A Study of Toxic Emissions from a Coal-Fired Power Plant Utilizing an ESP While Demonstrating the ICCT CT-121 FGD Project

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GLOSSARY

acfm	Actual Cubic Foot (Feet) per Minute
AAS	Atomic Absorption Spectrophotometry
ADA	ADA Technologies, Inc.
AP-42	Publication number of the principal emission factor document published by EPA.
APH	Air Preheater
ASTM	American Society for Testing and Materials
В	Data Flag (value has been blank corrected)
Btu	British Thermal Unit
С	Data Flag (with blank correction, value was below detection limit, detection limit reported)
CE	Combustion-Engineering, Inc.
CEM	Continuous Emission Monitor
CEMS	Continuous Emission Monitoring System
Chicago OPC	Chicago Office of Patent Counsel (U.S. DOE)
CI	Confidence Interval
Ģ	Pitot Tube Coefficient
CT-121	Chiyoda Thoroughbred-121 (a second-generation flue gas desulfurization process)
CT&E	Commercial Testing & Engineering
CVAA	Cold Vapor Atomic Absorption
CVAFS	Cold Vapor Atomic Fluorescence Spectrometry
DAS	Data Acquisition System
ΔΡ	"Delta P"; Pressure Drop; Pressure Difference (measured in inches of water column)
DL	Detection Limit

Glossary

DNPH Dinitrophenylhydrazine

DQO Data Quality Objective

dscfm Dry Standard Cubic Foot (Feet) per Minute

E Data Flag (analyte concentration exceeded calibration range)

EPA U.S. Environmental Protection Agency

EPRI Electric Power Research Institute

ESP Electrostatic Precipitator

FGD Flue Gas Desulfurization

f/sec Foot (Feet) per Second

g Gram(s)

GC/MS Gas Chromatography/Mass Spectrometry

GDMS Glow Discharge Mass Spectrometry

g-mole Gram-Mole (weight of a mole of a substance expressed in grams)

GPC Georgia Power Company

HAP Hazardous Air Pollutant

HHV Higher Heating Value

HPLC High Performance Liquid Chromatography

IC Ion Chromatography

ICCT Innovative Clean Coal Technology (a U.S. DOE program)

ICP-AES Inductively Coupled Plasma-Atomic Emission Spectroscopy

ICP-MS Inductively Coupled Plasma-Mass Spectrometry

INAA Instrumental Neutron Activation Analysis

J Data Flag (below the lower detection limit)

JBR Jet Bubbling Reactor (the absorber design used in the CT-121

process)

kg Kilogram(s)

L Liter

m Meter

mL Milliliter

MM5 Modified Method 5

 μg Microgram(s)

μL Microliter

μm Micrometer; 1 x 10⁶ meter

NA Not Applicable

ND Not Detected

Nm³ Normal Cubic Meter(s): 1m³ @ 0°C and 1.0 atm (equivalent to

37.44 ft³ @ 68°F and 1.0 atm)

Orsat Method of Fixed-Gas (O₂, CO₂, CO) Analysis

PAH Polycyclic Aromatic Hydrocarbon

PCDD Polychlorinated Dibenzodioxin

PCDF Polychlorinated Dibenzofuran

PNR Probe and Nozzle Rinse

POM Polycyclic Organic Matter

RPD Relative Percent Difference

PSD Particle Size Distribution

RSF Relative Sensitivity Factor (used in mass spectrometry)

RTI Research Triangle Institute

scf Standard Cubic Foot (feet): 1 ft³ @ 68°F and 1.0 atm (equivalent

to 0.02671 m³ @ 0° C and 1.0 atm)

scfm Standard Cubic Foot (Feet) per Minute

SCS Southern Company Services, Inc.

SIE Specific Ion Electrode

SW-846 Publication number of "Test Methods for Evaluating Solid Waste"

TCLP Toxicity Characteristic Leaching Procedure

Tenax An organic resin used for sample collection

UV-Vis Ultraviolet-Visible

VOC Volatile Organic Compound; Volatile Organic Chemical

VOST Volatile Organic Sampling Train

EXECUTIVE SUMMARY

The U.S. Department of Energy is performing comprehensive assessments of toxic emissions from eight selected coal-fired electric utility units. This program responds to the Clean Air Act Amendments of 1990, which require the U.S. Environmental Protection Agency (EPA) to evaluate emissions of hazardous air pollutants (HAPs) from electric utility power plants for potential health risks. The resulting data will be furnished to EPA for emissions factor and health risk determinations.

The assessment of emissions involves the collection and analysis of samples from the major input, process, and output streams of each of the eight power plants for selected hazardous pollutants identified in Title III of the Clean Air Act. Additional goals are to determine the removal efficiencies of pollution control subsystems for these selected pollutants and the concentrations associated with the particulate fraction of the flue gas stream as a function of particle size. Material balances are being performed for selected pollutants around the entire power plant and several subsystems to identify the fate of hazardous substances in each utility system.

Radian Corporation was selected to perform a toxics assessment at a plant demonstrating an Innovative Clean Coal Technology (ICCT) Project. The site selected is Plant Yates Unit No. 1 of Georgia Power Company, which includes a Chiyoda Thoroughbred-121 demonstration project.

Site Description

Plant Yates Unit No. 1 is a bituminous coal-fired steam electricity-generating unit with a net generating capacity of 100 megawatts. Located in Newnan, Georgia, the station is owned and operated by Georgia Power Company. The station uses a tangentially fired CE boiler that burns a 2.5%-sulfur blend of Illinois No. 5 and Illinois No. 6 bituminous coals. It uses an electrostatic precipitator to control particulate matter, and the Chiyoda Thoroughbred-121 process controls sulfur dioxide emissions from the entire flue gas stream.

Process Description

The Chiyoda Thoroughbred-121 is a second-generation FGD process employing a unique absorber design, called a jet bubbling reactor, to combine conventional SO₂ absorption, neutralization, sulfite oxidation, and gypsum crystallization in one reaction vessel. The process is designed to operate in a pH range of 3 to 5, where the driving force for limestone dissolution is high, resulting in nearly complete reagent utilization. Oxidation of sulfite to sulfate is also promoted at the lower pH because of the increased solubility of innate

oxidation catalysts such as iron. Because all the absorbed SO₂ is oxidized, there is sufficient surface area for gypsum crystal growth to prevent the slurry from becoming significantly supersaturated with respect to calcium sulfate. This significantly reduces the potential for gypsum scaling.

Sampling Locations

Three flue gas stream locations were identified for testing: the ESP inlet, the ESP outlet (FGD inlet), and the stack. The solid streams sampled were raw coal, pulverized feed coal, pulverizer rejects, individual ESP hopper ash, and raw limestone. Samples collected as slurried or sluiced streams include the bottom ash, the combined ESP hopper ash, limestone, and FGD slurry solids. The following liquid streams were sampled: ash pond water, gypsum pond water, ash sluice water (from the bottom ash and fly ash), FGD slurry blowdown filtrate, limestone slurry filtrate, coal pile run-off, and cooling water at the condenser inlet.

Sample Collection

Radian's approach to meeting the test objectives utilized established sampling methods (where possible) and a sampling strategy consistent with that of the EPRI-sponsored Field Chemical Emissions Monitoring (FCEM) program.¹ Samples were collected with the boiler operating within 10% of full load, at steady-state conditions, and in triplicate over two periods of three days each: June 21-23 and June 25-27, 1993.

Detection Limits

Detection limits for the gaseous phase target metals of interest are presented in Table ES-1. These numbers were derived from instrument method detection limits, the volume of gas sampled, and the amount of solid sample that was analyzed. Data are presented for detection limits derived from gas samples collected from the stack. This location was chosen to illustrate typical detection limits, as it represents the highest level of particulate detection limits, due to the low particulate loading at this location. Loading at the stack averaged 0.0145 g/Nm³, and the numbers presented in the table represent the analysis of approximately 35 mg of particulate collected from a nominal 3 m³ sample size.

Quality Assurance and Quality Control

During sample collection, quality assurance audits were conducted by Radian's internal QA auditor and by Research Triangle Institute, under contract with EPA. Radian's auditor also conducted a performance evaluation audit by submitting "double-blind" (identity and composition unknown) samples to the analytical laboratories. Quality control procedures involved the evaluation of results for field and laboratory blank samples, duplicate field samples, matrix-spiked and surrogate-spiked samples, and laboratory control samples.

Overall, QA/QC data associated with this program indicate that measurement data are acceptable and defensible. The QA/QC data indicate that the quality control mechanisms

Table ES-1
Detection Limits for Gaseous Phase Target Metals

Detection Limits, µg/Nm³

		Detection Da	με/11111
Specie	Method	Vapor	Solids
Antimony	ICP-MS	0.004	0.0008
Arsenic	GF-AAS	0.2	0.04
Barium	ICP-AES	0.16	0.09
Beryllium	ICP-AES	0.17	0.03
Boron	ICP-AES	4.6	NA
Cadmium	GF-AAS	0.07	0.17
Chromium	ICP-AES	0.76	0.44
Cobalt	ICP-AES	1.0	0.59
Copper	ICP-AES	1.2	0.44
Lead	GF-AAS	0.25	0.04
Manganese	ICP-AES	0.12	0.46
Mercury	CV-AAS	0.13	0.01
Molybdenum	ICP-AES	1.4	0.15
Nickel	ICP-AES	3.0	1.0
Selenium	GF-AAS	0.26	0.12
Vanadium	ICP-AES	0.72	0.66

NA = Not analyzed, insufficient sample size.

were effective in ensuring measurement data reliability within the expected limits of sampling and analytical error.

Plant Operating Conditions

During sample collection, operating conditions were continuously monitored using a computerized data acquisition system which logged process information as 15-minute averages. In addition, boiler operating data were logged hourly by control room operators. Overall, all processes were very stable, and the key operating parameters were within the targeted range during the entire test period.

Three continuous emission monitors were operated during the test period, providing data for sulfur dioxide, nitrogen oxides, and carbon monoxide. ESP characteristics were monitored by ADA Technologies, Inc.

Analytical Results

Samples were analyzed for trace elements, minor and major elements, volatile organic compounds, and semivolatile organic compounds. Analytical results have been tabulated in detail with 95% confidence intervals and detection limit ratios.

Procedures were provided by DOE for results below the detection limit, values outside the calibration range, and blanks. In the detailed data tabulations, some data have been flagged; for example, some background contamination was encountered.

Data Analysis: Mass Balances, Removal Efficiencies, and Emission Factors

Emission factors, removal efficiencies, and other results rely on measurement data that are near the limit of detection or below it for many of the substances of interest. For that reason, uncertainty analyses and the calculation of confidence intervals were performed as part of this program.

Following are observations as a result of the data analysis:

- Material balances were calculated for 27 elements. Sixty-percent of these met the target closure objectives of 70-130% for balance around the plant. Eight-five percent met a closure criteria of 50-150 percent.
- Removal efficiencies for non-volatile particulate metals averaged greater than 98% across the ESP. The JBR was also effective in further reducing the emission of several metals, due primarily to its effectiveness as a particulate control device.
- Emission factors have been calculated for the target trace elements and are presented in Table ES-2. Thirteen of these elements have emission rates of less than 10 pounds per billion Btu of coal.

Table ES-2 Emission Factors

	lb/10 12 Btu	95% CI
Anions		
Chloride	742	647
Fluoride	122	67
Selected Elements *		
Antimony	0.06	0.01
Arsenic	1.2	0.2
Barium	2.8	9.9
Beryllium	0.1	0.1
Cadmium	0.6	2.1
Chromium	5.3	49.5
Cobalt	0.7	0.8
Copper	2.0	2.3
Lead	0.6	0.6
Manganese	7.2	48
Mercury	3.0	0.3
Molybdenum	1.5	2.6
Nickel	40.1	435
Selenium	26.5	58
Vanadium	2.1	0.5
Aldehydes		
Acetaldehyde	8.6	9.2
Formaldehyde	24	36
Volatile Organics b,c		
Benzene	1.3	0.3
Carbon Disulfide	2.2	1.2
Toluene	2.0	1.0

Table ES-2 (Continued)

	lb/10 12 Btu	95% CI
Semivolatile Organics d		
2-Methylphenol (o-cresol)	2.9	3.8
4-Methylphenol (p-cresol)	0.95	1.9
Acetophenone	3.2	0.7
Benzoic Acid	120	7
Benzyl Alcohol	2.8	12
Naphthalene	1.5	1.0
Phenol	9.2	8.8

^{*} Run 1 particulate-phase data were invalidated for all elements included here except arsenic, selenium, and vanadium due to the filter background comprising 20% or greater of the measured concentration.

^b Only those compounds with an average concentration above the detection limit are included.

^e Methylene chloride, acetone, and other halogenated hydrocarbons are not included because their presence is strongly suspected to be the result of contamination.

^d Phthalate esters are not included because their presence is suspected to be the results of contamination.

The method used to determine uncertainties in calculated results is based on "Measurement Uncertainty" and is consistent with the approach to handling data used in the FCEM program.

Comparison of Vapor and Particulate Composition

Most of the substances measured at Plant Yates are distributed between the flue gas (vapor) and the particulate matter associated with bottom ash, collected ESP ash, ash removed in the FGD system, or emitted ash which exits with the flue gas through the stack. (The sampling and analytical techniques used for organic compounds did not quantify distribution between particulate and vapor phases.)

At ESP inlet conditions, more than 99% of most of the substances of interest are in the particulate phase. Exceptions are chloride, fluoride, selenium, and mercury. With these same exceptions, the particulate phase is the predominant phase at the ESP outlet and stack.

Distribution of HAPs as a Function of Particle Size in the Flue Gas and the Particle Size Distribution of the ESP

Most of the metals are removed across the ESP at a rate that is approximately the same as that of the total particulate. Exceptions are arsenic, cadmium, phosphorus, and selenium. Arsenic, cadmium, and phosphorus penetration could be due to low concentrations or to association with particles in the range of 0.5 to 2 μ m. The selenium penetration is thought to be due to sampling or analytical error.

Mercury Methods Comparison and Speciation Determinations

Two different methods were used to measure mercury concentrations in the flue gas. The Bloom mercury speciation train³ was used to measure the concentrations of individual vaporphase mercury species: ionic mercury, elemental mercury, and methyl mercury. Total mercury, particulate and vapor phases, was measured using a multi-metals train.⁴

Ionic mercury appears to be the predominant species in the ESP inlet and ESP outlet gas streams, but ionic mercury is more efficiently removed by the scrubber. Methyl mercury concentrations also appear to decrease across the scrubber.

Hexavalent Chromium Determinations

Hexavalent chromium as well as total chromium were nondetectable in the samples collected after appropriate blank correction had been applied. Although samples were collected as specified by the published method,⁵ it should be noted that the collection procedure for obtaining Cr⁶⁺ samples from a flue gas matrix containing SO₂ has not been validated.

Determinations of Toxics on Particle Surfaces

Because of the health and environmental importance of toxic substances that are found on the surfaces of particles and because these substances are more available to biological and ecological systems, a comparison between bulk composition and surface leachability was performed. Results have been tabulated, and some conclusions can be drawn for individual elements, but no overall trends are clearly evident.

Recommendations and Considerations

Some technical issues have been identified during this study that may warrant further consideration. Among these are the following sampling, analytical and/or process related issues:

- Selenium sampling and analysis;
- Mercury partitioning and speciation; and
- Fly ash penetration of the FGD process.

Selenium

Selenium could not be accurately quantified throughout the process. Apparent problems were associated with both the collection and the analysis of selenium. Further directed study of selenium is recommended. Problems associated with the quantification of selenium are discussed in Section 8.

Mercury

Mercury was collected and analyzed by both Method 296 and by the Bloom method⁷ which uses charcoal tubes for the absorption and speciation of mercury. Results obtained from these two methods are presented in Section 9. One of the phenomena observed is an apparent increase in the elemental mercury concentration across the FGD system. Another anomaly is the apparent enrichment in fly ash particles of mercury when collected from the flue gas via filtration. These two items warrant further study and investigation.

Fly Ash Penetration of FGD System

The link between particle size, surface orientation of trace elements, and the penetration of fine particles cannot be demonstrated by comparing the extractable and total metal concentrations of the particulate emissions from the FGD system. Fly ash penetration, the mass contribution from sulfuric acid mist and scrubber mist soluble salts (gypsum) add additional variables to the assessment of air toxic emissions as a function of surface orientation. The following penetration mechanisms can potentially impact the analysis of the particulate emissions from wet scrubbers:

- Direct penetration of the fly ash;
- Capture of the ash particles in the scrubber liquor and re-entrainment during recycle;
- Entrainment of scrubber-generated solids;
- Evaporation and penetration of scrubber mist as soluble salts; and
- Condensation and recovery of sulfuric acid mist as particulate.

Controlled condensation test methods should be used in future test efforts for measuring sulfuric acid emissions apart from gypsum, and SO₂ artifacts. The analysis of tracer elements associated only with the coal ash may be warranted to determine ash penetration and dilution from scrubber solids. Analysis of size-fractionated particulate emissions could potentially identify the predominant size ranges associated with individual components.

Test efforts to quantify the relative contribution of each phenomenon to particulate emissions may be of interest to those considering wet scrubbers for the control of air toxics as well as SO_2 . This data would provide a basis of comparison between the surface extractability of the dry ash entering an FGD system and the particulate emissions downstream.

References

- 1. Electric Power Research Institute. Field Chemical Emissions Monitoring (FCEM)
 Generic Sampling and Analytical Plan. Draft Report. Palo Alto, CA (May 1994).
- 2. American Society of Mechanical Engineers. Measurement Uncertainty: Instruments and Apparatus. PTC 19.1-1985 (reaffirmed 1990), pp 1-65. United Engineering Center, New York, NY. Published by the American National Standards Institute.
- 3. Nicolas S. Bloom, Eric M. Prestbo, and Vesna L. Miklavicic, "Fluegas Mercury Emissions and Speciations from Fossil Fuel Combustion." Published in the proceedings of the Second International Conference on Managing Hazardous Air Pollutants (sponsored by the Electric Power Research Institute) Washington, D.C. (July 1993).
- 4. 40 CFR 266, Subpart H, "Method 29: Determination of Metals Emissions in Exhaust Gases from Hazardous Waste Incineration and Similar Combustion Processes: Proposed Method."
- 40 CFR 266, Appendix IX: Methods Manual for Compliance with the BIF Regulations.
 "Determination of Hexavalent Chromium Emissions from Stationary Sources (Method Cr⁺⁶)."
- 6. 40 CFR 266, Subpart H, "Method 29: Determination of Metals Emissions in Exhaust Gases from Hazardous Waste Incineration and Similar Combustion Processes: Proposed Method."

Executive Summary

7. Nicolas S. Bloom, Eric M. Prestbo, and Vesna L. Miklavicic, "Fluegas Mercury Emissions and Speciations from Fossil Fuel Combustion." Published in the proceedings of the Second International Conference on Managing Hazardous Air Pollutants (sponsored by the Electric Power Research Institute) Washington, D.C. (July 1993).

INTRODUCTION

Background

The U.S. Department of Energy is performing comprehensive assessments of toxic emissions from eight selected coal-fired electric utility units. These data are being collected in response to the Clean Air Act Amendments of 1990, which require that EPA conduct a study of the emissions of hazardous air pollutants (HAPs) from electric utility power plants, and these emissions be evaluated for potential health risks. The data will be compiled and combined with similar data that are being collected as part of the Field Chemical Emissions Monitoring program¹ sponsored by the Electric Power Research Institute (EPRI) and will then be furnished to the U.S. Environmental Protection Agency for emissions factor and health risk determinations.

The assessments of emissions involve the collection and analysis of samples from the major input and output streams of each of the eight power plants for selected hazardous pollutants contained in Title III of the Clean Air Act. Additional goals of these assessments are to collect data from the selected plants that may be helpful in characterizing removal efficiencies of pollution control subsystems for these selected pollutants and to determine the concentrations associated with the particulate fraction of the flue gas stream as a function of particle size. Material balances will be performed for selected pollutants around the entire power plant and various subsystems to determine the fate of hazardous substances in each utility system.

Radian Corporation was selected to perform one toxics assessment at a plant demonstrating an Innovative Clean Coal Technology (ICCT) Project. The selected site is the Plant Yates Unit No. 1 of Georgia Power Company, which includes the ICCT CT-121 demonstration project.

Objectives

The specific objectives of this project are:

• To collect and subsequently analyze representative solid, liquid, and gas samples of all specified input and output streams of the Plant Yates, Unit No. 1, including the CT-121 flue gas desulfurization system, for selected hazardous air pollutants that are contained in Title III of the 1990 Clean Air Act Amendments and to assess the potential level of release (concentration) of these pollutants;

Introduction

- To determine the removal efficiencies of specified pollution control subsystems for selected pollutants at Plant Yates Unit No. 1;
- To determine material balances for selected pollutants in specified subsystems of the power plant and an overall material balance for the power plant;
- To determine the concentration as a function of particle size of the respective pollutants associated with the particulate fraction of the flue gas stream of Plant Yates Unit No. 1;
- To determine the concentration of the respective pollutants associated with the particulate and vapor-phase fractions of the specified flue gas streams of Plant Yates Unit No. 1;
- To determine the concentrations of toxic substances on the surfaces of fly ash particles;
- To provide data for EPA for use in risk assessments and in updating publication AP-42²;
- To determine hexavalent chromium stack emissions; and
- To compare Method 29³ vapor-phase mercury results with those obtained via charcoal absorption.

Table 1-1 lists the chemical substances analyzed during this project.

Emission factors, removal efficiencies, and other results rely on measurement data that vary and/or may be near the limit of detection or below it for many of the substances of interest. This report includes uncertainty analysis and confidence intervals in order to assess the quality of the data.

Auditing

During the field sampling program conducted at Plant Yates in June 1993, quality assurance audits were conducted by Radian Corporation's internal QA auditor as well as by Research Triangle Institute, under contract with the U.S. Environmental Protection Agency.

Radian's audit was conducted with the purpose of providing an objective, independent assessment of the sampling effort, ensuring that the sampling procedures, data generating, data gathering, and measurement activities produce reliable and useful results. The audit provided a review of calibration documentation, documentation of QC data, completeness of data forms and notebooks, data review/validation procedures, sample logging procedures, and others.

