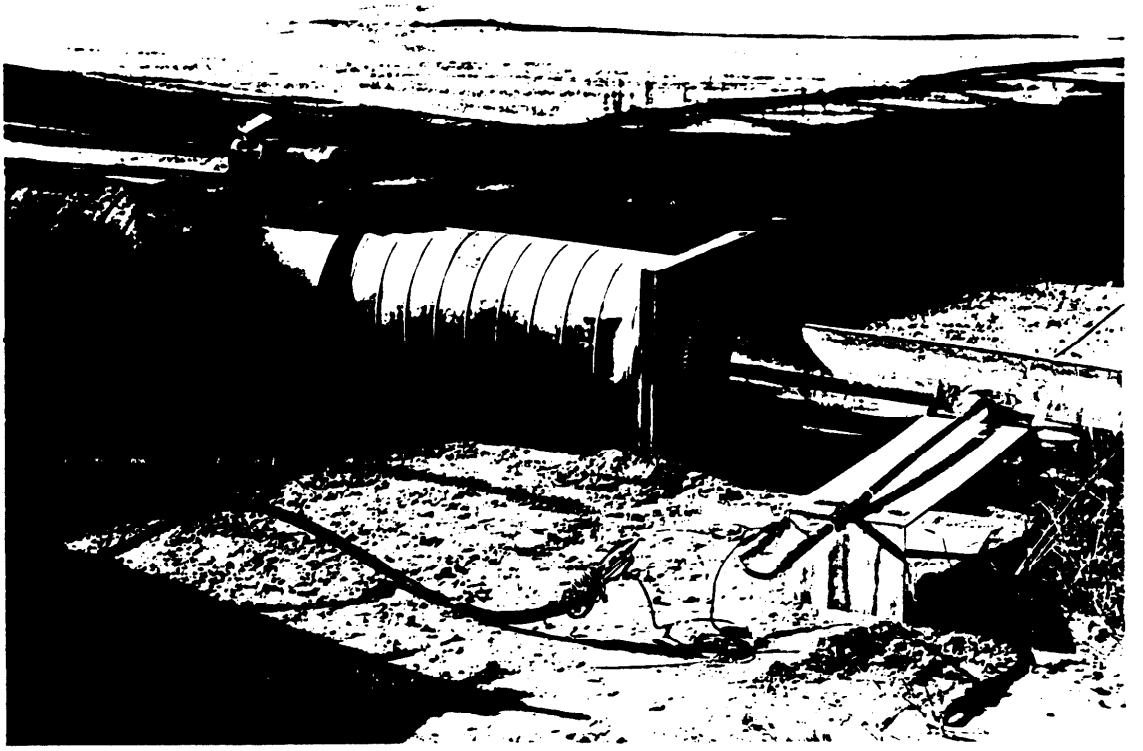

Figure 2-7. Transfer Point C1, Sample Location

2.4 MONITORING OF PROCESS OPERATING CONDITIONS

There are a number of process variables and weather conditions which could conceivably influence emission rates from the transfer point:

- Stone moisture level
- Stone size distribution
- Stone silt content
- Stone feed rates
- Stone friability
- Stone hardness and density

All of these variables with the exception of stone type were monitored using a combination of plant instruments, special monitoring equipment, and stone sample analyses. Stone type was not monitored since granite is the only type of stone processed at this plant.

2.4.1 Stone Moisture Level

Stone samples were removed from both conveyors C and J during the emission tests due to a noticeable difference in stone size distribution. These samples consisted of a 2 linear foot sample of stone from each conveyor entering the transfer points C1 and J2. The conveyor was stopped by plant personnel for approximately 5 minutes to permit the Entropy test crew to remove the stone sample. The sample was placed in a sealed plastic bucket.

A sample was selected for analysis by placing the stone in a pile and dividing it into four quadrants. The quadrant randomly selected for analysis was further subdivided in quadrants until the sample quantity was less than approximately 2 pounds. This sample was then weighed and heated in an oven at a gas temperature of approximately 350 degrees Fahrenheit. The weight loss during heating was calculated and reported as the stone moisture level.

2.4.2 Ambient PM10 Levels

One ambient PM10 monitor was operated in the sample area of the transfer point C1 see Figure 2-8. It was operated only during the time periods that emission sampling was in progress. The ambient air flow rates through the samplers were calibrated using an Airdata micromanometer. The filters were weighed and PM10 levels during the test were calculated.

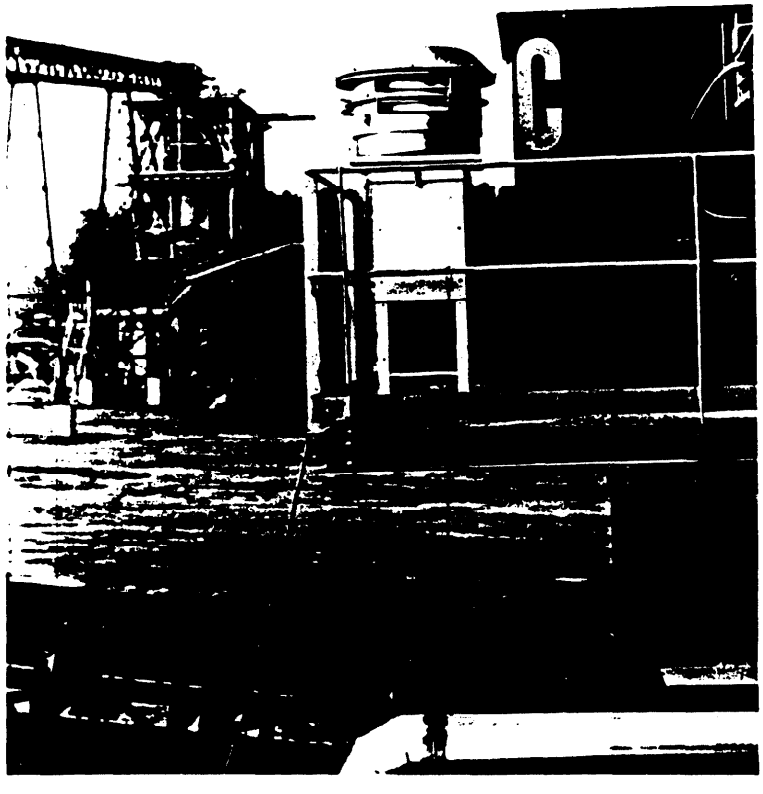

Figure 2-8. Ambient Pm10 Monitor

2.4.3 Stone Size Distribution and Silt Content

Samples of the stone obtained during the test (see Section 2.4.1) were used to determine the size distribution. The initial sample quadrants used for moisture analysis were used for analysis by ASTM sizing screens. The sample of approximately 2 pounds was heated to 350 Fahrenheit for 30 minutes to drive off the moisture, then allowed to cool, then loaded into the top pan. The screen size mesh openings included:

- 1.5 Inches
- 0.75 Inches
- 0.375 Inches
- 0.0787 Inches
- 0.0059 Inches
- 0.0029 Inches
- 0.0015 Inches
- Bottom pan

The loaded ASTM screens were placed in a RO-TAP shaker and processed for 10 minutes. The weights of stone remaining on each of the screens were then determined by subtracting the screen tare weights from the loaded weights.

2.4.4 Stone Processing and Production Rates

The stone processing rate of the transfer points has been defined by Entropy as the total volume of stone entering each transfer point. The volume of stone in tons for a particular test was calculated by removing and weighing a 2 foot section of the stone from both conveyors C and J entering their respective transfer points. This amount in pounds/feet was then multiplied by the speed of the conveyor in feet/minute (380 fpm Conveyor C, 360 fpm Conveyor J) to produce a rate in pounds/minute. Then to obtain the total amount of stone per hour this number was multiplied by 60 minutes per hour. This calculation is shown below:

Transfer Point C1

(Pounds Stone per 2 FT) X (Belt Speed to Transfer Point C1 380 FT per Minute)

= Pounds Stone per Minute

(Pounds Stone/Minute) X (60 Minutes/Hour) X (Ton/2000 Pounds)

= Tons of Stone/Hour

Transfer Point J2

(Pounds Stone per 2 FT) X (Belt Speed to Transfer Point J2 360 FT per Minute)

= Pounds Stone per Minute

(Pounds Stone/Minute) X (60 Minutes/Hour) X (Ton/2000 Pounds)

= Tons of Stone/Hour

3.0 TEST RESULTS

3.1 OBJECTIVES AND TEST MATRIX

The objective of this test program was to determine the PM10 particulate emission factors for two transfer points at a stone crushing plant. The test program concerned both wet and dry stone conditions. The specific objectives included the following:

- Capture the emissions from the inlet and outlet of a transfer point without significantly affecting the emission rate.
- Determine the PM10 emission concentrations by means of EPA Reference Method 201A.
- Calculate the emission rates using the known outlet duct gas flow rates and the Method 201A PM10 emission concentrations.
- Measure the stone moisture content, stone size distribution.

3.2 STONE MOISTURE LEVELS

The stone moisture levels for both transfer points emission tests are presented in Table 3-1. The moisture criteria proposed in the Test Plan were: dry condition - less than 1.5%, and wet conditions - equal to or greater than 1.5%. The actual values during the tests were consistently lower than these criteria. Furthermore transfer point J2 had higher moisture levels than C1, this can be attributed to the size distribution data presented in Table 3-7. Transfer point J2 handles finer crushed stone which has larger surface area thus a greater ability to absorb moisture.

During the emission tests, the stone color was used to qualitatively evaluate moisture levels. Short term changes in stone moisture were indicated by shifts between grey and white. These variations occurred in all of the wet condition tests, but they could not be quantified because of the time needed to obtain a representative stone sample. Stone moisture levels were controlled by the plant personnel operating certain water spray headers in the process.

TABLE 3-1. STONE MOISTURE LEVELS

Date	Conditions	Test	Moisture Content (% weight)	
			C1	J2
9-13-93	Wet	1	0.55	0.86
9-15-93	Wet	2	0.68	1.48
9-16-93	Wet	3	0.74	1.00
9-20-93	Dry	1	0.27	0.33

3.3 AMBIENT PM10 CONCENTRATIONS

The ambient PM10 concentrations were monitored by means of a Anderson PM10 Hi-Vol sampler. This instrument has a cyclonic pre-collector for particles greater than 10 microns followed by a back-up filter. The ambient air flow rates through the samplers were calibrated using an Airdata micromanometer. The analyzer was located on the ground near the sampling point, in this location, it indicated the PM10 levels in the sampling area.

This analyzer was turned on immediately prior to the emission test and turned off at the conclusion of the test. The PM10 concentrations were calculated by dividing the filter catch weights by the total standard cubic feet sampled during the on-line time. The PM10 ambient concentration data was subtracted from the total PM10 concentration data measured using the Method 201A sampling train. The data on the ambient PM10 levels have been presented in Table 3-2.

TABLE 3-2.
AMBIENT PARTICULATE CONCENTRATION
STANDARD GAS CONDITIONS

Date	Run Time Minutes	Grams Catch	PM10 Concentration mg/ft^3
9-13-93	251	0.3564	0.07103
9-15-93	251	0.3564	0.07103
9-16-93	307	0.5924	0.09784
9-20-93	213	1.2960	0.29373

3.4 STONE PRODUCTION RATES

The individual transfer point stone throughput rates were calculated following the formula outlined in Section 2.4.4 of this report. The measured test by test stone production rates for both transfer points are presented in Table 3-3.

TABLE 3-3. STONE PRODUCTION DATA

Date	Test	Condition	Total Processing Rate, Tons/Hour	
			C1	J2
9-13-93	1	Wet	530.1	529.2
9-15-93	2	Wet	427.5	469.8
9-16-93	3	Wet	530.1	496.8
9-20-93	1,2,3	Dry	467.4	472.5

3.5 PM10 EMISSION FACTORS

The PM10 emission factors were calculated in accordance with standard procedures. The particulate captured on the filter, in the cyclone outlet tube, and in the filter inlet housing was weighed and added to yield a total capture weight. This value is divided by the standard cubic feet of gas sampled to determine the concentration of PM10 particulate matter in the gas sampled. The data are expressed in pounds of PM10 per ton of stone put through the transfer point. The measured PM10 emission factors for transfer point C1 and J2 are presented in Table 3-4 and Table 3-5 respectively. The average values for the wet tests are well below the average value for the dry tests. This is consistent with general observations during the emission tests. During the dry tests, there were visible emissions from the outlet dust. No visible emissions were apparent during the wet tests.

TABLE 3-4. TRANSFER POINT C1 PM10 EMISSIONS

	PM10 Emissions; Pounds/Ton
Dry Stone (< 0.5%)	
Run 1	0.000226
Run 2	0.000203
Run 3	0.000418
Average	0.000282
Wet Stone (> 0.5%)	
Run 1	0.0000610
Run 2	0.0001180
Run 3	0.0000967
Average	0.0000919

TABLE 3-5. TRANSFER POINT J2 PM10 EMISSIONS

	PM10 Emissions; Pounds/Ton
Dry Stone (< 0.5%)	
Run 1	0.000788
Run 2	0.000740
Run 3	0.001620
Average	0.001049
Wet Stone (> 0.5%)	
Run 1	0.0000176
Run 2	0.0000507
Run 3	0.0000202
Average	0.0000295

The low emission factors are also substantiated by particle size distribution tests conducted by Entropy using dried stone. The size distribution data provided in Table 3-6 explains the higher moisture contents found on the stone material in transfer point J2. From the table one can see J2 had a larger percent of smaller particles than C1 therefore the particles of J2 had a larger surface area exposed to the wet suppression sprays. This explains the lower WET emissions and higher DRY emissions of transfer point J2 compared to transfer point C1.

TABLE 3-6. PARTICLE SIZE DISTRIBUTIONS

	Percent of Total Dry Sample in Specified Range For Transfer Point C1			
Size Range	Test 1, Wet	Test 2, Wet	Test 3 Wet	Test 1 Dry
> 1.5 Inches	28.1	24.3	11.2	31.9
> 0.75 Inches	37.5	41.9	30.3	27.8
> 0.375 Inches	13.8	12.4	19.4	11.0
> 0.0787 Inches	9.1	10.6	18.1	13.3
> 150 Microns	8.5	9.1	16.2	12.8
> 75 Microns	1.5	1.4	2.4	1.7
> 38 Microns	0.7	0.2	1.3	0.8
Bottom Pan	0.8	0.1	1.1	0.7
Moisture Content of Sample (% Wet Weight)	0.55	0.68	0.74	0.27

	Percent of Total Dry Sample in Specified Range For Transfer Point J2			
Size Range	Test 1, Wet	Test 2, Wet	Test 3 Wet	Test 1 Dry
> 1.5 Inches	00.0	00.0	00.0	00.0
> 0.75 Inches	37.7	21.8	35.9	30.2
> 0.375 Inches	25.1	29.0	32.7	18.8
> 0.0787 Inches	18.7	25.1	18.1	26.9
> 150 Microns	14.1	18.1	9.6	19.4
> 75 Microns	2.3	2.9	1.8	2.2
> 38 Microns	1.1	1.6	0.9	1.2
Bottom Pan	1.0	1.5	1.0	1.3
Moisture Content of Sample (% Wet Weight)	0.86	1.48	1.00	0.33

4.0 QA/QC ACTIVITIES

4.1 QC PROCEDURES

The specific internal quality assurance and quality control procedures used during this test program are described in this section. Velocity and volumetric flow rate data collection are discussed in Section 4.2. Section 4.3 discusses QA audits. QC procedures for particulate and percent isokinetics are presented in Sections 4.4 and 4.5, respectively. Manual equipment calibration is described in Section 4.6. Data validation is discussed in Section 4.7.

4.2 VELOCITY/VOLUMETRIC FLOW RATE DETERMINATION

The QC procedures for velocity / volumetric flow rate determinations follow guidelines set forth by EPA Method 2.

Flue gas moisture was determined according to EPA Method 4 sampling trains. Flue gas moisture content (B_{ws}) was determined by dividing the volume (mass) of moisture collected by the impingers by the standardized volume of gas sampled. The following QC procedures were followed in determining the volume of moisture collected:

- Preliminary reagent tare weights were measured to the nearest 0.1 g.
- The balance zero was checked and re-zeroed as necessary before each weighing.
- The balance was leveled and placed in a clean, motionless environment for weighing.
- The indicating silica gel was fresh for each run.
- The silica gel impinger gas temperature was maintained below 68°F.

The QC procedures below were followed regarding accurate sample gas volume determination:

- The dry gas meter is fully calibrated every 6 months using an EPA approved intermediate standard.
- The gas meter was read to a thousandth of a cubic foot for the initial and final readings.
- The meter thermocouples were compared with ambient prior to the test run as a check on operation.
- Readings of the dry gas meter, meter orifice pressure (ΔH), and meter

temperatures were taken at every sampling point.

- Accurate barometric pressures were recorded at least once per day.
- Post-test dry gas meter checks were completed to verify the accuracy of the meter full calibration constant (Y).
- The S-type pitot tube was visually inspected before sampling.
- Both legs of the pitot tube were leak checked before and after sampling.
- Proper orientation of the S-type pitot tube was maintained while making measurements. The roll and pitch axis of the S-type pitot tube were maintained at 90° to the flow.
- The pitot tube/manometer umbilical lines were inspected before and after sampling for moisture condensate.
- Cyclonic or turbulent flow checks were performed prior to testing the source.
- Average velocity pressure reading were recorded at each point instead of recording extreme high or low values.
- Pitot tube coefficients were determined based on physical measurement techniques as delineated in Method 2.
- The stack gas temperature measuring system was checked by observing ambient temperatures prior to placement in the stack.

4.3 QA AUDITS

Meterbox calibration audits were performed according to Method 5, section 4.4. All of the equipment pre-test and post-test results are presented in Appendix C.

4.4 PARTICULATE/CONDENSIBLES SAMPLING QC PROCEDURES

Quality control procedures for particulate sampling ensure high quality flue gas concentrations and emissions data. Flue gas concentrations are determined by dividing the mass of analyte (particulate) collected by the standardized volume of gas sampled. Sampling QC procedures which ensure that a representative amount of the analytes are collected by the sampling system include:

- The sampling rate is within $\pm$20 percent of isokinetic for Method 201A.
- Only properly prepared glassware is used.
- All sampling nozzles were manufactured and calibrated according to EPA standards.
- Filters are weighed, handled, and stored in a manner to prevent any contamination.

- Recovery procedures are completed in a clean environment.
- Field reagent blanks are collected.

4.5 SAMPLE VOLUME AND PERCENT ISOKINETICS

All sampling runs met the results acceptability criteria as defined by Section 6.3.5 of Method 201A. The isokinetic rates are within ±20 percent. A summary of the sample rates and percent isokinetics is presented in Table 4-1.

TABLE 4-1.
AVERAGE DELTA H AND ISOKINETIC RESULTS

Run #	Percent Iso (%)	Delta H (Avg)
Wet-C1-M201A-1	93.7	0.555
Wet-C1-M201A-2	86.6	0.650
Wet-C1-M201A-3	85.3	0.650
Dry-C1-M201A-1	89.1	0.640
Dry-C1-M201A-2	89.2	0.660
Dry-C1-M201A-3	88.3	0.668

Run #	Percent Iso (%)	Delta H (Avg)
Wet-J2-M201A-1	85.8	0.651
Wet-J2-M201A-2	84.8	0.635
Wet-J2-M201A-3	87.6	0.635
Dry-J2-M201A-1	86.6	0.639
Dry-J2-M201A-2	87.3	0.639
Dry-J2-M201A-3	87.1	0.639

4.6 MANUAL SAMPLING EQUIPMENT CALIBRATION PROCEDURES

4.6.1 Type-S Pitot Tube Calibration

The EPA has specified guidelines concerning the construction and geometry of an acceptable Type-S pitot tube. If the specified design and construction

guidelines are met, a pitot tube coefficient of 0.84 is used. Information pertaining to the design and construction of the Type-S pitot tube is presented in detail in Section 3.1.1 of EPA Document 600/4-77-027b. Only Type-S pitot tubes meeting the required EPA specifications are used. Pitot tubes are inspected and documented as meeting EPA specifications prior to field sampling.

4.6.2 Sampling Nozzle Calibration

Calculation of the isokinetic sampling rate requires that the cross sectional area of the sampling nozzle be accurately determined. All nozzles are thoroughly cleaned, visually inspected, and calibrated according to the procedure outlined in Section 3.4.2 of EPA Document 600/4-77-027b.

4.6.3 Temperature Measuring Device Calibration

Accurate temperature measurements are required during source sampling. Bimetallic stem thermometers and thermocouple temperature sensors are calibrated using the procedure described in Section 3.4.2 of EPA Document 600/4-77-027b. Each temperature sensor is calibrated at a minimum of three points over the anticipated range of use against a NIST-traceable mercury-in-glass thermometer. All sensors are calibrated prior to field sampling.

4.6.4 Dry Gas Meter Calibration

Dry gas meters (DGM's) are used in the sample trains to monitor the sampling rate and measure the sample volume. All DGM's are fully calibrated to determine the volume correction factor prior to their use in the field. Post-test calibration checks are performed as soon as possible after the equipment has been returned as a QA check on the calibration coefficients. Pre- and post-test calibrations should agree within 5 percent. The calibration procedure is documented in Section 3.3.2 of EPA Document 600/4-77-237b.

Prior to calibration, a positive pressure leak check of the system is performed using the procedure outlined in Section 3.3.2 of EPA Document 600/4-77-237b. The system is placed under approximately 10 inches of water pressure and a gauge oil manometer is used to determine if a pressure decrease can be detected over a one-minute period. If leaks are detected, they are eliminated before actual calibrations are performed.

After the sampling console is assembled and leak checked, the pump is allowed to run for 15 minutes to allow the pump and DGM to warm-up. The valve is then adjusted to obtain the desired flow rate. For the pre-test calibrations, data are collected at orifice manometer settings (ΔH) of 0.5, 1.0, 1.5, 2.0, 3.0 and 4.0 inches H_2O. Gas volumes of 5 ft^3 are used for the two lower orifice settings, and volumes of 10 ft^3 are used for the higher settings. The individual gas meter correction factors (Y_i) are calculated for each orifice setting and averaged. The method requires that each of the individual correction factors fall within ± 2 percent of the average correction

factor or the meter is cleaned, adjusted, and recalibrated. For the post-test calibration, the meter is calibrated three times at the average orifice setting and vacuum used during the actual test. The meter box field calibration data is presented in Table 4-2.

Table 4-2. Meter Box Calibration Audit

Meter Box Number	Pre-Audit Value	Allowable Error	Calculated Gamma	Acceptable
N-37	1.0099	0.9695<Y<1.0503	0.9941	Yes
N-19	1.0015	0.9614<Y<1.0416	1.0188	Yes

4.7 DATA VALIDATION

All data and/or calculations for flow rates, moisture content, and isokinetic rates made using a computer software program are validated by an independent check. All calculations are spot checked for accuracy and completeness.

In general, all measurement data are validated based on the following criteria:

- Process conditions during sampling or testing.
- Acceptable sample collection procedures.
- Consistency with expected other results.
- Adherence to prescribed QC procedures.

5.0 REFERENCES

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4. L.C. Lucas and L.M. Noland, "Keeping down the dust," Pit & Quarry, November 1988, p. 27-29.

5. B. Weaver, "Stretching water resources," Pit & Quarry, March 1991, p. 22-24.

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8. Industrial Ventilation, A Manual of Recommended Practice, Edwards Brothers, 1980.

9. JACA Corporation, Control of Air Emissions from Process Operations in the Rock Crushing Industry," EPA Contract No. 68-01-4135, U.S. Environmental Protection Agency, Washington, D.C., February 1978.

10. IT Environmental Programs, Inc., Regulatory and Inspection Manual for Nonmetallic Mineral Processing Plant, EPA-240/1/90-010, U.S. Environmental Protection Agency, Washington, D.C., 1991.

6.0 GLOSSARY

1. ASTM: American Society for Testing & Materials

2. Aggregate: in the case of materials of construction, essentially inert materials which, when bound together into a conglomerated mass by a matrix, form concrete, mastic, mortar or plaster; crushed rock or gravel screened to size for use in road surfaces, concrete or bituminous mixes; any of several hard materials such as sand, gravel, stone, slag, cinders or other inert materials used for mixing with a cementing material to form concrete. Aggregate, in a surface course in the building of roads is often called a "road metal".

3. Conveyor belt: a rubberized belt, usually 18" to 60" wide, used to carry aggregates.

4. Crusher (cone): a crusher that is specially designed to produce fines.

5. Crusher (primary): usually a jaw or gyratory type crusher which reduces very large rocks to a size that can be processed by a secondary crusher.

6. Crusher (secondary): any second or third stage crusher that further reduces the size of stone.

7. Fines: the smaller particles of aggregates; usually less than .25" in size.

8. Head Pulley: the driving pulley, usually at the discharge end of conveyor belt.

9. Ro-Tap screen: trade name for a type of testing screen.

10. Scalping: a screening operation, removing stone too large for the crusher.

11. Scalping Screen: removes oversize material.

12. Screen (or sieve): a metallic plate or sheet, woven wire cloth or similar device, with regularly spaced apertures of uniform size mounted in a suitable frame or holder for use in separating material according to size.

Appendix A. Field Data and Results Tabulation

FIELD DATA AND RESULTS TABULATION

PLANT: Wake Stone, Knightdale, North Carolina

SAMPLING LOCATION: C1 Transfer Point

		Dry-C1-M201A-1	Dry-C1-M201A-2	Dry-C1-M201A-3
	Test Date	9/20/93	9/20/93	9/20/93
	Run Start Time	717	835	950
	Run Finish Time	817	935	1050
	Net Traversing/Sampling Points	12	12	12
Theta	Net Run Time, Minutes	60	60	60
Dia	Nozzle Diameter, Inches	0.266	0.266	0.266
Cp	Pitot Tube Coefficient	0.84	0.84	0.84
Y	Dry Gas Meter Calibration Factor	1.0099	1.0099	1.0099
Pbar	Barometric Pressure, Inches Hg	30.11	30.11	30.11
Delta H	Avg. Pressure Differential of Orifice Meter, Inches H2O	0.64	0.66	0.6678
Vm	Volume of Metered Gas Sample, Dry ACF	27.11	27.361	27.609
tm	Dry Gas Meter Temperature, Degrees F	75.7	82.7	89
Vmstd	Volume of Metered Gas Sample, Dry SCF*	27.199	27.098	27.030
Vlc	Total Volume of Liquid Collected in Impingers & Silica Gel, mL	7.5	7.8	6.8
Vwstd	Volume of Water Vapor, SCF*	0.353	0.367	0.320
%H2O	Moisture Content, Percent by Volume	1.28 **	1.34 **	1.17 **
%H2OSAT	Moisture Sat. @ Flue Gas Conditions, %	1.70	2.06	2.54
Mfd	Dry Mole Fraction	0.987	0.987	0.988
%CO2	Carbon Dioxide, Percent by Volume, Dry	0	0	0
%O2	Oxygen, Percent by Volume, Dry	20.9	20.9	20.9
Md	Gas Molecular Weight, Lb/Lb-Mole, Dry	28.84	28.84	28.84
Ms	Gas Molecular Weight, Lb/Lb-Mole, Wet	28.70	28.69	28.71
Pg	Flue Gas Static Pressure, Inches H2O	-0.4	-0.4	-0.4
Ps	Absolute Flue Gas Pressure, Inches Hg	30.08	30.08	30.08
	Volumetric Air Flow Rate			
ts	Flue Gas Temperature, Degrees F	59.5	64.8	71
Delta-p	Average Velocity Head, Inches H2O	0.153	0.153	0.157
vs	Flue Gas Velocity, Feet per Second	21.79	21.90	22.31
A	Stack/Duct Area, Square Inches	113.1	113.1	113.1
Qsd	Volumetric Air Flow Rate, Dry SCFM*	1,036	1,030	1,039
Qmsd	Volumetric Air Flow Rate, Dry SCMM*	29	29	29
Qaw	Volumetric Air Flow Rate, Wet ACFM	1,027	1,032	1,051
ton/hr	Production Rate, tons/hour	467.40	467.40	467.40

* 68 ° F (20 ° C) -- 29.92 Inches of Mercury (Hg).

** Moisture used in calculations.

(Continued Next Page)

FIELD DATA AND RESULTS TABULATION

PLANT: Wake Stone, Knightdale, North Carolina

SAMPLING LOCATION: C1 Transfer Point

		Dry-C1-M201A-1	Dry-C1-M201A-2	Dry-C1-M201A-3
	Percent Isokinetic			
ts	Flue Gas Temperature, Degrees F	59.5	64.8	71
Delta-p	Average Velocity Head, Inches H2O	0.153	0.153	0.157
vs	Flue Gas Velocity, Feet per Second	21.79	21.90	22.31
%I	Isokinetic Sampling Rate, Percent	89.1	89.2	88.3
	PM10 Calculations			
ucyc	Stack Gas Viscosity	177.5	178.7	180.3
Qs	PM10 Flow, at Cyclone Conditions, ACFM	0.449	0.453	0.456
D50	Dia. of Particles in Cyclone, Microns	9.75	9.77	9.80
	Particulate Catch,			
mg<D50	≤ 10 Microns, Milligrams	29.0	26.8	46.4
mg>D50	> 10 Microns, Milligrams	267.8	281.7	464.5
mg	Total Milligrams	296.8	308.5	510.9
	Percent of Total Particulate,			
%<D50	≤ 10 Microns	9.8	8.7	9.1
%>D50	> 10 Microns	90.2	91.3	90.9
	Particulate ≤ 10 Microns			
	Concentration, milligrams/DSCF*			
mg/DSCF	Concentration in Gas Sample	1.07	0.99	1.72
mg/DSCF,A	Concentration in Ambient Air	0.29	0.29	0.29
mg/DSCF,adj	Adjusted Concentration in Gas Sample	0.77	0.70	1.42
lb/hr	Emission Rate, lb/hr	0.106	0.095	0.196
lb/ton	Emission Rate, lb/ton	2.26E-04	2.03E-04	4.18E-04

* 68 ° F (20 ° C) -- 29.92 Inches of Mercury (Hg).

FIELD DATA AND RESULTS TABULATION

PLANT: Wake Stone, Knightdale, North Carolina

SAMPLING LOCATION: C1 Transfer Point

		Wet-C1-M201A-1	Wet-C1-M201A-2	Wet-C1-M201A-3
	Test Date	9/13/93	9/15/93	9/16/93
	Run Start Time	805	735	725
	Run Finish Time	1505	1509	1458
	Net Traversing/Sampling Points	12	12	12
Theta	Net Run Time, Minutes	315	240	360
Dia	Nozzle Diameter, Inches	0.249	0.266	0.266
Cp	Pitot Tube Coefficient	0.84	0.84	0.84
Y	Dry Gas Meter Calibration Factor	1.0099	1.0099	1.0099
Pbar	Barometric Pressure, Inches Hg	30.21	30.1	30.05
Delta H	Avg. Pressure Differential of Orifice Meter, Inches H2O	0.5546	0.65	0.65
Vm	Volume of Metered Gas Sample, Dry ACF	137.801	107.505	163.409
tm	Dry Gas Meter Temperature, Degrees F	103.3	95.3	96.3
Vmstd	Volume of Metered Gas Sample, Dry SCF*	131.886	104.018	157.562
Vlc	Total Volume of Liquid Collected in Impingers & Silica Gel, mL	56.4	58.1	88.8
Vwstd	Volume of Water Vapor, SCF*	2.655	2.735	4.180
%H2O	Moisture Content, Percent by Volume	1.97 **	2.56 **	2.58 **
%H2OSAT	Moisture Sat. @ Flue Gas Conditions, %	3.11	3.41	3.31
Mfd	Dry Mole Fraction	0.980	0.974	0.974
%CO2	Carbon Dioxide, Percent by Volume, Dry	0	0	0
%O2	Oxygen, Percent by Volume, Dry	20.9	20.9	20.9
Md	Gas Molecular Weight, Lb/Lb-Mole, Dry	28.84	28.84	28.84
Ms	Gas Molecular Weight, Lb/Lb-Mole, Wet	28.62	28.56	28.56
Pg	Flue Gas Static Pressure, Inches H2O	-0.45	-0.45	-0.45
Ps	Absolute Flue Gas Pressure, Inches Hg	30.18	30.07	30.02
	Volumetric Air Flow Rate			
ts	Flue Gas Temperature, Degrees F	77.1	79.8	78.8
Delta-p	Average Velocity Head, Inches H2O	0.1602	0.157	0.165
vs	Flue Gas Velocity, Feet per Second	22.67	22.56	23.13
A	Stack/Duct Area, Square Inches	113.1	113.1	113.1
Qsd	Volumetric Air Flow Rate, Dry SCFM*	1,038	1,018	1,044
Qmsd	Volumetric Air Flow Rate, Dry SCMM*	29	29	30
Qaw	Volumetric Air Flow Rate, Wet ACFM	1,068	1,063	1,090
ton/hr	Production Rate, tons/hour	530.10	427.50	530.10

* 68 ° F (20 ° C) -- 29.92 Inches of Mercury (Hg).

** Moisture used in calculations.

(Continued Next Page)

FIELD DATA AND RESULTS TABULATION

PLANT: Wake Stone, Knightdale, North Carolina

SAMPLING LOCATION: C1 Transfer Point

		Wet-C1-M201A-1	Wet-C1-M201A-2	Wet-C1-M201A-3
	Percent Isokinetic			
ts	Flue Gas Temperature, Degrees F	77.1	79.8	78.8
Delta-p	Average Velocity Head, Inches H2O	0.1602	0.157	0.165
vs	Flue Gas Velocity, Feet per Second	22.67	22.56	23.13
%I	Isokinetic Sampling Rate, Percent	93.7	86.6	85.3
	PM10 Calculations			
ucyc	Stack Gas Viscosity	181.2	181.4	181.2
Qs	PM10 Flow, at Cyclone Conditions, ACFM	0.431	0.453	0.457
D50	Dia. of Particles in Cyclone, Microns	10.26	9.94	9.86
	Particulate Catch,			
mg<D50	≤ 10 Microns, Milligrams	40.4	46.4	73.9
mg>D50	> 10 Microns, Milligrams	81.6	99.2	145.6
mg	Total Milligrams	122.0	145.6	219.5
	Percent of Total Particulate,			
%<D50	≤ 10 Microns	33.1	31.9	33.7
%>D50	> 10 Microns	66.9	68.1	66.3
	Particulate ≤ 10 Microns			
	Concentration, milligrams/DSCF*			
mg/DSCF	Concentration in Gas Sample	0.31	0.45	0.47
mg/DSCF,A	Concentration in Ambient Air	0.07	0.07	0.10
mg/DSCF,adj	Adjusted Concentration in Gas Sample	0.24	0.38	0.37
lb/hr	Emission Rate, lb/hr	0.032	0.051	0.051
lb/ton	Emission Rate, lb/ton	6.10E-05	1.18E-04	9.67E-05

* 68 ° F (20 ° C) -- 29.92 Inches of Mercury (Hg).

FIELD DATA AND RESULTS TABULATION

PLANT: Wake Stone, Knightdale, North Carolina

SAMPLING LOCATION: J2 Transfer Point

		Dry-J2-M201A-1	Dry-J2-M201A-2	Dry-J2-M201A-3
	Test Date	9/20/93	9/20/93	9/20/93
	Run Start Time	730	855	1015
	Run Finish Time	830	955	1115
	Net Traversing/Sampling Points	12	12	12
Theta	Net Run Time, Minutes	60	60	60
Dia	Nozzle Diameter, Inches	0.266	0.266	0.266
Cp	Pitot Tube Coefficient	0.84	0.84	0.84
Y	Dry Gas Meter Calibration Factor	1.0015	1.0015	1.0015
Pbar	Barometric Pressure, Inches Hg	30.11	30.11	30.11
Delta H	Avg. Pressure Differential of Orifice Meter, Inches H2O	0.6389	0.6391	0.6394
Vm	Volume of Metered Gas Sample, Dry ACF	27.629	28.115	28.049
tm	Dry Gas Meter Temperature, Degrees F	89.6	91.7	93.3
Vmstd	Volume of Metered Gas Sample, Dry SCF*	26.794	27.161	27.019
Vlc	Total Volume of Liquid Collected in Impingers & Silica Gel, mL	8.1	8.6	7.2
Vwstd	Volume of Water Vapor, SCF*	0.381	0.405	0.339
%H2O	Moisture Content, Percent by Volume	1.40 **	1.47 **	1.24 **
%H2OSAT	Moisture Sat. @ Flue Gas Conditions, %	3.00	3.17	3.32
Mfd	Dry Mole Fraction	0.986	0.985	0.988
%CO2	Carbon Dioxide, Percent by Volume, Dry	0	0	0
%O2	Oxygen, Percent by Volume, Dry	20.9	20.9	20.9
Md	Gas Molecular Weight, Lb/Lb-Mole, Dry	28.84	28.84	28.84
Ms	Gas Molecular Weight, Lb/Lb-Mole, Wet	28.68	28.68	28.70
Pg	Flue Gas Static Pressure, Inches H2O	-0.45	-0.45	-0.45
Ps	Absolute Flue Gas Pressure, Inches Hg	30.08	30.08	30.08
	Volumetric Air Flow Rate			
ts	Flue Gas Temperature, Degrees F	75.9	77.6	79
Delta-p	Average Velocity Head, Inches H2O	0.1625	0.1649	0.1637
vs	Flue Gas Velocity, Feet per Second	22.82	23.02	22.96
A	Stack/Duct Area, Square Inches	113.1	113.1	113.1
Qsd	Volumetric Air Flow Rate, Dry SCFM*	1,050	1,055	1,052
Qmsd	Volumetric Air Flow Rate, Dry SCMM*	30	30	30
Qaw	Volumetric Air Flow Rate, Wet ACFM	1,075	1,085	1,082
ton/hr	Production Rate, tons/hour	472.50	472.50	472.50

* 68 ° F (20 ° C) -- 29.92 Inches of Mercury (Hg).

** Moisture used in calculations.

(Continued Next Page)

FIELD DATA AND RESULTS TABULATION

PLANT: Wake Stone, Knightdale, North Carolina

SAMPLING LOCATION: J2 Transfer Point

		Dry-J2-M201A-1	Dry-J2-M201A-2	Dry-J2-M201A-3
	Percent Isokinetic			
ts	Flue Gas Temperature, Degrees F	75.9	77.6	79
Delta-p	Average Velocity Head, Inches H2O	0.1625	0.1649	0.1637
vs	Flue Gas Velocity, Feet per Second	22.82	23.02	22.96
%I	Isokinetic Sampling Rate, Percent	86.6	87.3	87.1
	PM10 Calculations			
ucyc	Stack Gas Viscosity	181.4	181.7	182.2
Qa	PM10 Flow, at Cyclone Conditions, ACFM	0.457	0.465	0.463
D50	Dia. of Particles in Cyclone, Microns	9.84	9.74	9.80
	Particulate Catch,			
mg<D50	≤ 10 Microns, Milligrams	79.7	76.0	156.8
mg>D50	> 10 Microns, Milligrams	1008.5	1233.9	1537.0
mg	Total Milligrams	1088.2	1309.9	1693.8
	Percent of Total Particulate,			
%<D50	≤ 10 Microns	7.3	5.8	9.3
%>D50	> 10 Microns	92.7	94.2	90.7
	Particulate ≤ 10 Microns			
	Concentration, milligrams/DSCF*			
mg/DSCF	Concentration in Gas Sample	2.97	2.80	5.80
mg/DSCF,A	Concentration in Ambient Air	0.29	0.29	0.29
mg/DSCF,adj	Adjusted Concentration in Gas Sample	2.68	2.50	5.51
lb/hr	Emission Rate, lb/hr	0.372	0.350	0.767
lb/ton	Emission Rate, lb/ton	7.88E-04	7.40E-04	1.62E-03

* 68 ° F (20 ° C) -- 29.92 Inches of Mercury (Hg).

FIELD DATA AND RESULTS TABULATION

ce Stone, Knightdale, North Carolina

LOCATION: J2 Transfer Point

		Wet-J2-M201A-1	Wet-J2-M201A-2	Wet-J2-M201A-3
	Test Date	9/13/93	9/14/93	9/16/93
	Run Start Time	810	735	725
	Run Finish Time	1507	1510	1500
	Net Traversing/Sampling Points	12	12	12
Theta	Net Run Time, Minutes	306	255	360
Dia	Nozzle Diameter, Inches	0.266	0.266	0.266
Cp	Pitot Tube Coefficient	0.84	0.84	0.84
Y	Dry Gas Meter Calibration Factor	1.0015	1.0015	1.0015
Pbar	Barometric Pressure, Inches Hg	30.21	30.1	30.05
Delta H	Avg. Pressure Differential of Orifice Meter, Inches H2O	0.6512	0.635	0.6351
Vm	Volume of Metered Gas Sample, Dry ACF	139.898	111.850	164.576
tm	Dry Gas Meter Temperature, Degrees F	98.5	84.5	90.3
Vmstd	Volume of Metered Gas Sample, Dry SCF*	133.952	109.446	159.078
Vlc	Total Volume of Liquid Collected in Impingers & Silica Gel, mL	55.6	42	91.5
Vwstd	Volume of Water Vapor, SCF*	2.617	1.977	4.307
%H2O	Moisture Content, Percent by Volume	1.92 **	1.77 **	2.64 **
%H2OSAT	Moisture Sat. @ Flue Gas Conditions, %	3.26	3.92	3.37
Mfd	Dry Mole Fraction	0.981	0.982	0.974
%CO2	Carbon Dioxide, Percent by Volume, Dry	0	0	0
%O2	Oxygen, Percent by Volume, Dry	20.9	20.9	20.9
Md	Gas Molecular Weight, Lb/Lb-Mole, Dry	28.84	28.84	28.84
Ms	Gas Molecular Weight, Lb/Lb-Mole, Wet	28.63	28.64	28.55
Pg	Flue Gas Static Pressure, Inches H2O	-0.45	-0.45	-0.45
Ps	Absolute Flue Gas Pressure, Inches Hg	30.18	30.07	30.02
	Volumetric Air Flow Rate			
ts	Flue Gas Temperature, Degrees F	78.5	84.1	79.4
Delta-p	Average Velocity Head, Inches H2O	0.1606	0.16	0.16
vs	Flue Gas Velocity, Feet per Second	22.72	22.83	22.79
A	Stack/Duct Area, Square Inches	113.1	113.1	113.1
Qsd	Volumetric Air Flow Rate, Dry SCFM*	1,039	1,031	1,027
Qmsd	Volumetric Air Flow Rate, Dry SCMM*	29	29	29
Qaw	Volumetric Air Flow Rate, Wet ACFM	1,071	1,076	1,074
ton/hr	Production Rate, tons/hour	529.20	469.80	496.80

* 68 ° F (20 ° C) -- 29.92 Inches of Mercury (Hg).

** Moisture used in calculations.

(Continued Next Page)

FIELD DATA AND RESULTS TABULATION

PLANT: Wake Stone, Knightdale, North Carolina

SAMPLING LOCATION: J2 Transfer Point

		Wet-J2-M201A-1	Wet-J2-M201A-2	Wet-J2-M201A-3
	Percent Isokinetic			
ts	Flue Gas Temperature, Degrees F	78.5	84.1	79.4
Delta-p	Average Velocity Head, Inches H2O	0.1606	0.16	0.16
vs	Flue Gas Velocity, Feet per Second	22.72	22.83	22.79
%I	Isokinetic Sampling Rate, Percent	85.8	84.8	87.6
	PM10 Calculations			
ucyc	Stack Gas Viscosity	181.6	183.1	181.3
Qs	PM10 Flow, at Cyclone Conditions, ACFM	0.451	0.448	0.462
D50	Dia. of Particles in Cyclone, Microns	9.95	10.09	9.79
	Particulate Catch,			
mg<D50	≤ 10 Microns, Milligrams	18.6	26.9	27.3
mg>D50	> 10 Microns, Milligrams	29.0	41.7	44.1
mg	Total Milligrams	47.6	68.6	71.4
	Percent of Total Particulate,			
%<D50	≤ 10 Microns	39.1	39.2	38.2
%>D50	> 10 Microns	60.9	60.8	61.8
	Particulate ≤ 10 Microns			
	Concentration, milligrams/DSCF*			
mg/DSCF	Concentration in Gas Sample	0.14	0.25	0.17
mg/DSCF,A	Concentration in Ambient Air	0.07	0.07	0.10
mg/DSCF,adj	Adjusted Concentration in Gas Sample	0.07	0.17	0.07
lb/hr	Emission Rate, lb/hr	0.009	0.024	0.010
lb/ton	Emission Rate, lb/ton	1.76E-05	5.07E-05	2.02E-05

* 68 ° F (20 ° C) -- 29.92 Inches of Mercury (Hg).

Appendix B. Raw Field Data Sheets

Sampling and Velocity Traverse Point Determination
EPA Method 1

PLANT NAME: WAKE STONE

CITY, STATE: KNIGHTDALE, N.C

SAMPLING LOCATION: C1 / J2 TP

NO. OF PORTS AVAILABLE: ~~USE~~ 1

NO. OF PORTS USED: ~~USE~~ 1

PORT INSIDE DIAMETER: 4"

DISTANCE FROM FAR WALL TO OUTSIDE OF PORT: 12"

NIPPLE LENGTH AND/OR WALL THICKNESS: —

DEPTH OF STACK OR DUCT: _____

STACK OR DUCT WIDTH (IF RECTANGULAR): 12

EQUIVALENT DIAMETER:

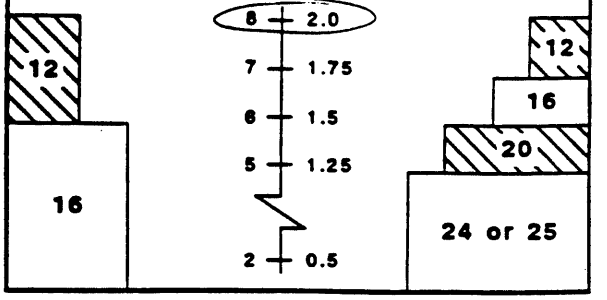
$D_E = \frac{2 \times \text{DEPTH} \times \text{WIDTH}}{\text{DEPTH} + \text{WIDTH}} = \frac{2 (\ -\ )(\ -\ )}{(\ -\ +\ -\ )} =$ 0

DISTANCE FROM PORTS TO FLOW DISTURBANCES	UPSTREAM	DOWNSTREAM
DIAMETERS	8	2
	96"	24"

STACK/DUCT AREA = — = 113/— IN²

DRAW HORIZONTAL LINE THROUGH DIAMETERS

If more than 8 and 2 diameters and if duct dia. is less than 24", use 8 or 9 points.