Table 1-1 Target Analytes

Trace Elements

Antimony

Boron Cadmium

Arsenic Barium

Chromium, total

Beryllium

Calak

Cobalt

Manganese Mercury

Copper Lead Molybdenum

Nickel

Selenium Vanadium

Radionuclides

Hexavalent Chromium

Mercury Speciation/Comparison

Anions

Chloride (HCl) Fluoride (HF) Sulfates Phosphates

Reduced Species

Ammonia Cyanide

Organics

Formaldehyde Dioxins Furans

Volatile Organics

Benzene
Bromoform
Carbon Disulfide
Carbon Tetrachloride
Chlorobenzene
Chloroform

1,4-Dichlorobenzene cis-1,3-Dichloropropene trans-1,3-Dichloropropene

Ethyl Benzene

Ethyl Chloride (Chloroethane)

Ethylene Dichloride (1,2-Dichloroethane) Ethylidene Dichloride (1,1-Dichloroethane)

Methyl Bromide (Bromomethane) Methyl Chloride (Chloromethane) Methyl Chloroform (1,1,1-Trichloroethane)
Methyl Ethyl Ketone (2-Butanone)
Methylene Chloride (Dichloromethane)
Propylene Dichloride (1,2-Dichloropropane)

Styrene 1,1,2,2-Tetrachloroethane

Tetrachloroethene

Toluene

1,1,2-Trichloroethane Trichloroethene Vinyl Acetate Vinyl Chloride

Vinylidene Chloride (1,1-Dichloroethene)

m,p-Xylene o-Xylene

Table 1-1 (Continued)

Semivolatile Organics

Acenaphthene Indeno(1,2,3-cd)pyrene 7,12-Dimethylbenz(a)anthracene Acenaphthylene Dimethylphenethylamine Isophorone Acetophenone Methyl Methanesulfonate 2,4-Dimethylphenol 4-Aminobiphenyl 3-Methylchlolanthrene Dimethylphthalate Aniline 2-Methylnaphthalene 4,6-Dinitro-2-methylphenol Anthracene 2-Methylphenol (o-cresol) 2,4-Dinitrophenol Benzidine 4-Methylphenol (p-cresol) 2,4-Dinitrotoluene N-Nitroso-di-n-butylamine Benzo(a)anthracene 2,6-Dinitrotoluene Benzo(a)pyrene N-Nitrosodimethylamine Diphenylamine N-Nitrosodiphenylamine 1,2-Diphenylhydrazine Benzo(b)fluoranthene N-Nitrosopropylamine Ethyl Methanesulfonate Benzo(g,h,i)perylene Benzo(k)fluoranthene N-Nitrosopiperidine 2-Nitrophenol 4-Nitrophenol Benzoic Acid Naphthalene 1-Naphthylamine Pentachlorobenzene Benzyl Alcohol 2-Naphthylamine Pentachloronitrobenzene 4-Bromophenyl Phenyl Ether 2-Nitroaniline Butylbenzylphthalate Pentachlorophenol 4-Chloro-3-Methylphenol 3-Nitroaniline Phenacetin 4-Nitroaniline Phenanthrene p-Chloraniline Nitrobenzene Phenol bis(2-Chloroethoxy)methane Di-n-octylphthalate 2-Picoline bis(2-Chioroethyl)ether bis(2-Chloroisopropyl)ether Dibenz(a,h)anthracene Pronamide Dibenz(a,j)acridine 1-Chloronaphthalene Pyrene 2-Chloronaphthalene Dibenzofuran Pyridine Dibutylphthalate 1,2,4,5-Tetrachlorobenzene 2-Chlorophenol 1,2-Dichlorobenzene 4-Chlorophenyl Phenyl Ether 2,3,4,6-Tetrachlorophenol 1,3-Dichlorobenzene 1,2,24-Trichlorobenzene Chrysene bis(2-Ethylhexyl)phthalate 1.4-Dichlorobenzene 2,4,5-Trichlorophenol Fluoranthene 3.3'-Dichlorobenzidine 2,4,6-Trichlorophenol 2-Fluorobiphenyl Fluorene 2,4-Dichlorophenol Hexachlorobenzene 2,6-Dichlorophenol 2-Fluorophenol Nitrobenzene-d5 Hexachlorobutadiene 2,6-Dichlorophenol Hexachlorocyclopentadiene Diethylphthalate Phenol-d5 Hexachloroethane p-Dimethylaminoazobenzene Terphenyl-d14 2,4,6-Tribromophenol

Additional Elements

Aluminum	Magnesium	Silicon	Zinc
Calcium	Potassium	Strontium	Uranium (coal only)
Iron	Sodium	Titanium	Thorium (coal only)

The completeness of the quality assurance data was reviewed to judge whether the quality of the measurement data could be evaluated with the available information. In general, the results of the QC checks available indicate that the samples are well characterized. An evaluation of the accuracy, precision, and bias of the data, even if only on a qualitative level, is considered to be an important part of the data evaluation. A full discussion of each of these components can be found in Appendix D.

RTI was on site during the field sampling program to conduct a systems audit and a performance audit. These audits addressed the Radian sampling program. Results of the RTI audit are presented in Appendix A.

Project Organization

Figure 1-1 shows the organization of this project.

Report Organization

Table 1-2 lists the contents of the major sections and appendices of this final report.

References

- 1. Electric Power Research Institute. Field Chemical Emissions Monitoring (FCEM)
 Generic Sampling and Analytical Plan. Draft Report. Palo Alto, CA (May 1994).
- 2. U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards. Compilation of Air Pollutant Emission Factors, Vol. 1: Stationary Point and Area Sources. AP 42, 4th ed., Research Triangle Park, NC (September 1985 with periodic updates).
- 3. 40 CFR 266, Subpart H, "Method 29: Determination of Metals Emissions in Exhaust Gases from Hazardous Waste Incineration and Similar Combustion Processes: Proposed Method."

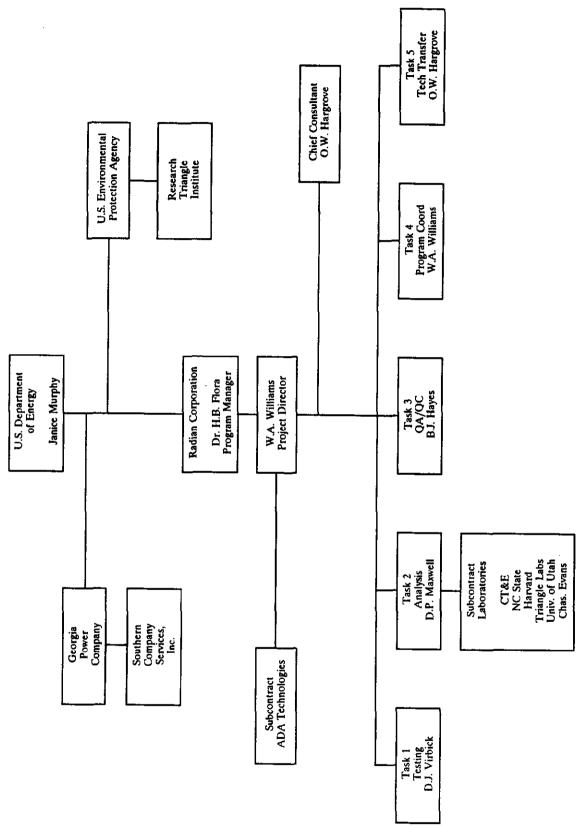


Figure 1-1 Project Organization

Table 1-2 Report Organization

Section	Contents	
Glossary	Acronyms, abbreviations, and definitions.	
Executive Summary	Stand-alone summary of the document.	
Introduction (p. 1-1)	Background, objectives, auditing, contractor organization, and report organization.	
Auditing (p. A-1, App. A)	Information on audits conducted by RTI.	
Site Description (p. 2-1)	Power plant configuration, process description, sampling locations, and plant operating conditions.	
Sample Collection (p. 3-1)	Sampling schedule, test matrix, samples collected, sample handling, sample presentation, sample compositing.	
Sampling Protocol (p. B-1, App. B)	Method descriptions, sample train disassembly, sample preparation for transportation, and storage.	
Sample Preparation and Analysis Methods (p. 4-1)	Preparation procedures and chemical analysis methods for gases, liquids, and solids.	
Analytical Protocol (p. E-1, App. E)	Method descriptions, deviations, and modifications.	
Analytical Results (p. 5-1)	Tabulated analytical information for gases, liquids, and solids.	
Sampling Data Sheets (p. C-1, App. C)	Data for gas samples, including calculations for samples at the stack outlet.	
Data Analysis and Interpretation (p. 6-1)	An evaluation of the overall quality of the data, material balances, trace species removal efficiencies, and emission factor determinations.	
Quality Assurance/Quality Control (p. D-1, App. D)	Radian systems and performance audits: precision, accuracy, and completeness in the areas of sample collection, analysis, and DQOs. Detailed QA/QC results in tabular form.	

Introduction

Table 1-2 (Continued)

Uncertainty Analysis (p. F-1, App. F) Uncertainty Analysis (p. F-1, App. Description of how the error propagation analysis was performed on calculated results. Treatment of Non-Detects, Values Outside of the Calibration Range, and Blanks (P. G-1, App. G)

SITE DESCRIPTION

Power Plant Configuration

The Plant Yates Unit No. 1 is a bituminous coal-fired steam electricity-generating unit with a net generating capacity of 100 megawatts. Located in Newnan, Georgia, the station is owned and operated by Georgia Power Company. Unit 1 includes a tangentially fired CE boiler that burns a 2.5% sulfur blend of Illinois No. 5 and Illinois No. 6 bituminous coals, an electrostatic precipitator for particulate control, and the CT-121 flue gas desulfurization system for sulfur dioxide (SO₂) emissions control during the ICCT demonstration.¹

A process flow diagram of the Plant Yates facility that includes sampling locations is presented in Figure 2-1. Flue gas flows through a single duct into the ESP, which is four chambers wide and three rows of chambers deep; however, only the first two rows of chambers are energized. The ESP has a separate row of hoppers to collect the fly ash from each field, i.e., one row of hoppers per field. After the ESP, the flue gas flows through a single ID fan and then to the CT-121 system. The flue gas exiting the CT-121 unit is vented to the atmosphere through a 250-foot exhaust stack. No other units at the station use this stack.

Process Description: Major Process Streams

CT-121 Wet FGD System

The CT-121 is a second-generation FGD process which employs a unique absorber design, called a jet bubbling reactor (JBR), to combine conventional SO₂ absorption, neutralization, sulfite oxidation, and gypsum crystallization in one reaction vessel. The process is designed to operate in a pH range (3 to 5) where the driving force for limestone dissolution is high, resulting in nearly complete reagent utilization. Oxidation of sulfite to sulfate is also promoted at the lower pH because of the increased solubility of innate oxidation catalysts such as iron (Fe). Because all of the absorbed SO₂ is oxidized, there is sufficient surface area for gypsum crystal growth to prevent the slurry from becoming significantly supersaturated with respect to calcium sulfate. This significantly reduces the potential for gypsum scaling, a problem that frequently occurs in natural-oxidation FGD systems. Since much of the crystal attrition and secondary nucleation associated with the large centrifugal pumps in conventional FGD systems is also eliminated in the CT-121 design, large, easily dewatered gypsum crystals can be produced.

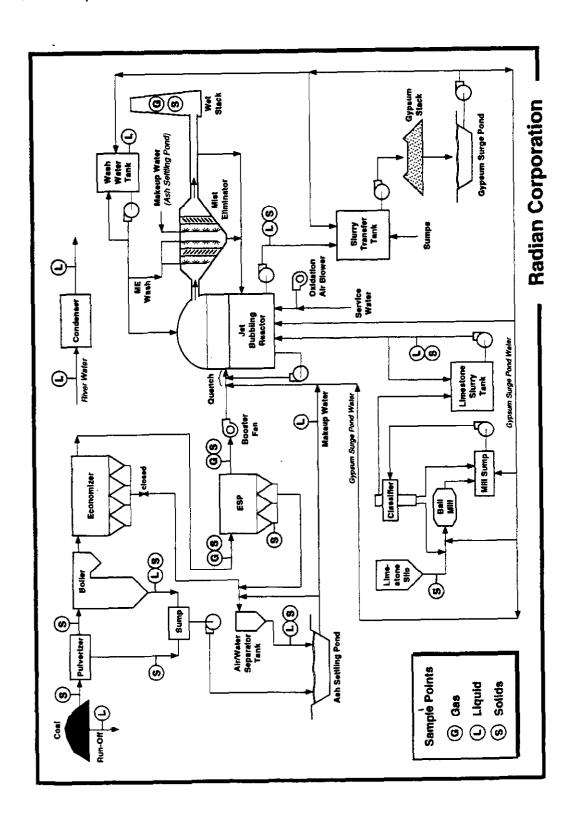


Figure 2-1 Simplified Process Flow Diagram Illustrating Sampling Locations and Flue Gas Flow

Gas Cooling Section. Flue gas from the boiler passes through the ESP and is pressurized by the Unit 1 I.D. fan. From the fan, the flue gas enters the gas cooling section. Here the flue gas is cooled and saturated with a mixture of JBR slurry, makeup water, and pond water. The quench slurry is sprayed into the gas at a liquid-to-gas ratio of about 10 gal/1000 acf at full boiler load using two centrifugal gas cooling pumps. The suction for the gas cooling pumps is located near the bottom of the JBR.

JBR. From the gas cooling section, the flue gas enters the JBR. The JBR is the central feature of the CT-121 process. The gas enters an enclosed plenum chamber formed by an upper deck plate and a lower deck plate. Sparger tube openings in the lower deck plate force the gas into the slurry contained in the jet bubbling (froth) zone of the JBR vessel. After bubbling through the slurry, the gas flows upward through gas risers which pass through both the lower and upper deck plates. Entrained liquor in the gas disengages in a second plenum above the upper deck plate, and the cleaned gas passes to the mist eliminator.

The slurry in the JBR can be divided into two zones: the jet bubbling or froth zone and the reaction zone. SO₂ absorption occurs in the froth zone, while neutralization, sulfite oxidation, and crystal growth occur in both the froth and reaction zones.

The froth zone is formed when the untreated gas is accelerated through the sparger tubes in the lower deck and bubbled beneath the surface of the slurry at a depth of 6 to 16 inches. The froth zone provides the gas-liquid interfacial area for SO_2 mass transfer to the slurry. The bubbles in the froth zone are continually collapsing and reforming to generate new and fresh interfacial areas and to transport reaction products away from the froth zone to the reaction zone. The amount of interfacial area can be varied by changing the level in the JBR, and consequently, the injection depth of flue gas. The deeper the gas is injected into the slurry, the greater the interfacial area for mass transfer and the greater the SO_2 removal. In addition, at deeper sparger depths, there is an increase in the gas-phase residence time. SO_2 removal can also be increased by increasing the pH of the slurry in the froth zone, since a higher pH results in higher slurry alkalinity. The pH is controlled by the amount of limestone fed to the reaction zone of the JBR.

The solids concentration in the JBR is maintained at a constant level by removing a slurry stream from the bottom of the reaction zone and pumping this stream to a holding tank (gypsum slurry transfer tank), where it is diluted with pond water before being pumped to the gypsum stack. This is done to keep the velocity high over a range of operating conditions.

The oxygen which reacts with absorbed SO₂ to produce sulfate is provided to some extent by oxygen diffusion from the flue gas, but the predominant source is air bubbled into the reaction zone of the JBR. The oxidation air lines enter through the very top of the JBR vessel, penetrate the upper and lower deck plates, and introduce the air near the bottom of the JBR. Oxygen diffuses from the air into the slurry as the bubbles rise to the froth zone of the JBR. Excess air mixes with the flue gas and exits the JBR to the mist eliminator. Before the oxidation air enters the JBR, it is saturated with service water to prevent a wetdry interface at the discharge of the oxidation air lines.

Ash and Cooling System

Plant Yates uses an ash settling and storage area consisting of one ash-settling pond. Bottom ash from the boiler and pyrites from the pulverizers are sluiced together and are disposed of in the ash-settling pond. The ESP ash, economizer ash, and air preheater ash are also sluiced together and disposed of in the same ash-settling pond. Water from the Chattahoochee River is used for cooling water in a once-through type steam condenser.

ESP Design

The ESP is a conventional weighted wire configuration typical of many of the older ESPs found on coal-fired utility boilers in the Midwest and Eastern parts of the United States. Details of the ESP are provided in Table 2-1. The specific collection area (SCA) is 210 ft²/kacfm at full load. This size is representative of the ESPs built during the 1970s to provide collection efficiencies of 95 to 99 percent. The plate-to-plate spacing is 9 inches, which is typical for this vintage ESP. Current ESP design standards use 12- to 16-inch spacing to reduce the impact of plate or wire misalignment which can cause sparking at lower voltages. The velocity is somewhat lower than many of the older ESPs which often operate at velocities of 6 or 7 ft/sec. The average ESP velocity of 4.4 ft/sec is more characteristic of modern design practices.

Figure 2-2 shows a schematic layout of the ESP. The ESP is configured with three mechanical sections and four electrical sections. As shown in the schematic, the arrangement is somewhat unusual in that the mechanical sections are not aligned with the electrical sections. This provided some minor difficulties in modeling the performance of the ESP, as described in Section 8.

Figure 2-2 also identifies the rapping components. The Plant Yates ESP uses a Forry Rapper Control System programmed to operate vibrators on the high voltage wire frames and electromechanical rappers on the collector plate assemblies. Table 2-2 presents a detailed breakdown of the rapping frequencies. The high-voltage wire frame vibrators are on a 12 minute repeat cycle and have 2 second on-times. The collector plate rappers have a 30 minute repeat cycle and are energized to lift the 20-pound solenoids nominally four inches before releasing them. The rapping cycles are offset so that only one section of the plates is rapped at any single period of time. This rapping procedure results in smaller but more frequent spikes in opacity.

Process Description: Sampling Locations

Samples were collected from streams representing three types of matrices: gases, solids, and liquids. Gaseous samples were collected from the inlet and outlet of the ESP and from the stack. Solids were collected of the coal feed, bottom and fly ashes, limestone,

Table 2-1 Summary of Design Data on the Yates Unit #1 ESP

Manufacturer	Bueil	
Housing	1 ESP Box	
Mechanical Sections	3	
Electrical Sections	4	
Gas Flow Passages	82	
Collector Electrodes		
Plate Spacing	9 inches	
Plate Height	30 ft	
Total Plate Length	21 ft	
Length of Sections	9 ft Section 1, 6 ft for Sections 2 & 3	
Total Plate Area	103,320 ft ²	
Total Cross Section Area	1845 ft ²	
Gas Conditions		
Gas Flow at Full Load	491,000 acfm	
Gas Velocity at Full Load	4.4 ft/second	
Residence Time at Full Load	4.7 seconds	
SCA at Full Load	210 ft ² /kacfm	
Emitter Design		
Design	Weighted Wire	
Diameter	0.110 inches	
Spacing	8 inches	
Number	2,296	
Total Wire Length	68,880 ft	

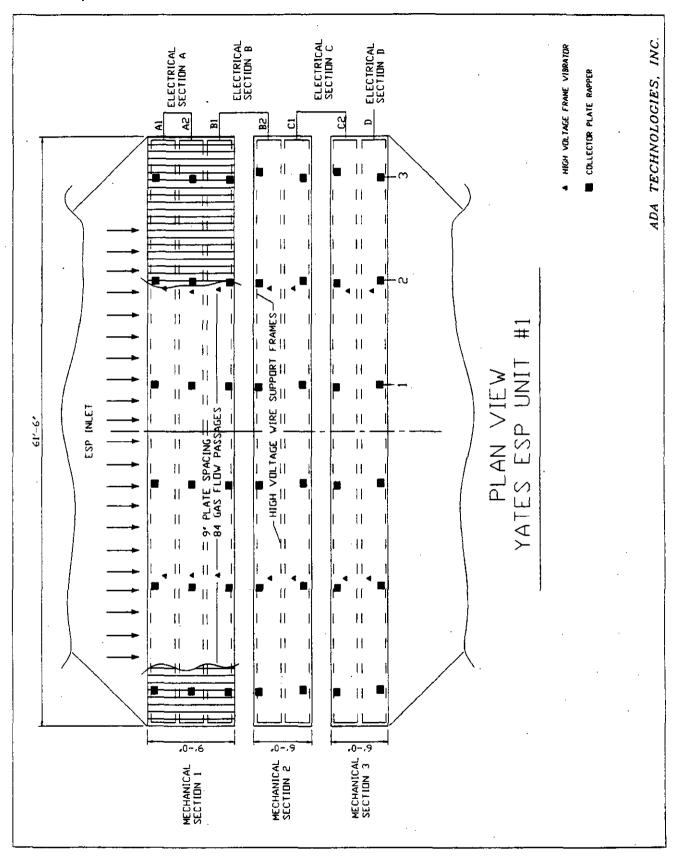


Figure 2-2 Plan View Plant Yates ESP Unit #1

Table 2-2 ESP Rapping Schedule Plant Yates Unit #1

Mechanical Section	Rapper Type	Cycle Repeat Time	Rapper Identification	Activated (minutes into cycle)
1	HV Vibrator (1 vibrator per frame)	12 minutes	HV: A1 HV: A2 HV: B1	4 8 12
2	HV Vibrator	12 minutes	HV: B2 HV: C1	5 10
3	HV Vibrator	12 minutes	HV: C2 HV: D	6 12
1	Plate Rapper (1 rapper per plate support)	30 minutes	Plate: A1-1 Plate: A1-2 Plate: A1-3	4 8 12
1	Plate Rapper	30 minutes	Plate: A2-1 Plate: A2-2 Plate: A2-3	5 10 15
1	Plate Rapper	30 minutes	Plate: B1-1 Plate: B1-1 Plate: B1-3	6 12 18
2	Plate Rapper	30 minutes	Plate: B2-1 Plate: B2-2 Plate: B2-3	7 14 21
2	Plate Rapper	30 minutes	Plate: C1-1 Plate: C1-2 Plate: C1-3	8 16 24
3	Plate Rapper	30 minutes	Plate: C2-1 Plate: C2-2 Plate: C2-3	9 18 27
3	Plate Rapper	30 minutes	Plate: D-1 Plate: D-2 Plate: D-3	10 20 30

Note: Rapping frequency and cycles are duplicated for each side of the ESP.

and FGD slurry. Liquids included the makeup waters, sluice waters associated with the ash steams, and filtrate from the limestone and FGD slurry streams, cooling water, and coal pile runoff. Figure 2-1 illustrates the sampling locations which are described in detail in the following sections.

Flue Gas Sample Streams

Three flue gas stream locations were identified for testing:

- ESP inlet;
- ESP outlet (FGD inlet); and
- Stack.

The ESP inlet sampling location is located at ground level. Sixteen four-inch ports are located horizontally just downstream of where two ducts which exit the air preheater are combined.

The ESP outlet location is located approximately 60 feet above ground level. Six four-inch ports are located vertically across the duct.

The stack sampling location is approximately 120 feet above ground level and has four four-inch ports, equally spaced at 90 degrees.

Solid Sample Streams

Solid streams sampled were the following:

- Raw coal;
- Pulverized feed coal;
- Pulverizer rejects;
- Bottom ash;
- ESP fly ash;
- Raw limestone;
- Limestone slurry solids; and
- FGD slurry solids.

Solid samples were collected concurrent with the gas stream testing and are considered to be representative of process operation.

Coal Samples. The sample locations for collecting coal samples are located around each of the four coal pulverizers serving Unit 1. Samples of raw coal were collected from each pulverizer feed chute after the weigh belt. Feed coal samples were collected at the exit of each pulverizer, just prior to the boiler feed, and the pulverizer rejects were collected at the inlet to each reject hopper.

Ash Samples. Bottom ash samples were collected wet at the bottom ash sluice water sump upstream of the bottom ash sluice pumps. Bottom ash was separated from the sluice water by allowing the solids to settle and siphoning off the sluice water. ESP fly ash was collected dry from the clean-out ports of the two energized banks of ESP hoppers, and sluiced ESP fly ash was also collected at the sluice water discharge to the ash pond.