PITOT USED (✓) TYPE "S" ____ STANDARD ____

POINT	% OF DUCT DEPTH	DISTANCE FROM INSIDE WALL	DISTANCE FROM OUTSIDE OF PORT
1	4.4	.528	1/2
2	14.6	1.752	1 3/4
3	29.6	3.552	3 1/2
4	70.4	8.448	8 1/2
5	85.4	10.248	10 1/4
6	95.6	11.472	11 1/2
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			

LOCATION OF POINTS IN CIRCULAR STACKS OR DUCTS

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	36.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.5	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.6
24											98.9

LOCATION OF POINTS IN RECTANGULAR STACKS OR DUCTS

	2	3	4	5	6	7	8	9	10	11	12
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5				90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50.0	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	86.4	79.2
11										95.5	87.5
12											95.8

SEE REVERSE FOR FIELD USE CHECKLIST

ENTROPY

AIR FLOW RATE DETERMINATIONS

Client FPA EMB

Plant Wake Stone — Run No. C1-M2-1

City/State Knightdale, N.C. — Date 09-13-93

Test Location C1 Transfer Point — Personnel JED

Barometric Pressure (Pbar) 30.21 "Hg — Static Presure (Pg) -.45 "H_2O

Pitot/Orifice ID DP609 — Pitot Coef. (C_p) .84 — Pres. Gauge Set ID N-37

Thermocouple ID R182 — Duct Depth/(Diameter) 12" — Width N/A

---Specify inches (") or feet (')---

VELOCITY TRAVERSES Start-Finish Times: 0755 - 0800

Point No.	ΔP In. H_2O	Temp. °F
A-1	.15	57
2	.16	58
3	.155	59
4	.18	59
5	.185	59
6	.175	59
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	CO (C) Reading	%CO (C-B)
	Average					

Orsat ID _____ Bag ID _____ F_o _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd =		SCFM
Wet at Stack Conditions, Qaw =		ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

F-1023 rev. 6-93

METHOD 201A (PM-10) FIELD DATA

Client: EPA EMB
Plant Name: Wake Stone
City/State: Knightdale, N.C.
Sampling Location: CI Transfer Point
Date: 09-13-93 Team Leader: JED Techs: —
Run Number: WET-CI-M201A-1
Time Start: 0805
Time Stop: 1505
Job Number: 50119
*Train Leak Check Vacuum, In. Hg: 4 5 — —
Train Leak Rate, Cubic Ft./Min.: .018 .004 — —
Barometric Pressure, In. Hg: 30.21
Static Pressure, In. H_2O: -.45

EQUIPMENT CHECKS

- ✓ Pitot, Pretest
- ✓ Pitot, Posttest
- N/A M3 Sampling Sys/Ted Bag
- ✓ Thermocouple @ 59 Pre
- ✓ Thermocouple @ 85 Post

IDENTIFICATION NUMBERS

Meterbox: N37
Meterbox Gamma: 1.0099
Reagent Box: 0214
T/C Readout: 77
T/C Probe: R316
Umbilical: 68
Sampling Box: 49
Orsat Pump: N/A
Tedlar Bag: N/A
Nozzle(s) Actually Used:
No. 1004 Diameter .249 No. ____ Diameter ____
Pitot: DP 609

FILTER NO.	TARE
PM2	0.2167

Est % H_2O: 2

Delta $H_@$	1.866
Delta H_t	0.651
Delta H_{t+50}	0.541
Delta H_{t-50}	0.797
Delta P_{avg}	.167
Meter Temp.	104
Stack Temp.	76

NOZZLE SELECTION CRITERIA

Desired Dia. .241

	Nozzle 1	Nozzle 2
Diameter	0.249	
Nozzle Number	1004	
Delta P_{min}	0.0367	
Delta P_{max}	0.2801	

PYRITE

C_p .84

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (ΔP)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (ΔH)	Vacuum Gauge, In. Hg	Gas Temps Filter Box, °F	Gas Temps Imping Exit, °F	Cyclone Temp, °F
1	A-2	15	0	728.608	.16	80	59	.65	2	N/A	56	59
2	2	15	15	735.39	.16	90	62	.65	2		54	62
3	2	15	30	742.21	.16	96	64	.65	2		53	64
4	2	15	45	749.02	.16	100	67	.65	2		53	67
5	2	15	60	755.85	.16	102	69	.65	2		52	69
6	2	15	75	762.68	.16	104	74	.65	2		52	74
7	2	15	90	769.44	.16	105	75	.65	2		52	75
8	2	15	105	776.15	.16	105	76	.65	2		53	76
9	2	15	120	782.94	.16	106	76	.65	2		53	76
10	2	15	135	789.74	.16	106	78	.65	2		53	78
11	2	15	150	796.51	.16	107	78	.65	2		53	78
12	2	15	165	803.23	.16	107	79	.65	2		51	79
		____ minutes		____ Vm		____ $(\sqrt{\Delta P})^2$		____ tm	____ ts			____ ΔH

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

METHOD 201A (PM-10) FIELD DATA (continued)

Plant Name: Wake Stone
City/State: Knightdale, N.C.
Sampling Location: C1 Transfer Point

Run Number: WET-C1-M201A-1
Time Start: 0805
Time Stop: 1505

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (ΔP)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (ΔH)	Vacuum Gauge, In. Hg	Gas Temps: Filter Box, °F	Gas Temps: Imping Exit, °F	Cyclone Temp, °F
13	A-2	15	180	809.93	.16	109	80	.65	2	N/A	51	80
14	2	15	195	816.73	.16	109	80	.65	2		51	80
15	2	15	210	823.52	.16	98	84	.65	2		57	84
16	2	15	225	830.21	.16	103	83	.65	2		54	83
17	2	15	240	836.92	.16	106	83	.65	2		54	83
18	2	15	255	843.61	.16	108	84	.65	2		53	84
19	2	15	270	850.35	.16	110	85	.65	2		52	85
20	2	15	285	857.03	.16	112	83	.65	2		53	85
21	2	15	300	863.87	.16	112	84	.65	2		53	84
22	2	15	315	866.409	.16							
23												
24												
25												
26												
27												
28												
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30												
31												
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36												
37												
38												
39												
40												

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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minutes	Vm	$(\sqrt{\Delta P})^2$	tm	ts	ΔH

ENTROPY

AIR FLOW RATE DETERMINATIONS

Client EPA EMB

Plant Wake Stone — Run No. C1-MZ-2

City/State Knightdale, N.C. — Date 09-13-93

Test Location C1 Transfer Point — Personnel JED, DWS

Barometric Pressure (Pbar) 30.21 "Hg — Static Presure (Pg) -.47 "H_2O

Pitot/Orifice ID DP 60-9 — Pitot Coef. (C_p) .84 — Pres. Gauge Set ID N-37

Thermocouple ID R 182 — Duct Depth/Diameter 12" — Width ____

---Specify inches (") or feet (')---

VELOCITY TRAVERSES Start-Finish Times: 1528 - 1535

Point No.	ΔP In. H_2O	Temp. °F
A-1	.145	85
2	.165	85
3	.18	85
4	.19	85
5	.19	85
6	.175	85
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	$\%O_2$ (B-A)	CO (C) Reading	%CO (C-B)
	Average					

Orsat ID ____ Bag ID ____ F_o ____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd =		SCFM
Wet at Stack Conditions, Qaw =		ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

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AIR FLOW RATE DETERMINATIONS

Client EPA EMB

Plant Wake Stone — Run No. C1-M2-1

City/State Knightdale, N.C. — Date 09-15-93

Test Location C1 Transfer Point — Personnel JED, DWS

Barometric Pressure (Pbar) 30.1 "Hg — Static Presure (Pg) -.45 "H_2O

Pitot/Orifice ID DP 60-9 — Pitot Coef. (C_p) .84 — Pres. Gauge Set ID N 37

Thermocouple ID R 182 — Duct Depth/(Diameter) 12" — Width N/A

---Specify inches (") or feet (')---

VELOCITY TRAVERSES Start-Finish Times: 0655 - 0700

Point No.	ΔP In. H_2O	Temp. °F
A-1	.145	70
2	.14	70
3	.145	70
4	.18	70
5	.175	70
6	.16	70
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	CO (C) Reading	%CO (C-B)
	Average					

Orsat ID _____ Bag ID _____ F_o _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd =		SCFM
Wet at Stack Conditions, Qaw =		ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

F-1023 rev. 6-93

METHOD 201A (PM-10) FIELD DATA

Client EPA EMB
Plant Name Wake Stone
City/State Knightdale, N.C.
Sampling Location C1 Transfer Point
Date 09-15-93 Team Leader _____ Techs —
*Train Leak Check Vacuum, In. Hg 5
Train Leak Rate, Cubic Ft./Min. .012

Run Number WET C1-M201A-2
Time Start 0735
Time Stop 1501
Job Number 50119
Barometric Pressure, In. Hg 30.1
Static Pressure, In. H_2O -.45

EQUIPMENT CHECKS
- ✓ Pitot, Pretest
- ✓ Pitot, Posttest
- N/A M3 Sampling Sys/Ted Bag
- ✓ Thermocouple @ 71 Pre
- ✓ Thermocouple @ 85 Post

IDENTIFICATION NUMBERS
Meterbox N37 Meterbox Gamma 1.0099 Reagent Box 0214
T/C Readout 77 T/C Probe R316 Umbilical 68
Sampling Box 49 Orsat Pump N/A Tedlar Bag N/A
Nozzle(s) Actually Used: Pitot DP60-9
No. CAE Diameter .266 No. _____ Diameter _____

FILTER NO.	TARE
PM366	0.2733

Est % H_2O _____

Delta $H_@$	1.866
Delta H_t	.651
Delta H_{t+50}	.544
Delta H_{t-50}	.794
Delta P_{avg}	.157
Meter Temp.	95
Stack Temp.	80

NOZZLE SELECTION CRITERIA
Desired Dia. .246

	Nozzle 1	Nozzle 2
Diameter	.266	
Nozzle Number	CAE	
Delta P_{min}	.0288	
Delta P_{max}	.2310	

FYRITE
C_p .84

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (ΔP)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (ΔH)	Vacuum Gauge, In. Hg	Gas Temps: Filter Box, °F	Gas Temps: Imping Exit, °F	Cyclone Temp, °F
1	6	0	0	867.338	.157	73	72	.65	2	N/A	54	72
2	6	15	15	874.128	.157	80	71	.65	2		52	71
3	6	30 15	30	880.97	.157	86	71	.65	2		50	71
4	6	45 15	45	887.68	.157	87	74	.65	2		50	74
5	6	60 15	60	894.44	.157	88	76	.65	2		51	78
6	6	75 15	75	901.22	.157	92	79	.65	2		52	79
7	6	90 15	90	907.95	.157	95	79	.65	2		52	79
8	6	105 15	105	914.78	.157	100	80	.65	2		52	80
9	6	120 15	120	921.62	.157	102	81	.65	2		53	81
10	6	135 15	135	928.34	.157	103	82	.65	2		53	81
11	6	150 15	150	935.25	.157	94	83	.65	2		57	83
12	6	165 15	165	942.08	.157	99	84	.65	2		55	84
		_____ minutes		Vm	$(\sqrt{\Delta P})^2$		tm	ts			ΔH	

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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METHOD 201A (PM-10) FIELD DATA (continued)

Client: EPA EMB
Plant Name: Wake Stone
City/State: Knightdale, N.C.
Sampling Location: C1 Transfer Point

Run Number: WET-C1-M201A-2
Job Number: 50119

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (P)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (H)	Vacuum Gauge, In. Hg	Gas Temps Filter Box, °F	Gas Temps Imping Exit, °F	Cyclone Temp, °F
13	6	15	180	948.83	.157	103	85	.65	2	N/A	55	85
14	6	15	195	955.67	.157	107	85	.65	2		54	85
15	6	15	210	962.39	.157	108	86	.65	2		55	86
16	6	15	225	969.20	.157	108	86	.65	2		55	86
17	6	15	240	974.843	.157							
18	6	15	255		.157							
19	6	15	270		.157							
20	6	15	285		.157							
21	6	15	300		.157							
22	6	15	315		.157							
23	6	15	330		.157							
24	6	15	345		.157							
25			360		.157							
26												
27												
28												
23												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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AIR FLOW RATE DETERMINATIONS

Client EPA EMB

Plant Wake Stone — Run No. C1-M2-2

City/State Knightdale, N.C. — Date 09-15-93

Test Location C1 Transfer Point — Personnel JED DWS

Barometric Pressure (Pbar) 30.1 "Hg — Static Presure (Pg) -.47 "H_2O

Pitot/Orifice ID DP 60 G — Pitot Coef. (C_p) .84 — Pres. Gauge Set ID N37

Thermocouple ID F 182 — Duct Depth/Diameter 12" — Width N/A

---Specify inches (") or feet (')---

VELOCITY TRAVERSES Start-Finish Times: 1530 - 1535

Point No.	ΔP In. H_2O	Temp. °F
A-1	.16	87
2	.155	87
3	.165	87
4	.195	87
5	.195	87
6	.16	87
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	CO (C) Reading	%CO (C-B)
	Average					

Orsat ID _____ Bag ID _____ F_o _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd	=	SCFM
Wet at Stack Conditions, Qaw	=	ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

F-1023 rev. 6-93

AIR FLOW RATE DETERMINATIONS

Client EPA EMB

Plant Wake Stone — Run No. C1-M2-1

City/State Knightdale, N.C. — Date 09-16-93

Test Location C1 Transfer Point — Personnel JED, DWS

Barometric Pressure (Pbar) 30.05 "Hg — Static Presure (Pg) -.45 "H_2O

Pitot/Orifice ID DP 60-9 — Pitot Coef. (C_p) .84 — Pres. Gauge Set ID N 37

Thermocouple ID R 182 — Duct Depth/(Diameter) 12" — Width N/A

---Specify inches (") or feet (')---

VELOCITY TRAVERSES Start-Finish Times: 0655 - 0659

Point No.	ΔP In. H_2O	Temp. °F
A-1	.15	74
2	.14	74
3	.155	74
4	.185	74
5	.20	74
6	.165	74
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	CO (C) Reading	%CO (C-B)
	Average					

Orsat ID _____ Bag ID _____ F_o _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd =		SCFM
Wet at Stack Conditions, Qaw =		ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

F-1023 rev. 6-93

METHOD 201A (PM-10) FIELD DATA

Client: EPA EMB
Plant Name: Wake Stone
City/State: Knightdale, N.C.
Sampling Location: C1 Transfer Point
Date: 09-16-93 Team Leader: JED Techs: —

Run Number: WET-C1-M201A-3
Time Start: 0725
Time Stop: 1458
Job Number: 50119

*Train Leak Check Vacuum, In. Hg: 7 | 5" | — | —
Train Leak Rate, Cubic Ft./Min.: .011 | .009 | — | —

Barometric Pressure, In. Hg: 30.05
Static Pressure, In. H_2O: -.45

EQUIPMENT CHECKS

- ✓ Pitot, Pretest
- ✓ Pitot, Posttest
- N/A M3 Sampling Sys/Ted Bag
- ✓ Thermocouple @ 74 Pre
- ✓ Thermocouple @ 84 Post

IDENTIFICATION NUMBERS

Meterbox: N37 Meterbox Gamma: 1.0099 Reagent Box: 0214
T/C Readout: 77 T/C Probe: D88 Umbilical: 68
Sampling Box: 102 Orsat Pump: N/A Tedlar Bag: N/A
Nozzle(s) Actually Used: Pitot: DP 60 G
No. — Diameter: .266 No. — Diameter —

FILTER NO.	TARE
PM355	0.29016

Est % H_2O: 25

Delta $H_@$	1.866
Delta H_t	0.647
Delta H_{t+50}	0.540
Delta H_{t-50}	0.791
Delta P_{avg}	.165
Meter Temp.	96
Stack Temp.	78.5

NOZZLE SELECTION CRITERIA

Desired Dia. —

	Nozzle 1	Nozzle 2
Diameter	.266	
Nozzle Number	G.G	
Delta P_{min}	0.0284	
Delta P_{max}	26.84	

FYRITE

C_p .84

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (ΔP)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (ΔH)	Vacuum Gauge, In. Hg	Gas Temps: Filter Box, °F	Gas Temps: Imping Exit, °F	Cyclone Temp, °F
1	A-6	15	0	974.921	.165	73	74	.65	2	N/A	58	74
2	6	15	15	981.75	.165	77	74	.65	2		55	74
3	6	15	30	988.54	.165	82	75	.65	2		52	75
4	6	15	45	995.35	.165	88	76	.65	2		52	76
5	6	15	60	1002.17	.165	94	77	.65	2		51	77
6	6	15	75	1009.02	.165	96	78	.65	2		51	78
7	6	15	90	1015.88	.165	98	78	.65	2		52	78
8	6	15	105	1023.29	.165	94	77	.65	2		52	77
9	6	15	120	1030.21	.165	97	77	.65	2		51	77
10	6	15	135	1037.08	.165	99	78	.65	2		52	78
11	6	15	150	1043.83	.165	100	78	.65	2		53	78
12	6	15	165	1050.61	.165	100	78	.65	2		53	78
		—	—	—	—	—	—	—				
		minutes		Vm	$(\sqrt{\Delta P})^2$		tm	ts				ΔH

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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METHOD 201A (PM-10) FIELD DATA (continued)

Client EPA EMB
Plant Name Wake Stone
City/State Knightdale, N.C.
Sampling Location C1 Transfer Point

Run Number WET-C1-M201A-3
Job Number 50119

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (P)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (H)	Vacuum Gauge, In. Hg	Gas Temps Filter Box, °F	Gas Temps Imping Exit, °F	Cyclone Temp, °F
13	A-6	15	180	~~10.5~~ 1057.33	.165	101	78	.65	2	N/A	54	78
14	6	15	195	~~10.64.0~~ 1064.07	.165	103	79	.65	2		52	79
15	6	15	210	1070.94	.165	92	80	.65	2		52	80
16	6	15	225	1077.86	.165	93	80	.65	2		51	80
17	6	15	240	1084.57	.165	96	80	.65	2		51	80
18	6	15	255	1091.32	.165	100	81	.65	2		50	81
19	6	15	270	1097.93	.165	103	81	.65	2		51	81
20	6	15	285	1104.66	.165	104	82	.65	2		52	82
21	6	15	300	1111.43	.165	104	82	.65	2		52	82
22	6	15	315	1118.18	.165	105	82	.65	2		53	82
23	6	15	330	1124.91	.165	106	83	.65	2		54	83
24	6	15	345	1131.63	.165	106	83	.65	2		54	83
25			360	1138.33								
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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AIR FLOW RATE DETERMINATIONS

Client EPA EMB

Plant Wake Stone — Run No. C1-M2-2

City/State Knightdale, N.C. — Date 09-16-93

Test Location C1 Transfer Point — Personnel JED, DWS

Barometric Pressure (Pbar) 30.05 "Hg — Static Presure (Pg) -.45 "H_2O

Pitot/Orifice ID DP60-9 — Pitot Coef. (C_p) .84 — Pres. Gauge Set ID N37

Thermocouple ID R182 — Duct Depth/(Diameter) 12" — Width N/A

---Specify inches (") or feet (')---

VELOCITY TRAVERSES Start-Finish Times: 1510 - 1514

Point No.	ΔP In. H_2O	Temp. °F
A-1	.14	85
2	.15	85
3	.16	85
4	.195	85
5	.20	85
6	.175	85
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	CO (C) Reading	%CO (C-B)
	Average					

Orsat ID _____ Bag ID _____ F_o _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd =		SCFM
Wet at Stack Conditions, Qaw =		ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

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AIR FLOW RATE DETERMINATIONS

Client EPA EMB

Plant Wake Stone — Run No. C1-M2-1

City/State Knightdale, N.C. — Date 09-20-93

Test Location C1 Transfer Point — Personnel JED, DWS

Barometric Pressure (Pbar) 30.11 "Hg — Static Presure (Pg) -.40 "H_2O

Pitot/Orifice ID DP60-9 — Pitot Coef. (C_p) .84 — Pres. Gauge Set ID N 37

Thermocouple ID R 182 — Duct Depth/(Diameter) 12" — Width N/A

---Specify inches (") or feet (')---

VELOCITY TRAVERSES Start-Finish Times: 0750 - 0754

Point No.	ΔP In. H_2O	Temp. °F
A-1	.125	58
2	.13	58
3	.145	58
4	.175	58
5	.19	58
6	.16	58
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	$\%O_2$ (B-A)	CO (C) Reading	%CO (C-B)
	Average					

Orsat ID _____ Bag ID _____ F_o _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd =		SCFM
Wet at Stack Conditions, Qaw =		ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

METHOD 201A (PM-10) FIELD DATA

Client EPA EMB
Plant Name Wake Stone
City/State Knightdale, N.C
Sampling Location Ci Transfer Point
Date 09-20-93 Team Leader JED Techs —

Run Number DRY-CI-M201A-1
Time Start 0717
Time Stop 0817
Job Number 50119

*Train Leak Check Vacuum, In. Hg 7 6 — —
Train Leak Rate, Cubic Ft./Min. .004 .006 — —

Barometric Pressure, In. Hg 30.11
Static Pressure, In. H_2O -.40

EQUIPMENT CHECKS

- ✓ Pitot, Pretest
- ✓ Pitot, Posttest
- N/A M3 Sampling Sys/Ted Bag
- ✓ Thermocouple @ 59 Pre
- ✓ Thermocouple @ 61 Post

IDENTIFICATION NUMBERS

Meterbox N37 Meterbox Gamma 1.0099 Reagent Box —
T/C Readout 77 T/C Probe D-88 Umbilical 68
Sampling Box 49 Orsat Pump N/A Tedlar Bag N/A
Nozzle(s) Actually Used: Pitot DP60-9
No. — Diameter .266 No. N/A Diameter N/A

FILTER NO.	TARE
PM374	.2643

Est % H_2O 1

Delta $H_@$ 1.866
Delta H_t .643
Delta H_{t+50} .535
Delta H_{t-50} .788
Delta P_{avg} .153
Meter Temp. 76
Stack Temp. 60

NOZZLE SELECTION CRITERIA

Desired Dia. .247

	Nozzle 1	Nozzle 2
Diameter	.266	
Nozzle Number	CAE	
Delta P_{min}	.0284	
Delta P_{max}	.225	

FYRITE N/A

C_p .84

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (ΔP)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (ΔH)	Vacuum Gauge, In. Hg	Gas Temps: Filter Box, °F	Gas Temps: Imping Exit, °F	Cyclone Temp, °F
1	A-3	10	0	143.347	.153	64	59	.64	2	N/A	53	59
2	3	10	10	147.84	.153	73	59	.64	2		49	59
3	3	10	20	152.35	.153	76	59	.64	2		48	59
4	3	10	30	156.87	.153	79	60	.64	2		48	60
5	3	10	40	161.39	.153	80	60	.64	2		50	60
6	3	10	50	165.92	.153	82	60	.64	2		51	60
7			60	170.457								
8												
9												
10												
11												
12												

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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minutes Vm $(\sqrt{\Delta P})^2$ tm ts ΔH

AIR FLOW RATE DETERMINATIONS

Client EPA EMB

Plant Wake Stone — Run No. C1-M2-2

City/State Knightdale, N.C — Date 09-20-93

Test Location C1 Transfer Point — Personnel JED, DWS

Barometric Pressure (Pbar) 30.11 "Hg — Static Presure (Pg) -.40 "H_2O

Pitot/Orifice ID DP 60-9 — Pitot Coef. (C_p) .84 — Pres. Gauge Set ID N37

Thermocouple ID R182 — Duct Depth/(Diameter) 12" — Width N/A

---Specify inches (") or feet (')---

VELOCITY TRAVERSES Start-Finish Times: 0825 - 0828

Point No.	ΔP In. H_2O	Temp. °F
A-1	.12	61
2	.13	61
3	.135	61
4	.175	61
5	.19	61
6	.175	61
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	CO (C) Reading	%CO (C-B)
	Average					

Orsat ID _____ Bag ID _____ F_o _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd =		SCFM
Wet at Stack Conditions, Qaw =		ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

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METHOD 201A (PM-10) FIELD DATA

Client EPA EMB
Plant Name Wake Stone
City/State Knightdale, N.C.
Sampling Location C1 Transfer Point
Date 09-20 93 Team Leader JED Techs —

Run Number DRY-C1-M201A-2
Time Start 0835
Time Stop 0935
Job Number 50119

*Train Leak Check Vacuum, In. Hg 6 4" — —
Train Leak Rate, Cubic Ft./Min. .008 .008 — —

Barometric Pressure, In. Hg 30.11
Static Pressure, In. H_2O —

EQUIPMENT CHECKS

- ✓ Pitot, Pretest
- ✓ Pitot, Posttest
- N/A M3 Sampling Sys/Ted Bag
- ✓ Thermocouple @ 102 Pre
- ✓ Thermocouple @ 105 Post

IDENTIFICATION NUMBERS

Meterbox N-37 Meterbox Gamma 1.099 Reagent Box —
T/C Readout 77 T/C Probe R316 Umbilical 68
Sampling Box 102 Orsat Pump N/A Tedlar Bag N/A
Nozzle(s) Actually Used: Pitot DP60-9
No. CAE Diameter .2666 No. N/A Diameter N/A

FILTER NO.	TARE
PM203	.2717

Est % H_2O 1

Delta $H@$ 1.866
Delta H_t .1656
Delta H_{t+50} .546
Delta H_{t-50} .802
Delta P_{avg} .153
Meter Temp. 83
Stack Temp. 65

NOZZLE SELECTION CRITERIA

Desired Dia. .247

	Nozzle 1	Nozzle 2
Diameter	.266	
Nozzle Number	CAE	
Delta P_{min}	.0285	
Delta P_{max}	.2214	

FYRITE N/A

C_p .84

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (ΔP)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (ΔH)	Vacuum Gauge, In. Hg	Gas Temps: Filter Box, °F	Gas Temps: Imping Exit, °F	Cyclone Temp, °F
1	A-3	10	0	170.501	.153	78	62	.66	2	N/A	53	62
2	3	10	10	175.04	.153	80	63	.66	2		50	63
3	3	10	20	179.59	.153	82	64	.66	2		48	64
4	3	10	30	184.13	.153	84	65	.66	2		48	65
5	3	10	40	188.75	.153	85	67	.66	2		49	67
6	3	10	50	193.33	.153	87	68	.66	2		50	68
7			60	197.862								
8												
9												
10												
11												
12												

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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minutes Vm $(\sqrt{\Delta P})^2$ tm ts ΔH

AIR FLOW RATE DETERMINATIONS

Plant Name Wake Stone Run No. C1-M2-3

City/State Knightdale, N.C. Date 09-20-93

Test Location C1 Transfer Point Personnel JED, DWS

Barometric Pres. (Pbar) 30.11 In. Hg Static Pres. (Pg) -.40 In. H_2O

Pitot/Orifice ID DP 60-9 Pitot Coef. (Cp) .84 Pres. Gauge Set ID N 37

Thermocouple ID R 182 Duct Length/~~Diameter~~ 12'' Width N/A

--Specify inches (") or feet (')--

VELOCITY TRAVERSES
Start-Finish Times: 0937 - 0940

Point No.	ΔP In. H_2O	Temp. °F
A-1	.145	69
2	.15	69
3	.15	69
4	.17	69
5	.17	69
6	.155	69
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	$\%O_2$ (B-A)	$\%CO+N_2$ (100-B)
	Average				

Bag No. _____ Pump _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd =		SCFM
Wet at Stack Conditions, Qaw =		ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

See page 2 for field flow rate calculations.

ENTROPY

METHOD 201A (PM-10) FIELD DATA

Client: EPA EMB
Plant Name: Wake Stone
City/State: Knightdale, N.C.
Sampling Location: CI Transfer Point
Date: 09-20-93 Team Leader: JED Techs: —

Run Number: DRY-CI-M201A-3
Time Start: 0950
Time Stop: 1050
Job Number: 50119

*Train Leak Check Vacuum, In. Hg: 7 | 5 | — | —
Train Leak Rate, Cubic Ft./Min.: .005 | .004 | — | —

Barometric Pressure, In. Hg: 30.11
Static Pressure, In. H_2O: —

EQUIPMENT CHECKS

- ✓ Pitot, Pretest
- ✓ Pitot, Posttest
- N/A M3 Sampling Sys/Ted Bag
- ✓ Thermocouple @ 70 Pre
- ✓ Thermocouple @ 72 Post

IDENTIFICATION NUMBERS

Meterbox: N37 Meterbox Gamma: 1.0099 Reagent Box:
T/C Readout: 77 T/C Probe: D88 Umbilical: 68
Sampling Box: 69 Orsat Pump: N/A Tedlar Bag: N/A
Nozzle(s) Actually Used: Pitot: DP 609
No.: CAE Diameter: .266 No.: N/A Diameter: N/A

FILTER NO.	TARE
PM354	.2451

Est % H_2O: 1

Delta $H_@$	1.866
Delta H_t	.657
Delta H_{t+50}	.548
Delta H_{t-50}	.801
Delta P_{avg}	.157
Meter Temp.	89
Stack Temp.	71

NOZZLE SELECTION CRITERIA

Desired Dia.: .247

	Nozzle 1	Nozzle 2
Diameter	.266	
Nozzle Number	CAE	
Delta P_{min}	.0290	
Delta P_{max}	.2330	

FYRITE: N/A

C_p .84

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (ΔP)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (ΔH)	Vacuum Gauge, In. Hg	Gas Temps: Filter Box, °F	Gas Temps: Imping Exit, °F	Cyclone Temp, °F
1	A-6	10	0	197.943	.157	84	70	.67	2	N/A	56	70
2	6	10	10	202.56	.157	86	70	.67	2		54	70
3	6	10	20	207.15	.157	88	71	.67	2		54	71
4	6	10	30	211.75	.157	90	71	.67	2		54	71
5	6	10	40	216.35	.157	92	72	.67	2		55	72
6	6	10	50	220.95	.157	94	72	.67	2		55	72
7			60	225.552								
8												
9												
10												
11												
12												

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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minutes | Vm | $(\sqrt{\Delta P})^2$ | tm | ts | ΔH

AIR FLOW RATE DETERMINATIONS

Plant Name Wake Stone Run No. C1-MZ-4

City/State Knightdale, N.C Date 09-20-93

Test Location C1 Transfer Point Personnel JED, DWS

Barometric Pres. (Pbar) 30.11 In. Hg Static Pres. (Pg) _____ In. H_2O

Pitot/Orifice ID DP60-9 Pitot Coef. (Cp) .84 Pres. Gauge Set ID N 37

Thermocouple ID R 182 Duct Length/Diameter 12" Width N/A

--Specify inches (") or feet (')--

VELOCITY TRAVERSES
Start-Finish Times: 1055 - 1058

Point No.	ΔP In. H_2O	Temp. °F
A-1	.13	72
2	.14	72
3	.155	72
4	.18	72
5	.19	72
6	185	72
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	%$CO+N_2$ (100-B)
	Average				

Bag No. _____ Pump _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd =		SCFM
Wet at Stack Conditions, Qaw =		ACFM

ADDITIONAL DATA

* ΔP average is square of average square root. See page 2 for field flow rate calculations.

ENTROPY

AIR FLOW RATE DETERMINATIONS

Client EPA EMB

Plant Wake Stone — Run No. J2-M2-1

City/State Knightdale, N.C. — Date 09-[illegible]-93

Test Location J2 Transfer Point — Personnel JED, DWS

Barometric Pressure (Pbar) 30.21 "Hg — Static Presure (Pg) -.45 "H_2O

Pitot/Orifice ID DP-60-9 — Pitot Coef. (C_p) .84 — Pres. Gauge Set ID N-37

Thermocouple ID R 182 — Duct Depth/Diameter 12" — Width N/A

---Specify inches (") or feet (')---

VELOCITY TRAVERSES Start-Finish Times: 0710 - 0715

Point No.	ΔP In. H_2O	Temp. °F
A-1	.145	59
2	.17	59
3	.17	59
4	.165	59
5	.16	59
6	.155	59
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	CO (C) Reading	%CO (C-B)
	Average					

Orsat ID _____ Bag ID _____ F_o _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd =		SCFM
Wet at Stack Conditions, Qaw =		ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

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METHOD 201A (PM-10) FIELD DATA

Client: EPA / STONE CRUSHING
Plant Name: WAKE STONE
City/State: KNIGHTDALE, N.C.
Sampling Location: J2 TRANSFER POINT
Date: 9/13/95 Team Leader: TIB Techs: DWS / JRD

Run Number: WFT-J2-M201A-1
Time Start: 0810
Time Stop: 1507
Job Number: 50119

*Train Leak Check Vacuum, In. Hg: 10
Train Leak Rate, Cubic Ft./Min.: .001

Barometric Pressure, In. Hg: 30.21
Static Pressure, In. H_2O: -.45

EQUIPMENT CHECKS

- ✓ Pitot, Pretest
- ✓ Pitot, Posttest
- NA M3 Sampling Sys/Ted Bag
- 63 Thermocouple ✓ Pre
- 85 Thermocouple ✓ Post

IDENTIFICATION NUMBERS

Meterbox: N19 Meterbox Gamma: 1.0015 Reagent Box: 612
T/C Readout: F64 T/C Probe: R278 Umbilical: UB2
Sampling Box: 102 Orsat Pump: NA Tedlar Bag: NA
Nozzle(s) Actually Used: Pitot: —
No. 2004 Diameter: .252 No. ____ Diameter ____

FILTER NO.	TARE
PM 373	.2710

Est % H_2O: 1.0

Delta $H_@$: 1.87
Delta H_t: .651
Delta H_{t+50}: .542
Delta H_{t-50}: .798
Delta P_{avg}: .1607
Meter Temp.: 80
Stack Temp.: 59

NOZZLE SELECTION CRITERIA

Desired Dia.: .244

	Nozzle 1	Nozzle 2
Diameter	.252	
Nozzle Number	2004	
Delta P_{min}	.0353	
Delta P_{max}	.2724	

FYRITE: NA

C_p: .84

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (ΔP)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (ΔH)	Vacuum Gauge, In. Hg	Gas Temps: Filter Box, °F	Gas Temps: Imping Exit, °F	Cyclone Temp, °F
1	A-5	15	0	955.318	.16	83	63	.6514	1.0	NA	65	63
2			15	962.28		85	63				64	63
3			30	969.19		87	66				60	66
4			45	976.16		92	68				56	68
5			60	983.14		97	73				56	73
6			75	990.09		97	73				54	73
7			90	997.07		98	74				54	74
8			105	1003.98		98	76				52	76
9			120	1010.92		98	79				50	79
10			135	1017.85		99	80				49	80
11			150	1024.79		100	80				50	80
12			165	1031.54		100	80				50	80
			CONT. →									

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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minutes | Vm | $(\sqrt{\Delta P})^2$ | tm | ts | ΔH

METHOD 201A (PM-10) FIELD DATA (continued)

Client: EPA / STONE CRUSHING
Plant Name: WAKE STONE
City/State: KNIGHTDALE, N.C.
Sampling Location: J2 TRANSFER POINT

Run Number: WET-J2-M201A-1
Job Number: 50119

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (P)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (H)	Vacuum Gauge, In. Hg	Gas Temps Filter Box, °F	Gas Temps Imping Exit, °F	Cyclone Temp, °F
13	A-5	15	180	1038.37	.16	103	82	.6514	1.0	NA	50	82
14			195	1045.19		92	85				50	85
15			210	1052.16		98	85				52	85
16			~~225~~	1059.11		99	85				50	85
17			240	1066.05		100	85				50	85
18			255	1073.03		100	85				50	85
19			~~270~~	1079.99		105	85				52	85
20			~~285~~	1086.91		106	85				54	85
21			300	1092.45		110	85				54	85
22			~~315~~	1095.216							56	85
23			~~330~~									
24			~~345~~									
25	STOP	306.26	~~360~~									
26	AT											
27												
28												
23												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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AIR FLOW RATE DETERMINATIONS

Client EPA EMB

Plant Wake Stone — Run No. JZ-M2-2

City/State Knightdale, N.C. — Date 09-13-93

Test Location JZ Transfer Point — Personnel JED, DWS

Barometric Pressure (Pbar) 30.21 "Hg — Static Presure (Pg) -.49 "H_2O

Pitot/Orifice ID DP-60-9 — Pitot Coef. (C_p) .84 — Pres. Gauge Set ID N37

Thermocouple ID E182 — Duct Depth/(Diameter) 12" — Width N/A

---Specify inches (") or feet (')---

VELOCITY TRAVERSES Start-Finish Times: 1535 - 1538

Point No.	ΔP In. H_2O	Temp. °F
A-1	.185	85
2	.21	85
3	.19	85
4	.20	85
5	.205	85
6	.19	85
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	CO (C) Reading	%CO (C-B)
	Average					

Orsat ID _____ Bag ID _____ F_o _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd =		SCFM
Wet at Stack Conditions, Qaw =		ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

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AIR FLOW RATE DETERMINATIONS

Client EPA EMB

Plant Wake Stone — Run No. J2-M2-1

City/State Knightdale, N.C. — Date 09-15-93

Test Location J2 Transfer Point — Personnel JED, DWS

Barometric Pressure (Pbar) 30.1 "Hg — Static Presure (Pg) -.45 "H_2O

Pitot/Orifice ID DP 60-9 — Pitot Coef. (C_p) .84 — Pres. Gauge Set ID N 37

Thermocouple ID R 182 — Duct Depth/(Diameter) 12" — Width N/A

---Specify inches (") or feet (')---

VELOCITY TRAVERSES Start-Finish Times: 0702 - 0707

Point No.	ΔP In. H_2O	Temp. °F
A-1	.16	70
2	.165	70
3	.155	70
4	.17	70
5	.16	70
6	.145	70
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	CO (C) Reading	%CO (C-B)
	Average					

Orsat ID _____ Bag ID _____ F_o _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd =		SCFM
Wet at Stack Conditions, Qaw =		ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

F-1023 rev. 6-93

METHOD 201A (PM-10) FIELD DATA

Client: EPA / STONE CRUSHING
Plant Name: WAKE STONE
City/State: KNIGHTDALE, N.C.
Sampling Location: J2 TRANSFER POINT
Date: 9/15/93 Team Leader: TTB Techs: DWS / JED
*Train Leak Check Vacuum, In. Hg: 10
Train Leak Rate, Cubic Ft./Min.: .002

Run Number: WFT-J2-M201A-2
Time Start: 0785
Time Stop: 0310
Job Number: 50119
Barometric Pressure, In. Hg: 30.10
Static Pressure, In. H_2O: -.45

EQUIPMENT CHECKS

- ✓ Pitot, Pretest
- ✓ Pitot, Posttest
- ✓ M3 Sampling Sys/Ted Bag
- ✓ Thermocouple @ 70 Pre
- ✓ Thermocouple @ 72 Post

IDENTIFICATION NUMBERS

Meterbox: N19 Meterbox Gamma: 1.0015 Reagent Box: 612
T/C Readout: F64 T/C Probe: R278 Umbilical: 492
Sampling Box: 77 Orsat Pump: NA Tedlar Bag: NA
Nozzle(s) Actually Used: Pitot: NA
No.: CAE Diameter: .266 No.: Diameter:

FILTER NO.	TARE
PM552	.2645

Est % H_2O: 2.0

Delta $H_@$	1.87
Delta H_t	.635
Delta H_{t+50}	.530
Delta H_{t-50}	.774
Delta P_{avg}	.159
Meter Temp.	80
Stack Temp.	70

NOZZLE SELECTION CRITERIA

Desired Dia.: .245

	Nozzle 1	Nozzle 2
Diameter	.266	
Nozzle Number	CAE	
Delta P_{min}	.0288	
Delta P_{max}	.2310	

FYRITE: NA

C_p: .84

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (ΔP)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (ΔH)	Vacuum Gauge, In. Hg	Gas Temps: Filter Box, °F	Gas Temps: Imping Exit, °F	Cyclone Temp, °F
1	A-5	15	0	95.856	.16	70	72	.635	1.0	NA	60	72
2			15	102.81		80	71				54	71
3			30	109.68		85	73				45	73
4			45	116.60		85	78				45	78
5			60	123.49		85	78				45	78
6			75	130.39		85	79				45	79
7			90	137.27		85	82				45	82
8			105	144.19		85	82				45	82
9			120	151.38		85	82				45	82
10			135	158.34		85	86				42	86
11			150	165.29		85	90				40	90
12			165	172.26		85	91				40	91
			CONT. →									

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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minutes	Vm	$(\sqrt{\Delta P})^2$	tm	ts	ΔH

METHOD 201A (PM-10) FIELD DATA (continued)

Client: EPA / STONE CRUSHING
Plant Name: WAKE STONE
City/State: KNIGHTDALE, N.C.
Sampling Location: J2 T.P.

Run Number: WET-J2-M201A-2
Job Number: 50119

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (P)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (H)	Vacuum Gauge, In. Hg	Gas Temps Filter Box, °F	Gas Temps Imping Exit, °F	Cyclone Temp, °F
13	A-5	15	180	179.24	.16	85	91	.635	1.0	NA	42	91
14	↓	↓	195	186.21	↓	85	93	↓	↓	↓	42	93
15			210	193.18		88	93				43	93
16			225	200.15		88	94				45	94
17			240	207.12		90	94				46	94
18			255	207.706		95	95				50	95
19												
20												
21			STOP									
22			4:02:51									
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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AIR FLOW RATE DETERMINATIONS

Client EPA EMB

Plant Wake Stone — Run No. J2-M2-2

City/State Knightdale, N.C. — Date 09-15-93

Test Location J2 Transfer Point — Personnel JED, DWS

Barometric Pressure (Pbar) 30.1 "Hg — Static Presure (Pg) -.46 "H_2O

Pitot/Orifice ID DP60-9 — Pitot Coef. (C_p) .84 — Pres. Gauge Set ID N37

Thermocouple ID R182 — Duct Depth/Diameter 12" — Width N/A

---Specify inches (") or feet (')---

VELOCITY TRAVERSES Start-Finish Times: 1536 - 1540

Point No.	ΔP In. H_2O	Temp. °F
A-1	.18	89
2	.175	89
3	.175	89
4	.19	89
5	.18	89
6	.17	89
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	CO (C) Reading	%CO (C-B)
	Average					

Orsat ID _____ Bag ID _____ F_o _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd	=	SCFM
Wet at Stack Conditions, Qaw	=	ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

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AIR FLOW RATE DETERMINATIONS

Client EPA EMB

Plant Wake Stone Run No. J2-M2-1

City/State Knightdale, N.C. Date 09-16-93

Test Location J2 Transfer Point Personnel JED, DWS

Barometric Pressure (Pbar) 30.05 "Hg Static Presure (Pg) -.45 "H_2O

Pitot/Orifice ID DP 60-9 Pitot Coef. (C_p) .84 Pres. Gauge Set ID N 37

Thermocouple ID R 182 Duct Depth/(Diameter) 12" Width N/A

---Specify inches (") or feet (')---

VELOCITY TRAVERSES Start-Finish Times: 0700 - 0705

Point No.	ΔP In. H_2O	Temp. °F
A-1	.145	75
2	.17	75
3	.16	75
4	.17	75
5	.17	75
6	.16	75
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	CO (C) Reading	%CO (C-B)
	Average					

Orsat ID _____ Bag ID _____ F_o _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd	=	SCFM
Wet at Stack Conditions, Qaw	=	ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

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METHOD 201A (PM-10) FIELD DATA

Client: EPA / STONE CRUSHING
Plant Name: WAKE STONE
City/State: KNIGHTDALE, N.C
Sampling Location: I2 TRANSFER POINT
Date: 9/14/93 Team Leader: TTB Techs: DWS/JEB

Run Number: WET-I2-M201A-3
Time Start: 0725
Time Stop: 1500
Job Number: 30119

*Train Leak Check Vacuum, In. Hg: 10
Train Leak Rate, Cubic Ft./Min.: .002

Barometric Pressure, In. Hg: 30.05
Static Pressure, In. H_2O: -.45

EQUIPMENT CHECKS

- ✓ Pitot, Pretest
- ✓ Pitot, Posttest
- ✓ M3 Sampling Sys/Ted Bag
- ✓ Thermocouple @ 74 Pre
- ✓ Thermocouple @ 85 Post

IDENTIFICATION NUMBERS

Meterbox: N19 Meterbox Gamma: 1.0015 Reagent Box: 612
T/C Readout: F64 T/C Probe: R278 Umbilical: V92
Sampling Box: 77 Orsat Pump: NA Tedlar Bag: NA
Nozzle(s) Actually Used: Pitot: NA
No.: CAE Diameter: .266 No.: Diameter:

FILTER NO.	TARE
PM295	.2702

Est % H_2O: 2.0

Delta $H_@$	1.87
Delta H_t	.635
Delta H_{t+50}	.531
Delta H_{t-50}	.773
Delta P_{avg}	.162
Meter Temp.	80
Stack Temp.	74

NOZZLE SELECTION CRITERIA

Desired Dia.: .245

	Nozzle 1	Nozzle 2
Diameter	.266	
Nozzle Number	CAE	
Delta P_{min}	.0290	
Delta P_{max}	.2327	

FYRITE: NA

C_p .84

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (ΔP)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (ΔH)	Vacuum Gauge, In. Hg	Gas Temps: Filter Box, °F	Gas Temps: Imping Exit, °F	Cyclone Temp, °F
1	A-6	15	0	209.243	.16	70	74	.6351	1.0	NA	60	74
2			15	215.88		72	74				58	74
3			30	222.71		80	74				52	74
4			45	229.54		80	75				50	75
5			60	236.38		82	75				48	75
6			75	243.20		85	77				42	77
7			90	250.05		87	78				40	78
8			105	257.39		90	79				40	79
9			120	264.26		90	79				40	79
10			135	271.15		92	79				42	79
11			150	278.03		92	79				44	79
12			165	284.93		95	79				45	79
			CONT. →									

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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minutes | Vm | $(\sqrt{\Delta P})^2$ | tm | ts | ΔH

METHOD 201A (PM-10) FIELD DATA (continued)

Client: EPA / STONE CRUSHING
Plant Name: WAKE STONE
City/State: KNIGHTDALE, N.C
Sampling Location: J2 TP

Run Number: WET-J2-M201A-3
Job Number: 50119

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (P)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (H)	Vacuum Gauge, In. Hg	Gas Temps Filter Box, °F	Gas Temps Imping Exit, °F	Cyclone Temp, °F
13			180	291.82		98	79				45	79
14			195	298.55		100	80				45	80
15			210	305.37		84	83				42	83
16			225	312.26		90	82				42	82
17			240	319.09		90	83				40	83
18			255	325.92		94	83				40	83
19			270	332.79		98	83				40	83
20			285	339.62		99	83				42	83
21			300	346.47		99	82				42	82
22			315	353.33		100	82				45	82
23			330	360.18		100	82				45	82
24			345	366.99		100	82				46	82
25			360	373.819								
26												
27												
28												
23												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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AIR FLOW RATE DETERMINATIONS