Limestone. Limestone samples were collected from two sampling locations. Raw limestone was collected off the weigh belt feed to the grinding mill, and limestone slurry was collected from a sample tap on the recirculating limestone slurry feed line to the JBR. Slurry samples were filtered to obtain the solids.

FGD Solids. FGD solids were sampled from a sample tap at the discharge of the JBR underflow slurry pumps. The solids were filtered through a filter press to separate the solid and liquid phases at the time of collection.

Liquid Sample Streams

The following liquid streams were sampled:

- Ash pond water;
- Gypsum pond water;
- Ash sluice water (bottom ash and fly ash);
- FGD slurry blowdown filtrate;
- Limestone slurry filtrate;
- Coal pile run-off; and
- Cooling water at the condenser inlet.

Liquid samples were collected concurrent with the gas-phase testing and are considered to be representative of process operation during that time period.

Pond Waters. Ash and gypsum pond water were sampled from sample taps. The ash pond water sample tap is located near the limestone slurry tank containment area where ash pond water is used in limestone slurry preparation. Gypsum pond water was collected from a sample tap located on the mist eliminator wash water tank.

Ash Sluice Water. Bottom ash and ESP fly ash sluice water samples were obtained by siphoning the aqueous phase of the ash/water sluice mixture from the solid phase after allowing approximately 2 hours for the solids to settle. The collection points for the ash sluice samples are described in the section on solid sample streams.

Limestone and FGD Filtrates. The aqueous phases of the limestone slurry and JBR underflow slurry were obtained from filtration of the collected solids samples described earlier. Limestone slurry and all FGD filtrates for organic compound analyses were sampled from a filter press at the point of collection to avoid loss of organics and to prevent further reactions in the FGD slurry matrix.

Coal Pile Run-off. Coal pile run-off collection was performed after a rain storm. Samples were collected from shallow trenches leading from the coal pile to the run-off collection pond.

Condenser Water Samples. Cooling water samples at the inlet of the turbine steam condenser were collected from a sample tap located at the discharge of the cooling water pumps.

Plant Operating Conditions

Operating conditions were continuously monitored via a computerized data acquisition system (DAS) which logged process information as 15 minute averages. In addition, boiler operating data were logged hourly by the control room operators. Of the total amount of data collected, key parameters have been summarized and are presented in Table 2-3. These data reflect the general stability of the process. Unit load and furnace gas oxygen concentrations are shown graphically in Figures 2-3 and 2-4. The dashed lines represent the bounds of what is considered normal operation. Also, the grey shaded areas represent the periods during which testing was being performed. Key operating parameters for the CT-121 process are shown in Figures 2-5 and 2-6. Overall, all processes were very stable and the key operating parameters were within the targeted range during the entire test period.

Three continuous emission monitors were operated during the test period. Sulfur dioxide and nitrogen oxides were monitored continuously by existing Plant Yates instrumentation. Carbon monoxide was monitored using an instrument supplied by Radian. The results of the CEM monitoring are presented in Figures 2-7, 2-8, and 2-9.

Table 2-3 Summary of Process Monitoring Data*

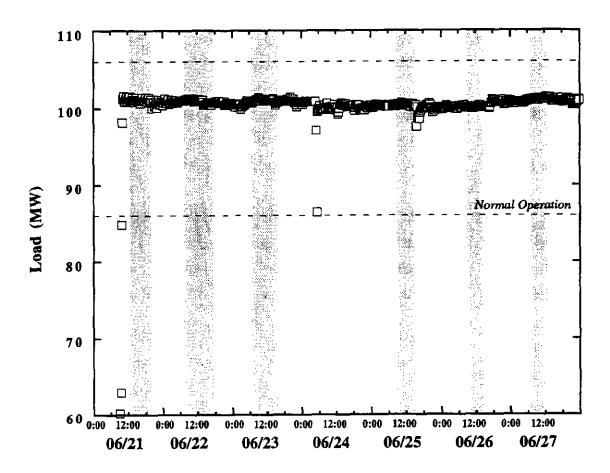
Parameter	6/21	6/22	6/23	6/25	6/26	6/27
Boiler:						
Load (MW)	101	101	101	100	100	101
Coal Flow (1,000 lb/hr, wet)	89	88	89	90	91	92
Furnace O ₂ (%)	3.5	3.6	3.5	3.3	3.3	3.4
Burners in Service	16	16	16	16	16	16
ESP:						•
Opacity (%)	15.0	14.4	16.0	17.1	17.7	18.6
JBR:						
SO ₂ removal ^b (%)	93.0	91.6	90.7	88.8	¢	¢
Scrubber pH	4.6	4.5	4.5	4.5	4.5	4.5
JBR &P (Inches H ₂ O)	14.1	14.1	14.1	14.1	14.1	14.1
Stack:						
O ₂ (%, dry)	8.2	8.0	7.9	7.7	7.7	7.6
SO ₂ (ppmv, dry)	160	181	202	236	182	186
NO _x (ppmv, dry)	430	490	470	430	420	320
CO (ppmv, dry)	3.5	d	2.6	2.6	2.0	5.7

^{*} Daily averages.

^b Based upon SO₂ corrected to 3% O₂.

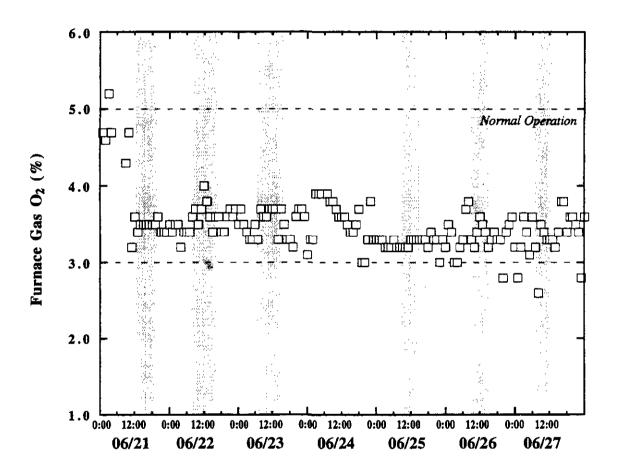
^c Inlet O₂ monitor not functioning properly.

^d CO monitor not functioning properly.



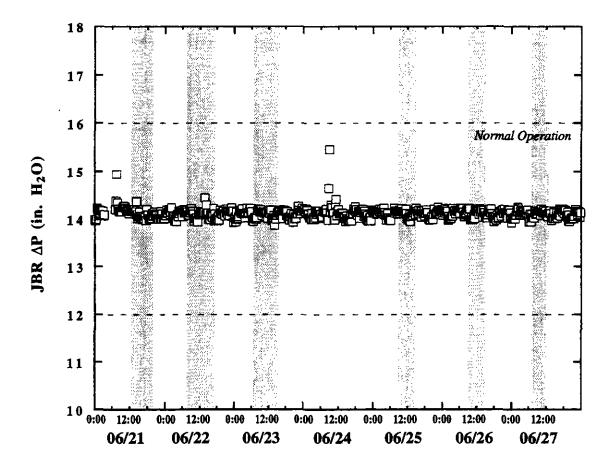
Load
Data points are 15-minute average values.

Figure 2-3 Unit 1 Load



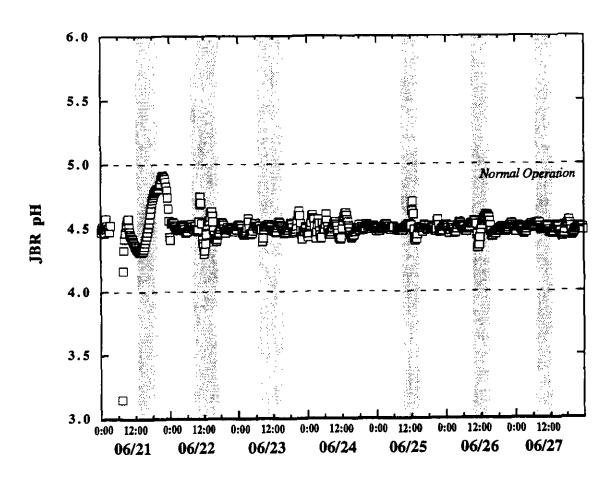
Furnace Gas O₂
Data points are hourly values.

Figure 2-4
Furnace Gas Oxygen



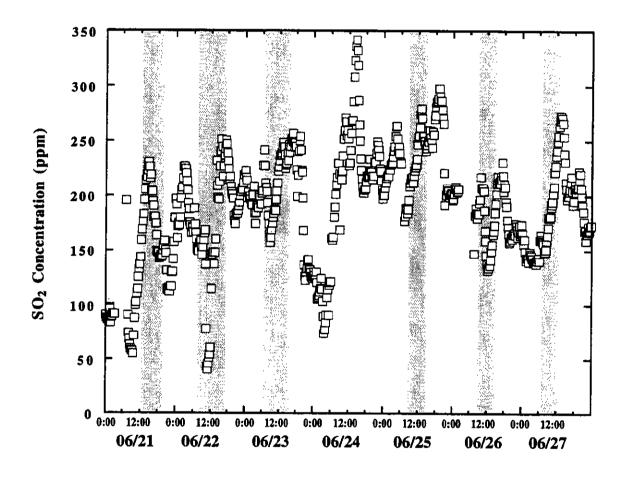
 $\begin{array}{c} \textbf{JBR Deck } \Delta \textbf{P} \\ \textbf{Data points are 15-minute average values}. \\ \hline \end{array}$

Figure 2-5
JBR Pressure Drop



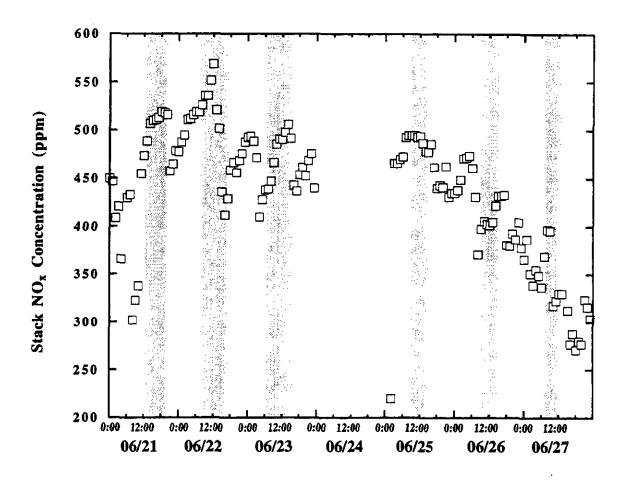
JBR pH
Data points are 15-minute average values.

Figure 2-6 JBR pH



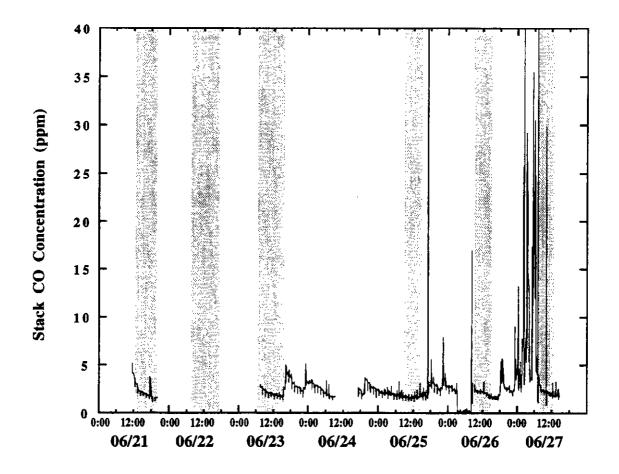
Stack SO₂ Concentration @ 3% O₂ Data points are 15-minute average values.

Figure 2-7 Stack SO₂



Stack NO_x Concentration @ 3% O_2 Data points are hourly values.

Figure 2-8 Stack NO_x



Stack CO Concentration

Data points are 15-minute average values.

Figure 2-9 Stack CO

Problems

Only slight operational problems were encountered during the test effort. On the first day of testing, a steam leak was detected and, although the leak was minor, plant personnel opted to bring the plant down to fix the leak, rather than run the risk of having a major problem occur while the testing was in progress. Repairing the leak resulted in a six-hour delay in the start of the testing activities on day one.

The average JBR SO₂ removal efficiency dropped below 90% on June 25. A change in the JBR piping is believed to have resulted in a high bias in the pH indicators. For this reason, SO₂ removal was generally lower than expected. However, with respect to the range of SO₂ removal achieved over the previous four days, the 88.8% removal is within normal operating limits and had no effect on the test results.

Deviations from Sampling Plan

The sampling approach was defined with soot blowing confined to the evening shifts and no testing was to be performed during soot blowing events (with the exception of round-theclock sample collection for PSD at the stack and bulk particulate collection at the stack and ESP Outlet). However, during the second day of the material balance period a high pressure drop was encountered across the air pre-heater (APH). Sampling was delayed for two hours while the APH soot-blowers were activated. A full pressure drop reduction could not be achieved and the decision was made to continue testing with the APH soot blowers activated continuously. Testing on the third day was also done with the APH soot blowers activated. This approach provided consistent process operation for the testing. Soot blowing at all other boiler locations was not performed until after the testing was completed each day. A post-test inspection of boiler operator logs indicated that APH soot-blowing was probably done continuously during the first day of the material balance period also. Although boiler control room instructions were for "no soot blowing," the post-test inspection revealed a steadily decreasing pressure drop across the APH on Day 1 of the material balance period. Typically, this only happens if the APH soot blowers are on. There was, however, no way to confirm this after the fact. The impact of the APH soot blowing is currently judged not to have an impact on the data quality or the overall test results.

References

1. David P. Burford, Oliver W. Hargrove, and Harry J. Ritz, "Demonstration of Innovative Applications of Technology for the CT-121 FGD Process." Published in the proceedings of the First Annual Clean Coal Technology Conference (sponsored by the U.S. Department of Energy), Cleveland, OH (September 1992).

SAMPLE COLLECTION

Radian used established sampling methods (where possible) and a sampling strategy consistent with that of the EPRI-sponsored Field Chemical Emissions Monitoring (FCEM) program¹ to accomplish the project goals. Samples were collected with Plant Yates operating within 10% of full load, at steady-state conditions, and in triplicate over two three-day periods.

Sampling Schedule

Radian performed the test program at the Yates facility in two discrete three-day sampling periods. During the first three-day period (Phase I), samples were collected for the characterization of organic species and particle size distribution, and ADA Technologies performed an assessment of the ESP operating characteristics. The second three-day sampling period (Phase II) was a "material balance period," during which samples were collected for analysis of inorganic components.

Figures 3-1 and 3-2 illustrate the sampling periods for each sample stream. Field blank samples were collected June 20, 1993 for the organic-phase test parameters and field blank samples were collected for the "material balance" parameters on June 24, 1993.

Samples Collected

All sampling was performed according to the procedures detailed in the Management Plan for the Plant Yates CT-121 FGD Project.

Only two deviations were noted from the specifications provided in the Management Plan. The first involves the collection of dry ash from the ESP ash hoppers. The management plan specified for the collection of samples from three rows of hoppers; however, after arrival on site, it was discovered that only the first two rows were energized. The sampling approach was modified to limit the sampling to just the first two rows of hoppers. These first two rows (four hoppers per row) of hoppers were to be sampled individually; however, only seven of the eight hoppers could be sampled. A valve stuck open on hopper number 7, and the system could not be isolated from the sluice system.

The second deviation concerned the collection of condenser water. No condenser outlet samples could be collected, as the two valves located at the condenser outlet were not operational.

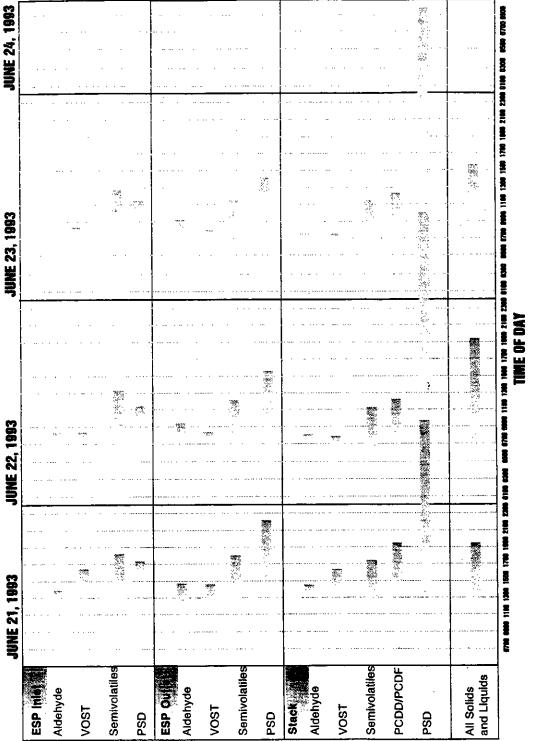


Figure 3-1 Sample Collection Schedule for June 21-24, 1993

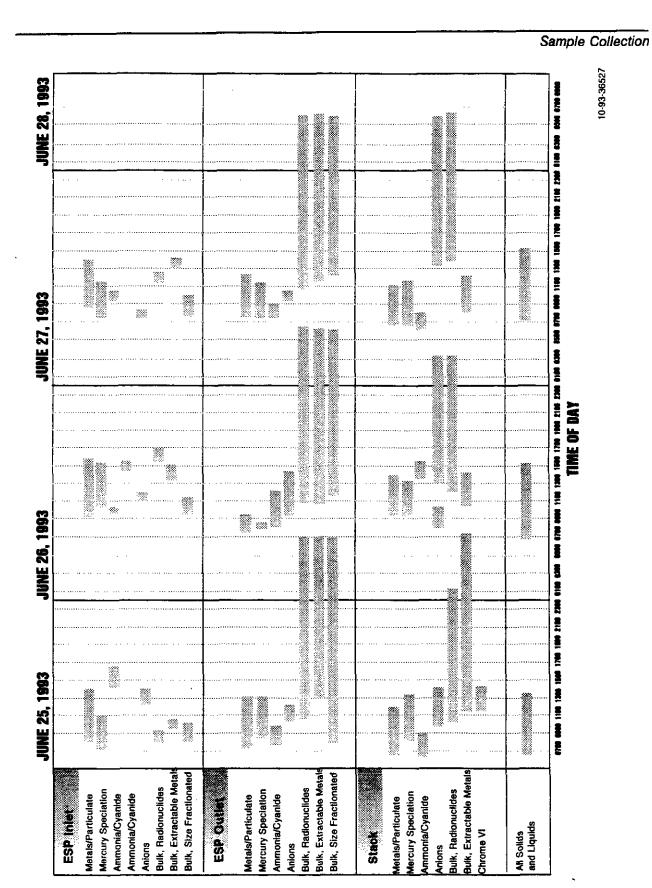


Figure 3-2 Sample Collection Schedule for June 25-28, 1993

Gas Samples

Samples were collected from three separate gas locations during the toxics emission study, namely the ESP inlet, the ESP outlet, and the stack. Sampling was performed concurrently at each location with specific run times varying due to effluent conditions.

A summary of the samples collected from the gaseous locations is presented in Table 3-1. The summary identifies the sample type, collection method, the number of samples collected and analyzed from each location, and the sample preservation techniques. Samples collected as part of the QA/QC program for gaseous samples are identified in Table 3-2.

Gas sampling data sheets are available in Appendix C. Data presented in Appendix C include the sample run times and sample volumes. In addition to the summarized field data, the calculations used for data reduction are also presented.

Liquid Samples

Liquid samples were collected concurrently with the gaseous sampling. The primary liquid collection technique was grab sampling. Table 3-3 identifies each of the streams sampled as well as the collection method, number of samples collected and analyzed, and the sample preservation techniques. Table 3-4 lists the liquid samples which were collected and/or analyzed as part of the QA/QC program.

Liquid samples were composited daily during each test run with the exception of the aldehydes and volatile organic compound (VOC) samples which were collected as single grab samples. The sluices and slurry filtrates were also collected as composite samples during each test run and the solids removed either by settling and decantation, or direct filtration from the process sample point. Detailed descriptions of the sampling techniques are presented in Appendix B.

Solid Samples

Solid samples were collected concurrently with the gaseous and liquid sampling. Sampling was performed by compositing grab samples that were collected at regular intervals during the gas sampling period. In addition to the grab sampling, solids were also collected during sluicing operations of the bottom ash and ESP ash. These samples were collected by grab sampling techniques through the duration of the sluicing and composited into one sample per test run.

Detailed descriptions of the solids sampling techniques are presented in Appendix B. Table 3-5 summarizes the solid sampling effort during this program. The table identifies the sample location or sample type, the collection method, the number of samples collected and analyzed, and the sample preservation techniques. Samples collected or submitted to support the QA/QC program for the solids are listed in Table 3-6.

Table 3-1 Gaseous Sampling Summary

Samples Samples <t< th=""><th></th><th></th><th>ESP</th><th>ESP Inlet</th><th>ESP (</th><th>ESP Outlet</th><th>Stack</th><th>농</th><th></th></t<>			ESP	ESP Inlet	ESP (ESP Outlet	Stack	농	
		Collection Method*	Samples Collected	Samples Analyzed	Samples Collected	Samples Analyzed	Samples Collected	Samples Analyzed	Sample Handling and Preservation
O E <td></td> <td>EPA Method 0011</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> <td>Cooled to <4 °C prior to analysis</td>		EPA Method 0011	3	3	3	3	3	3	Cooled to <4 °C prior to analysis
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		Modified Method 5	6	ю	6	6	e	e	Cooled to <4 °C prior to analysis
の の の 女 の の の の しの の の の の の の の し		Method 23	,			•	е.	eı	Cooled to <4 °C prior to analysis
・の		Method 17	E	ы	3	е.	es	е	No special handling
60 64 69 69 69 1 60 60 60 60 60 1 60 60 60 60 60 1	~	Method 5/Method 29	6	т	e.	т.	е.	ы	No special handling
т т т т т т т т т т т т т т т т т т т		Nick Bloom Method	e	m	3	ю	6	e	No special handling
**************************************		Method 5 (Modified)	ю	е,	3	е	ო	c	No special handling
	_	Method 5 (Modified)	4	ю	e	m	es.	60	Cooled to <4 °C prior to analysis
3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3		Method 5/17	ю	m	e	ю	т	es	No special handling
		Method 5/17	٣		3	81	80	EO.	No special handling
		Method 17	en	co.	3	m	•	,	No special handling
		Method Cr*6	1	,		•	en	ы	Analyzed on-site

* Detailed references are shown in Appendix B.