Client EPA EMB

Plant Wake Stone — Run No. J2-M2-2

City/State Knightdale, N.C. — Date 09-16-93

Test Location J2 Transfer Point — Personnel JED, DWS

Barometric Pressure (Pbar) 30.05 "Hg — Static Presure (Pg) -.45 "H_2O

Pitot/Orifice ID DP 60-9 — Pitot Coef. (C_p) .84 — Pres. Gauge Set ID N 37

Thermocouple ID R182 — Duct Depth/(Diameter) 12' — Width N/A

---Specify inches (") or feet (')---

VELOCITY TRAVERSES Start-Finish Times: 1515 - 1519

Point No.	ΔP In. H_2O	Temp. °F
A-1	.19	85
2	.17	85
3	.175	85
4	.175	85
5	.185	85
6	.175	85
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	CO (C) Reading	%CO (C-B)
	Average					

Orsat ID _____ Bag ID _____ F_o _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd	=	SCFM
Wet at Stack Conditions, Qaw	=	ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

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AIR FLOW RATE DETERMINATIONS

Client EPA EMB

Plant Wake Stone — Run No. J2-M2-1

City/State Knightdale, N.C — Date 09-20-93

Test Location J2 Transfer Point — Personnel JED, DWS

Barometric Pressure (Pbar) 30.11 "Hg — Static Presure (Pg) -.42 "H_2O

Pitot/Orifice ID DP 60-9 — Pitot Coef. (C_p) .84 — Pres. Gauge Set ID N37

Thermocouple ID R182 — Duct Depth/(Diameter) 12" — Width N/A

---Specify inches (") or feet (')---

VELOCITY TRAVERSES Start-Finish Times: 0755 - 0759

Point No.	ΔP In. H_2O	Temp. °F
A-1	.205	58
2	.16	58
3	.17	58
4	.17	58
5	.175	58
6	.155	58
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	CO (C) Reading	%CO (C-B)
	Average					

Orsat ID _____ Bag ID _____ F_o _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd =		SCFM
Wet at Stack Conditions, Qaw =		ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

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METHOD 20[illegible] (PM-10) FIELD DATA

Client: EPA / STONE CRUSHING
Plant Name: WAKE STONE
City/State: KNIGHTDALE, N.C
Sampling Location: J2 TRANSFER POINT
Date: 9/20/93 Team Leader: TIB Techs: DWS, JED
*Train Leak Check Vacuum, In. Hg: 10
Train Leak Rate, Cubic Ft./Min.: .002

Run Number: DRY-J2-M201A-1
Time Start: 0730
Time Stop: 0830
Job Number: 5011.9
Barometric Pressure, In. Hg: 30.11
Static Pressure, In. H_2O: -.45

EQUIPMENT CHECKS
- ✓ Pitot, Pretest
- ✓ Pitot, Posttest
- ✓ M3 Sampling Sys/Ted Bag
- ✓ Thermocouple @ 58 Pre
- ✓ Thermocouple @ 63 Post

IDENTIFICATION NUMBERS
Meterbox: N19 Meterbox Gamma: 1.0015 Reagent Box: 626
T/C Readout: F64 T/C Probe: R778 Umbilical: 492
Sampling Box: 69 Orsat Pump: NA Tedlar Bag: NA
Nozzle(s) Actually Used: Pitot: NA
No. CAE Diameter .266 No. _____ Diameter _____

FILTER NO.	TARE
PM353	.2634

Est % H_2O: 1.0

Delta $H_@$	1.87
Delta H_t	.650
Delta H_{t+50}	.541
Delta H_{t-50}	.797
Delta P_{avg}	.172
Meter Temp.	80
Stack Temp.	58

NOZZLE SELECTION CRITERIA
Desired Dia. .240

	Nozzle 1	Nozzle 2
Diameter	.266	
Nozzle Number	CAE	
Delta P_{min}	.0284	
Delta P_{max}	.228	

FYRITE: NA

C_p .84

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (ΔP)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (ΔH)	Vacuum Gauge, In. Hg	Gas Temps: Filter Box, °F	Gas Temps: Imping Exit, °F	Cyclone Temp, °F
1	A-5	10	0	376.745	.17	60	58	.6504	1.0	NA	50	58
2		↓	10	381.35		70	60				50	60
3		↓	20	385.91	↓	78	61	↓	↓	↓	49	61
4	↓		30	390.51		80	61				47	61
5			40	395.12		82	62				45	62
6			50	399.74		82	63				42	63
7			60	404.374								
8												
9												
10												
11												
12												

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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minutes | Vm | $(\sqrt{\Delta P})^2$ | tm | ts | ΔH

AIR FLOW RATE DETERMINATIONS

Plant Name Wake Stone — Run No. JZ-MZ-2

City/State Knightdale, NC — Date 05-20-93

Test Location JZ Transfer Point — Personnel JED, DWS

Barometric Pres. (Pbar) 30.11 In. Hg — Static Pres. (Pg) -.42 In. H_2O

Pitot/Orifice ID DP 60-9 — Pitot Coef. (Cp) .84 — Pres. Gauge Set ID N-19

Thermocouple ID R 182 — Duct Length/Diameter 12" — Width N/A

--Specify inches (") or feet (')--

VELOCITY TRAVERSES Start-Finish Times: 0838 - 0841

Point No.	ΔP In. H_2O	Temp. °F
A-1	.195	62
2	.18	62
3	.175	62
4	.18	62
5	.17	62
6	.155	62
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	%$CO+N_2$ (100-B)
	Average				

Bag No. _____ Pump _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd =		SCFM
Wet at Stack Conditions, Qaw =		ACFM

ADDITIONAL DATA

* ΔP average is square of average square root. See page 2 for field flow rate calculations.

ENTROPY

METHOD 20[illegible] (PM-10) FIELD DATA

Client: EPA / STONE CRUSHING
Plant Name: WAKE STONE
City/State: KNIGHTDALE, N.C
Sampling Location: J2 TRANSFER POINT
Date: 7/20/93 Team Leader: TB Techs: DNS, JED

Run Number: DC1-J2-M201A-2
Time Start: 0855
Time Stop: 0955
Job Number: 5011.9
Barometric Pressure, In. Hg: 30.11
Static Pressure, In. H_2O: -.45

*Train Leak Check Vacuum, In. Hg: 10
Train Leak Rate, Cubic Ft./Min.: .002

EQUIPMENT CHECKS

- ✓ Pitot, Pretest
- ✓ Pitot, Posttest
- ✓ M3 Sampling Sys/Ted Bag
- ✓ Thermocouple @ 64 Pre
- ✓ Thermocouple @ 70 Post

IDENTIFICATION NUMBERS

Meterbox: N19 Meterbox Gamma: 1.0015 Reagent Box: 626
T/C Readout: FG4 T/C Probe: R278 Umbilical: U92
Sampling Box: 69 Orsat Pump: NA Tedlar Bag: NA
Nozzle(s) Actually Used: Pitot: NA
No.: .266 Diameter: CAE No.: _____ Diameter: _____

FILTER NO.	TARE
PM342	.2692

Est % H_2O: 1.0

Delta $H_@$	1.87
Delta H_t	.651
Delta H_{t+50}	.543
Delta H_{t-50}	.796
Delta P_{avg}	.176
Meter Temp.	80
Stack Temp.	64

NOZZLE SELECTION CRITERIA

Desired Dia.: .240

	Nozzle 1	Nozzle 2
Diameter	.266	
Nozzle Number	CAE	
Delta P_{min}	.0287	
Delta P_{max}	.2307	

FYRITE: .NA
C_p: .84

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (ΔP)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (ΔH)	Vacuum Gauge, In. Hg	Gas Temps Filter Box, °F	Gas Temps Imping Exit, °F	Cyclone Temp, °F
1	A-4	10	0	404.483	.18	80	64	.6512	1.0	NA	45	64
2	↓	↓	10	409.13	↓	80	65	↓	↓	↓	42	65
3	↓	↓	20	413.83	↓	80	68	↓	↓	↓	40	68
4			30	418.52		86	69				40	69
5			40	423.22		86	69				38	69
6			50	427.92		90	70				38	70
7			60	432.598								
8												
9												
10												
11												
12												

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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minutes | Vm | $(\sqrt{\Delta P})^2$ | tm | ts | ΔH

AIR FLOW RATE DETERMINATIONS

Plant Name Wake Stone — Run No. J2-M2-3

City/State Knightdale, N.C. — Date 09-20-93

Test Location J2 Transfer Point — Personnel JED, DWS

Barometric Pres. (Pbar) 30.11 In. Hg — Static Pres. (Pg) -.40 In. H_2O

Pitot/Orifice ID DP 60-9 — Pitot Coef. (Cp) .84 — Pres. Gauge Set ID N-19

Thermocouple ID R182 — Duct Length/(Diameter) 12" — Width N/A

--Specify inches (") or feet (')--

VELOCITY TRAVERSES Start-Finish Times: 1002 - 1003

Point No.	ΔP In. H_2O	Temp. °F
A-1	.165	71
2	.16	71
3	.17	71
4	.185	71
5	.18	71
6	.175	71
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	%$CO+N_2$ (100-B)
	Average				

Bag No. _____ Pump _____

FYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd	=	SCFM
Wet at Stack Conditions, Qaw	=	ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

See page 2 for field flow rate calculations.

ENTROPY

METHOD 201A (PM-10) FIELD DATA

Client: EPA / STONE CRUSHING
Plant Name: WAKE STONE
City/State: KNIGHTDALE, N.C
Sampling Location: J2 TRANSFER POINT
Date: 9/20/93 Team Leader: TIB Techs: DWS, TED
*Train Leak Check Vacuum, In. Hg: 10
Train Leak Rate, Cubic Ft./Min.: .001

Run Number: DRY-J2-M201A-3
Time Start: 1015
Time Stop: 1115
Job Number: 50119
Barometric Pressure, In. Hg: 30.11
Static Pressure, In. H_2O: -.45

EQUIPMENT CHECKS
- ✓ Pitot, Pretest
- ✓ Pitot, Posttest
- ✓ M3 Sampling Sys/Ted Bag
- ✓ Thermocouple @ 71 Pre
- ✓ Thermocouple @ 75 Post

IDENTIFICATION NUMBERS
Meterbox: N19 Meterbox Gamma: 1.0015 Reagent Box: 626
T/C Readout: F64 T/C Probe: R278 Umbilical: U92
Sampling Box: 19 Orsat Pump: NA Tedlar Bag: NA
Nozzle(s) Actually Used: Pitot: NA
No. CAE Diameter .266 No. ____ Diameter ____

FILTER NO.	TARE
PM371	.2762

Est % H_2O: 1.0

Delta $H_@$	1.87
Delta H_t	.652
Delta H_{t+50}	.545
Delta H_{t-50}	.795
Delta P_{avg}	.172
Meter Temp.	80
Stack Temp.	71

NOZZLE SELECTION CRITERIA
Desired Dia. .241

	Nozzle 1	Nozzle 2
Diameter	.266	
Nozzle Number	CAE	
Delta P_{min}	.0291	
Delta P_{max}	.2339	

FYRITE: NA
C_p .84

	Sample Point	Dwell Time, Minutes	Elapsed Time, Minutes	Dry Gas Meter Readings Cubic Feet	Pitot Reading, In. H_2O (ΔP)	Gas Meter Temp, °F	Stack Temp, °F	Orifice Setting, In. H_2O (ΔH)	Vacuum Gauge, In. Hg	Gas Temps: Filter Box, °F	Gas Temps: Imping Exit, °F	Cyclone Temp, °F
1	A-6	10	0	432.787	.175	88	74	.6521	1.0	NA	50	74
2	↓	↓	10	437.48	↓	88	72	↓	↓	↓	50	72
3	↓	↓	20	442.14	↓	90	73	↓	↓	↓	52	73
4			30	446.79		90	73				52	73
5			40	451.44		92	74				52	74
6			50	456.17		92	74				52	74
7			60	460.836								
8												
9												
10												
11												
12												

* REMOVE HEAD BEFORE POSTTEST LEAK CHECK

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minutes ____ Vm ____ $(\sqrt{\Delta P})^2$ ____ tm ____ ts ____ ΔH ____

AIR FLOW RATE DETERMINATIONS

Plant Name Wake Stone Run No. J2-M2-4

City/State Knightdale, N.C. Date 09-20-93

Test Location J2 Transfer Point Personnel JED, DWS

Barometric Pres. (Pbar) 30.11 In. Hg Static Pres. (Pg) -.40 In. H_2O

Pitot/Orifice ID DP 60-9 Pitot Coef. (Cp) .84 Pres. Gauge Set ID N 19

Thermocouple ID R 182 Duct Length/Diameter 12" Width N/A

--Specify inches (") or feet (')--

VELOCITY TRAVERSES Start-Finish Times: _____ - _____

Point No.	ΔP In. H_2O	Temp. °F
A-1	.155	75
2	.155	75
3	.16	75
4	.18	75
5	.19	75
6	.17	75
Avg.*		

ORSAT DATA

Sampling Time	Analysis Time	CO_2 (A) Reading	O_2 (B) Reading	%O_2 (B-A)	%$CO+N_2$ (100-B)
	Average				

Bag No. _____ Pump _____

PYRITE DATA, % CO_2				

MOISTURE DATA (WET BULB/DRY BULB)

Port	Time	Dry Bulb °F	Wet Bulb °F	Diff.	% H_2O

MOISTURE DATA (STOICHIOMETRIC)

Free Water in Fuel, %		
Water from Fuel Combustion, %		
Ambient Water, %		
Relative Humidity, %		
Ambient Temperature, °F		
Total %		

VOLUMETRIC AIR FLOW RATES

Dry at Standard Conditions, Qsd	=	SCFM
Wet at Stack Conditions, Qaw	=	ACFM

ADDITIONAL DATA

* ΔP average is square of average square root.

See page 2 for field flow rate calculations.

ENTROPY

Appendix C. Calibration Data Sheets

ISOKINETIC METERBOX FULLTEST CALIBRATION

Meterbox No. N19 Date 7-26-93 Calibrated By PJ

Barometric Pressure (P_b) 29.63 (In. Hg) Meterbox Vacuum 0 (In. Hg)

Standard Meter No. 1054682 Standard Meter Coeff. (Y_{ds}) .9961

STANDARD METER			METERBOX METERING SYSTEM				
Gas Volume (V_{ds}) cf	Temp. (t_{ds}) °F	Time (θ) Min.	Orifice Setting (ΔH) In. H_2O	Gas Volume (V_d) cf	Temp. (t_d) °F	Coefficient (Y_d)	ΔH@ In. H_2O
5.279	77	13	0.5	5.318	84	1.0004	1.743
5.249		13	0.5	5.328	88.5	1.0011	1.748
5.415		7	2.0	5.534	94	1.0006	1.886
5.390		7	2.0	5.521	97	1.0037	1.893
5.826		5	4.8	5.989	102	1.0039	1.967
5.788	↓	5	4.8	5.982	104.5	1.0012	1.984
					Average	1.0015	1.870

1. Coefficient range: 0.97-1.03.
2. Coefficient tolerance: for individual runs, ± 0.02 from average.
3. ΔH@ range: 1.6-2.0.
4. ΔH@ tolerance: for individual runs, ± 0.20 from average.

$$Y_d = \frac{Y_{ds} * V_{ds} * (t_d + 460) * P_b}{V_d * (t_{ds} + 460) * (P_b + \{\Delta H / 13.6\})}$$

$$\Delta H@ = \frac{0.0319 * \Delta H}{P_b * (t_d + 460)} * \left[\frac{(t_{ds} + 460) * \theta}{Y_{ds} * V_{ds}} \right]^2$$

ISOKINETIC METERBOX FULLTEST CALIBRATION

Meterbox No. A37 Date 6-3-93 Calibrated By PJ

Barometric Pressure (P_b) 29.41 (In. Hg) Meterbox Vacuum 0 (In. Hg)

Standard Meter No. 3586003 Standard Meter Coeff. (Y_{ds}) .9901

STANDARD METER			METERBOX METERING SYSTEM				
Gas Volume (V_{ds}) cf	Temp. (t_{ds}) °F	Time (θ) Min.	Orifice Setting (ΔH) In. H_2O	Gas Volume (V_d) cf	Temp. (t_d) °F	Coefficient (Y_d)	ΔH@ In. H_2O
5.200	76	13	0.5	5.275	89	.9984	1.808
5.141	76	13	0.5	5.305	99	.9994	1.807
5.334	77	7	2.0	5.568	111	1.0035	1.923
5.345	77	7	2.0	5.579	117	1.0142	1.895
5.920	77	5	4.8	6.146	120-5	1.0192	1.881
5.914	77	5	4.8	6.121	122	1.0245	1.879
					Average	1.0099	1.866

1. Coefficient range: 0.97-1.03.
2. Coefficient tolerance: for individual runs, ± 0.02 from average.
3. ΔH@ range: 1.6-2.0.
4. ΔH@ tolerance: for individual runs, ± 0.20 from average.

$$Y_d = \frac{Y_{ds} * V_{ds} * (t_d + 460) * P_b}{V_d * (t_{ds} + 460) * (P_b + \{\Delta H / 13.6\})}$$

$$\Delta H@ = \frac{0.0319 * \Delta H}{P_b * (t_d + 460)} * \left[\frac{(t_{ds} + 460) * \theta}{Y_{ds} * V_{ds}} \right]^2$$

ISOKINETIC METERBOX POSTTEST CALIBRATION

Meterbox No. N19 Date 9-21-93 Calibrated By PJ

Job Number 50119 Plant Name EPA - Stone

Barometric Pressure (P_b) 29.67 (In. Hg) Meterbox Vacuum 1.0 (In. Hg)

Standard Meter No. 3586003 Standard Meter Coeff. (Y_{ds}) .9901

STANDARD METER			METERBOX METERING SYSTEM				
Gas Volume (V_{ds}) cf	Temp. (t_{ds}) °F	Time (θ) Min.	Orifice Setting (ΔH) In. H_2O	Gas Volume (V_d) cf	Temp. (t_d) °F	Coefficient (Y_d)	$\Delta H@$ In. H_2O
6.216	73	13	0.7	6.307		.9906	1.759
6.184	↓	↓	↓	6.335		.9865	1.767
6.174	↓	↓	↓	6.342		.9893	1.763
					Average	.9888	1.763

Fulltest Y_d 1.0015 Date 7-26-93 % Deviation 1.3 *

* Allowed Deviation: ± 5%

$$Y_d = \frac{Y_{ds} * V_{ds} * (t_d + 460) * P_b}{V_d * (t_{ds} + 460) * (P_b + \{\Delta H / 13.6\})}$$

$$\Delta H@ = \frac{0.0319 * \Delta H}{P_b * (t_d + 460)} * \left[\frac{(t_{ds} + 460) * \theta}{Y_{ds} * V_{ds}} \right]^2$$

ISOKINETIC METERBOX POSTTEST CALIBRATION

Meterbox No. N37 Date 9-21-93 Calibrated By PS

Job Number 50119 Plant Name EPA - Stone

Barometric Pressure (P_b) 29.67 (In. Hg) Meterbox Vacuum 2 (In. Hg)

Standard Meter No. 6838323 Standard Meter Coeff. (Y_{ds}) .9881

STANDARD METER			METERBOX METERING SYSTEM				
Gas Volume (V_{ds}) cf	Temp. (t_{ds}) °F	Time (Θ) Min.	Orifice Setting (ΔH) In. H_2O	Gas Volume (V_d) cf	Temp. (t_d) °F	Coefficient (Y_d)	$\Delta H@$ In. H_2O
6.195	72	13	0.7	6.360	83	.9807	1.768
6.186	72	13	↓	6.374	88	.9861	1.757
7.125	73	15	↓	7.373	92.5	.9881	1.755
					Average	.9850	1.760

Fulltest Y_d 1.0099 Date 6-3-93 % Deviation 2.5 *

* Allowed Deviation: ± 5%

$$Y_d = \frac{Y_{ds} * V_{ds} * (t_d + 460) * P_b}{V_d * (t_{ds} + 460) * (P_b + \{\Delta H / 13.6\})}$$

$$\Delta H@ = \frac{0.0319 * \Delta H}{P_b * (t_d + 460)} * \left[\frac{(t_{ds} + 460) * \Theta}{Y_{ds} * V_{ds}} \right]^2$$

STANDARD DRY GAS METER CALIBRATION

Meter Number 1054682

Date 7-28-92 Auditor(s) MBC/PJ Barometric Press. (P_{bar}) 29.66

Spirometer Gas Volume Cubic Feet (V_s)	Spirometer Temp. °F (t_s)	Dry Gas Meter Gas Volume Cubic Feet (V_{ds})	Dry Gas Meter Temp. °F (t_{ds})	Pressure In. H_2O (ΔP)	Time Min. (θ)	Test Flow Rate cfm	Calc'd Flow Rate cfm (Q)	Meter Coeff. Gamma (Y_{ds})
2.760	75.2	2.764	79.5	-.27	10	0.23	.2698	1.0071
2.732	75.2	2.734	79	-.28	|	0.23	.2671	.9926
2.714	76.1	2.730	78.5	-.27	|	0.23	.2649	.9993
4.126	77	4.167	78	-.47	|	0.55	.3654	.9931
4.162	77	4.155	78	-.49	|	0.55	.4055	1.0048
4.135	77	4.135	77.5	-.50	|	0.55	.4029	1.0021
4.891	77	4.932	77	-.61	|	0.80	.4765	.9931
4.909	77	4.912	77	-.63	|	0.80	.4783	1.0009
4.891	77	4.932	77	-.61	|	0.80	.4675	.9950
7.796	77	7.850	77	-1.30	|	2.10	.7596	.9982
7.796	77	7.865	77.5	-1.30	|	2.10	.7596	.9954
7.805	77	7.842	78	-1.30	|	2.10	.7605	1.0004
9.945	78.8	10.042	78.5	-2.00	|	3.45	.9657	.9948
9.927	78.8	10.013	78	-2.00	|	3.45	.9640	.9904
9.945	78.8	10.042	78	-2.00	|	3.45	.9657	.9938
11.603	78.8	11.724	79	-2.60	|	4.70	1.1267	.9965
11.576	78.8	11.726	79	-2.60	|	4.70	1.1241	.9939
11.521	78.8	11.694	79	-2.60	|	4.70	1.1187	.9891
12.732	78.8	12.910	79	-3.10	|	5.80	1.2364	.9942
12.728	78.8	12.983	79	-3.20	|	5.80	1.2408	.9924
12.714	78.8	12.928	79	-3.15	↓	5.80	1.2346	.9916
							Average	.9961

$$Y_{ds} = \frac{(V_s)\ (t_{ds} + 460)\ (P_{bar})}{(V_{ds})\ (t_s + 460)\ [P_{bar} + (\Delta P / 13.6)]}$$

$$Q = (17.64)\ \left[\frac{(P_b)\ (V_s)}{(t_s + 460)\ (\theta)}\right]$$

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STANDARD DRY GAS METER CALIBRATION