Table 3-2 Number and Type of Gas Sample Analyses Plant Yates

Parameter	Field Samples	Matrix Spike	Audit Samples	Field Blanks	Trip Blanks	Total Samples
Moisture	9					9
Particulate Loading	9			3	1	13
Particle Size Distribution	9					9
Chloride (Particulate)	9	1		1		11
Fluoride (Particulate)	9	1		1		11
Sulfate (Particulate)	9	1		1		11
ICP Screen (Particulate)	9	1	1	3	1	15
GFAAS Metals* (Particulate)	9	1	1	3	1	15
Mercury (Particulate)	9	1	1	3	1	15
Semivolatiles (Particulate & Flue Gas)	9	2		3	1	15
PCDD/PCFD (Particulate)	3			1	1	5
Radioactivity (Particulate)	9			1		12
Ammonia (Flue gas)	9	1	1	1		12
Cyanide (Flue gas)	9	1	1	1		12
Chloride (Flue gas)	9	1	1	1		12
Fluoride (Flue gas)	9	1	1	1		12
Sulfate (Flue gas)	9	1	1	1	_	12
ICP Screen (Flue gas)	9	1	1	3	1	15
GFAAS Metals' (Flue gas)	9	1	1	3	1	15
Mercury (Flue gas)	9	1	1	3	1	15
Aldehydes (Flue gas)	9	2		3	2	16
Volatile Organics (Flue gas)	27			9	1	37
PCDD/PCDF (Flue gas)	3	-+		1	1	5

^{*} GFAAS metals include As, Cd, Pb, and Se.

Table 3-3 Liquids Sampling Summary

		44	Ash Pond	Gypsum Pond Water	Vader	Ash Sluice Fikrates	luice ntes	JBR	<u> </u>	Limestone Slurry Filtrate	e Sturry	Coal Pile Rus-Off	Pile Off	Condenser	a diser
Test Parameter	Collection	Collected	Collected Analyzed	Collected	Analyzed	Collected Analyzed Collected Analyzed Collected Analyzed Collected Analyzed Collected Analyzed	Analyzed	Collected	Analyzed	Collected	Analyzod	Collected	Analyzed	Collected	Analyzed
Formaldehyde	Grab	3	3	3	3	9	9	3	3	3	3	2	2	3	-
Volatile Organics	Grab	e	6		7	۰	۰	m	٣	ŧ	60	2	-	6	
Semivolatile Organica	Grab	en		•	7	•	•	4	8	4	60	2	-	4	€
Metain, Soluble	Grab	m	•	m	m	٠	٠	۳	m	m	ю		,	•	m
Metala, Total	Grab	m		6	m			,	,		,	•		€	m
Anion	Grab	۳.	E0	F.	*	ø	vo	₩.	•	₩.	6	•		E	•
Ammonia	Grab	е.	•	•	m	v	v	•	•	€	•		•	m	6 0
Cynnide	Grab	•	€	m	E	ø	٠	m	m				,	€0	6

Table 3-4 Liquid Stream QA/QC Samples

Parameter	Field Samples	Field Dups	Matrix Spike	Audit Samples	Trip Blanks	Total Samples
Chloride	21	7	3	1		32
Fluoride	21	7	3	1		32
Phosphate	21	7	3	1		32
Sulfate	21	7	3	1		32
Sulfite	3	1				4
Ammonia	21	7	3	1		32
Cyanide	21	7	3	1		32
ICP Screen (Soluble)	30	10	4	2		46
Arsenic	30	10	4	2		46
Cadmium	30	10	4	2	••	46
Lead	30	10	4	2		46
Mercury	30	10	4	2		46
Selenium	30	10	4	2		46
Aldehydes	23	7	6			36
Semivolatile Organics	22	7	6			35
Volatile Organics	22	7			1	30

Table 3-5 Solids Sampling Summary

										Limenton	Limentone Sturry						
		Kaw	Raw Coal	Pulverizer	r Rejects	Food	Feed Coal	Kaw Lá	Raw Limentone	Solids		Bottom Ash	A A	ESP Fly Ash	A A A	FGD Sherry Solids	ry Solids
Test Parameter	Collection Method	Collected	Analyzed	Ollection Method Collected Analyzed Collected		Collected	Analyzed	Collected	Analyzed	Collected	Analyzed	Collected	Analyzed	Collected	Analyzed	Analyzed Collected Analyzed Collected Analyzed Collected Analyzed Collected Analyzed Collected Analyzed Collected Analyzed	Analyzod
Formaldehyde	Grab	,						,					ŀ		,	6	3
Semivolatile Organica	Grub		ı	,	•	•	,	•	•	•	,	6 0	ю.	\$	•	m	€0
Particle Size Distribution	Grab		,		ı	,	,	,		•		,	ı	•	v	ı	
Metals, Total	Grab	60	m	<u></u>	m	e		m	€	e	en	m	۴	•	vo	e n	ĸ
Anions	Grab	m	m	~		•	6			€0		m	E	٠	•	m	6
Radionuclides	Grab	•	•	•		m	60	€	€0	•	ı	m	6	3 0	٠	6	en.
Moisture,	Grap	en	m		ю		1 0	€0	€.		,	m _		•	•	•	•
Ultimate/ Proximate	Grab	en .	m.	m	6	m	en .						• • •				
Heating Value	Grab	т.	m	•	•	m	m										

Table 3-6 Solid Stream QA/QC Samples

Parameter	Field Samples	Field Dups	Matrix Spike	Audit Samples	Total Samples
Moisture	12	4	**		16
Particle Size Distribution	6	2			8
Ultimate/Proximate	9	3		1	13
Carbon	12	4			16
Sulfur	9	3			12
Heating Value	6	2		1	9
Chloride	30	10	4	2	4 6
Fluoride	30	10	4	2	46
Phosphate (Phosphorus)	30	10	4	2	46
Sulfate/Sulfite	3	1	1		5
ICP Screen	30	10	4	2	46
Metals	9	3		1	13
Arsenic	30	10	4	2	46
Cadmium	30	10	4	2	46
Lead	30	10	4	2	46
Mercury	30	10	4	2	46
Selenium	30	10	4	2	46
Aldehydes	3	1	2		6
Semivolatile Organics	12	4	4		20
Radioactivity	15	4			19

Process Stream Flow Rates

Table 3-7 presents average process stream flow rates for Phase II of the testing. The methods used to measure and equations used to calculate these flow rates are described in Table 3-8. These flow rates were used in the material balance calculations, described in Section 6.2. Those flow rates measured directly are presented on a run-by-run basis. Others are presented as Phase II test period averages, since they are calculated from averaged data; i.e., the dry feed coal flow rate is calculated from the average wet raw coal flow rate and average water content. Gaseous flow rates were measured at three different locations at the site: ESP inlet, outlet, and the stack. The actual measurements from these locations averaged 293,000 dscfm $\pm < 3\%$, well within the expected limits of the measurement technique. However, given the various physical properties of the three locations, engineering judgment would indicate that the measurements from the stack were the most accurate of the three and, since the stack measurements also reflect ultimate emissions, the measurements from this location should be the reference point for consistency in the treatment of data and determination of internal mass flow rates. An average of 4,000 scfm of oxidation air was added to the flue gas as it passes through the JBR. Therefore, the rate of gas that enters and exits the ESP is that amount measured at the stack minus (-) the oxidation air added at the JBR. The stack flow rate was 288,000 dscfm - 4,000 dscfm (oxidation air) = 284,000dscfm as the flow rate for the INLET AND OUTLET of the ESP. The ESP operates at negative pressure; therefore, these numbers represent maximum rates, since any inleakage of gas would be measured at the stack.

Coal flow rates were determined from data obtained from the boiler control room. Raw coal is loaded into buckets which hold nominally 500 pounds of coal and a counter records each time a bucket is dumped. These readings, obtained over a 24-hour period, provide the basis for the coal feed rate. The dry feed coal rate was determined from the raw coal rate (corrected for moisture) less the pulverizer rejects. This method yields an average feed coal rate for the material balance period of 80,200 lb/hr. As a consistency check, the full-load unit heat rate was used to calculate a coal feed rate of 86,000 lb/hr, approximately 7% higher than measured. The calculated coal feed rate falls within the 95% confidence interval of the measured coal rate shown in Table 3-7. The bottom ash flow rate was determined by subtracting the ash flow rate measured at the ESP inlet from the ash contained in the feed coal.

Other flow rates used in mass balance calculations were measured by process instrumentation and are discussed in Section 6. Uncertainties for these calculated flow rates, expressed as 95% confidence intervals, were calculated using the method detailed in Appendix F.

References

1. Electric Power Research Institute. Field Chemical Emissions Monitoring (FCEM) Generic Sampling and Analytical Plan. Draft Report. Palo Alto, CA (May 1994).

Table 3-7
Process Flow Rates During Phase II of Testing

	Run 1 6/25/93	Run 2 6/26/93	Run 3 6/27/93	Mean	Std. Dev.
Raw Coal Moisture (%)	12.7	11.2	11.2	11.7	0.9
Feed Coal Ash (%, dry)	10.5	11.3	11.6	11.1	0.6
Measured Flow Rates and Grain Lo	adings:				
Raw Coal (lb/hr, wet)	90,200	90,700	92,000	91,000	3,200*
Coal Pulverizer Rejects (lb/hr)	110	130	110	120	15 ⁶
ESP Inlet Loading (gr/dscf)	3.38	3.67	3.88	3.64	0.25
ESP Outlet Loading, (gr/dscf)	0.0598	0.0489	0.0644	0.0577	0.0080
Stack Gas (dscfm)	290,000	287,000	285,000	288,000	2,500
Stack Loading (gr/dscf)	0.0078	0.0048	0.0051	0.0059	0.0017
Calculated Flow Rates:					95% CI
Feed Coal (lb/hr, dry)				80,200	8,200
ESP Inlet Gas (dscfm) ^c				284,000	6,200
ESP Outlet Gas (dscfm) ^c				284,000	6,200
ESP Inlet Ash, (lb/hr) ^d				8,870	1,500
ESP Outlet Ash, (lb/hr)		_		140	49
ESP Collected Ash (lb/hr)				8,730	2,500
Bottom Ash (lb/hr) ^e	_			440	1,100
Particulate Emissions:					
Emissions (lb/hr)				14.6	10.4
Emissions (lb/10 ⁶ Btu)				0.014	0.009

^{*} Standard deviation calculated from 71 hourly values measured over the three days of testing.

^b Standard deviation calculated from 9 values measured over the three days of testing.

^c The stack gas flow rate was considered to be the most accurate measurement of the gas flow rate; the ESP inlet and outlet flow rates were assumed equal to the stack gas less the JBR oxidation air (4,100 scfm).

^d Includes 4.5% unburned carbon.

^e Includes 2.3% unburned carbon.

Table 3-8 Flow Rate Calculations

Raw Coal:

Counting of 500 lb (nominal) buckets

Pulverizer Rejects:

Measured by bucket-and-stopwatch method

Stack Gas:

Measured by Pitot tube traverse

Feed Coal, dry basis:

91,000 lb/hr Raw Coal - 91,000 lb/hr * 0.117 lb Water/lb coal - 120 lb/hr Rejects = 80,200 lb/hr

ESP Inlet and ESP Outlet Flue Gas:

288,000 dscfm Stack Gas - 4,100 scfm Oxidation Air = 284,000 dscfm

ESP Inlet Ash:

284,000 dscfm * 3.64 gr/dscf * 0.000143 lb/gr * 60 m/hr = 8,870 lb/hr

ESP Outlet Ash:

284,000 dscfm * 0.0577 gr/dscf * 0.000143 lb/gr * 60 m/hr = 140 lb/hr

ESP Collected Ash:

8,870 lb/hr ESP Inlet Ash - 140 lb/hr ESP Outlet Ash = 8,730 lb/hr

Bottom Ash:

[80,200 lb/hr Dry Feed Coal * 0.111 lb ash/lb coal - (8,870 lb/hr ESP Inlet Ash- 8,870 lb/hr *0.045 lb Carbon/lb Ash]/(1-0.023) lb Carbon-Free Bottom Ash/lb Bottom Ash = 440 lb/hr

Stack Emissions:

288,000 dscfm Stack Gas * 0.0059 gr/dscf * 0.000143 lb/gr * 60 m/hr = 14.6 lb/hr

Stack Emission Factor:

 $14.6 \text{ lb/hr/}(80,200 \text{ lb/hr Feed coal} * 12,700 \text{ Btu/lb}) * 1,000,000 = 0.014 \text{ lb/10}^6 \text{ Btu}$

4

SAMPLE PREPARATION AND ANALYSIS METHODS

Preparation procedures and chemical analysis methods for gases are shown in Figures 4-1 through 4-12.

Procedures for liquid sample preparation and analysis are shown in Figure 4-13. Procedures for coal are shown in Figure 4-14 and Table 4-1. Procedures for ash are in Figure 4-15. Procedures for limestone and FGD solids are shown in Figure 4-16.

Appendix E of this technical note contains descriptions of and references for the methods used for this project.

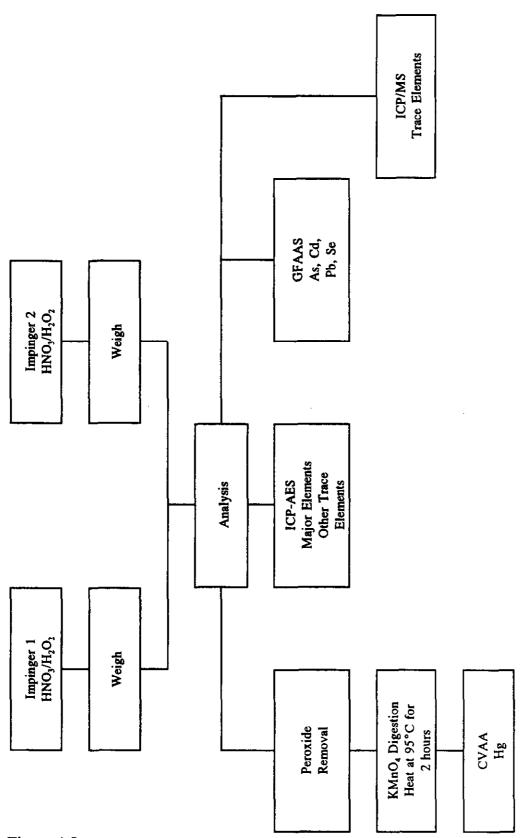


Figure 4-2
Flue Gas Impinger Sample Preparation and Analysis Plan for Metals

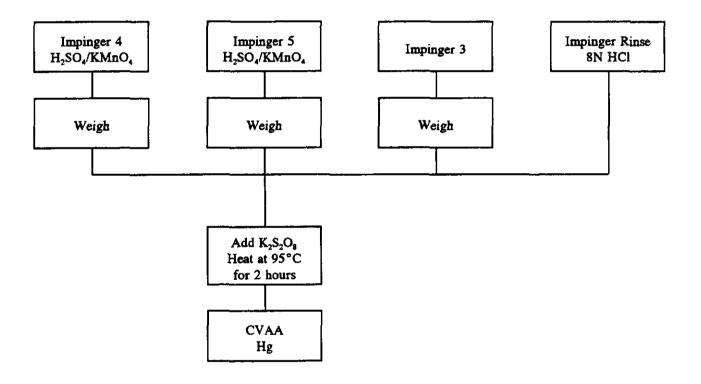


Figure 4-3
Flue Gas Impinger Sample Preparation and Analysis Plan for Mercury

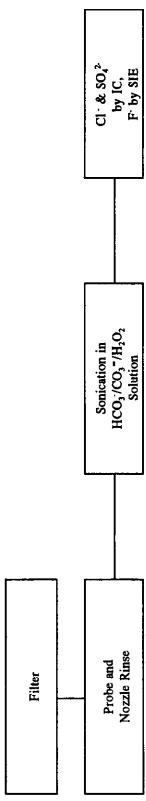


Figure 4-4
Gas Particulate Sample Preparation and Analysis Plan for Anions

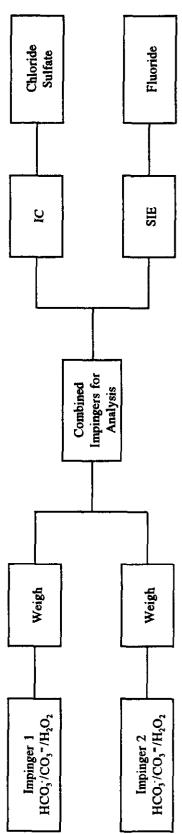


Figure 4-5
Flue Gas Impinger Sample Preparation and Analysis Plan for Anions

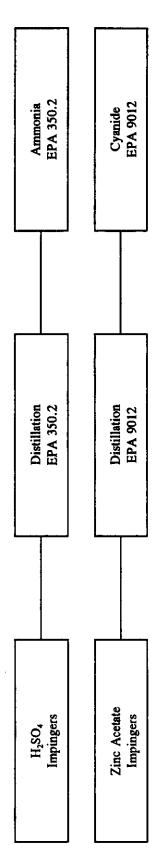


Figure 4-6
Flue Gas Impinger Sample Preparation and Analysis Plan for Ammonia and Cyanide

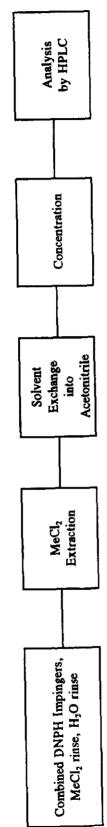


Figure 4-7
Flue Gas Impinger Sample Preparation and Analysis Plan for Formaldehyde

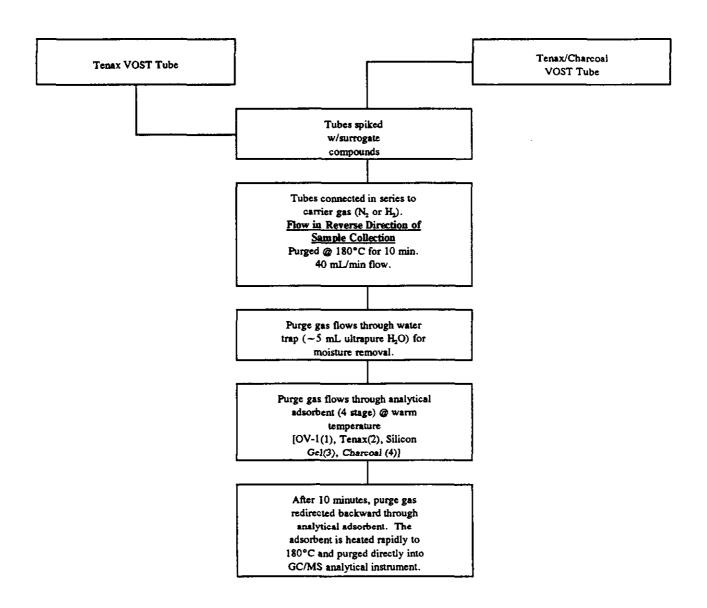


Figure 4-8
VOST Sorbent Sample Preparation and Analysis Plan for Volatile Organic Compounds

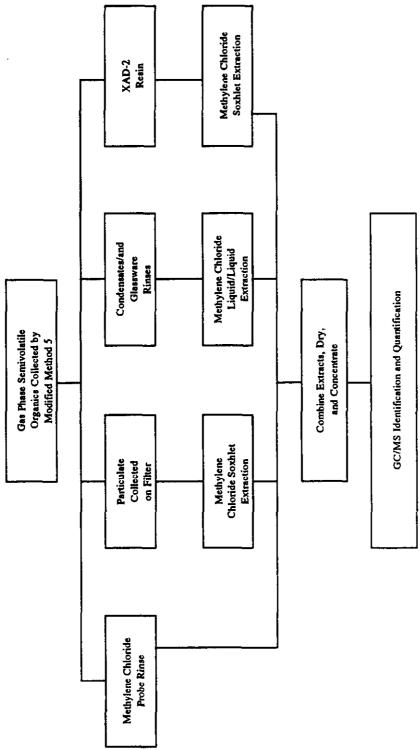


Figure 4-9
Flue Gas Sample Preparation and Analysis Plan for Semivolatile Organic Compounds

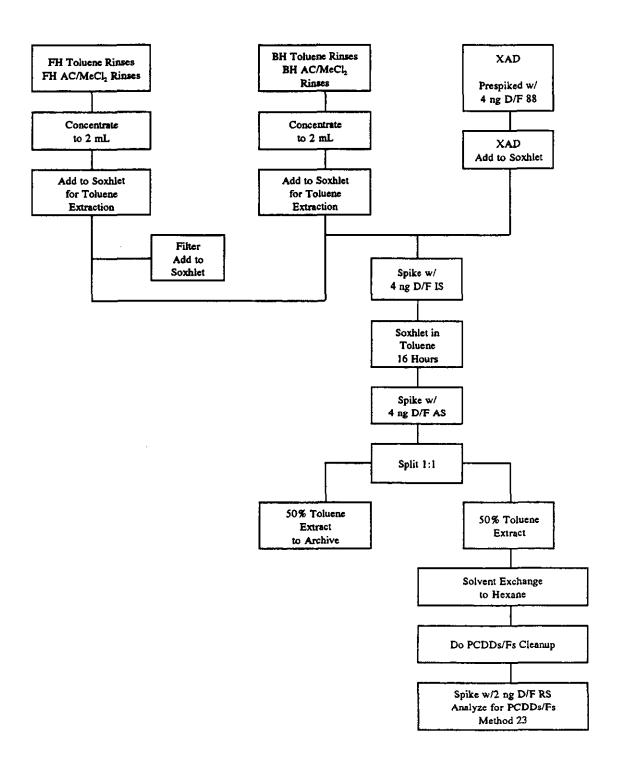


Figure 4-10 Flue Gas Sample Preparation and Analysis Plan for Dioxins and Furans

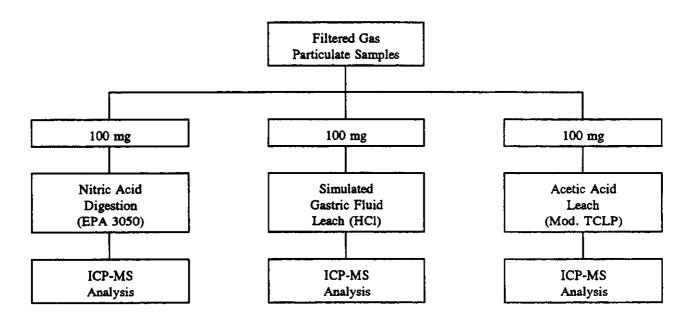


Figure 4-11
Gas Particulate Sample Preparation and Analysis Plan for Extractable Metals

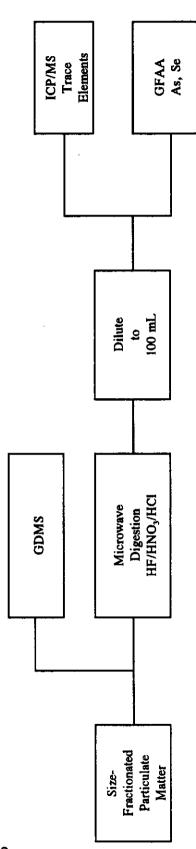


Figure 4-12
Size-Fractionated Particulate Sample Preparation and Analysis Plan for Metals

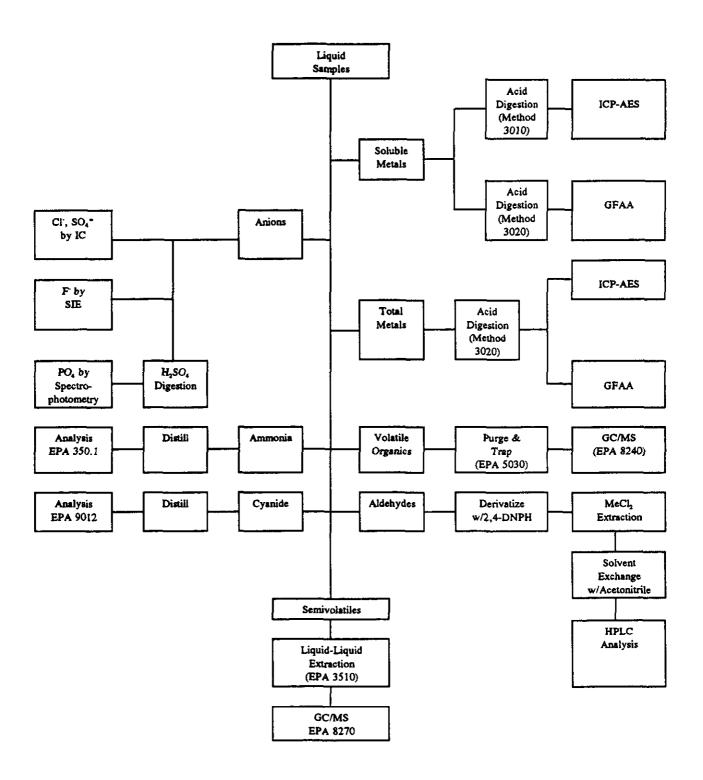


Figure 4-13 Liquid Sample Preparation and Analysis Plan

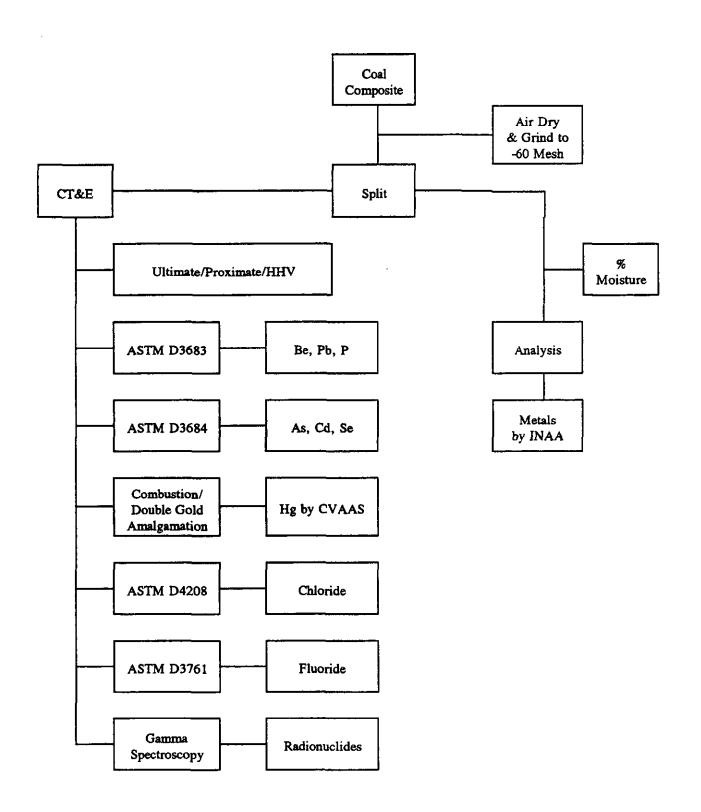


Figure 4-14 Coal Sample Preparation and Analysis Plan

Sample Preparation and Analysis Methods

Table 4-1 Summary of Coal Analytical Methods

Chemical Substance	Analytical Method
Ultimate/Proximate/Higher Heating Value	
Moisture	ASTM D3173
Ash	ASTM D3174
Carbon, Hydrogen, Nitrogen	ASTM D5373
Sulfur	ASTM D4239
Volatile Matter	ASTM D3175
Heating Value	ASTM D2015
Chlorine in Coal	ASTM D4208
Fluorine in Coal	ASTM D3761
Radionuclides	Gamma Emission Spectroscopy

ASTM = American Society for Testing and Materials.

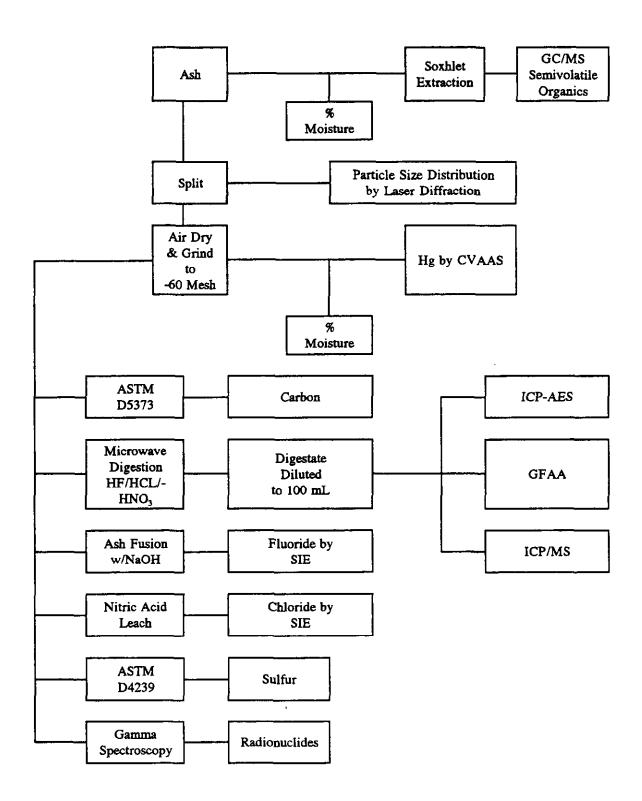


Figure 4-15
Ash Sample Preparation and Analysis Plan

5

Analytical Results

The results of the analyses performed on samples collected during the emissions test program are presented in this section. The results are reported by stream matrix, i.e., gaseous, solid, or liquid, and are presented as averages for individual process streams along with the 95% confidence interval (CI) and the detection limit (DL) ratio. The detection limit ratio represents the percentage of the average value that is contributed by data which were below the detection limit. The analytical results for organic species reported in the following tables have been limited to only those compounds which were detected in any of the three test runs. Complete details of the analytical results may be found in Appendix H. Appendix H contains results on a per run basis, the analytical method used for each analysis, appropriate data flags for each value, additional analytical results for compounds which were not part of the scope of work but which information was obtained by virtue of the particular analytical method used, along with the averages of Runs 1-3, 95% CI, and DL ratios. Treatment of values that were less than the method detection limit are explained in Appendix G. Confidence intervals and error propagation are described in Appendix F.

Some data in Appendix H have been flagged. These data (which have been shaded) are suspect due to extremely high background contamination and have been excluded from the mean and CI calculations. High background contamination was encountered in gaseous particulate samples obtained from three of the multi-metals runs performed at the ESP outlet and the stack. This problem arose from the misidentification (during the field prep phase) of three glass fiber filter substrates. These glass fiber substrates were prepped, labelled and treated as quartz filters. The error was discovered during analysis when very high levels of barium and zinc were identified. The glass fiber substrates were used in Runs 1 and 3 at the ESP outlet and in Run 1 at the stack. Table 5-1 shows results for a blank analysis of a quartz and glass fiber filter. Background results are similar for Sb, As, Se, and V. All other species (except Mo) are substantially higher in the glass fiber matrix. Again, shaded data have been invalidated and are not included in the reported mean values.

Gases

The particulate loading and analytical results for the ESP inlet, ESP outlet and the stack are presented in Table 5-2. Concentration of trace elements as a function of particle size is given for three approximate size ranges; less than $3 \mu m$, $3-10 \mu m$, and greater than $10 \mu m$ on an aerodynamic basis. The analysis of boron and silicon in the fly ash samples filtered from the flue gas streams was not performed due to the limited quantity of sample and the limitations of the sampling and sample preparation techniques. For gas particulate samples, the filtered solids are prepared for analysis by digesting the entire filter with a mixed acid solution containing hydrochloric, nitric, and hydrofluoric acids.

Table 5-1
Filter Substrate Data Comparison

Specie	Quartz (μg)	Glass Fiber (µg)
Aluminum	122	36,500
Antimony	<9	<9
Arsenic	0.14	<0.12
Barium	8.6	57,600
Beryllium	0.08	6
Cadmium	<0.13	4
Calcium	101	15,500
Chromium	1.4	21
Cobalt	0.25	22
Copper	0.57	4
Iron	15	312
Lead	<0.13	35
Magnesium	14	2,700
Manganese	0.60	15
Mercury	0.07	0.1
Molybdenum	19	2
Nickel	2.6	8
Phosphorus	<7.5	144
Potassium	<205	30,000
Selenium	0.06	<0.09
Sodium	224	88,800
Strontium Titanium Vanadium Zinc	0.80 8.2 0.65 6.3	664 78 0.15 39,900

Table 5-2
Gas Process Stream Data Summary

		E	SP Inlet		E	SP Outlet			Stack	
Analyte Group/			95%	DL		95%	DL		95%	DL
Specie	Units	Average	CI	Ratio	Average	CI	Ratio	Average	CI	Ratio
Particulate Loading	g/Nm³	8.95	1.5		0.142	0.05		0.0145	0.010	
Reduced Species										
Ammonia as N	$\mu g/Nm^3$	29.0	7.4		27	16		11	17	
Hydrogen Cyanide	μg/Nm³	0.15	0.24		0.90	1.7		28	94	
Anions-Vapor										
Chloride	μg/Nm³	112,000	34,300		136,000	67,000		540	820	
Fluoride	μg/Nm³	8,300	1,400		7,900	3,200		124	66	
Sulfate	μg/Nm³	7,460,000	432,000		6,900,000	1,500,000		680,000	160,000	
Anions-Particulate										
Chloride	μg/Nm³	6,100	9,100		45	94		210	310	
Fluoride	μg/Nm³	1.3	2.4		0.12	0.21		0.051	0.041	
Sulfate	μg/Nm³	79,000	98,000		4,200	760		5,900	8,700	
Anions-Total	•	•								
Chloride	μg/Nm³	118,000	31,000		136,000	67,000		750	800	
Fluoride	μg/Nm³	8,300	1,400		7,900	3,200		124	66	
Sulfate		7,500,000			6,900,000	1,500,000		690,000	170,000	
Radionuclides	F-6	.,,	,		-,,	-,,		,	,	
Actinium-228 @ 338 KeV	pCi/g	25	36	11%						
Actinium-228 @ 911 KeV	pCi/g	20	15							
Actinium-228 @ 968 KeV	pCi/g	29	41	13%						
Bismuth-212 @ 727 KeV	pCi/g	<39		100%						
Bismuth-214 @ 1120.4 KeV	pCi/g	<24		100%						
Bismuth-214 @ 1764.7 KeV	pCi/g	49	71	12%						
Bismuth-214 @ 609.4 KeV	pCi/g	28	17							
K-40 @ 1460 KeV	pCi/g	230	317		73	31		<56		48%
Lead-210 @ 46 KeV	pCi/g pCi/g	79	33		, ,	31	-	730	-	40 %
	pCi/g pCi/g	19	19					•		
Lead-212 @ 238 KeV Lead-214 @ 295.2 KeV	pCi/g pCi/g	24	20							
-	pCi/g pCi/g	25	8.0							
Lead-214 @ 352.0 KeV			50							
Radium-226 @ 186.0 KeV	pCi/g	130 17	11							
Thallium-208 @ 583 KeV	pCi/g pCi/g			100%						
Thallium-208 @ 860 KeV		< 67 79	25							
Thorium-234 @ 1001 KeV	pCi/g		35							
Thorium-234 @ 63.3 KeV	pCi/g	69	43	***						
Uranium-235 @ 143 KeV	pCi/g	69	43							
Part Metals by Wt.		OT 000			101 000					
Aluminum	μg/g	97,000	11,000		101,000			13,800	7,300	
Antimony	μg/g	3.6	2.4		2.7	0.65		3.8	5.7	
Arsenic	μg/g	45	12		117	48		81	71	
Barium	μg/g	490	106		620			210	1,100	
Beryllium	μg/g	10	0.57		14			2.9	2.1	
Cadmium	µ8/g	2.70	1.4		8.9			41	79	
Calcium	μg/g	18,100	3,900		14,800			18,600	31,000	
Chromium	μ 8/ g	320	500		190			330	3,000	
Cobalt	μg/g	31	0.83		37			< 150		52%

Table 5-2 (Continued)

		E	SP Inlet		E	SP Outlet		Stack			
Analyte Group/	•	· · · · · · · · · · · · · · · · · · ·	95%	DL		95%	DL	-	95%	DL	
Specie	Units	Average	CI	Ratio	Average	CI	Ratio	Average	CI	Ratio	
Copper	µg/g	86	2.6		116	35		56	49		
Iron	μg/g	91,000	27,000	-	61,000	14,000		11,700	22,000		
Lead	μg/g	79	19	-	153			36	20		
Magnesium	μg/g	4,690	480		5,500	-		2,800	10,700		
Manganese	μg/g	237	32		243	68		490	2,600		
Mercury	μg/g	0.79	0.59		0.90	0.3		0.57	5.2	14%	
Molybdenum	μg/g	35	39		58	31		73	120		
Nickel	μg/g	230	250		157	25		2,500	27,000		
Phosphorus	μg/g	230	150		830			< 220		100%	
Potassium	μg/g	17,500	1,900		17,900			2,900	1,600		
Selenium	μg/g	15	7.0		570	860		1,700	3,500		
Sodium	μg/g	5,120	190		6,700			4,200	1,900		
Strontium	μg/g	324	12	*-	360			106	53		
Titanium	μg/g	6,140	790		5,400	1,600		910	1,700		
Vanadium	μg/g	308	5.7		381	93		112	46		
Part Metals by Vol											
Aluminum	μg/Nm³	870,000	240,000		12,100			190	260		
Antimony	μg/Nm³	33	26		0.39	0.11		0.052	0.019		
Arsenic	μg/Nm³	400	170		16	6.6		1.1	0.24		
Barium	μg/Nm³	4,400	1,700		74			2.8	10		
Beryllium	μg/Nm³	93	16		1.7			0.041	0.047		
Cadmium	μg/Nm³	24	15		1.1			0.59	2.2		
Calcium	μg/Nm³	161,300	7,200		1,800			270	920		
Chromium	μg/Nm³	2,900	4,600		23	**		5.1	50		
Cobalt	μg/Nm³	275	48		4.5			< 0.6		59%	
Copper	μg/Nm³	770	130	**	16	1.2		0.77	0.76		
Iron	μg/Nm³	808,000	99,000		8,500	1,100	**	170	600		
Lead	μg/Nm³	710	290		18			0.50	0.64		
Magnesium	μg/Nm³	42,000	11,000		660	•		41	220		
Manganese	μg/Nm³	2,120	120		34	3.7		7.2	49		
Mercury	μg/Nm³	7.1	5.6		0.126	0.037		0.0071	0.057	18%	
Molybdenum	μg/Nm³	320	390		8.1	1.3		1.4	2.6		
Nickel	μg/Nm³	2,000	2,300		22	5.7		39	440		
Phosphorus	μg/Nm³	2,100	1,600	**	100			< 2.6		100%	
Potassium	μg/Nm³	157,000	43,000		2,150			40	53		
Selenium	μg/Nm³	133	73		82	130		26	58		
Sodium	μg/Nm³	45,800	6,200		800			59	140	+-	
Strontium	μg/Nm³	2,910	570		43			1.5	3.5		
Titanium	μg/Nm³	55,000	16,000		760	230		12.5	0.59		
Vanadium	μg/Nm³	2,760	430		54	11	**	1.6	0.47		
Metals, Vapor	r.e	_,, •••			- •						
Aluminum	$\mu g/Nm^3$	150	940		58	48		< 8.7		50%	
Antimony	μg/Nm³	0.56	6.5		0.021	0.0096		0.012	0.0019		
Arsenic	μg/Nm³	< 0.17		100%	< 0.18		100%	< 0.18		100%	
Barium	μg/Nm³	1.5	7.9		1.0	1.1		< 0.14		54%	
Beryllium	μg/Nm³	0.06	0.25		< 0.16		57%	< 0.17		82%	
,	F-8						2.70			/-	

Table 5-2 (Continued)

		E	SP Inlet		ES	SP Outlet		Stack		
Analyte Group/	•		95%	DL		95%	DL		95%	DL
Specie	Units	Average	CI	Ratio	Average	CI	Ratio	Average	CI	Ratio
Boron	μg/Nm³	6,400	12,000		6,900	1,200		440	70	**
Cadmium	μg/Nm³	0.11	0.93	16%	0.10	0.31	21%	< 0.064		100%
Calcium	μg/Nm³	300	110		184	87		<40		52%
Chromium	$\mu g/Nm^3$	11	140		< 0.73		42%	< 0.67	••	100%
Cobalt	$\mu g/Nm^3$	< 0.74		55%	< 1.0		31%	0.39	0.77	
Copper	$\mu g/Nm^3$	1.1	1.6		1.1	1.2	16%	1.2	2.4	14%
Iron	$\mu g/Nm^3$	140	120		50	78		< 1.8		50%
Lead	$\mu g/Nm^3$	< 0.21		100%	0.40	1.1	20%	< 0.22		100%
Magnesium	μg/Nm³	20	18		12	6.4		<7.0		24%
Manganese	μg/Nm³	< 0.10		100%	< 0.11	~~	100%	< 0.11	•-	100%
Mercury	μg/Nm³	5.5	5.6		5.6	1.1		3.0	0.27	
Molybdenum	μg/Nm³	< 1.4		52%	< 1.4		37%	0.12	0.048	•
Nickel	μg/Nm³	7	7%	8%	< 2.9		59%	< 2.6		46%
Phosphorus	μg/Nm³	< 16		100%	<17		100%	< 16		100%
Potassium	μg/Nm³	10	130	2%	20	100	1%	37	96	0.4%
Selenium	μg/Nm³	< 0.22		100%	< 0.23	**	100%	0.80	1.6	
Sodium	μg/Nm³	240	360		290	280		<11	••	100%
Strontium	μg/Nm³	2	4		1.4	0.28	••	< 0.045		100%
Titanium	μg/Nm³	9	71		2.5	3.4		< 0.27	_	58%
Vanadium	μg/Nm³	1.2	3		1.0	1.3	12%	0.55	0.57	
Total Metals	P.B. 3				1.0	22		0.00	•••	
Aluminum	μg/Nm³	870,000	240,000		12,200			200	250	- -
Antimony	μg/Nm³	33	25		0.41	0.12		0.065	0.026	
Arsenic	μg/Nm³	410	170		17	6.6		1.2	0.24	
Barium	μg/Nm³	4,400	1,700		75			2.9	10	
Beryllium	μg/Nm³	93	16		1.7			0.099	0.29	
Boron (vapor only)	μg/Nm³	6,600	2,500		6,900	1.200		440	70	
Cadmium	μg/Nm³	24	15		1.3			0.63	2.2	
Calcium	μg/Nm³	163,300	6,200		1,900			290	830	
	μg/Nm ³	2,900						5.4	50	
Chromium	. •		4,700		23		*-			
Cobalt	μg/Nm³	276	48		5			0.74	4	
Copper	μg/Nm³	770	130	**	17	1.9		2.0	1.8	
Iron	μg/Nm³	809,000	98,000		8,600	1,100		170	600	
Lead	μg/Nm³	710	290		19			0.61	0.54	
Magnesium	μg/Nm³	42,000	11,200		670			45	230	
Manganese	μg/Nm³	2,120	130		34	3.7		7.3	49	
Mercury	μg/Nm³	13	5.6		5.7	1.1		3.1	0.44	
Molybdenum	μg/Nm³	320	390		8.7	1.4		1.5	2.4	
Nickel	μg/Nm³	2,100	2,300		24	6.3		41	430	••
Phosphorus	$\mu g/Nm^3$	2,100	1,600		110			< 10		100%
Potassium	μg/Nm³	157,000	43,000		2,200			79	540	
Selenium	$\mu g/Nm^3$	133	73		80	130		27	57	
Sodium	$\mu g/Nm^3$	46,100	6,200		1,000			65	130	
Strontium	μg/Nm³	2,920	580		45			1.5	3.5	

Table 5-2 (Continued)

		E	SP Inlet		E	SP Outlet		Stack		
Analyte Group/	•		95%	DL		95%	DL		95%	DL
Specie	Units	Average	CI	Ratio	Average	CI	Ratio	Average	CI	Ratio
Titanium	μg/Nm³	55,000	16,000		760	230		13	0.26	
Vanadium	$\mu g/Nm^3$	2,770	440		55	10		2.2	1	-
Hg Vapor, Bloom										
Mercury, Elemental	$\mu g/Nm^3$	2.0	1.8		2.5	0.28		2.8	1.1	
Mercury II	$\mu g/Nm^3$	4.1	1.4		4.2	2		0.47	0.33	
Mercury, Methyl	$\mu g/Nm^3$	0.31	0.59		0.63	0.45		0.044	0.041	
Mercury, Total	μg/Nm³	6.4	1.1		7.3	2.4		3.3	0.88	
Hexavalent Chromium										
Chromium VI	$\mu g/Nm^3$							< 0.190		100%
Total Chromium	$\mu g/Nm^3$							< 0.560	**	100%
Extract Metals, Nitric										
Antimony	μg/g	2.7	1		3.2	3.4		5.8		
Arsenic	µg/g	43	45		98	40		160		
Barium	μg/g	220	145		318	8.4	-	350		
Beryllium	μg/g	4.1	2.3		5.4	5.8		10		~-
Boron	μg/g	1,520	857		1,900	1,200		< 15		100%
Cadmium	μg/g	2.2	5	5%	10	18	-	67		
Chromium	μg/g	29	30		64	61		44		
Cobalt	μg/g	5.0	10		17	3.8		< 0.90		100%
Copper	µg/g	32	36		98	32		120		
Lead	μg/g	39	52		116	31		91	••	
Manganese	μg/g	120	87		1000	3,500		330		***
Mercury	μg/g	80	230	0.4%	4.0	11	8.1%	<7.0		100 %
Molybdenum	μg/g	43	59		72	21		51		
Nickel	μg/g	45	30		84	46		390		
Selenium	μg/g	< 23		100%	<23		100%	<87		100%
Vanadium	μg/g	150	160	*-	270	260		390		
Extract Metals, Gastric										
Antimony	μg/g	0.71	0.095		1.0	0.4		3.4		
Arsenic	μg/g	< 0.68		100 %	< 0.66		100 %	< 2.5		100 %
Barium	μg/g	103	55		125	22		210		
Beryllium	μg/g	1.1	0.61		2.7	0.66		4.2		
Boron	μg/g	698	4.6		822	88		150		
Cadmium	µg∕g	1.8	3.0		5.9	3.2		12		
Chromium	µg/g	27	13		54	18		85		
Cobalt	μg/g	1.8	1.4		5.5	2		11		
Copper	μg/g	10	5.3		33	9.3		51		
Lead	μg/g	9.4	9.6		33	7.1		66		
Manganese	μg/g	60	65		46	11		350		
Mercury	μg/g	1.9	3.0		0.38	0.22		< 0.15		100 %
Molybdenum	μg/g	29	22		61	12		49		
Nickel	µg/g	10	21		38	22		170		
Selenium	μg/g	<0.88	••	100%	18	6.8		140		
Vanadium	μg/g	< 0.36		100 %	122	79		<1.3		100 %