Meter Number 3586003

Date 9-3-92 Auditor(s) MBC/PJ Barometric Press. (P_{bar}) 29.88

Spirometer Gas Volume Cubic Feet (V_s)	Spirometer Temp. °F (t_s)	Dry Gas Meter Gas Volume Cubic Feet (V_{ds})	Dry Gas Meter Temp. °F (t_{ds})	Pressure In. H_2O (ΔP)	Time Min. (θ)	Test Flow Rate cfm	Calc'd Flow Rate cfm (Q)	Meter Coeff. Gamma (Y_{ds})
2.696	77	2.733	79	-.43	10	0.23	.2646	.9911
2.723	77	2.720	79	-.44		0.23	.2673	1.0060
2.796	78.8	2.789	79	-.44		0.23	.2735	1.0040
4.117	78.8	4.184	79	-.69		0.55	.3661	.9859
4.144	79.7	4.158	79	-.70		0.55	.4047	.9970
4.162	80.6	4.153	79	-.71		0.55	.4058	1.0010
4.991	80.6	5.018	80	-.89		0.80	.4866	.9957
5.009	80.6	5.005	80	-.89		0.80	.4884	1.0019
4.945	81.5	5.011	80	-.89		0.80	.4814	.9863
7.978	82.4	8.034	80.5	-1.80		2.10	.7753	.9940
7.869	83.3	8.020	81	-1.75		2.10	.7634	.9812
7.951	84.4	8.062	81	-1.75		2.10	.7701	.9847
10.155	84.2	10.311	81	-2.80		3.45	.9835	.9859
10.118	84.2	10.292	81.5	-2.80		3.45	.9800	.9850
10.109	84.2	10.280	82	-2.80		3.45	.9791	.9862
11.940	84.2	12.174	82	-3.80		4.70	1.1564	.9860
11.867	84.2	12.118	82	-3.80		4.70	1.1494	.9845
11.885	84.2	12.131	82	-3.80		4.70	1.1511	.9758
13.078	84.2	13.311	82	-4.50		5.80	1.2667	.9895
13.024	84.2	13.309	82	-4.50		5.80	1.2614	.9855
13.097	84.2	13.387	82	-4.50	↓	5.80	1.2685	.9853
						Average		.9901

$$Y_{ds} = \frac{(V_s)\ (t_{ds} + 460)\ (P_{bar})}{(V_{ds})\ (t_s + 460)\ [P_{bar} + (\Delta P / 13.6)]}$$

$$Q = (17.64)\ \left[\frac{(P_b)\ (V_s)}{(t_s + 460)\ (\theta)}\right]$$

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STANDARD DRY GAS METER CALIBRATION

Meter Number 6838323

Date 2-4-93 Auditor(s) MBC Barometric Press. (P_{bar}) 30.0

Spirometer Gas Volume Cubic Feet (V_s)	Spirometer Temp. °F (t_s)	Dry Gas Meter Gas Volume Cubic Feet (V_{ds})	Dry Gas Meter Temp. °F (t_{ds})	Pressure In. H_2O (ΔP)	Time Min. (θ)	Test Flow Rate cfm	Calc'd Flow Rate cfm (Q)	Meter Coeff. Gamma (Y_{ds})
2.714	75.2	2.699	68.5	-.25	10	0.23	.2684	.9936
2.741	76.1	2.732	70	-.26	↓	0.23	.2706	.9926
2.760	77	2.743	72	-.26		0.23	.2719	.9973
4.098	77	4.137	73	-.44		0.55	.4039	.9843
4.098	77	4.090	73.5	-.45		0.55	.4039	.9966
4.107	77	4.076	74	-.45		0.55	.4048	1.0032
4.818	77	4.875	74	-.55		0.80	.4748	.9841
4.873	77.9	4.882	74	-.56		0.80	.4794	.9922
4.854	78.8	4.867	74.5	-.57		0.80	.4768	.9916
7.705	78.8	7.768	75	-1.20		2.10	.7568	.9878
7.650	78.8	7.749	75.5	-1.20		2.10	.7514	.9873
7.714	78.8	7.713	76	-1.20		2.10	.7577	.9979
9.873	78.8	10.091	76	-1.90		3.45	.9697	.9779
9.909	78.8	10.083	76	-1.90		3.45	.9732	.9822
9.900	78.8	10.057	76	-1.90		3.45	.9723	.9838
11.585	78.8	11.759	76	-2.45		4.70	1.1378	.9860
11.548	78.8	11.767	76	-2.45		4.70	1.1343	.9821
11.530	78.8	11.746	76	-2.45		4.70	1.1325	.9824
12.705	78.8	12.931	76	-2.90		5.80	1.2479	.9844
12.632	78.8	12.892	76	-2.95		5.80	1.2407	.9818
12.669	78.8	12.945	76	-2.90	↓	5.80	1.2443	.9805
							Average	.9881

$$Y_{ds} = \frac{(V_s)\ (t_{ds} + 460)\ (P_{bar})}{(V_{ds})\ (t_s + 460)\ [P_{bar} + (\Delta P / 13.6)]}$$

$$Q = (17.64)\ \left[\frac{(P_b)\ (V_s)}{(t_s + 460)\ (\theta)}\right]$$

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ENTROPY

Appendix D. Sampling Log and Chain-of-Custody Records

FIELD SAMPLE RECOVERY QUALITY CONTROL

Box No. 0214 Assembly Date 9/7/93 Assembled By mm

Client EPA EMB Job No. 50119

Plant WAKE STONE City/State Rightdale, NC

Sampling Loc. Transfer Point C1 Method 201A

Individual Tare Of Reagent 200 (Ml)(gm) Of DI

Individual Tare Of Reagent _____ (Ml)(gm) Of _____

Individual Tare Of Reagent _____ (Ml)(gm) Of _____

Individual Tare Of Sil. Gel ~200 Gm _____ other (specify)

Run Number	Run Date	Filter or XAD Number	Filter or XAD Tare, grams	Liquid Tare at Mark? @	Init.	Sample Recov. Date	%Sil. Gel Spent	Liquid Level Marked?	Init.
wet-C1-M201A-1	9/13	PM2	0.2167	✓	TTB	9/13	25	✓	TTB
				Filter Appearance*: Light Gray					
				Reagents Appearance*: clear					
2		PM326	0.2733	✓	TTB	9/15	15	✓	TTB
				Filter Appearance*: Light Light Gray					
				Reagents Appearance*: Clear					
3		PM355	2806	✓	TTB	9/16	25	✓	TTB
				Filter Appearance*: "					
				Reagents Appearance*: "					
				Filter Appearance*					
				Reagents Appearance*					

* Use "REMARKS" section if needed.

@ All liquid levels at mark? (check) YES ___ NO ___ (estimate loss if not at mark; use "REMARKS" section).

REMARKS _____

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RECORD OF CUSTODY, CONTAINER No. 0214

Client EPA EMB Job No. 5019

Plant Name Wake Stone

City/State Nightdale, NC

Sampling Method(s) 201A (EPA, NIOSH, etc.)

Container Type (√) Reagent Box X Cooler __ Other (specify) _____

Seal No. or "PC"	Date	Time	*	Full Signature	Reason for Breaking Seal**
	9/7/93	4:45	S	Mary Mullins	
1894	9/12/93	14:40	B	Todd Boyell	Chg Trains
1720	9/16/93	15:45	S	Todd Boyell	
			B		
			S		
			B		
			S		
			B		
			S		
			B		
			S		
			B		
			S		
			B		

PC = Personal Custody * S = Sealed By; B = Broken By ** Use "REMARKS" Section if more space needed.

Container Received by Entropy Sample Custodian

Signature | 9-21-93 Date | 1033 Time | Seal Intact?** Yes X No __ NA __

As Applicable:

All liquid levels at mark (√) YES __ NO __ (Estimate loss if not at mark; describe in "REMARKS")

As Applicable:

TUBE SAMPLES put in freezer by _____ Date _____ Time _____

CONDENSATE SAMPLES put in refrige. by _____ Date _____ Time _____

REMARKS _____

L-0023 rev. 8-93

FIELD SAMPLE RECOVERY QUALITY CONTROL

Box No. 0207 Assembly Date 8/26/93 Assembled By [illegible]

Client EPA, EMB Job No. 5019

Plant Wake Stone City/State Knightdale, NC

Sampling Loc. Transfer PT C1 Method 201A

Individual Tare Of Reagent 200 (Ml) (gm) Of DI H_2O

Individual Tare Of Reagent _____ (Ml)(gm) Of _____

Individual Tare Of Reagent _____ (Ml)(gm) Of _____

Individual Tare Of Sil. Gel ~200 Gm _____ other (specify)

Run Number	Run Date	Filter or XAD Number	Filter or XAD Tare, grams	Liquid Tare at Mark? @	Init.	Sample Recov. Date	%Sil. Gel Spent	Liquid Level Marked?	Init.
DRY TEST-C1-M201A-1	9/20/93	PM354	.2643	✓	TMB	9/20/93	5	✓	TMB
2	9/20/93	PM203	.2717	✓	TMB	9/20/93	5	✓	TMB
3	9/20/93	PM354	.2651	✓	TMB	9/20/93	5	✓	TMB

Filter Appearance* Gray w/ Particulate

Reagents Appearance* clear

Filter Appearance* "

Reagents Appearance* "

Filter Appearance* "

Reagents Appearance* "

Filter Appearance*

Reagents Appearance*

* Use "REMARKS" section if needed.

@ All liquid levels at mark? (check) YES ___ NO ___ (estimate loss if not at mark; use "REMARKS" section).

REMARKS _____

RECORD OF CUSTODY, CONTAINER No. 0207

Client ~~WAKE STONE~~ EPA EMB Job No. 50119

Plant Name Knightdale, NC WAKE STONE

City/State Knightdale, NC

Sampling Method(s) 201A (EPA, NIOSH, etc.)

Container Type (√) Reagent Box ✓ Cooler __ Other (specify)_____

Seal No. or "PC"	Date	Time	*	Full Signature	Reason for Breaking Seal**
PC for 1086	8/26/93	1130	S	[illegible] Jackson	
	9/15/93	947	B	Todd T. Bigelow	Chg Trains
2059	9/20/93	13:21	S	Todd T. Bigelow	
			B		
			S		
			B		
			S		
			B		
			S		
			P		
			S		
			B		
			S		
			B		

PC = Personal Custody * S = Sealed By; B = Broken By ** Use "REMARKS" Section if more space needed.

Container Received by Entropy Sample Custodian

[signature] Signature | 9-24-93 Date | 1035 Time | Seal Intact?** Yes ✓ No __ NA __

As Applicable:

All liquid levels at mark (√) YES __ NO __ (Estimate loss if not at mark; describe in "REMARKS")

As Applicable:

TUBE SAMPLES put in freezer by _____ Date _____ Time _____

CONDENSATE SAMPLES put in refrige. by _____ Date _____ Time _____

REMARKS _____

L-0023 rev. 8-93

FIELD SAMPLE RECOVERY QUALITY CONTROL

Box No. 612 Assembly Date 9/7/93 Assembled By mm

Client ~~We~~ EPA EMB Job No. 5019

Plant Wake Stone City/State Nightdale, NC

Sampling Loc. Transfer PT 52 Method 201A

Individual Tare Of Reagent 200 (Ml)(gm) Of DI

Individual Tare Of Reagent _____ (Ml)(gm) Of _____

Individual Tare Of Reagent _____ (Ml)(gm) Of _____

Individual Tare Of Sil. Gel 200 Gm _____ other (specify)

Run Number	Run Date	Filter or XAD Number	Filter or XAD Tare, grams	Liquid Tare at Mark? @	Init.	Sample Recov. Date	%Sil. Gel Spent	Liquid Level Marked?	Init.
WET-52-M201A-1	9/13/93	PM373	.2710	✓	TTB	9/13/93	25	✓	TTB
				Filter Appearance* Gray					
				Reagents Appearance* Clear					
2	9/15	PM352	0.2645	✓	TTB	9/15/93	25	✓	TTB
				Filter Appearance* Daylight Grey					
				Reagents Appearance* Clear					
3	9/16	PM295	0.2702	✓	TTB	9/16	25	✓	TTB
				Filter Appearance*					
				Reagents Appearance*					
				Filter Appearance*					
				Reagents Appearance*					

* Use "REMARKS" section if needed.

@ All liquid levels at mark? (check) YES ✓ NO ___ (estimate loss if not at mark; use "REMARKS" section).

REMARKS _____

RECORD OF CUSTODY, CONTAINER No. 612

Client EPA, EMB Job No. 50119

Plant Name Wake Stone

City/State Nightdale, NC

Sampling Method(s) M201A (EPA, NIOSH, etc.)

Container Type (√) Reagent Box R✓ Cooler __ Other (specify) _____

Seal No. or "PC"	Date	Time	*	Full Signature	Reason for Breaking Seal**
	9/7/93	4:48	S	Mary Mullens	
197	9/12/93	14:50	B	Todd Bidell	Org Rains
925	9/16/93	15:47	S	Todd Bidell	
			B		
			S		
			B		
			S		
			B		
			S		
			B		
			S		
			B		
			S		
			B		

PC = Personal Custody * S = Sealed By; B = Broken By ** Use "REMARKS" Section if more space needed.

Container Received by Entropy Sample Custodian

Signature | 9-21-93 Date | 1030 Time | Seal Intact?** Yes ✓ No __ NA __

As Applicable:

All liquid levels at mark (√) YES __ NO __ (Estimate loss if not at mark; describe in "REMARKS")

As Applicable:

TUBE SAMPLES put in freezer by _____ Date _____ Time _____

CONDENSATE SAMPLES put in refrige. by _____ Date _____ Time _____

REMARKS _____

L-0023 rev. 8-93

FIELD SAMPLE RECOVERY QUALITY CONTROL

Box No. 626 Assembly Date 9/7/93 Assembled By mm

Client EDA, EMB Job No. 5019

Plant Wake Stone City/State Knightdale, NC

Sampling Loc. Transfer PT J2 Method 201A

Individual Tare Of Reagent 200 (Ml)(gm) Of DI

Individual Tare Of Reagent _____ (Ml)(gm) Of _____

Individual Tare Of Reagent _____ (Ml)(gm) Of _____

Individual Tare Of Sil. Gel ~200 Gm _____ other (specify)

Run Number	Run Date	Filter or XAD Number	Filter or XAD Tare, grams	Liquid Tare at Mark? @	Init.	Sample Recov. Date	%Sil. Gel Spent	Liquid Level Marked?	Init.
DRY-J2-M201A-1	9/20/93	PM353	.2634	✓	TJB	9/20/93	8%	✓	TJB
2	9/20/93	PM342	0.2692	✓	TJB	9/20/93	10%	✓	TJB
3	9/20/93	PM371	.2762	✓	TJB	9/20/93	5%	✓	TJB

Filter Appearance* Gray Light Particulate

Reagents Appearance* Clear

Filter Appearance* "

Reagents Appearance* "

Filter Appearance* "

Reagents Appearance* "

Filter Appearance*

Reagents Appearance*

* Use "REMARKS" section if needed.

@ All liquid levels at mark? (check) YES ___ NO ___ (estimate loss if not at mark; use "REMARKS" section).

REMARKS _____

RECORD OF CUSTODY, CONTAINER No. 626

Client EPA, EMB Job No. 5019

Plant Name Wake Stone

City/State Knightdale, NC

Sampling Method(s) 201A (EPA, NIOSH, etc.)

Container Type (√) Reagent Box R✓ Cooler __ Other (specify)_____

Seal No. or "PC"	Date	Time	*	Full Signature	Reason for Breaking Seal**
	9/7/93	4:44	S	Mary Mullen	
1604	9/6/93	1004	B	Todd Bagell	Chg Trains
861	9/2/93	13:18	S	Todd Bagell	
			B		
			S		
			B		
			S		
			B		
			S		
			B		
			S		
			B		
			S		
			B		

PC = Personal Custody * S = Sealed By; B = Broken By ** Use "REMARKS" Section if more space needed.

Container Received by Entropy Sample Custodian

Signature | 9-9-93 Date | 1032 Time | Seal Intact?** Yes ✓ No __ NA __

As Applicable:

All liquid levels at mark (√) YES __ NO __ (Estimate loss if not at mark; describe in "REMARKS")

As Applicable:

TUBE SAMPLES put in freezer by _____ Date _____ Time _____

CONDENSATE SAMPLES put in refrige. by _____ Date _____ Time _____

REMARKS _____

L-0023 rev. 8-93

FIELD TEST LOG (USE REVERSE SIDE ALSO)

Plant Name Wake Stone Job No. 50119

Sampling Location C1 Transfer Point

Run No. WET-C1-M201A-1

Date 09-12-93

Start	Stop	Comments/Problems
0805	1121	stop for plant lunch break
1315	1505	stopped test

Sampling Team Initials JED (Team Leader) _____ (Others)

Posttest Leak Rate .004-5" Sample Appearance _____

Good Run (check)? ✓ YES ___ NO (if NO, explain in "Comments/Problems")

Run No. WET-C1-M201A-2

Date 09-15-93

Start	Stop	Comments/Problems
0735	0807	stopped, plant problems
0935	1126	stopped for plant lunchtime shutdown
1305	1401	stopped to get a 2' belt cut sample.
1430	1509	end run

Sampling Team Initials JED (Team Leader) _____ (Others)

Posttest Leak Rate _____ Sample Appearance _____

Good Run (check)? ✓ YES ___ NO (if NO, explain in "Comments/Problems")

Run No. WET-C1-M201A-3

Date 09-16-93

Start	Stop	Comments/Problems
0725	0903	stopped because process stopped
0930	1124	stopped for plant lunchtime shut down
1230	1458	end run

Sampling Team Initials JED (Team Leader) _____ (Others)

Posttest Leak Rate .009-5" Sample Appearance _____

Good Run (check)? ✓ YES ___ NO (if NO, explain in "Comments/Problems")

ENTROPY

Appendix E. Moisture Analytical Data

ENTROPY
Environmentalists, Inc.

P.O. Box 12291
Research Triangle Park
North Carolina 27709-2291
919-781-3550 FAX 919-787-8442

REQUEST FOR ANALYSIS

PO#:E3712 - 50119-13 Customer Name: Wake Stone
Knightdale, NC

Laboratory: EEI

Date Transmitted: 9/21/93 Results Due By: 10/05/93

Sample Matrix: Method 201A PM: TTB

Analysis: Analyze for particulate > 10 microns and ≤ 10 microns.

Sample #	Sample ID	Components/Comments
1	Wet-J2-M201A-1	filter, nozzle rinse, F½ acetone rinse
2	Wet-J2-M201A-2	filter, nozzle rinse, F½ acetone rinse
3	Wet-J2-M201A-3	filter, nozzle rinse, F½ acetone rinse
4	Dry-J2-M201A-1	filter, nozzle rinse, F½ acetone rinse
5	Dry-J2-M201A-2	filter, nozzle rinse, F½ acetone rinse
6	Dry-J2-M201A-3	filter, nozzle rinse, F½ acetone rinse
7	Wet-C1-M201A-1	filter, nozzle rinse, F½ acetone rinse
8	Wet-C1-M201A-2	filter, nozzle rinse, F½ acetone rinse
9	Wet-C1-M201A-3	filter, nozzle rinse, F½ acetone rinse
10	Dry-C1-M201A-1	filter, nozzle rinse, F½ acetone rinse
11	Dry-C1-M201A-2	filter, nozzle rinse, F½ acetone rinse
12	Dry-C1-M201A-3	filter, nozzle rinse, F½ acetone rinse
13	blank	acetone

Final! 01-05-94

JBR

~~201-1~~
~~M201-2~~

M201A-3

Submitted By:

ANALYTICAL NARRATIVE - RFA No. E3712-50119

Plant/City/State Wake Stone Knightdale, NC

Analyst DLK Date Rec'd in Lab 9-21-93

Lead Analyst D. L. Kinchelor Analysis Date 01-05-94

Analysis Method & Analytes M201A

Sample Matrix & Components Filters, Acetone

Summary of Sample Prep (added rinse in lab, final volumed, pH adjusted, etc.)
Transfer filters and particulate to tared, teflon baggies, desiccate 24 hrs., weigh until final. Transfer rinses to tared, teflon baggies, evaporate in evaporator tank, desiccate 24hrs., weigh until final.

Summary of Instrumentation Mettler AT 100 Analytical Balance.

Minimum Detectable Limit 0.1 mg. ± 0.3 mg.

Summary of QA/QC Sample Analysis N/A

Spikes (describe spikes and % recovery) N/A

Specific Comments Regarding Sample Analysis (Note unusual catch weights, interferences, odd sample behavior, and steps taken to confirm unusual results. Also note any deviations from standard analytical procedures, together with justification and possible affect on results. Specify run number(s) when applicable.)
Samples were delayed analysis at Client's request until notification by client to complete analysis. The client notified Entropy, and on 01-04-93 analysis was started.

THE RINSE (NOZZLE & CYCLONE) FOR RUN WET-CI-M201A-3 IS SIMILAR IN LOADING TO RUNS 1&2. (N&C)

THE RINSE FOR FOR DRY-CI-M201A-3 IS VISIBLY HEAVIER THAN 1 OR 2

Will the sample(s) require additional analysis? Yes ___ No ✓

If applicable, Custodian has been notified the data is in QA Officer review: _____ (Custodian/Date)

Confirmation of Data Review

Lead Analyst Signature D. Kinchelor Date 01-05-94

Lab QA Officer Signature [signature] Date 1/6/94

USE PAGE 2 IF ADDITIONAL SPACE NEEDED FOR ANY ITEM

REAGENT BLANK LABORATORY RESULTS (Version 04.28.92)

Plant Name:	WAKE STONE	EEI Ref#	50119
Sampling Location:	NA	File:	M201A-3
Date Received:	09/21/93	File Pathway:	H:\JOBS\50119\LAB\M201A-3.WQ1

Run Number			ACETONE BLANK	
Sample ID/Container #			B / 851	
	init.	date		
	DK	01/05	@	3.8389
	DK	01/04	@	3.8389
Tare Wt., g.		(100	ml)	3.8381
SAMPLE WT., g.				0.0008

Date of full balance span: 01/03/94

Notes and comments:

PARTICULATE SAMPLING LABORATORY RESULTS (Version 04.28.92)

Plant Name:	WAKE STONE	EEI Ref#	50119
Sampling Location:	Transfer Point C1, Condition Wet	File:	M201A-3
Date Received:	09/21/93		Page 7 of 12

File Pathway: H:\JOBS\50119\LAB\M201A-3.WQ1

Run Number: Wet-C1-M201A-1

	init.	date		
Sample I.D.			in stack filter / 821	
Container #			< = 10 ug	
	DK	01/05	@	3.9473
	DK	01/04	@	3.9473
Baggie Tare Wt., g.				3.6970
Filter Tare Wt., g.				0.2167
FILTER SAMPLE WT., g.				0.0336

	init.	date			date		
Sample I.D.			in stack filter rinse / 839			nozzle & cyclone rinse / 840	
Container #			< = 10 ug			>10ug	
	DK	01/05	@	3.8881	01/05	@	3.9657
	DK	01/04	@	3.8881	01/04	@	3.9657
Tare Wt., g.		(85	ml)	3.8806	(110	ml)	3.8832
RINSE SAMPLE WT., g.				0.0075			0.0825

Filter Catch, mg.	33.6	NA
Rinse Catch, mg.	7.5	82.5
Blank Residue, mg.	0.7	0.9
Net Rinse Catch, mg.	6.8	81.6
FILTERABLE PARTICULATE, mg.	40.4	81.6

Blank Beaker #	B / 851	
Final wt., mg.	3.8389	
Tare wt., mg.	3.8381	
Residue, mg.	0.8	
Volume, ml.	100	
Density, mg/ml	785.0	
Conc., mg/mg	1.019E-05	
Upper Limit, mg/mg	1.000E-05	<-

—Legend—
@ = Final Weight
F = Filter R = Rinse
1 = Light
2 = Medium
3 = Heavy or Dark

Sample Description

Run #	Color	Loading
-1	(1) 2 3	1 (2) 3

Predominate color of samples is: LIGHT GRAYISH BROWN.
Date of full balance span: 01/03/94
Notes and comments:

PARTICULATE SAMPLING LABORATORY RESULTS (Version 04.28.92)

Plant Name:	WAKE STONE	EEI Ref#	50119
Sampling Location:	Transfer Point C1, Condition Wet	File:	M201A-3
Date Received:	09/21/93		Page 8 of 12