Table 5-2 (Continued)

		E	SP Inlet		E	SP Outlet		Stack		
Analyte Group/			95%	DL		95%	DL		95%	DL
Specie	Units	Average	CI	Ratio	Average	CI	Ratio	Average	CI	Ratio
Extract Metals, Acetic										
Antimony	μg/g	0.80	1.1		0.88	0.38		< 0.03		100%
Arsenic	μg/g	1.0	0.63		3.4	3.9		< 0.5		100%
Barium	μg/g	48	30		44	13		17		
Beryllium	μg/g	0.32	0.54		0.98	0.53		2.9		
Boron	μg/g	1,010	240		910	280		< 0.82		100%
Cadmium	μg/g	1.6	2.9		10	27		5.9		
Chromium	μg/g	7.4	1		19	7.2		36		
Cobalt	μg/g	1.5	0.87		6.0	7.4		7.5		
Copper	μg/g	11	14		18	4.9		64		
Lead	μg/g	0.21	0.35		1.5	0.98		20		
Manganese	μg/g	51	52		39	8.5		470		
Mercury	μg/g	0.70	1.9		0.13	0.38		< 0.38	**	100%
Molybdenum	μg/g	1.5	5.3		4.0	12		3.5		
Nickel	μg/g	8.6	5.6		23	1.0		66		
Selenium	μg/g	< 0.54		41%	4.1	3.3		61		
Vanadium	μg/g	1.5	1.0	+-	5.0	10		< 0.19		100%
Metals by Size, >10 μm										
Percent of Total Mass	%	57			16					
Aluminum	μg/g	109,000	35,000		72,000	16,000				
Antimony	μg/g	2.0	1.1		3.2	1.0				
Arsenic	μg/g	26	8.4		49	21				
Barium	μg/g	520	130	••	390	100				
Beryllium	μ g /g	10	5.6		10	18				
Cadmium	μg/g	1.7	0.88		3.6	1.8				
Calcium	μg/g	22,100	10,000		14,000	3,900				
Chromium	μg/g	184	4.3		213	35				
Cobalt	μg/g	32	4.4		32	18				
Copper	μg/g	87	23		102	33				
Iron	μg/g	102,000	2,500		160,000	140,000				
Lead	μg/g	51	19		72	31				
Magnesium	μg/g	5,400	2,000		3,700	1,600				
Manganese	μg/g	238	17		700	1,100				
Mercury	μg/g	0.50	0.47		0.55	0.21				
Molybdenum	μg/g	16	20		43	13				
Nickel	μg/g	121	34		129	96				
Phosphorus	μg/g	<72		100%	<71		100%			
Potassium	μg/g	18,500	2,700		14,600	2,900				
Selenium	μg/g	11	1		160	210				
Silicon	μg/g	218,000	20,000		175,000	77,000				
Sodium	μg/g	4,600	1,900		5,500	4,000				
Strontium	μg/g	357	97		294	58				
Titanium	μg/g	6,150	560		5,300	2,000				
Vanadium	μg/g	293	45	=	290	120				

Table 5-2 (Continued)

		E	SP Inlet		E	SP Outlet			Stack	
Analyte Group/			95%	DL		95%	DL		95%	DL
Specie	Units	Average	CI	Ratio	Average	CI	Ratio	Average	CI	Ratio
Metals by Size, 3-10 μm										
Percent of Total Mass	%	27			44					
Aluminum	μg/g	118,000	23,000	**	105,000	63,000	~**			
Antimony	µg∕g	4.8	2.7		8.6	1.1				
Arsenic	$\mu g/g$	71	31		127	11				
Barium	μg/g	630	250		629	8 5				
Beryllium	μg/g	13	8.1		18	15				
Cadmium	$\mu g/g$	5.8	3.6		11	2.4				
Calcium	μg/g	19,000	17,000		14,000	1,600				
Chromium	μg/g	218	16		275	65	•			
Cobalt	μg/g	43	5.6		51	10				
Copper	μg/g	142	22		170	39				
Iron	μg/g	64,000	19,000		63,000	14,000				
Lead	μg/g	119	82		191	5.2				
Magnesium	μg/g	6,350	520		5,000	4,200				
Manganese	μg/g	226	34		280	110				
Mercury	μg/g	0.47	0.54		< 0.48		18%			
Molybdenum	μg/g	46	34		80	25				
Nickel	μg/g	152	69		211	73				
Phosphorus	μg/g	<73		100%	228	100				
Potassium	μg/g	21,800	3,300		21,300	7,200	**			
Selenium	μg/g	3.1	7.3	6%	45	33	••			
Silicon	μg/g	231,000	14,000		218,000	20,000				
Sodium	μg/g	6,700	2,600		7,900	1,500				
Strontium	μg/g	384	11		370	120				
Titanium	μg/g	6,830	960		6,860	850				
Vanadium	μg/g	390	190		509	91				
Metals by Size, <3 μm	, , ,									
Percent of Total Mass	%	16			40					
Aluminum	μg/g	135,000	18,000		122,000	10,000				
Antimony	μg/g	10	5.7		13	0.94				
Arsenic	μg/g	160	110		202	54				
Barium	μg/g	780	400		758	85				
Beryllium	μg/g	17	9.8		15	5.0				
Cadmium	μg/g	15	12		21	8.0				
Calcium	μ <u>ε</u> /g	19,000	13,000	-	16,200	2,100				
Chromium	μ <u>ε</u> /ε μ <u>ε</u> /ε	246	65		290	84				
Cobalt	#8/8 #8/8	63	28		64	15				
Copper	μg/g	195	52		250	180				
Iron	<i>не/ в</i> µg/g	58,600	4,700		67,900	5,100				
Lead	με/ε με/ε	180	120		220	230				
Magnesium	μ <u>ε</u> /ε μ g/ g	7,500	1,500	-	6,700	3,500				
Manganese	μ <u>ε</u> /ε μ <u>g</u> /g	7,500 267	79		319	3,300 29				
Mercury		0.63	0.25		0.39	0.15				
Molybdenum	μg/g	103		••						
*	μ g/g		72		118	49				
Nickel	μg/g	202	49		235	52				

Table 5-2 (Continued)

		E	SP Inlet		E	SP Outlet			Stack	
Analyte Group/			95%	DL		95%	DL		95%	DL
Specie	Units	Average	CI	Ratio	Average	CI	Ratio	Average	CI	Ratio
Phosphorus	μg/g	< 499		35%	820	790				
Potassium	μg/g	24,500	2,600		22,700	5,700	••			
Selenium	μg/g	< 8.0	-	36%	60	43				
Silicon	μg/g	223,000	38,000		207,000	18,000				
Sodium	μg/g	8,000	2,300		8,300	2,800				
Strontium	μ g /g	430	120		429	91				
Titanium	μg/g	6,970	480		6,890	170				
Vanadium	μg/g	2,700	9,100		770	230				
Organics, Aldehydes										
Acetaldehyde	$\mu g/Nm^3$	130	170		1.2	2.8		8.7	9.2	
Formaldehyde	μg/Nm³	61	56		0.50	1.1		24	35	
Organics, Semivolatile										
2-Methylphenol(o-cresol)	ng/Nm³	1,500	4,500	1%	5,000	11,000	_	3,000	3,700	
4-Methylphenol(p-cresol)	ng/Nm³	1,100	2,700	3 %	1,730	780		960	2,000	3 %
Acetophenone	ng/Nm³	2,400	5,000	1 %	3,260	750		3,300	710	
Benzoic acid	ng/Nm³	140,000	100,000		130,000	70,000		119,000	5,000	
Benzyl alcohol	ng/Nm³	2,300	9,100	4%	4,000	18,000	2%	2,800	1,100	3 %
Butylbenzylphthalate	ng/Nm³	< 230		39%	340	170		300	130	
Dibutylphthalate	ng/Nm³	2,600	10,000		< 160		39%	170	260	
Diethylphthalate	ng/Nm³	260	360	12%	190	530	24%	240	140	
Dimethylphthalate	ng/Nm³	< 110		100%	< 96		100 %	180	560	18%
Naphthalene	ng/Nm³	900	460		1,100	1,000		1,500	980	
Phenol	ng/Nm³	8,000	11,000		9,000	15,000		9,300	8,700	
bis(2-Ethylhexyl)phthalate	ng/Nm³	1,400	1,700		15,000	41,000		1,400	1,400	
Organics, Volatile										
1,1,1-Trichloroethane	ng/Nm³	700	270	-	690	190	_	640	810	14%
Acetone	ng/Nm³	16,000	63,000	6%	< 2,600		100%	3,600	6,300	13 %
Benzene	ng/Nm³	1,100	680		1,470	240		1,310	360	
Carbon Disulfide	ng/Nm³	7,000	25,000		3,400	7,700		2,300	1,200	
Chloromethane	ng/Nm³	< 460		100%	<530		100%	6,000	13,000	1%
Methylene Chloride	ng/Nm³	170,000	540,000		33,000	37,000		130,000	280,000	
Tetrachloroethene	ng/Nm³	1,000	800		820	470		1,500	2,300	
Toluene	ng/Nm³	1,200	2,000		1,200	1,100		2,000	1,000	
Trichlorofluoromethane	ng/Nm³	9,000	27,000		< 540		44%	1,100	1,700	
m,p-Xylene	ng/Nm³				< 540		40%			
Dioxins/Furans										
Total TCDD	ng/Nm³							0.0067	0.008	16%

Boric acid is added to dissolve the insoluble metal fluorides that are produced during digestion. This addition of boric acid makes the quantification of boron in the sample impossible. Silicon in the gas particulate sample cannot be isolated due to the overwhelming contribution of silicon from the filter media.

The results presented in the data tables in this section of the report have been corrected for significant figures and may vary slightly from the detailed data summary presented in Appendix H. The number of significant figures reported is directly related to the order of magnitude of the 95% CI. Therefore, numbers with a small degree of variability will contain more significant figures than those whose CI is extremely broad.

Detection limit ratios are presented where the mean value is derived in some part from results that are below the method detection limit. If all values used in determining the mean value were above the detection limit, then no DL ratio was calculated and is represented by "--- "

Flue Gas Particle Size Distribution Results

Flue gas particle size distributions were measured in three runs at the ESP inlet, ESP outlet, and the stack. All of these measurements were performed with inertial sizing devices. The Andersen High Capacity Source Sampler was used at the ESP inlet. This device has two impaction stages, a cyclone, and a final filter. The University of Washington Mark V cascade impactor was used at the ESP outlet and at the stack. This impactor was equipped with a right angle pre-cutter, eleven impaction stages, and a final filter. Because the cutpoint of the pre-cutter was close to the cutpoints of the first two stages, the weights of the pre-cutter and first two impaction stages were combined for the size distribution calculations.

Since these particle sizing devices are inertial sizing devices, the particle cutpoints are reported from the field in aerodynamic micrometers. Conversion of aerodynamic diameter to physical diameter will be described and used in Section 8. Table 5-3 gives the average cumulative particle size distributions for the ESP inlet, ESP outlet, and stack in terms of aerodynamic particle size for the three runs. As an example of how to read the tables, Table 5-3 shows that at the ESP outlet, 15.5% of the particulate mass was found in particles with aerodynamic diameters less than 2.1 aero μ m.

ESP Hopper Particle Size Distribution Results

The particle size distributions of ESP hopper catches were also measured. ESP hopper catches were collected once during Runs 1 and 2 and twice during Run 3. Field 1 and Field 2 hopper catch composites were made and analyzed by Microtracs laser diffraction. This method measures particle volumes as a function of physical particle diameter. Table 5-4 shows the average cumulative percent particle volumes as a function of physical particle diameter for the ESP Field 1 composites and the ESP Field 2 composites, respectively. These results are discussed in Section 8.

Table 5-3
Flue Gas Particle Size Distribution

	Aerodynamic Particle Diameter (Aero μm)	Average Mass Percent Less than Indicated Diameter
ESP Inlet	12.0	32.6
	6.5	20.3
	1.8	3.8
ESP Outlet	10.1	66.3
	4.3	35.0
	2.1	15.5
	1.14	7.4
	0.74	4.1
	0.57	3.1
	0.43	2.1
	0.33	1.4
	0.27	0.7
	0.16	0.7
Stack	10.7	60.8
	4.6	52.6
	2.3	43.2
	1.26	30.0
	0.85	17.7
	0.67	11.7
	0.52	7.3
	0.41	3.7
	0.34	0.6
	0.21	0.6

Table 5-4
ESP Fields 1 and 2 Hopper Composite Catches

Ho	pper 1	Hopper 2				
Physical Particle Diameter (physical µm)	Average Volume Percent Less than Indicated Diameter	Physical Particle Diameter (physical μm)	Average Volume Percent Less than Indicated Diameter			
106	100.0	42	100.0			
75	90.6	30	93.4			
5 3	76.6	21	83.9			
38	67.7	15	72.5			
27	57.3	10.6	60.5			
19	46.4	7.5	47.9			
13	38.4	5.3	34.6			
9.4	30.5	3.7	24.5			
6.6	21.2	2.6	17.2			
4.7	15.0	1.7	11.1			
3.3	8.2	1.01	6.0			
2.4	3.5	0.66	2.7			
1.7	2.1	0.43	0.8			
1.0	0.7	0.34	0.3			
0.66	0.1	0.24	0.1			

FGD System

Analytical results for influent and effluent streams associated with the JBR have been compiled and are presented in Table 5-5. Mean results are presented for the limestone slurry, the JBR underflow slurry and the inlet and outlet gaseous streams. These data are also presented elsewhere in this section with 95% CI and DL ratios.

Solids

Data for the solid streams have been summarized and are presented in Tables 5-6 to 5-9. Table 5-6 contains data representing the coal feed section of the process. Table 5-7 represents the primary ash streams exiting the boiler, Table 5-8 contains ESP hopper ash data and Table 5-9 contains data from the JBR/FGD removal process.

Liquids

Liquid streams data have been summarized and are presented in Tables 5-10 to 5-12. Table 5-10 contains data from the ash sluice system. Table 5-11 presents the FGD process stream data and ancillary streams such as the cooling water and coal pile run-off are in Table 5-12. As with the gaseous results, the only organic results that are presented are for those species which were detected. Detailed results are contained in Appendix H.

Table 5-5 FGD System Summary

	Limestone Slurry		JBR Und Slur		ESP Outlet	Stack
Specie	Aqueous (μg/mL)	Solids (µg/g)	Aqueous (μg/mL)	Solids (µg/g)	Total (μg/Nm³)	Total (μg/Nm³)
Aluminum	0.26	760	12.3	1,100	12,200	200
Antimony	< 0.24	0.019	< 0.19	0.073	0.53	0.41
Arsenic	0.07	< 0.33	0.20	< 0.41	17	1.9
Barium	4	5.39	3.39	4.02	75	3.2
Beryllium	< 0.0055	0.143	0.0069	0.129	2.4	0.43
Boron	1,400	202	1,400	425	6,900	440
Cadmium	0.0067	0.608	0.456	0.247	1.3	1.2
Calcium	7,070	392,000	17,000	255,-	1,900	300
Chromium	0.063	13.4	0.07	000	24	6.4
				11.3		
Cobalt	0.09	1.48	0.304	0.99	6.0	0.74
Copper	0.04	3.71	0.239	2.73	18	2.0
Iron	< 0.06	2,510	< 0.048	2,190	8,600	170
Lead	0.0017	0.98	0.013	0.84	19	1.3
Magnesium	1,900	1,390	1,800	810	670	47
Manganese	40	429	307	103	35	7.9
Mercury	0.00006	< 0.012	0.001	0.178	5.7	3.1
Molybdenum	0.21	0.23	0.064	1.48	9.1	1.5
Nickel	0.8	4.0	1.52	2.8	25	42
Phosphorus	0.16	110	0.720	88	120	< 19
Potassium	140	338	123	310	2,200	80
Selenium	0.128	8.4	0.50	25.5	80	27
Silicon	7	370	42.4	447		
Sodium	290	55	244	84.1	1,000	71
Strontium	40	112	32.9	73.8	45	2.1
Titanium	0.5	< 0.16	0.82	20.9	760	13
Vanadium	0.19	6.7	0.24	9.9	55	2.2

Table 5-6 Coal Data

Analyte Group			F	eed Coal	!	F	taw Coal		Pulve	erizer Reje	ects
Analyte				95%	DL		95%	DL			DL
Group	Specie	Units	Average	CI	Ratio	Average	CI	Ratio	Average	CI	Ratio
Anions	Chloride	μ 8 /8	1,400	90		1,350	220		510	100	•
	Fluoride	μ <u>8</u> /8	100	0		123	38		323	29	
Metals	Aluminum	μ <u>8</u> /g	14,500	1,400		14,300	3,100		27,200	9,600	
	Antimony	μg/g	0.61	0.16		0.62	0.33		1.2	0.45	
	Arsenic	μ <u>g</u> /g	2.3	1.4		3.0	0		47	45	
	Barium	μg/g	80	51		112	19		330	520	
	Beryllium	μ g /g	1.1	0		1.13	0.14		1.5	1.9	
	Boron	µg/g	100	0		110	25		120	120	
	Bromine	μg/g	7.44	0.53		7.4	1		4.3	1.5	
	Cadmium	μg/g	0.30	0		0.53	0.72		4.1	8.6	
	Calcium	μ g /g	2,100	1,300		3,000	1,300		12,700	6,500	
	Chlorine	μ <u>g</u> /g	1,240	100		1,210	140		59 0	130	
	Chromium	μg/g	24.8	2.9		25.8	0.37		64	14	
	Cobalt	μg/g	3.5	1.9		4.08	0.19		7.8	0.8	
	Copper	μ <u>8</u> /g	36	62		42	50		68	85	14%
	Iron	μ <u>8</u> /g	11,400	1,100		12,800	1,700		127,000	17,000	
	Lead	μ <u>g</u> /g	8.0	2.5		9.0	4.3		37	32	
	Magnesium	μg/g	570	170		660	58		1,370	320	
	Manganese	μ <u>α</u> /g	23.4	3.3		24.4	5.9		99	53	
	Mercury	μg/g	0.077	0.029		0.043	0.014		0.13	0.29	
	Molybdenum	$\mu g/g$	22.3	6.1		18	11		13	20	
	Nickel	$\mu g/g$	30.0	6.4		40	14		<120	_	66%
	Phosphorus	μg/g	84	16		100	120		1,500	2,200	
	Potassium	$\mu_{\rm g}/{\rm g}$	3,300	720		3,100	2,300		2,700	6,600	
	Selenium	μg/g	2.3	1.4		2.3	1.4		8.7	3.8	
	Silver	$\mu \mathbf{g}/\mathbf{g}$	< 0.52	_	100%	< 0.41		100%	<1.9		59%
	Sodium	μg/g	631	82		679	89		1,110	240	
	Strontium	μg/g	74.9	9.3		88	14		450	460	
	Tin	$\mu \mathbf{g}/\mathbf{g}$	< 16	-	100%	< 17	-	100%	<31		49 %
	Titanium	μg/g	890	170		850	170		1,980	110	
	Uranium	μg/g	1.8	0.6		1.60	0.37		4.1	1.9	
	Vanadium	μg/g	39.4	1.2		37.7	6.3		59.8	8.2	
Ultimate/Proximate	% Ash	%	11.1	1.4		12.2	2.5				
	% Carbon	%	72.0	0.52		70.8	1.2		38.5	4.2	
	% Hydrogen	%	4.83	0.014		4.76	0.17				
	% Moisture	%				11.7	2.2				
	% Nitrogen	% .	1.52	0.14		1.45	0.052				
	% Oxygen (diff.)	%	7.74	0.62		7.92	0.93				
	% Sulfur	%	2.74	0.29		2.90	0.36		16.0	2.3	
	Fixed Carbon	%	50.8	2.5		50.7	0.74				
	Higher Heating	Btu/lb	12,697	64		12,590	270				
	Value										
	Heating Value (MAF)	MAF Btu	14,290	160		14,330	150				
	Volatile Matter	%	37.0	2.7		37.1	1.9				

Table 5-6 (Continued)

Analyte			F	eed Coa	ı	R	aw Coal	l	Pulve	rizer Rej	ects
Analyte				95%	DL		95%	DL		95%	DL
Group	Specie	Units	Average	CI	Ratio	Average	CI	Ratio	Average	CI	Ratio
Radionuclides	Actinium-228 @ 338 KeV	pCi/g	0.33	0.29			*				
	Actinium-228 @ 911 KeV	pCi/g	0.33	0.14							
	Actinium-228 @ 968 KeV	pCi/g	0.07	0.29							
	Bismuth-212 @ 727 KeV	pCi/g	ND	-							
	Bismuth-214 @	pCi/g	0.93	0.38							
	Bismuth-214 @ 1764.7 KeV	pCi/g	0.10	0.43							
	Bismuth-214 @ 609.4 KeV	pCi/g	0.67	0.14							
	K-40 @ 1460 KeV	pCi/g	1.4	3.6							
	Lead-210 @ 46 KeV	pCi/g	1.3	0.9							
	Lead-212 @ 238 KeV	pCi/g	0.20	0							
	Lead-214 @ 295.2 KeV	pCi/g	0.63	0.14							
	Lead-214@ 352.0 KeV	pCi/g	0.63	0.14							
	Radium-226 @ 186.0 KeV	pCi/g	1.17	0.72							
	Thailium-208 @ 583 KeV	pCi/g	0.30	0.25							
	Thailium-208 @ 860 KeV	pCi/g	ND	_							
	Thorium-234 @ 63.3 KeV	pCi/g	1.0	1.4							
	Thorium-234 @ 92.6 KeV	pCi/g	0.67	0.38							
	Uranium-235 @ 143 KeV	pCi/g	0.07	0.29							

Table 5-7
Boiler Process Solids Data

			E	lottom Ash	·	Sl	niced Fly A	lsh
Analyte Group	Specie	Units	Average	95% CI	DL Ratio	Average	95% CI	DL Ratio
Anions	Chloride	μg/g	130	170	13 %	<100	-	100%
	Fluoride	μg/g	32	26		99	67	
Metals	Aluminum	μg/g	76,000	11,000		98,000	8,000	
	Antimony	μg/g	1.14	0.20		339	2.04	
	Arsenic	μg/g	7.2	6.2		61	37	
	Barium	μ g/g	457	66		496	87	
	Beryllium	μg/g	7.7	2.9		11.1	3.1	
•	Boron	μg/g	280	170		470	230	
	Cadmium	μg/g	0.32	0.39		4.10	3	
	Calcium	μg/g	20,300	3,400		13,800	2,000	
	Chromium	μg/g	192	18		185	21	
	Cobalt	μg/g	31.6	4.3		36.9	5.8	
	Copper	μ g /g	7 7	18		104	23	
	Iron	μg/g	130,000	31,000		89,000	22,000	
	Lead	μg/g	20	3.8		83	40	
	Magnesium	μg/g	3610	820		4,880	350	
	Manganese	μg/g	270	56		245	46	
	Mercury	μg/g	< 0.011	_	70%	0.150	0.12	
	Molybdenum	μg/g	<3.0	-	39%	< 14	_	29%
	Nickel	μg/g	131	15		143	32	
	Phosphorus	μg/g	400	210		70	140	
	Potassium	μg/g	14,200	1,100		18,210	1,000	
	Selenium	μg/g	<1	-	100%	12	11	
	Silicon	μg/g	213,000	11,000		219,000	7,600	
	Sodium	μg/g	36,10	580		5,100	1,200	
	Strontium	μg/g	280	41		322	30	
	Titanium	$\mu g/g$	5,550	560		6,330	750	
	Vanadium	μg/g	277	29		327	58	
Ultimate/Proximate	% Carbon	%	2.3	4.2		4.50	2.7	
	% Sulfur	%	0.15	0.41		0.134	0.041	
Radionuclides	Actinium-228 @ 338 KeV	pCi/g	2.1	0		2.37	0.14	
	Actinium-228 @ 911 KeV	pCi/g	2.20	0.25		2.33	0.14	
	Actinium-228 @ 968 KeV	pCi/g	2.2	1		2.50	0.25	
	Bismuth-212 @ 727 KeV	pCi/g	3.0	1.2		2.60	0.99	
	Bismuth-214 @ 1120.4 KeV	pCi/g	7.4	1.3		6.50	2.4	
	Bismuth-214 @ 1764.7 KeV	pCi/g	6.8	2.2		5.90	1.8	
	Bismuth-214 @ 609.4 KeV	pCi/g	7.1	1.5		6.50	1.4	
	K-40 @ 1460 KeV	pCi/g	16.7	2.9		18.0	2.5	
	Lead-210 @ 46 KeV	pCi/g	1.37	0.52		6.40	2.7	
	Lead-212 @ 238 KeV	pCi/g	2.03	0.72		2.20	0.25	

Analytical Results

Table 5-7 (Continued)

			В	ottom Asl	h	Sh	riced Fly	Ash
Analyte Group	Specie	Units	Average	95% CI	DL Ratio	Average	95% CI	DL Ratio
Radionuclides (Cont'd)	Lead-214 @ 295.2 KeV	pCi/g	7.3	1.9		6.50	1.4	
	Lead-214@ 352.0 KeV	pCi/g	7.6	1.8		6.60	1.3	
	Radium-226 @ 186.0 KeV	pCi/g	10.3	1.5		9.9	2.9	
	Thallium-208 @ 583 KeV	pCi/g	2.20	0.43		2.23	0.29	
	Thallium-208 @ 860 KeV	pCi/g	1.9	4.2		2.97	0.14	
	Thorium-234 @ 63.3 KeV	pCi/g	5.77	0.76		6.60	4.3	
	Thorium-234 @ 92.6 KeV	pCi/g	5.0	1.3		5.00	2.2	
	Uranium-235 @ 143 KeV	pCi/g	0.31	0.16		0.220	0.15	
Organics, Semivolatile	2-Methylnaphthalene	ng/g	34	97	22%	<26	-	100%
	bis(2-Ethylhexyl)phthalate	ng/g	<86	-	26%	230	520	2%

Table 5-8 ESP Hopper Ash

			ESP Ho	pper Ash-Fio	ald 1	ESP Hop	per Ash-F	ield 2
Analyte Group	Specie	Units	Average	95% CI	DL Ratio	Average	95% CI	DL Ratio
Anions	Chloride	μg/g	350	650	5%	<100		100%
	Fluoride	μg/g	90	49		125	91	
Metals	Aluminum	μg/g	97,000	51,000		89,000	11,000	
	Antimony	μg/g	2.99	1.01		4.19	1.38	
	Arsenic	μg/g	46	11		71.9	9.8	
	Barium	μg/g	490	150		493	98	
	Beryllium	μg/g	10.9	3.3		17.2	3.4	
	Cadmium	μg/g	3.26	0.72		5.42	0.69	
	Calcium	μg/g	17,900	6,400		15,640	960	
	Chromium	μg/g	183	31		220	110	
	Cobalt	μg/g	34.0	4.1		42	6	
	Copper	μ g /g	98	26		150	150	
	Iron	μg/g	90,000	17,000		80,000	8,600	
	Lead	μg/g	72	11		96	20	
	Magnesium	μg/g	4,600	2,700		4,100	1,000	
	Manganese	μg/g	219	52		216	25	
	Mercury	μg/g	0.119	0.087		0.18	0.18	
	Molybdenum	μg/g	25	19		49	32	
	Nickel	μg/g	127	28		158	31	
	Phosphorus	μg/g	100	140	12%	<72	_	1005
	Potassium	μg/g	17,400	3,100		18,100	1,100	
	Selenium	μ g /g	9.3	4.7		16.6	3.3	
	Silicon	μg/g	223,000	35,000		215,000	15,000	
	Sodium	μg/g	5,200	1,200		6,000	1,400	
	Strontium	μg/g	320	120		327	41	
	Titanium	μg/g	6,120	190		6,450	290	
	Vanadium	μg/g	305	37		357	55	
Radionuclides	Actinium-228 @ 338 KeV	pCi/g	2.13	0.38		2.17	0.38	
	Actinium-228 @ 911 KeV	pCi/g	2.10	0.43		2.2	0.5	
	Actinium-228 @ 968 KeV	pCi/g	2.43	0.87		2.63	0.14	
	Bismuth-212 @ 727 KeV	pCi/g	2.8	1.6		2.8	1.3	
	Bismuth-214 @ 1120.4 KeV	pCi/g	6.1	2.6		6.27	0.76	
	Bismuth-214 @ 1764.7 KeV	pCi/g	5.9	2.3		5.7	0.9	
	Bismuth-214 @ 609.4 KeV	pCi/g	6.2	2.1		6.0	1.9	
	K-40 @ 1460 KeV	pCi/g	17.0	4.3		17.3	1.4	
	Lead-210 @ 46 KeV	pCi/g	5.43	0.72		7.8	1.4	
	Lead-212 @ 238 KeV	pCi/g	2.10	0.75		1.87	0.76	
	Lead-214 @ 295.2 KeV	pCi/g	6.1	1.5		6.0	1.2	
	Lead-214@ 352.0 KeV	pCi/g	6.2	2.1		6.1	1.1	
	Radium-226 @ 186.0 KeV	pCi/g	9.0	2.2		9.7	2.8	

Analytical Results

Table 5-8 (Continued)

			ESP Hop	per Ash-Fi	eld 1	ESP Hopper Ash-Field 2			
Analyte Group	Specie	Units	Average	95% CI	DL Ratio	Average	95% CI	DL Ratio	
Radionuclides (Cont'd)									
	Thallium-208 @ 583 KeV	pCi/g	2.07	0.29		2.17	0.38		
	Thallium-208 @ 860 KeV	pCi/g	2.1	1.9		2.2	4.8		
	Thorium-234 @ 63.3 KeV	pCi/g	5.6	2.2		5.5	1.6		
	Thorium-234 @ 92.6 KeV	pCi/g	4.3	1.6		4.8	1.6		
	Uranium-235 @ 143 KeV	pCi/g	0.22	0.17		0.9	2.8		
Organics, Semivolatile	bis(2-Ethylhexyl)phthalate	ng/g	190	7 80	3 %	200	590	2%	

Table 5-9 FGD Process Solids Data

				Underflow Ty Solids	,	Limeston	ie Shurry	Solids	Raw l	Limesto)ne
Analyte Group	Specie		Average	95% CI	DL Ratio	Average	95% CI	DL Ratio	Average	95% CI	DL Ratio
Anions	Chloride	μg/g	9,550	720		4,100	2,900		179	47	
	Fluoride	μg/g	750	140		85.0	46		59.0	19	
	Sulfate	μg/g	496,300	8,700							
	Sulfite	μg/g	<240	-	100%						
Metals	Aluminum	μg/g	1,100	190		760	320		980	160	
	Antimony	μg/g	0.073	0.028		0.019	0.003		0.007	0.01	
	Arsenic	μg/g	< 0.41	_	100%	< 0.33	-	100%	< 0.33	-	100%
	Barium	μg/g	4.02	0.94		5.39	0.66		4.87	0.59	
	Beryllium	μg/g	0.129	0.066		0.143	0.017		0.137	0.028	
	Boron	μg/g	425	43		202	88		3.5	1.3	
	Cadmium	μg/g	0.247	0.035		0.608	0.042		0.332	0.016	
	Calcium	μg/g	255,000	15,000		392,000	27,000		395,000	9,000	
	Chromium	μg/g	11.3	2.5		13.4	2.3		9.80	0.64	
	Cobalt	μg/g	0.99	0.43		1.48	0.51		1.30	0.62	
	Соррег	μg/g	2.73	0.81		3.71	0.48		1.5	1.1	
	Iron	μg/g	2,190	370		2,510	670		1,787	57	
	Lead	μg/g	0.84	0.21		0.98	0.11		1.1	0.2	
	Magnesium	μg/g	810	100		1,390	190		1,233	29	
	Manganese	μg/g	103	11		429	33		207	6.6	
	Mercury	μg/g	0.178	0.055		< 0.012	-	29 %	0.005	0.012	40%
	Molybdenum	μg/g	1.48	0.56		0.230	0.4		< 0.222	_	50%
	Nickel	μg/g	2.8	1.3		4.00	2.5		3.16	0.88	
	Phosphorus	μg/g	88	29		110	10		108	31	
	Potassium	μg/g	310	160		338	86		363	45	
	Selenium	μg/g	25.5	1.2		8.40	2.8		3.9	2	
	Silicon	μg/g	447	73		370	220		440	110	
	Sodium	μg/g	84.1	7.8		55.0	19		20.9	2.5	
	Strontium	μg/g	73.8	7.4		112	5.3		108	2.5	
	Titanium	μg/g	20.9	7.1		< 0.16	-	100%	30	110	0.00- 2%
	Vanadium	μg/g	9.9	2.1		6.7	4.3		8.13	0.41	* / ·
Moisture	Percent Moisture	w1%							8.7	1.4	
Radionuclides	Actinium-228 @ 338 KeV	pCi/g	ND	-					0.30	0.19	
	Actinium-228 @ 911 KeV	pCi/g	0.05	0.23					0.17	0.38	
	Actinium-228 @ 968 KeV	pCi/g	ND	-					ND	-	

Table 5-9 (Continued)

			JBR Und	ierflow S Solids	lurry	Limeston	e Siurr	y Solids	Raw	Limest	one
Analyte	•	-		95%	DL		95%	DL		95%	DL
Group	Specie	Units	Average	CI	Ratio	Average	CI	Ratio	Average	CI	Ratio
	Bismuth-212 @ 727 KeV	pCi/g	ND	-					ND	-	
	Bismuth-214 @ 1120.4 KeV	pCi/g	0.25	0.54					ND		
	Bismuth-214 @ 1764.7 KeV	pCi/g	0.11	0.27					0.32	0.32	
	Bismuth-214 @ 609.4 KeV	pCi/g	0.11	0.23					0.15	0.14	
	K-40 @ 1460 KeV	pCi/g	ND	_					0.39	0.86	
	Lead-210 @ 46 KeV	pCi/g	0.30	1.1					0.2	1.1	
	Lead-212 @ 238 KeV	pCi/g	0.09	0.05					0.113	0.038	
	Lead-214 @ 295.2 KeV	pCi/g	0.05	0.23					0.19	0.11	
	Lead-214@ 352.0 KeV	pCi/g	0.140	0.075					0.193	0.072	
	Radium-226 @ 186.0 KeV	pCi/g	0.33	0.72					0.42	0.91	
	Thallium-208 @ 583 KeV	pCi/g	0.20	0.21					0.07	0.3	
	Thallium-208 @ 860 KeV	pCi/g	ND	-					ND	-	
	Thorium-234 @ 63.3 KeV	pCi/g	0.19	0.8				,	0.12	0.53	
	Thorium-234 @ 92.6 KeV	pCi/g	0.20	0.44					0.08	0.36	
	Uranium-235 @ 143 KeV	pCi/g	ND	-					ND	_	
Aldehydes	Acetaldehyde	μg	< 0.10		100%						
	Formaldehyde	μg	< 0.10	-	100%						
Organics, Semivolatile	bis(2-Ethylhexyl) phthalate	ng/g	100	350	15%						

Table 5-10 Liquid Ash Sluice System Data Summary

			Ash I	Pond Water	r		a Ash Slui Filtrate	ce		Ash Slu Utrate	iice
Analyte Group	Specie	Units	Average	95% CI	DL Ratio	Average	95% CI	DL Ratio	Average	95% CI	DL Ratio
Reduced Species	Cyanide	μg/mL	0.0019	0.0024	_	0.002	0.0011		0.0015	0.0016	
	Ammonia as N	μg/mL	0.20	0.12	-	0.45	0.43		0.38	0.08	_
Anions	Chloride	$\mu g/mL$	8.9	1.9	_	7.9	1.1		10.4	1.6	-
	Fluoride	$\mu g/mL$	0.43	0.11		0.281	0.046	_	0.74	0.57	_
	Phosphate	μg/mL	< 0.014	_	100%	0.025	0.037	13 %	0.023	0.047	14%
	Sulfate	$\mu g/mL$	113	12	-	81	34		340	510	_
Metals, Soluble	Aluminum	$\mu g/mL$	0.014	0.012	-	0.31	0.31		1.0	3.3	-
	Antimony	$\mu g/mL$	< 0.024	_	100%	< 0.024	_	100%	< 0.024	_	67%
	Arsenic	$\mu g/mL$	< 0.00066	_	100%	0.024	0.088	_	0.017	0.049	
	Barium	$\mu g/mL$	0.155	0.028	-	0.102	0.084		0.24	0.16	
	Beryllium	$\mu g/mL$	< 0.00055	_	31%	< 0.00055	-	100%	< 0.00055		100%
	Boron	μg/mL	1.08	0.23	_	0.87	0.64	_	10	15	-
	Cadmium	$\mu \mathrm{g/mL}$	0.0011	0.0010	_	0.0011	0.0021	4%	0.0027	0.004	-
	Calcium	μg/mL	32.8	3.5	••	39	23		140	170	_
	Chromium	$\mu { m g/mL}$	< 0.0025		53%	0.0031	0.0026		0.0480	0.051	
	Cobalt	$\mu g/mL$	< 0.0034		60%	< 0.0034	_	100%	< 0.0034	_	98%
	Copper	$\mu g/mL$	0.0044	0.0049		0.0180	0.047		0.0026	0.0015	
	Iron	$\mu g/mL$	5.40	3.8	-	0.0280	0.034	_	0.0060	0.015	_
	Lead	$\mu g/mL$	0.008	0.011	-	0.0100	0.013		0.0048	0.0036	
	Magnesium	$\mu \mathrm{g/mL}$	3.11	0.17	-	2.3	1.6	-	4.5	2	
	Manganese	$\mu \mathrm{g/mL}$	0.560	0.21	_	0.05	0.12	-	ó.020	0.045	_
	Mercury	$\mu g/mL$	0.00006	0.000043		0.00004	0.00007	_	< 0.00004		38%
	Molybdenum	$\mu g/mL$	0.035	0.021	_	0.072	0.083	-	0.62	0.98	_
	Nickel	$\mu \mathrm{g/ml}$	0.0197	0.0055		0.005	0.014	-	0.024	0.026	-
	Phosphorus	$\mu g/mL$	0.070	0.18	16%	0.11	0.13		0.14	0.26	7%
	Potassium	$\mu g/mL$	5.34	0.78	-	4.4	2.7		12	17	_
	Selenium	$\mu g/mL$	0.0019	0.0037	-	0.0039	0.0009	-	0.035	0.04	
	Silicon	$\mu \mathrm{g/mL}$	3.45	0.7	_	4.7	0.5		4.1	2.7	-
	Sodium	$\mu g/mL$	12.4	0.75		9.4	2.2	-	22	25	
	Strontium	$\mu \mathrm{g/mL}$	0.342	0.020	-	0.28	0.31	_	0.62	0.66	-
	Tin	$\mu \mathrm{g/mL}$	< 0.014	-	84%	< 0.014	-	43 %	0.0040	0.015	-
	Titanium	μg/mL	< 0.0024	_	62%	0.0013	0.0022	13%	0.016	0.067	
	Vanadium	$\mu g/mL$	0.0050	0.016	-	0.029	0.049	_	0.07	0.12	-
Metals, Total	Aluminum	μ g/mL	0.18	0.39	-						
	Antimony	μg/mL	0.018	0.012	_						
	Arsenic	μg/mL	0.0007	0.0014	_						
	Barium	$\mu \mathrm{g/mL}$	0.153	0.032	-						
	Beryllium	$\mu g/mL$	0.00026	0.00064	-						
	Boron	μg/mL	1.03	0.16							

Table 5-10 (Continued)

			Ash 1	Pond Wate	•		n Ash Slu Filtrate	ice	•	/ Ash Sh Utrate	nice
Analyte		•		95%	DL		95%	DL		95%	DL
Group	Specie	Units	Average	CI	Ratio	Average	CI	Ratio	Average	CI	Ratio
Metals, Total (Cont'd)	Cadmium	μg/mL	0.0018	0.0039	-						
	Calcium	$\mu \mathrm{g/mL}$	33.7	2.7	-						
	Chromium	$\mu g/mL$	0.0016	0.0011							
	Cobalt	$\mu g/mL$	0.00638	0.00077							
	Copper	$\mu g/mL$	0.0073	0.0051	-						
	Iron	$\mu g/mL$	10.2	5.4							
	Lead	μg/mL	0.017	0.057	1 %						
	Magnesium	μg/mL	3.17	0.20	-						
	Manganese	$\mu g/mL$	0.56	0.21	~						
	Mercury	μg/mL	0.00005	0.00007	-						
	Molybdenum	$\mu g/mL$	0.084	0.034	-						
	Nickel	$\mu g/mL$	0.024	0.013	-						
	Phosphorus	$\mu g/mL$	0.027	0.052	-						
	Potassium	$\mu g/mL$	5.74	0.83	-						
	Selenium	$\mu g/mL$	0.0048	0.0026	-						
	Silicon	$\mu g/mL$	3.70	0.73	-						
	Sodium	$\mu g/mL$	12.8	1.9	-						
	Strontium	μg/mL	0.34	0.026	-						
	Tin	$\mu g/mL$	< 0.014	-	50%						
	Titanium	μg/mL	0.00068	0.00098	-						
	Vanadium	μg/mL	0.024	0.011							
Aldehydes	Acetaldehyde	μg/mL	0.08	0.17	-	0.080	0.16		0.04	0.11	-
	Formaldehyde	$\mu g/mL$	0.015	0.021	-	0.023	0.036	-	0.03	0.048	-
Organics, Semivolatile	Diethylphthalate	μg/L	< 0.39	-	100%	0.5	1.3	24%	<0.38	-	100%
Organics, Volatile	Methylene Chloride	μg/L	<5.0		19%	<5.0	-	46 %	4.9	2.9	-

Table 5-11 Liquid FGD Process Stream Data Summary

			Gypsu	n Pond W	ater	JBR Und	ierflow (Filtrate	Jurry		tone Slau Altrate	ту
Analyte Group	Specie	Units	Average	95% CI	DL Ratio	Average	95% CI	DL Ratio	Average	95% CI	DL Ratio
Reduced Species	Cyanide	μg/mL	0.0486	0.0046	_	0.082	0.1	_	0.050	0.1	
	Ammonia as N	$\mu g/mL$	15	3	_	< 40	-	19%	14.1	2.4	_
Anions	Chloride	μg/mL	16,400	4,100	_	26,100	4,200		13,100	2,100	_
	Fluoride	$\mu g/mL$	14.9	3.1	-	31.0	16	-	1.84	0.95	_
	Phosphate	$\mu \mathrm{g/mL}$	0.033	0.021	_	0.050	0.15	7%	< 0.020	-	100%
	Sulfate	$\mu \mathrm{g/mL}$	980	140	-	712	65		780	160	_
	Sulfite	$\mu { m g/mL}$	`		_	0.033	0.038	_	-	_	
Metals, Solubie	Aluminum	$\mu g/mL$	0.76	0.68	-	12.3	4.7		0.260	0.85	-
	Antimony	$\mu g/mL$	< 0.24	_	100%	< 0.19	_	100%	< 0.24	-	100%
	Arsenic	μg/mL	0.127	0.027	_	0.200	0.26		0.070	0.13	-
	Barium	$\mu g/mL$	1.19	0.057	_	3.39	0.29		4.00	11	_
	Beryllium	$\mu g/mL$	< 0.0055		68%	0.0069	0.0047		< 0.0055	_	56 %
	Boron	μg/mL	533	89	_	1,400	190		1,400	4,100	
	Cadmium	$\mu g/mL$	0.149	0.035	_	0.456	0.065	_	0.0067	0.0026	
	Calcium	μg/mL	8,100	2,100		17,000	10,000		7.070	190	
	Chromium	μg/mL	0.101	0.03	-	0.070	0.091		0.063	0.047	_
	Cobalt	μg/mL	0.11	0.13	-	0.304	0.0029		0.090	0.3	_
	Copper	μg/mL	0.057	0.048	_	0.239	0.086		0.040	11.0	•
	Iron	$\mu g/mL$	< 0.060		100%	< 0.048	-	100%	< 0.060	_	100%
	Lead	μg/mL	0.0022	0.0072	16%	0.013	0.0089	_	0.0017	0.0013	
	Magnesium	μg/mL	690	120	-	1,800	100		1,900	5,600	
	Manganese	$\mu g/mL$	120	20	-	307	41		40	110	_
	Mercury	μg/mL	0.00024	0.00022	_	0.0010	0.0011		0.000057	1e-05	
	Molybdenum	$\mu g/mL$	0.087	0.068	-	0.064	0.016		0.210	0.63	-
	Nickel	$\mu g/mL$	0.62	0.14		1.52	0.32		0.800	2.3	-
	Phosphorus	μg/mL	0.34	0.13	_	0.72	0.13		0.160	0.19	
	Potassium	$\mu g/mL$	52	12	_	123	8.6		140	420	_
	Selenium	μg/mL	0.36	0.23	_	0.5	1	0%	0.128	0.049	-
	Silicon	$\mu g/mL$	15.8	2.7		42	6		7	21	-
	Sodium	μg/ml.	97	16	_	244	5		290	860	_
	Strontium	μg/mL	13:2	2.1	_	32.9	4.3		40	110	_
	Tin	μg/mL	0.18	0.6	13%	< 0.14		100%	< 0.14		95%
	Titanium	μg/mL	2.19	0.45	_	0.82	0.13		0.5	1	0.3%
	Vanadium	μg/mL	0.322	0.065		0.24	0.22		0.19	0.23	_
Metals, Total	Aluminum	μg/mL	2.04	0.69	_						
	Antimony	μg/mL	< 0.14	_	100%						
	Arsenic	μg/mL	0.127	0.031	_						
	Barium	μg/mL	1.19	0.25	_						
	Beryllium	μg/mL	< 0.0055	_	35%						
	Boron	μg/mL	540	150	_						