File Pathway: H:\JOBS\50119\LAB\M201A-3.WQ1

Run Number: Wet-C1-M201A-2

Sample I.D.				in stack filter / 822	
Container #				< = 10 ug	
	init.	date			
	DK	01/05	@	4.1881	
	DK	01/04	@	4.1881	
Baggie Tare Wt., g.				3.8761	
Filter Tare Wt., g.				0.2733	
FILTER SAMPLE WT., g.				0.0387	

Sample I.D.				in stack filter rinse / 841 < = 10 ug			nozzle & cyclone rinse / 842 >10ug	
Container #								
	init.	date			date			
	DK	01/05		3.7688	01/05	@	3.8898	
	DK	01/04	@	3.7687	01/04		3.8899	
Tare Wt., g.		(75	ml)	3.7604	(125	ml)	3.7896	
RINSE SAMPLE WT., g.				0.0083			0.1002	

Filter Catch, mg.	38.7	NA
Rinse Catch, mg.	8.3	100.2
Blank Residue, mg.	0.6	1.0
Net Rinse Catch, mg.	7.7	99.2
FILTERABLE PARTICULATE, mg.	46.4	99.2

Blank Beaker #	B / 851	
Final wt., mg.	3.8389	
Tare wt., mg.	3.8381	
Residue, mg.	0.8	
Volume, ml.	100	
Density, mg/ml	785.0	
Conc., mg/mg	1.019E-05	
Upper Limit, mg/mg	1.000E-05	<-

—Legend—
@ = Final Weight
F = Filter R = Rinse
1 = Light
2 = Medium
3 = Heavy or Dark

Sample Description		
Run #	Color	Loading
-2	(1)2 3	1(2)3

Predominate color of samples is: LIGHT GRAYISH BROWN.
Date of full balance span: 01/03/94
Notes and comments:

Printing Date: 05-Jan-94 Printing Time: 01:23 PM

PARTICULATE SAMPLING LABORATORY RESULTS (Version 04.28.92)

Plant Name: WAKE STONE — EEI Ref# 50119
Sampling Location: Transfer Point C1, Condition Wet — File: M201A-3
Date Received: 09/21/93 —
File Pathway: H:\JOBS\50119\LAB\M201A-3.WQ1

Run Number: Wet-C1-M201A-3

Sample I.D.			in stack filter / 823	
Container #			< = 10 ug	
	init.	date		
	DK	01/05	@ 4.0374	
	DK	01/04	@ 4.0374	
Baggie Tare Wt., g.			3.6980	
Filter Tare Wt., g.			0.2806	
FILTER SAMPLE WT., g.			0.0588	

Sample I.D.			in stack filter rinse / 843 < = 10 ug			nozzle & cyclone rinse / 844 >10ug	
Container #							
	init.	date		date			
	DK	01/05	@ 3.9049	01/05	@	3.8147	
	DK	01/04	@ 3.9049	01/04	@	3.8147	
Tare Wt., g.		(75	ml) 3.8892	(200	ml)	3.6675	
RINSE SAMPLE WT., g.			0.0157			0.1472	

Filter Catch, mg.	58.8	NA
Rinse Catch, mg.	15.7	147.2
Blank Residue, mg.	0.6	1.6
Net Rinse Catch, mg.	15.1	145.6
FILTERABLE PARTICULATE, mg.	73.9	145.6

Blank Beaker #	B / 851	
Final wt., mg.	3.8389	
Tare wt., mg.	3.8381	
Residue, mg.	0.8	
Volume, ml.	100	
Density, mg/ml	785.0	
Conc., mg/mg	1.019E-05	
Upper Limit, mg/mg	1.000E-05	<--

---Legend---
@ = Final Weight
F = Filter R = Rinse
1 = Light
2 = Medium
3 = Heavy or Dark

Sample Description

Run #	Color	Loading
-3	(1) 2 3	1 (2) 3

Predominate color of samples is: LIGHT GRAYISH BROWN.
Date of full balance span: 01/03/94
Notes and comments:

MOISTURE ANALYTICAL RESULTS

Plant Name Wake Stone Job No. 50119

City/State Nightdale, NC Sampling Loc. Transfer Pt: C1

Run Number	WET-C1-M201A-1	2	3
Sampling Date	9/13/93	9/15/93	9/16/93
Analysis Date	"	"	"
Analyst	TTB	TTB	TTB
Reagent 1 (200ml DI)			
Final Weight, g	613.7	622.9	615.2
Tared Weight, g	581.9	585.7	552.5
Water Catch, g	31.8	37.2	62.7
Reagent 2 (_____)			
Final Weight, g			
Tared Weight, g			
Water Catch, g			
Reagent 3 (_____)			
Final Weight, g			
Tared Weight, g			
Water Catch, g			
CONDENSED WATER, g			
Silica Gel			
Final Weight, g	226.8	222.4	220.8
Tared Weight, g	202.2	201.5	194.7
ADSORBED WATER, g	24.6	20.9	26.1
TOTAL WATER COLLECTED, g	56.4	58.1	88.8

Balance No. 45 Type (✓) Triple Beam ✓ Electronic ___ Reagent Box No. 0214

Balance located in stable, draft-free area (✓)? Yes ___ No ___ (If "No", explain below.)

Comments _____

L-0036 rev. 7-92

ENTROPY

PARTICULATE SAMPLING LABORATORY RESULTS (Version 04.28.92)

Plant Name:	WAKE STONE	EEI Ref#	50119
Sampling Location:	Transfer Point C1, Condition Dry	File:	M201A-3
Date Received:	09/21/93	Page	10 of 12
	File Pathway:	H:\JOBS\50119\LAB\M201A-3.WQ1	

Run Number				Dry-C1-M201A-1				
Sample I.D.				in stack filter / 824				
Container #				< = 10 ug				
	init.	date			date			
	DK	01/05	@	4.1102				
	DK	01/04	@	4.1102				
Baggie Tare Wt., g.				3.8260				
Filter Tare Wt., g.				0.2643				
FILTER SAMPLE WT., g.				0.0199				
Sample I.D.				in stack filter rinse / 845			nozzle & cyclone rinse / 846	
Container #				< = 10 ug			>10ug	
	init.	date			date			
	DK	01/05	@	3.7847	01/05		4.1122	
	DK	01/04	@	3.7847	01/04	@	4.1119	
Tare Wt., g.		(100	ml)	3.7748	(200	ml)	3.8425	
RINSE SAMPLE WT., g.				0.0099			0.2694	
Filter Catch, mg.				19.9			NA	
Rinse Catch, mg.				9.9			269.4	
Blank Residue, mg.				0.8			1.6	
Net Rinse Catch, mg.				9.1			267.8	
FILTERABLE PARTICULATE, mg.				29.0			267.8	

Blank Beaker #	B / 851		
Final wt., mg.	3.8389		
Tare wt., mg.	3.8381		
Residue, mg.	0.8		
Volume, ml.	100		
Density, mg/ml	785.0		
Conc., mg/mg	1.019E-05		
Upper Limit, mg/mg	1.000E-05	<-	

—Legend—
@ = Final Weight
F = Filter R = Rinse

1 = Light
2 = Medium
3 = Heavy or Dark

Sample Description		
Run #	Color	Loading
-1	(1) 2 3	1 (2) 3

Predominate color of samples is: LIGHT, SLIGHTLY GRAYISH BROWN.
Date of full balance span: 01/03/94
Notes and comments:

PARTICULATE SAMPLING LABORATORY RESULTS (Version 04.28.92)

Plant Name:	WAKE STONE	EEI Ref#	50119
Sampling Location:	Transfer Point C1, Condition Dry	File:	M201A-3
Date Received:	09/21/93	Page	11 of 12
	File Pathway:	H:\JOBS\50119\LAB\M201A-3.WQ1	

Run Number			Dry-C1-M201A-2					
Sample I.D.			in stack filter / 825					
Container #			< = 10 ug					
	init.	date						
	DK	01/05	4.0311					
	DK	01/04	4.3031					
Baggie Tare Wt., g.			3.7409					
Filter Tare Wt., g.			0.2717					
FILTER SAMPLE WT., g.			0.0185					

Sample I.D.				in stack filter			nozzle & cyclone		
Container #				rinse / 847			rinse / 848		
				< = 10 ug			>10ug		
	init.	date			date				
	DK	01/05	@	3.7558	01/05	@	4.1252		
	DK	01/04	@	3.7558	01/04	@	4.1252		
Tare Wt., g.		(75	ml)	3.7469	(180	ml)	3.8421		
RINSE SAMPLE WT., g.				0.0089			0.2831		

Filter Catch, mg.	18.5	NA
Rinse Catch, mg.	8.9	283.1
Blank Residue, mg.	0.6	1.4
Net Rinse Catch, mg.	8.3	281.7
FILTERABLE PARTICULATE, mg.	26.8	281.7

Blank Beaker #	B / 851	
Final wt., mg.	3.8389	
Tare wt., mg.	3.8381	
Residue, mg.	0.8	
Volume, ml.	100	
Density, mg/ml	785.0	
Conc., mg/mg	1.019E-05	
Upper Limit, mg/mg	1.000E-05	<-

—Legend—
@ = Final Weight
F = Filter R = Rinse
1 = Light
2 = Medium
3 = Heavy or Dark

Sample Description			
	Run #	Color	Loading
	-2	(1)2 3	1 (2) 3

Predominate color of samples is: LIGHT BROWNISH GRAY.
Date of full balance span: 01/03/94
Notes and comments:

PARTICULATE SAMPLING LABORATORY RESULTS (Version 04.28.92)

Plant Name:	WAKE STONE	EEI Ref#	50119
Sampling Location:	Transfer Point C1, Condition Dry	File:	M201A-3
Date Received:	09/21/93	Page	12 of 12
	File Pathway:	H:\JOBS\50119\LAB\M201A-3.WQ1	

Run Number: Dry-C1-M201A-3

Sample I.D.			in stack filter / 826
Container #			< = 10 ug
	init.	date	
	DK	01/05 @	4.1670
	DK	01/04 @	4.1670
Baggie Tare Wt., g.			3.8755
Filter Tare Wt., g.			0.2651
FILTER SAMPLE WT., g.			0.0264

Sample I.D.			in stack filter rinse / 849		nozzle & cyclone rinse / 850
Container #			< = 10 ug		>10ug
	init.	date		date	
	DK	01/05 @	3.7943	01/05 @	4.2171
	DK	01/04 @	3.7943	01/04 @	4.2171
Tare Wt., g.		(60 ml)	3.7738	(150 ml)	3.7514
RINSE SAMPLE WT., g.			0.0205		0.4657

Filter Catch, mg.	26.4	NA
Rinse Catch, mg.	20.5	465.7
Blank Residue, mg.	0.5	1.2
Net Rinse Catch, mg.	20.0	464.5
FILTERABLE PARTICULATE, mg.	46.4	464.5

Blank Beaker #	B / 851	
Final wt., mg.	3.8389	
Tare wt., mg.	3.8381	
Residue, mg.	0.8	
Volume, ml.	100	
Density, mg/ml	785.0	
Conc., mg/mg	1.019E-05	
Upper Limit, mg/mg	1.000E-05	<-

—Legend—
@ = Final Weight
F = Filter R = Rinse
1 = Light
2 = Medium
3 = Heavy or Dark

Sample Description		
Run #	Color	Loading
-3	(1)2 3	1 (2)3

Predominate color of samples is: LIGHT BROWNISH GRAY.
Date of full balance span: 01/03/94
Notes and comments:

MOISTURE ANALYTICAL RESULTS

Plant Name Wake Stone Job No. 5019

City/State Knightdale, NC Sampling Loc. Transfer PT C1

	Run Number	NBV-C1-M201A-1	2	3
	Sampling Date			
	Analysis Date			
	Analyst			
Reagent 1 (200mls)	Final Weight, g	586.1	588.3	550.8
	Tared Weight, g	583.6	586.4	550.5
	Water Catch, g	2.5	1.9	.3
Reagent 2 (_____)	Final Weight, g			
	Tared Weight, g			
	Water Catch, g			
Reagent 3 (_____)	Final Weight, g			
	Tared Weight, g			
	Water Catch, g			
CONDENSED WATER, g				
Silica Gel	Final Weight, g	205.9	204.9	194.4
	Tared Weight, g	200.9	199.0	187.9
ADSORBED WATER, g		5.0	5.9	6.5
TOTAL WATER COLLECTED, g		7.5	7.8	6.8

Balance No. 45 Type (✓) Triple Beam ✓ Electronic ___ Reagent Box No. _____

Balance located in stable, draft-free area (✓)? Yes ___ No ___ (If "No", explain below.)

Comments _____

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ENTROPY

PARTICULATE SAMPLING LABORATORY RESULTS (Version 04.28.92)

Plant Name:	WAKE STONE	EEI Ref#	50119
Sampling Location:	Transfer Point J2, Condition Wet	File:	M201A-3
Date Received:	09/21/93		Page 1 of 12

File Pathway: H:\JOBS\50119\LAB\M201A-3.WQ1

Run Number: Wet-J2-M201A-1

Sample I.D.				in stack filter / 815				
Container #				< = 10 ug				
	init.	date			date			
	DK	01/05	@	4.2524				
	DK	01/04	@	4.2524				
Baggie Tare Wt., g.				3.9648				
Filter Tare Wt., g.				0.2710				
FILTER SAMPLE WT., g.				0.0166				

Sample I.D.				in stack filter			nozzle & cyclone	
Container #				rinse / 827			rinse / 828	
				< = 10 ug			>10ug	
	init.	date			date			
	DK	01/05	@	3.8741	01/05	@	3.8384	
	DK	01/04	@	3.8741	01/04	@	3.8384	
Tare Wt., g.		(75	ml)	3.8715	(80	ml)	3.8088	
RINSE SAMPLE WT., g.				0.0026			0.0296	

Filter Catch, mg.	16.6	NA
Rinse Catch, mg.	2.6	29.6
Blank Residue, mg.	0.6	0.6
Net Rinse Catch, mg.	2.0	29.0
FILTERABLE PARTICULATE, mg.	18.6	29.0

Blank Beaker #	B / 851	
Final wt., mg.	3.8389	
Tare wt., mg.	3.8381	
Residue, mg.	0.8	
Volume, ml.	100	
Density, mg/ml	785.0	
Conc., mg/mg	1.019E-05	
Upper Limit, mg/mg	1.000E-05	<-

—Legend—
@ = Final Weight
F = Filter R = Rinse
1 = Light
2 = Medium
3 = Heavy or Dark

Sample Description		
Run #	Color	Loading
-1	(1) 2 3	1 (2) 3

Predominate color of samples is: LIGHT GRAY.
Date of full balance span: 01/03/94
Notes and comments:

PARTICULATE SAMPLING LABORATORY RESULTS (Version 04.28.92)

Plant Name:	WAKE STONE	EEI Ref#	50119
Sampling Location:	Transfer Point J2, Condition Wet	File:	M201A-3
Date Received:	09/21/93		Page 2 of 12
	File Pathway:	H:\JOBS\50119\LAB\M201A-3.WQ1	

Run Number				Wet-J2-M201A-2				
Sample I.D.				in stack filter / 816				
Container #				< = 10 ug				
	init.	date						
	DK	01/05		4.1108				
	DK	01/04	@	4.1106				
Baggie Tare Wt., g.				3.8333				
Filter Tare Wt., g.				0.2645				
FILTER SAMPLE WT., g.				0.0128				

Sample I.D.				in stack filter rinse / 829			nozzle & cyclone rinse / 830	
Container #				< = 10 ug			>10ug	
	init.	date			date			
	DK	01/05	@	3.7841	01/05	@	3.8075	
	DK	01/04	@	3.7841	01/04	@	3.8075	
Tare Wt., g.		(100	ml)	3.7692	(120	ml)	3.7649	
RINSE SAMPLE WT., g.				0.0149			0.0426	

Filter Catch, mg.	12.8	NA
Rinse Catch, mg.	14.9	42.6
Blank Residue, mg.	0.8	0.9
Net Rinse Catch, mg.	14.1	41.7
FILTERABLE PARTICULATE, mg.	26.9	41.7

Blank Beaker #	B / 851	
Final wt., mg.	3.8389	
Tare wt., mg.	3.8381	
Residue, mg.	0.8	
Volume, ml.	100	
Density, mg/ml	785.0	
Conc., mg/mg	1.019E-05	
Upper Limit, mg/mg	1.000E-05	<-

—Legend—
@ = Final Weight
F = Filter R = Rinse
1 = Light
2 = Medium
3 = Heavy or Dark

Sample Description		
Run #	Color	Loading
-2	(1) 2 3	1 (2) 3

Predominate color of samples is: LIGHT GRAY.
Date of full balance span: 01/03/94
Notes and comments:

PARTICULATE SAMPLING LABORATORY RESULTS (Version 04.28.92)

Plant Name:	WAKE STONE	EEI Ref#	50119
Sampling Location:	Transfer Point J2, Condition Wet	File:	M201A-3
Date Received:	09/21/93		Page 3 of 12

File Pathway: H:\JOBS\50119\LAB\M201A-3.WQ1

Run Number: Wet-J2-M201A-3

Sample I.D.				in stack filter / 817				
Container #				< = 10 ug				
	init.	date			date			
	DK	01/05	@	4.1244				
	DK	01/04	@	4.1244				
Baggie Tare Wt., g.				3.8319				
Filter Tare Wt., g.				0.2702				
FILTER SAMPLE WT., g.				0.0223				

Sample I.D.				in stack filter rinse / 831			nozzle & cyclone rinse / 832	
Container #				< = 10 ug			>10ug	
	init.	date			date			
	DK	01/05	@	3.8856	01/05	@	3.7411	
	DK	01/04	@	3.8856	01/04		3.7413	
Tare Wt., g.		(65	ml)	3.8801	(150	ml)	3.6958	
RINSE SAMPLE WT., g.				0.0055			0.0453	

Filter Catch, mg.	22.3	NA
Rinse Catch, mg.	5.5	45.3
Blank Residue, mg.	0.5	1.2
Net Rinse Catch, mg.	5.0	44.1
FILTERABLE PARTICULATE, mg.	27.3	44.1

Blank Beaker #	B / 851	
Final wt., mg.	3.8389	
Tare wt., mg.	3.8381	
Residue, mg.	0.8	
Volume, ml.	100	
Density, mg/ml	785.0	
Conc., mg/mg	1.019E-05	
Upper Limit, mg/mg	1.000E-05	<-

—Legend—
@ = Final Weight
F = Filter R = Rinse
1 = Light
2 = Medium
3 = Heavy or Dark

Sample Description

Run #	Color	Loading
-3	(1) 2 3	1 (2) 3

Predominate color of samples is: LIGHT GRAY.
Date of full balance span: 01/03/94
Notes and comments:

MOISTURE ANALYTICAL RESULTS

Plant Name Wake Stone Job No. 5019

City/State Nightdale, NC Sampling Loc. Transfer Pt J2

Run Number	WET-J2-M201A-1	2	3
Sampling Date	9/13/93	9/15/93	9/16/93
Analysis Date	"	"	"
Analyst	TTB	TTB	TTB
Reagent 1 (200mb DI)			
Final Weight, g	580.0	599.1	647.9
Tared Weight, g	552.5	578.7	582.2
Water Catch, g	27.5	20.4	65.7
Reagent 2 (_____)			
Final Weight, g			
Tared Weight, g			
Water Catch, g			
Reagent 3 (_____)			
Final Weight, g			
Tared Weight, g			
Water Catch, g			
CONDENSED WATER, g			
Silica Gel			
Final Weight, g	~~228~~ 219.4	220.3	232.1
Tared Weight, g	191.3	198.7	206.3
ADSORBED WATER, g	~~35.5~~ 28.1	21.6	25.8
TOTAL WATER COLLECTED, g	55.6	42.0	91.5

Balance No. 45 Type (✓) Triple Beam ✓ Electronic ___ Reagent Box No. 612

Balance located in stable, draft-free area (✓)? Yes ___ No ___ (If "No", explain below.)

Comments _____

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ENTROPY

PARTICULATE SAMPLING LABORATORY RESULTS (Version 04.28.92)

Plant Name:	WAKE STONE	EEI Ref#	50119
		File:	M201A-3
Sampling Location:	Transfer Point J2, Condition Dry		
Date Received:	09/21/93	Page	4 of 12
	File Pathway:	H:\JOBS\50119\LAB\M201A-3.WQ1	

Run Number			Dry-J2-M201A-1					
Sample I.D.			in stack filter / 818					
Container #			< = 10 ug					
	init.	date						
	DK	01/05	@	4.2119				
	DK	01/04	@	4.2119				
Baggie Tare Wt., g.				3.8995				
Filter Tare Wt., g.				0.2634				
FILTER SAMPLE WT., g.				0.0490				
Sample I.D.			in stack filter rinse / 833			nozzle & cyclone rinse / 834		
Container #			< = 10 ug			>10ug		
	init.	date			date			
	DK	01/05	@	3.9041	01/05	@	4.7822	
	DK	01/04	@	3.9041	01/04		4.7825	
Tare Wt., g.		(100	ml)	3.8726	(250	ml)	3.7717	
RINSE SAMPLE WT., g.				0.0315			1.0105	

Filter Catch, mg.	49.0	NA
Rinse Catch, mg.	31.5	1010.5
Blank Residue, mg.	0.8	2.0
Net Rinse Catch, mg.	30.7	1008.5
FILTERABLE PARTICULATE, mg.	79.7	1008.5

Blank Beaker #	B / 851
Final wt., mg.	3.8389
Tare wt., mg.	3.8381
Residue, mg.	0.8
Volume, ml.	100
Density, mg/ml	785.0
Conc., mg/mg	1.019E-05
Upper Limit, mg/mg	1.000E-05 <-

---Legend---
@ = Final Weight
F = Filter R = Rinse

1 = Light
2 = Medium
3 = Heavy or Dark

Sample Description –		
Run #	Color	Loading
-1	(1) 2 3	1 2 (3)

Predominate color of samples is: LIGHT GRAY.
Date of full balance span: 01/03/94
Notes and comments:

PARTICULATE SAMPLING LABORATORY RESULTS (Version 04.28.92)

Plant Name:	WAKE STONE	EEI Ref#	50119
Sampling Location:	Transfer Point J2, Condition Dry	File:	M201A-3
Date Received:	09/21/93	Page	5 of 12
	File Pathway:	H:\JOBS\50119\LAB\M201A-3.WQ1	

Run Number				Dry-J2-M201A-2					
Sample I.D.				in stack filter / 819					
Container #				< = 10 ug					
	init.	date			date				
	DK	01/05	@	4.0434					
	DK	01/04		4.0435					
Baggie Tare Wt., g.				3.7264					
Filter Tare Wt., g.				0.2692					
FILTER SAMPLE WT., g.				0.0478					
Sample I.D.				in stack filter				nozzle & cyclone	
Container #				rinse / 835				rinse / 836	
				< = 10 ug				>10ug	
	init.	date			date				
	DK	01/05	@	3.8008	01/05	@		4.9852	
	DK	01/04	@	3.8008	01/04			4.9853	
Tare Wt., g.		(75	ml)	3.7720	(200	ml)		3.7497	
RINSE SAMPLE WT., g.				0.0288				1.2355	
Filter Catch, mg.				47.8				NA	
Rinse Catch, mg.				28.8				1235.5	
Blank Residue, mg.				0.6				1.6	
Net Rinse Catch, mg.				28.2				1233.9	
FILTERABLE PARTICULATE, mg.				76.0				1233.9	

Blank Beaker #	B / 851	—Legend—				
Final wt., mg.	3.8389	@ = Final Weight				
Tare wt., mg.	3.8381	F = Filter R = Rinse		Sample Description		–
Residue, mg.	0.8					
Volume, ml.	100	1 = Light		Run #	Color	Loading
Density, mg/ml	785.0	2 = Medium				
Conc., mg/mg	1.019E-05	3 = Heavy or Dark		-2	(1) 2 3	1 2 (3)
Upper Limit, mg/mg	1.000E-05	<–				

Predominate color of samples is: LIGHT GRAYISH TAN.

Date of full balance span: 01/03/94

Notes and comments:

PARTICULATE SAMPLING LABORATORY RESULTS (Version 04.28.92)

Plant Name:	WAKE STONE	EEI Ref#	50119
Sampling Location:	Transfer Point J2, Condition Dry	File:	M201A-3
Date Received:	09/21/93		Page 6 of 12
	File Pathway:	H:\JOBS\50119\LAB\M201A-3.WQ1	

Run Number: Dry-J2-M201A-3

Sample I.D.				in stack filter / 820				
Container #				< = 10 ug				
	init.		date			date		
	DK		01/05	@	4.3311			
	DK		01/04		4.3312			
Baggie Tare Wt., g.					3.9399			
Filter Tare Wt., g.					0.2762			
FILTER SAMPLE WT., g.					0.1150			

Sample I.D.				in stack filter rinse / 837			nozzle & cyclone rinse / 838	
Container #				< = 10 ug			>10ug	
	init.		date			date		
	DK		01/05	@	3.8534	01/05	@	5.2040
	DK		01/04		3.8536	01/04		5.2042
Tare Wt., g.		(100	ml)		3.8108	(155	ml)	3.6658
RINSE SAMPLE WT., g.					0.0426			1.5382

Filter Catch, mg.	115.0	NA
Rinse Catch, mg.	42.6	1538.2
Blank Residue, mg.	0.8	1.2
Net Rinse Catch, mg.	41.8	1537.0
FILTERABLE PARTICULATE, mg.	156.8	1537.0

Blank Beaker #	B / 851	
Final wt., mg.	3.8389	
Tare wt., mg.	3.8381	
Residue, mg.	0.8	
Volume, ml.	100	
Density, mg/ml	785.0	
Conc., mg/mg	1.019E-05	
Upper Limit, mg/mg	1.000E-05	<-

—Legend—
@ = Final Weight
F = Filter R = Rinse
1 = Light
2 = Medium
3 = Heavy or Dark

Sample Description

Run #	Color	Loading
-3	(1) 2 3	1 2 (3)

Predominate color of samples is: LIGHT GRAYISH BROWN.
Date of full balance span: 01/03/94
Notes and comments:

MOISTURE ANALYTICAL RESULTS

Plant Name Wake Stone Job No. 5019

City/State Knightdale, NC Sampling Loc. Transfer PT S2

Run Number	NRV-S2-M201A-1	2	3
Sampling Date			
Analysis Date			
Analyst			
Reagent 1 (200ml 5 DI)			
Final Weight, g	585.3	580.7	575.5
Tared Weight, g	582.7	576.8	574.5
Water Catch, g	2.6	3.9	1.0
Reagent 2 (_____)			
Final Weight, g			
Tared Weight, g			
Water Catch, g			
Reagent 3 (_____)			
Final Weight, g			
Tared Weight, g			
Water Catch, g			
CONDENSED WATER, g			
Silica Gel			
Final Weight, g	193.9	200.7	205.1
Tared Weight, g	188.4	196.0	198.9
ADSORBED WATER, g	5.5	4.7	6.2
TOTAL WATER COLLECTED, g	8.1	8.6	7.2

Balance No. 45 Type (✓) Triple Beam ✓ Electronic ___ Reagent Box No. 626

Balance located in stable, draft-free area (✓)? Yes ___ No ___ (If "No", explain below.)

Comments _____

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ENTROPY

SAMPLE TRANSFER RECORD OF CUSTODY

Please include this form with the final (typed) results, and whenever the final results are faxed to Entropy.

The samples referenced in Entropy Environmentalists Inc. RFA or purchase order No. E3712— 50119 were shipped by Entropy on 9-21-93 (date) via Personal Custody (mode) to EI (laboratory) by _____ (signature)

The samples were received for analysis on 9/21/93 (date) at EEI (laboratory) by _____ (signature)

As applicable, note any broken seals, leakage, spillage, or damage to samples. If discrepancy, specify seal No., jar No., sample No., etc.

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ENTROPY

ENTROPY
Environmentalists, Inc.

P.O. Box 12291
Research Triangle Park
North Carolina 27709-2291
919-781-3550 FAX 919-787-8442

REQUEST FOR ANALYSIS

PO#:E3711 - 50119-13 Customer Name: Wake Stone
Knightdale, NC

Laboratory: EEI

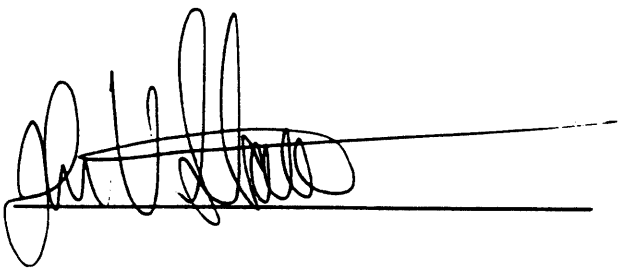
Date Transmitted: 9/21/93 Results Due By: 10/05/93

Sample Matrix: Hi-vol filters PM: TTB

Analysis: Analyze for particulate.

Sample #	Sample ID	Components/Comments
1	Dry-Amb-1	hi-vol filter
2	Wet-Amb-1/2	hi-vol filter
3	Wet-Amb-3	hi-vol filter

Processed: 9-29-93

Submitted By: 

ANALYTICAL NARRATIVE - RFA No. E3711-5C119

Plant/City/State Wake Stone, Knightdale, NC

Analyst D K Date Rec'd in Lab 9-29-93

Lead Analyst D. Kinchelo Analysis Date 10-02-93

Analysis Method & Analytes Hi Vol Particulate Analysis

Sample Matrix & Components 3 Hi-Vol (8"x10") Glass mat Filters.

Summary of Sample Prep (added rinse in lab, final volumed, pH adjusted, etc.)

Transfer filters to desiccater, dessicate at least 24 hrs., weigh, redesiccate 24 hrs., weigh, etc., weigh until final weigh is obtained.

Summary of Instrumentation Mettler AT 100 Analytical Balance

Minimum Detectable Limit 0.1 mg., ± 0.3 mg.

Summary of QA/QC Sample Analysis N/A

Spikes (describe spikes and % recovery) N/A

Specific Comments Regarding Sample Analysis (Note unusual catch weights, interferences, odd sample behavior, and steps taken to confirm unusual results. Also note any deviations from standard analytical procedures, together with justification and possible affect on results. Specify run number(s) when applicable.)

At client's request, this job was put on hold until client requested a continuation of this job. Lab was notified on 01-04-94 to complete this job.

Will the sample(s) require additional analysis? Yes ___ No ✓

If applicable, Custodian has been notified the data is in QA Officer review: _____ (Custodian/Date)

Confirmation of Data Review

Lead Analyst Signature D. Kinchelo Date 10-2-93 resubmitted 01-05-94

Lab QA Officer Signature [signature] Date 1/6/94

USE PAGE 2 IF ADDITIONAL SPACE NEEDED FOR ANY ITEM

HI-VOL PARTICULATE LABORATORY RESULTS (Version 09.30.92)

Plant Name: WAKE STONE **EEI Ref#:** 50119 **Filename:** II-HI

Date Received: 09/21/93 **File Pathway:** H:\JOBS\50119\LAB\II-HI.WQ1

	Run Number:	DRY-AMB-1	WET-AMB-1/2	WET-AMB-3
Sample Location: STONE CRUSHER				
	10/02	• 5.6481	• 4.7361	• 4.9318
	10/01	5.6484	4.7376	4.9328
	Filter Tare Wt., g.	4.3521	4.3797	4.3394
FILTER SAMPLE WT., g.		1.2960	0.3564	0.5924

	Run Number:			
Sample Location:				
	Filter Tare Wt., g.	0.0000	0.0000	0.0000
FILTER SAMPLE WT., g.				

	Run Number:			
Sample Location:				
	Filter Tare Wt., g.	0.0000	0.0000	0.0000
FILTER SAMPLE WT., g.				

SAMPLE DESCRIPTION

	Run #	Color	Loading	Run #	Color	Loading
LEGEND	1	1 (2) 3	1 (2) 3		1 2 3	1 2 3
1 = Light	1/2	1 (2) 3	(1) 2 3		1 2 3	1 2 3
2 = Medium	3	1 (2) 3	(1) 2 3		1 2 3	1 2 3
3 = Heavy or Dark		1 2 3	1 2 3		1 2 3	1 2 3
		02/01/93			1 2 3	1 2 3

Predominate color of samples is: MEDIUM GRAY.
Date of full balance span: 09/27/93
Notes and comments:

SAMPLE TRANSFER RECORD OF CUSTODY

Please include this form with the final (typed) results, and whenever the final results are faxed to Entropy.

The samples referenced in Entropy Environmentalists Inc. RFA or purchase order No. E3711 — 50119 were shipped by Entropy on -93 (date) via Personal Custody (mode) to EI (laboratory) by [signature] (signature)

The samples were received for analysis on 9-29-93 (date) at EEI (laboratory) by D. Kinchelor (signature)

As applicable, note any broken seals, leakage, spillage, or damage to samples. If discrepancy, specify seal No., jar No., sample No., etc.

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ENTROPY

RECORD OF LABORATORY FILTER TARE WEIGHTS

FILTER DESCRIPTION:

Filter Type: Wake Inc Hi Vols — Pore Size (if applicable): _____

Filter Dimensions: 8" x 10" — Lot Number (if applicable): _____

Weigh Each Filter to a Final Weight (0.5 mg difference from previous weight).
Allow Six Hours Minimum Between Weighings. Check Weight to be used as Final.
Include Copy of this Record with Sets of Pre-Numbered Filters.

CONDITIONS AT TIME OF WEIGHING:

Filters Desiccated 24 Hrs. Prior to 1ST Weight? _____

	1ST WEIGHT	2ND WEIGHT	3RD WEIGHT	4TH WEIGHT
Lab Temp. (°F):	73°	71		
Barom. Pressure:	29.80	29.80		
Time:	1530	1240		
Rel. Humidity (%):	37%	37%		
Operator:	DLK	DLK		
Today's date:	10-01-93	10-2-93		

Des. #5

FILTER NUMBER	1ST WEIGHT	2ND WEIGHT	3RD WEIGHT	4TH WEIGHT
5955491	4.9328	4.9318		
5955492	4.7376	4.7361		
5955490	5.6484	5.6481		

RECORD OF LABORATORY FILTER TARE WEIGHTS

FILTER DESCRIPTION:

Filter Type: _____ — Pore Size (if applicable): _____

Filter Dimensions: _____ — Lot Number (if applicable): _____

Weigh Each Filter to a Final Weight (0.5 mg difference from previous weight).
Allow Six Hours Minimum Between Weighings. Check Weight to be used as Final.
Include Copy of this Record with Sets of Pre-Numbered Filters.

CONDITIONS AT TIME OF WEIGHING:

Filters Desiccated 24 Hrs. Prior to 1ST Weight? _____

	1ST WEIGHT	2ND WEIGHT	3RD WEIGHT	4TH WEIGHT
Lab Temp. (°F):				
Barom. Pressure:				
Time:				
Rel. Humidity (%):				
Operator:				
Today's date:				

FILTER NUMBER	1ST WEIGHT	2ND WEIGHT	3RD WEIGHT	4TH WEIGHT

Appendix F. Audit Data Sheets

SAMPLING EQUIPMENT AUDIT

Plant Name Wake Stone Job No. 50119

City/State Knightdale, N.C. Auditor(s) JED

Test Loc. C1 Date 09-12-93

BAROMETER
Entropy In-House Ref. Barometer _____ "Hg vs Field Barometer _____ "Hg

Date Compared _____ Dev. _____ "Hg (Max. Allowable Dev.: ± 0.1 "Hg)

Field Barometric Pressure Corrected for Test Location Elevation? (√) ____
(Note: deduct 0.1" Hg from local NWS *STATION* pressure for each 100' of test location elevation; example: 29.6 - (300'/100 * 0.1) = 29.3" Hg.)

Ref. Therm. Initial Ambient Temp., °F 80

	Allowable Deviation From Ambient	Ambient Temperature, °F				Audit OK (√)
THERMOMETERS *						
Dry Gas Meter	± 5.4 °F	81 (Meterbox No. N37)				✓
Impinger Exit	± 2.0 °F	59	____	____	____	✓
Filter Box	± 5.4 °F	____	____	____	____	____

* Adjust thermometer until acceptable. If it cannot be adjusted, use as back-up. If no backup, record ambient temperature indicated by unadjusted thermometer and label with correction factor (indicate):

THERMOCOUPLES Allowable Deviation from Ambient: ± 8.0°F* (± 2.0°F)**

TC No./ °F	OK (√)	TC No./ °F	OK (√)	TC No./ °F	OK (√)	TC No./ °F	OK (√)	TC No./ °F	OK (√)
R182 / 60	✓	/		/		/		/	

* ± 8.0 °F = ± 1.5% of ambient absolute temperature.
** (± 2.0 °F if used in saturated or water droplet-laden gas stream.)

ISOKINETIC METERBOX I.D. N37 Gamma (Y) 1.0099 ΔH@ 1.866

As Applicable (check): Zero Magnehelics? ✓ Zero/Level Manometer? ____

Barometric Pressure (P_{bar}) 30.18 Auditor JED Date 09-12-93

Dry Gas Meter Reading (Cubic Ft.)	Meter Temperature (°F)	Lower and Upper Limits for Audit Gamma
Final 705.156	Final 102	0.96 * Y = .9695
Initial 697.427	Initial 95	1.04 * Y = 1.0503

Dry Gas Volume Metered (Cubic Ft.)	Average Meter Temp. (°F)	Run Time (Base = 10)	
		(Minutes)	(Seconds)
Vm = 7.729	Tm = 98.5	10	0

$$Y_c = \frac{[\text{Min.} + (\text{Sec.} / 60)]}{Vm} * \left[\frac{0.0319\ (Tm + 460)}{P_{bar}}\right]^{1/2}$$

$$Y_c = \frac{[10 + (0 / 60)]}{7.729} * \left[\frac{0.0319\ (98.5 + 460)}{30.18}\right]^{1/2} = \underset{\text{Audit Gamma}}{.9941}$$

Audit Gamma Acceptable (between lower & upper limits)? (√) ✓ Yes ___ No

ENTROPY

SAMPLING EQUIPMENT AUDIT

Plant Name WAKE STONE/STONE CRUSHING Job No. 50119

City/State KNIGHTDALE, N.C Team Leader TTB

Test Location J2 TRANSFER POINT

BAROMETER

Barometer (Van) No. _____ Checked OK? (√) ___ Shop Auditor _____

Entropy In-House Ref. Barometer _____ "Hg vs Van Barometer _____ "Hg

Date Compared _____ Dev. _____ "Hg (Max. Allowable Dev.: ± 0.1 "Hg)

Test Loc. Elevation Above Ground (Van) _____ Ft. Date _____ Field Auditor _____

Field Barometric Pressure Reduced for Test Location Elevation by _____ "Hg

Ref. Therm. Initial Ambient Temp., °F 80

Date _____ Auditor _____

THERMOMETERS	Allowable Deviation From Ambient	Ambient Temperature, °F	√ OK
Dry Gas Meter	± 5.4 °F	_____ (Meterbox I.D. _____)	___
Impinger Exit	± 2.0 °F	_____ _____ _____ _____	___
Filter Box	± 5.4 °F	_____ _____ _____ _____	___

THERMOCOUPLES

TC No./ °F	√ OK	TC No./ °F	√ OK	TC No./ °F	√ OK	TC No./ °F	√ OK	TC No./ °F	√ OK
_____/_____ (Including Temp. Change and Direction)	___	_____/_____ (Including Temp. Change and Direction)	___	_____/_____ (Including Temp. Change and Direction)	___	_____/_____ (Including Temp. Change and Direction)	___	_____/_____ (Including Temp. Change and Direction)	___
Auditor _____		Auditor _____		Auditor _____		Auditor _____		Auditor _____	

Allowable Deviation from Ambient: ± 8.0°F * (or ± 2.0°F) **

* ± 8.0 °F = ± 1.5% of ambient absolute temperature.

** (± 2.0 °F if used in saturated or water droplet-laden gas stream.)

ISOKINETIC METERBOX

I.D. N19 Gamma (Y) 1.0015 ΔH@ 1.87

As Applicable (check): Zero Magnehelics? ✓ Zero/Level Manometer? ___

Barometric Pressure (P_{bar}) 30.18 Auditor DWS Date 9/12/93

Dry Gas Meter Reading (Cubic Ft.)	Meter Temperature (°F)	Lower and Upper Limits for Audit Gamma
Final 909.137	Final 87	0.96 * Y = .9614
Initial 901.685	Initial 83	1.04 * Y = 1.0416

Dry Gas Volume Metered (Cubic Ft.)	Average Meter Temp. (°F)	Run Time (Base = 10)	
		(Minutes)	(Seconds)
Vm = 7.452	Tm = 85	10	0

$$Y_c = \frac{[10 + (0 / 60)]}{7.452 \quad 30.18} * \left[\frac{0.0319\ (85 + 460)}{30.18}\right]^{.5} = \frac{1.0188}{\text{Audit Gamma}}$$

Audit Gamma Acceptable (between lower & upper limits)? (√) Yes ✓ No ___

Ideal Sampling Rate = 0.75

Positive Pressure Leak Check OK? Yes ___ No ___

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ENTROPY

Appendix G. Example Test Calculations For Run Wet-C1-M201A-1

Example Test Calculations for
Run Wet-C1-M201A-1

Volume of Dry Gas Sampled At Standard Conditions

$$Vmstd = Y * Vm * \frac{Pbar + (Delta\ H / 13.6)}{(460 + tm)} * \frac{(460 + tstd)}{Pstd}$$

$$Vmstd = 1.0099 * 137.801 * \frac{30.21 + (0.5546 / 13.6)}{(460 + 103.3)} * \frac{(460 + 68)}{29.92}$$

Vmstd = 131.886 Dry Standard Cubic Feet

Volume of Water Vapor at Standard Conditions

Vwstd = 0.04707 * Vlc * (460 + tstd) / 528

Vwstd = 0.04707 * 56.4 * (460 + 68) / 528

Vwstd = 2.655 Standard Cubic Feet (at 68 Degrees Fahrenheit)

Percent Moisture, by Volume, as Measured in Flue Gas

$\%H_2O = 100 * Vwstd / (Vwstd + Vmstd)$

$$\%H_2O = 100 * \frac{2.655}{(2.655 + 131.886)} = 1.973\ \%H_2O$$ (Moisture Used in Calculations)

Absolute Flue Gas Pressure

Ps = Pbar + (Pg / 13.6)

Ps = 30.21 + (-0.45 / 13.6) = 30.177 inches Hg

Saturated Percent Moisture at Flue Gas Temperature

$$\%H_2OSAT = \frac{10^{[6.6911 - (3144 / (ts + 390.86))]}}{Ps} * 100$$

$$\%H_2OSAT = \frac{10^{[6.6911 - (3144 / (77.1 + 390.86))]}}{30.18} * 100 = 3.11\%$$

Dry Mole Fraction of Flue Gas

$Mfd = 1 - (\%H_2O / 100)$

Mfd = 1 - (1.973 / 100) = .980

Dry Molecular Weight of Flue Gas

$$Md = (\%CO_2/100 * 44) + (\%O_2/100 * 32) + ((100-\%CO_2 - \%O_2)/100 * 28$$

$$Md = (0 / 100 * 44) + (20.9 / 100 * 32) + ((100 - 20.9)/100 * 28$$

$$Md = 28.84 \text{ lb/lb-Mole}$$

Wet Molecular Weight of Flue Gas

$$Ms = (Md * Mfd) + (0.18 * \%H_2O)$$

$$Ms = (28.84 * .980) + (0.18 * 1.973) = 28.62$$

Average Flue Gas Velocity [Note: (Delta P)avg is = to $\sqrt{(\text{Delta p avg})^2}$]

$$vs = 85.49 * Cp * \left[\frac{(\text{Delta P})avg * (460 + ts)}{Ps * Ms} \right]^{\frac{1}{2}}$$

$$vs = 85.49 * 0.840 * \left[\frac{(0.1602) * (460 + 77.1)}{30.18 * 28.62} \right]^{\frac{1}{2}} = 22.67 \text{ feet/second}$$

Dry Volumetric Flue Gas Flow Rate at Standard Conditions

$$Qsd = \frac{60}{144} * Mfd * vs * A * \frac{460 + tstd}{460 + ts} * \frac{Ps}{Pstd}$$

$$Qsd = \frac{60}{144} * 0.980 * 22.67 * 113.1 * \frac{460 + 68}{460 + 77.1} * \frac{30.18}{29.92}$$

Qsd = 1038.2 Dry Standard Cubic Feet / Minute

Wet Volumetric Flue Gas Flow Rate at Actual Conditions

$$Qaw = 60 / 144 * vs * A$$

$$Qaw = 60 / 144 * 22.67 * 113.1 = 1068.3 \text{ Actual Cubic Feet / Minute}$$

Percent Isokinetic of Sampling Rate

$$\%I = \frac{Pstd}{460 + tstd} * \frac{100}{60} * \frac{(ts + 460) * Vmstd}{Ps * vs * Mfd * Theta * (\pi * (NozzleDia/2)^2/144}$$

$$\%I = \frac{29.92}{460 + 68} * \frac{100}{60} * \frac{(77.1 + 460) * 131.886}{30.08 * 22.67 * 0.980 * 315 * (\pi * (0.249/2)^2/144}$$

%I = 93.7%

Transfer Point Concentration, Milligrams Per Dry Standard Cubic Foot, PM10 Particulate

mg/DSCF = mg≤10 Microns / Vmstd

mg/DSCF = 40.4 / 131.886 = 0.306

Total Flow Through Ambient PM10 Monitor Dry Standard Cubic Feet

$$QAMB\text{-}STD = vs\ AMB\ Monitor * 0.33FT^2 * \frac{tstd}{ts} * \frac{Pbar}{Pstd} * Minutes * \frac{(1-\%H_2O)}{1}$$

$$QAMB\text{-}STD = 62 * .33 * \frac{(460 + 68)}{(460 + 74)} * \frac{30.21}{29.92} * 251 * \frac{(1 - 0.021)}{1}$$

QAMB-STD = 5019.3 Dry Standard Cubic Feet

Ambient Air Concentration, Milligrams Per Dry Standard Cubic Foot, PM10 Particulate

CPM10AMB = mg≤10 Microns AMB / QAMB-STD

CPM10AMB = 356.4 / 5019.3 = 0.07 mg/DSCF

Calculation of Adjusted PM10 Concentration in M201A Gas Sampled

CPM10AMBADJ = mg/DSCF - CPM10AMB)

CPM10AMBADJ = 0.306 - 0.071 = .24 mg/ DSCF

Calculation of PM10 Emission Rate Pounds Per Hour

$$lb/hr = \frac{mg}{DSCF} * \frac{1\ Gram}{1000\ mg} * \frac{lb}{453.6\ Grams} * \frac{Qsd}{Minute} * \frac{60\ Minutes}{Hour}$$

lb/hr = .24 * 0.001 * 0.0022 * 1038 * 60 = 0.032

Calculation of PM10 Emission Rate Pounds Per Ton

$$lb/ton = \frac{lb}{1\ hour} * \frac{1\ hour}{ton}$$

$$lb/ton = \frac{0.032\ lb}{1\ hour} * \frac{1\ hour}{530.10\ tons} = 0.00006\ lb/ton$$