Table 5-11 (Continued)

			Gypsur	n Pond W	ater	JBR Und	erflow Utrate	Slurry		tone Slu Utrate	ггу
Analyte				95%	DL		95%	DL		95%	DL
Group	Specie	Units	Average	CI	Ratio	Average	CI	Ratio	Average	CI	Ratio
Metals, Total (Cont'd)	Calcium	μg/mL	9,500	6,000	-					·	
	Cadmium	$\mu g/mL$	0.177	0.018	-						
	Chromium	$\mu g/mL$	0.075	0.094							
	Cobalt	μg/mL	0.143	0.065	_						
	Copper	$\mu g/mL$	0.053	0.029	_						
	Iron	$\mu g/mL$	0.68	0.73							
	Lead	$\mu g/mL$	0.0036	0.0048							
	Magnesium	μg/mL	720	210							
	Manganese	$\mu g/mL$	123	39	_						
	Mercury	$\mu g/mL$	0.00030	0.00004	-						
	Molybdenum	μg/mL	0.076	0.012	_						
	Nickel	μg/mL	0.63	0.18	_						
	Phosphorus	$\mu g/mL$	0.236	0.024	-						
	Potassium	$\mu g/mL$	52	13	_						
	Selenium	$\mu \mathrm{g/mL}$	0.27	0.17	_						
	Silicon	μg/mL	18.4	3.2	_						
	Sodium	$\mu g/mL$	102	25							
	Strontium	$\mu g/mL$	13.7	4.6	_						
	Tin	μg/mL	< 0.086		100%						
	Titanium	μg/mL	1.10	2.8	_						
	Vanadium	$\mu g/mL$	0.22	0.28	_						
Aldehydes	Acetaldehyde	μg/mL	0.05	0.11	_	0.06	0.12	••	0.050	0.1	-
	Formaldehyde	μg/mL	0.023	0.027		80.0	0.26	-	0.021	0.025	_
Organics, Semivolatile	Dimethylphthalate	μg/L	1.3	2.2	-	2.1	4.2	2%	< 0.36	-	100%
	bis(2-Ethylhexyl)phthalate	μg/L	8.0	81	_	4.4	1.5		140	560	-
Organics, Volatile	Acetone	μg/L	<10	-	26%	<10		60%	22.3	7.2	-

Table 5-12 Liquid Ancillary Stream Data Summary

			Cooling Water			Coal Pile Run-off		
Analyte Group	Specie	Units	Average	95% CI	DL Ratio	Average	95% CI	DL Ratio
Reduced Species	Cyanide	μg/mL	0.00148	0.00091				
•	Ammonia as N	μg/mL	0.047	0.014	_			
Anions	Chloride	μg/mL	5.7	1.8	_			
	Fluoride	μg/mL	0.134	0.018	_			
	Phosphate	μg/mL	0.094	0.07	_			
	Sulfate	μg/mL	6.3	1.4	_			
Metals, Soluble	Aluminum	μg/mL	0.031	0.047	_			
	Antimony	μg/mL	< 0.024	_	65%			
	Arsenic	μg/mL	< 0.0007		100%			
	Barium	μg/mL	0.0131	1800.0	_			
	Beryllium	μg/mL	< 0.0006	-	100%			
	Boron	μg/mL	0.9	3.4	_			
	Cadmium	μg/mL	0.0020	0.007				
	Calcium	μg/mL	19	53	_			
	Chromium	μg/mL	0.0020	0.0027	_			
	Cobalt	μg/mL	< 0.0034	_	85%			
	Copper	μg/mL	0.03	0.13				
	Iron	μg/mL	0.11	0.13				
	Lead	μg/mL	0.027	0.097				
	Magnesium	μg/mL	3.1	4				
	Manganese	μg/mL	0.07	0.25	-			
	Mercury	μg/mL	0.00005	0.00003	-			
	Molybdenum	μg/mL	0.00152	0.00069	-			
	Nickel	μg/mL	0.0021	0.0048	_			
	Phosphorus	μg/mL	< 0.061		21%			
	Potassium	μg/mL	2.42	0.49	_			
	Selenium	μg/mL	< 0.0014	_	100%			
	Silicon	μg/mL	4.6	4.3	_			
	Sodium	μg/mL	8	12				
	Strontium	μg/mL	0.049	0.08	_			
	Tin	μg/mL	< 0.014	_	68%			
	Titanium	μg/mL	0.0011	0.0012				
	Vanadium	μg/mL	0.0027	0.0006	-			
Metals, Total	Aluminum	μg/mL	2.9	4.4	_			
	Antimony	μg/mL	0.022	0.034				
	Arsenic	μg/mL	0.007	0.031	3 %			
	Barium	μg/mL	0.031	0.028				
	Beryllium	μg/mL	< 0.0006	••	55%			
	Boron	μg/mL	0.32	0.35				

Table 5-12 (Continued)

Analyte Group Specie Metals, Total (Cont'd) Calcium Chromium Cobalt Copper	Units µg/ml µg/ml µg/ml µg/ml µg/ml µg/ml µg/ml	Average 0.001 5.9 0.0049 0.005 0.010 4.1 0.030	95% CI 0.0024 1.6 0.0046 0.004 0.0081 5.4	DL Ratio	Average	95% CI	DL Ratio
(Cont'd) Calcium Chromium Cobalt Copper	μg/ml. μg/ml. μg/ml. μg/ml. μg/ml.	5.9 0.0049 0.005 0.010 4.1	1.6 0.0046 0.004 0.0081				
Chromium Cobalt Copper	μg/mL μg/ml. μg/ml. μg/ml. μg/ml.	0.0049 0.005 0.010 4.1	0.0046 0.004 0.0081	- - -			
Cobalt Copper	μg/ml. μg/ml. μg/ml. μg/ml.	0.005 0.010 4.1	0.004 0.0081				
Copper	μg/mL μg/mL μg/mL	0.010 4.1	0.0081				
••	μg/mL μg/mL	4.1					
Îron	μg/mL		5.4	**			
****	· -	0.030					
Lead		0.000	0.058	-			
Magnesium	μg/mL	1.69	0.71	-			
Manganese	μg/mL	0.18	0.17	-			
Mercury	μg/mL	0.00004	0.00003	-			
Molybdenum	μg/mL	0.0024	0.0015	-			
Nickel	μg/mL	< 0.0099	_	34%			
Phosphorus	μg/mL	0.12	0.2	9%			
Potassium	μg/mL	2.76	0.97	-			
Selenium	μg/mL	0.008	0.03	6%			
Silicon	μg/mL	6.6	4.8	-			
Sodium	μg/mL	5.4	1.9	, -			
Strontium	$\mu { m g/mL}$	0.0276	0.0076	-			
Tin	$\mu \mathrm{g/mL}$	< 0.014	_	100%			
Titanium	μg/mL	0.16	0.21				
Vanadium	μ g /mL	0.0083	0.0095	-			
Aldehydes Acetaldehyde	μ g/mL	0.06	0.12	سد	0.09	0.27	-
Formaldehyde	μg/mL	0.026	0.049	-	0.06	0.39	-
Organics, Butylbenzylphthalat Semivolatile	te μg/L	<0.45	-	100%	0.54	-	-
bis(2-Ethylhexyl)ph	nthalate μg/L	3.5	7.2	3%	3.3	_	_
Organics, Volatile Acetone	μg/L	< 10	_	45 %	40	250	_

6

DATA EVALUATION AND ANALYSIS

This section presents an evaluation of data presented in Section 5. In evaluating these data, the following question is fundamental:

• Are the measured concentration data representative?

Since there is insufficient information to address this question directly, statistics, along with engineering and scientific judgment, must be used to answer this question. This is done by addressing related topics which can be evaluated quantitatively:

- Were analytical techniques accurate and precise?
- Were sampling techniques accurate and precise?
- Was process operation steady and representative?

If the answer to each of the above questions is "yes," then the measurements are considered representative and no qualifications made to their use. If analysis turns up potential problems with one or more of the above areas for certain data, caution must be exercised in using these data, since there is a good chance that they are not representative.

Assessment of sampling and analytical techniques is the purview of the QA/QC program. Detailed QA/QC results are presented in Appendix D, and these results are summarized below. An evaluation of process operation and a discussion of mass balance closures, which are used as an additional check on data representativeness, are also presented in this section. Finally, a discussion of the organic results concludes this section.

Evaluation of Sampling Techniques

Several factors are evaluated to determine acceptable sample collection. Key components of the sampling equipment including the Pitot tubes, thermocouples, orifice meters, dry gas meters, and sampling nozzles were calibrated in the Radian Source Sampling Laboratory before use in the field. These calibrations were also checked after the equipment was returned to the laboratory after completion of the field activities. Standard EPA methods or other acceptable sampling methods were used to collect the organic, metal, and anion samples. The sampling runs were well documented, and all gas samples were collected at rates of between 90 and 110% of the isokinetic rates. Sufficient data were collected to ensure acceptable data completeness and comparability of the measurements.

Gas samples were collected from the ESP inlet, ESP outlet, and stack as integrated samples for most analyses over a specified time period. Solid samples of coal, limestone, bottom ash, ESP fly ash, and FGD slurry were collected at hourly intervals over each of the test runs. These individual grabs were combined to provide a single composite sample of each stream for each of the three test runs. Liquid streams were also collected as hourly grabs which were combined to provide a single composite for analysis for each test run. All sampling was conducted while the plant was operating at 85 to 100% of full load and should be representative of typical operation for Plant Yates.

Thus, the applicable QA/QC evaluation indicates that sampling techniques were acceptable and effective in providing measurement data reliability within the expected limits of sampling error.

Evaluation of Analytical Techniques

Generally, the type of quality control information obtained pertains to measurement precision, accuracy (which includes precision and bias), and blank effects that are determined using various types of replicate, spiked and blank samples. The specific characteristics evaluated depend on the type of quality control checks performed. For example, blanks may be prepared at different stages in the sampling and analysis process to isolate the source of the blank effect. Similarly, replicate samples may be generated at different stages to isolate and measure sources of variability. The QA/QC measures used as part of this program data evaluation protocol and the characteristic information obtained are provided in Appendix D.

Different QC checks provide different types of information, particularly pertaining to the sources of inaccuracy, imprecision, and blank effects. As part of this program, measurement precision and accuracy are typically being estimated from QC indicators that cover as much of the total sampling and analytical process as feasible. Precision and accuracy measurements are based primarily on the actual sample matrix. The precision and accuracy estimates obtained experimentally during the test program are compared to the data quality objectives (DQOs) established for the program as listed in the project QAPP.

Appendix D includes a presentation of the types of quality control data reported for the program and a summary of precision and accuracy estimates. Almost all of the quality control results met the project objectives.

The following potential problems were identified by the quality control data.

- Chloromethane, methylene chloride, and tetrachloroethene were found in one or more of the field blanks analyzed for volatile organics. In many cases, the same concentrations were also found in the field samples.
- A standard limestone sample (NIST 1C) was submitted blind as a performance audit sample. Aluminum, silicon, and sodium recoveries in this sample were below 50%, and the recovery of potassium was greater than 200 percent. This may indicate a similar bias for these elements in the limestone process streams.

• Selenium showed no spike recovery in the impinger solutions analyzed by GFAAS.

These and other QA/QC findings are summarized, according to major species categories, in the discussions below.

Semivolatile Organics

Precision. The precision of the semivolatile organic analyses was estimated using matrix spiked duplicate pairs. The precision objective was met for all of the gas-phase solid samples, the gas vapor-phase samples, the solid stream samples, and aqueous-phase sample streams.

Accuracy. The accuracy of the semivolatile analyses was estimated using matrix spiked duplicate samples. All of the spiked compounds analyzed in the gas solid-phase samples and the aqueous process streams were within the accuracy objectives. Matrix spikes into the solid process streams were all within the recovery objects for all analytes in the FGD solid stream and all except pyrene in the ESP ash solids. Recovery for pyrene was 51% and 56% (project objective--52-115%) for the ESP ash sample and 48% and 37% for the ESP ash field duplicate.

Blank Effects. Acetophenone and benzoic acid were found in one or more of the field blanks associated with the gas-phase solids analyses. The concentrations of these compounds in the blanks, however, were not significant in comparison to the concentrations found in the samples. Several phthalates were also found in the field blanks. The concentrations found in the samples were about the same level as found in the blanks and are therefore considered an artifact of the sampling and handling process.

Volatile Organics

Precision. Precision for volatile organic analysis of the aqueous process streams was estimated using matrix spiked duplicate samples. The 50% precision objectives were met for each of the volatile analytes used for the matrix spikes.

Accuracy. Accuracy for the volatile organic analyses in the aqueous process streams was estimated using matrix spiked samples, and accuracy for the gas vapor-phase streams was estimated using surrogates spiked into each sample prior to analysis. The method specified accuracy objectives for matrix spike recoveries (0.1-234% were met for all analytes of interest (actual recoveries ranged from 70-136%) for the aqueous streams. Accuracy objectives for surrogate recoveries of 70 to 130% for the gas-phase streams were met for all samples except for toluene-d8 in one stack sample. Accuracy based on the analysis of two laboratory method spikes met the recovery objectives for all analytes of interest except for one acetone, chloromethane, chloroethane, and methylene chloride spike.

Blank Effects. Chloromethane, methylene chloride, and tetrachloroethene were found in one or more of the field gas vapor-phase blank samples. In most cases these compounds were found in the investigative field samples at about the same level as in the field blank or

at lower concentrations. Chloromethane and methylene chloride were also found in one laboratory blank. The presence of these compounds in both blanks and samples merely raises the uncertainty about their presence in the flue gas.

Aldehydes

Precision. Precision for the aldehyde analyses was estimated using duplicate sample analyses. The precision objectives of 50% were met for both formaldehyde and acetaldehyde in the gas vapor-phase samples and the aqueous process stream sample analyses.

Accuracy. Accuracy for the aldehydes was estimated using matrix spiked samples. The project accuracy objectives of recoveries of 50-150% were met for the gas vapor-phase and aqueous stream sample spikes for both formaldehyde and acetaldehyde.

Metals

Precision. The precision of metals analyses by ICP-AES, GFAAS, and CVAAS was estimated for samples using matrix-spiked duplicate samples. The precision objectives (RPD <20%) were met for all target analytes analyzed by ICP-AES except aluminum and barium in the gas solid-phase spiked samples and boron in the process solid-spiked samples. The precision objectives for the GFAAS analyses were met except for lead in the gas vapor-phase matrix-spiked samples, selenium in the process solid matrix-spiked samples, and mercury and selenium in the aqueous process stream matrix spikes.

Accuracy. The accuracy of metals analyses was estimated for the gas solid-phase samples using standard reference material (NIST 1633a fly ash) submitted blind to the laboratory as a performance audit sample. All of the metals analyzed by ICP-AES were within the 75-125% accuracy objectives except for beryllium (147%) which was recovered above the objectives.

The accuracy of the metals analyses was estimated for coal samples using a standard reference coal sample (NIST 1632b) submitted blind to the laboratory. All of the metals analyzed by INAA in the reference sample were within the 75-125% accuracy objective.

The accuracy of the metals analyses was estimated for the limestone samples using a standard reference limestone (NIST Limestone 1C) submitted blind to the laboratory. The results show that the recoveries for most of the metals were outside the 75-125% accuracy objectives. Aluminum, silicon, and sodium recoveries were 50%, and the recovery for potassium was greater than 200 percent. The recoveries of these analytes may show a similar bias in the limestone process streams.

The accuracy of the metals analyses for the gas vapor-phase samples and the aqueous process streams were estimated using performance audit samples prepared from EPA reference standards. The results show that the recoveries of all the metals analyzed by ICP-AES and GFAAS were within the 75-125% accuracy objectives except Ca (368%) and Sb (127%), Ca (169%, 520%), Fe (139%), and Mg (131%, 246%) by ICP-AES and Se (50%) by GFAAS. The concentrations of these elements in the samples were at or near the detection limit.

Matrix-spiked samples were also used to determine the accuracy of the metals analyses in the gas, process solids, and aqueous process matrices. Recoveries for the target analytes were within the 75-125% accuracy objectives except for selenium (0% recovery) in the gas vaporphase matrix and mercury (35% recovery) in the aqueous process stream matrix.

Blank Effects. Aluminum, iron, manganese, and nickel were found at concentrations above the reporting limits in the field blanks to the gas vapor-phase sampling train. These elements were also found to a lesser extent in the impinger reagent blank solutions.

Anions

Precision. Precision for the anions analyses was estimated for the gas vapor-phase samples, process solid streams, and aqueous process streams by the analysis of matrix spiked samples. The precision objectives of 20% were met for chloride, fluoride, and sulfate except for chloride and sulfate in one matrix spike pair from the stack with RPDs of 22% and 24%, respectively.

Accuracy. Accuracy for the anions analyses was estimated using matrix spiked duplicate samples. The accuracy objectives of 80-120% recovery was met for all analytes and all sample matrices except for the fluoride spikes into the ESP ash solid samples with recoveries of 56% and 60 percent.

Cyanide, Ammonia, and Phosphate

Precision. Precision for the cyanide, ammonia, and phosphate analyses was estimated using matrix spiked duplicate sample analyses. The precision objectives of 20% were met for each of the analytes for both the gas vapor phase and aqueous process streams except for ammonia spikes into the JBR process liquids. The spike concentration was too low in comparison to the level found in the native process sample.

Accuracy. Accuracy for ammonia, cyanide and phosphate was estimated using both matrix spiked duplicate samples and "double blind" performance audit samples. The accuracy objectives (cyanide, 75-125%; ammonia, 80-120%; phosphate, 75-125%) were met for all matrix spiked samples except for the ammonia spikes into the JBR process liquids with recoveries at 60 and 273 percent. Recoveries for the performance audit samples met the accuracy objectives for all analytes with recoveries of 88% for ammonia, 80% for cyanide, and 97% for phosphate. Recoveries for performance audit samples spiked into the gas vapor-phase impinger solutions were not as good as the aqueous spiked audit samples. The recovery for ammonia in the impinger solutions was 63% and the recovery for cyanide was 50 percent. The aqueous spikes and impinger spikes were performed using the same spiking solutions and were spiked at the same concentration levels.

Evaluation of Process Operation

Plant operating data were examined to ensure that process operation was stable and representative of normal operation during the sampling periods. Excessive scatter or significant

trends can indicate periods where operational problems were encountered. The availability of data from the CT-121 data acquisition system allowed for a comprehensive review of process operation. Data points were logged as 15-minute averages. Plots of unit load, furnace gas O₂, JBR Δ P, JBR pH, stack SO₂, CO, and NO_x concentrations are located in Section 2. The range of normal operation is indicated on most of these figures. A statistical summary of process data is presented in Table 6-1. Daily average values for process parameters are presented along with the minimum and maximum values. Variability is expressed by the standard deviation. Note that high standard deviations are to be expected for some variables, such as return water flow rates, which are controlled by on/off controllers. Table 6-1 was used to identify areas of concern with process operation. A parameter with values steadily increasing or decreasing over the course of the test period may indicate a period of non-steady operation. The following paragraph summarizes the process analysis and points out areas of concern.

Analysis of the process data revealed that process operation was steady and representative during sampling periods. Problems with data quality are not likely to be the result of process variability. Some comments on process operation are as follows:

- Due to problems with the JBR inlet O₂ monitor, the JBR inlet SO₂ concentration, which is corrected with the O₂ meter reading, is biased low on 6/26 and 6/27. Additionally, the stack O₂ monitor calibration check showed it to be biased on 6/26. However, the average stack CEM O₂ data are not significantly different from the O₂ concentration measured using the Orsat method.
- The average FGD makeup water was approximately twice as high on 6/25 than on other days. This was revealed to be an instrument problem.
- SO₂ removal was slightly lower than expected, even accounting for the bias in the inlet O₂ monitor. The slightly lower SO₂ removal should not raise concerns about the representativeness of the data, however, as SO₂ removal was still within the range of normal operation for this type of scrubber. A possible explanation for the lower removal involves modifications made to the JBR limestone inlet piping. Modifications to the piping are suspected to have created a region of higher limestone concentration in the JBR where the pH indicators are located. As a result, the pH in this region was slightly higher than in the remainder of the reactor. Therefore, the average reactor pH may have been slightly lower than was indicated, resulting in lower SO₂ removal.
- A brief dip in load occurred on 6/24 between 1700 and 1730. The lowest point reached is unknown since the process data are reported on 15 minute average basis, the lowest of which was 86 MW. Since testing was completed by this time on 6/24, there is no effect on data representativeness.

Data Analysis: Mass Balances, Removal Efficiencies, and Emission Factors

Calculations based on measured data have two general purposes: they can be used to assess the representativeness of the measured data or to evaluate process performance. Mass

Table 6-1 Daily Summary

	_			Date			
· · · · · · · · · · · · · · · · · · ·	6/21	6/22	6/23	6/24	6/25	6/26	6/27
Gross Load, MW							
Average, daily	100	100	100	100	100	100	100
Sample Std. Dev.	0.5	0.24	0.32	1.5	0.44	0.34	0.22
Maximum Value	100	100	100	100	100	100	100
Minimum Value	98	100	100	86	98	100	100
Raw Coal Flow, lb/hr							٠
Average, daily	89,000	88,000	89,000	88,000	90,000	91,000	92,000
Sample Std. Dev.	3,000	3,400	3,300	3,000	2,400	2,900	4,000
Maximum Value	94,000	94,000	99,000	95,000	96,000	98,000	100,000
Minimum Value	85,000	82,000	84,000	81,000	84,000	85,000	84,000
Furnace Gas O ₂ , %							
Average, daily	3.5	3.6	3.5	3.5	3.3	3.3	3.4
Sample Std. Dev.	0.062	0.17	0.19	0.28	0.078	0.23	0.3
Maximum Value	3.6	4.0	3.7	3.9	3.4	3.8	3.8
Minimum Value	3.4	3.2	3.1	3.0	3.0	2.8	2.6
Opacity, %							
Average, daily	15	14	16	17	17	18	19
Sample Std. Dev.	3.6	0.96	1.7	2.5	1.3	1.3	1.5
Maximum Value	31	18	27	33	23	22	23
Minimum Value	12	13	14	14	14	15	16
Stack O2, % on Dry Basis*							
Average, daily	8.2	8	7.9	8	7.7	7.7	7.6
Sample Std. Dev.	0.12	0.23	0.18	0.22	0.072	0.18	0.1
Maximum Value	8.5	8.6	8.1	9	7.9	9	7.7
Minimum Value	7.8	6.6	6.3	6.7	7.6	7.5	7
Stack SO ₂ , ppm at 3% O ₂ *							
Average, daily	160	180	200	200	240	180	190
Sample Std. Dev.	38	47	37	65	31	25	38
Maximum Value	230	250	260	340	300	230	270
Minimum Value	88	41	120	74	180	130	140

Table 6-1 (Continued)

	Date								
	6/21	6/22	6/23	6/24	6/25	6/26	6/27		
JBR pH									
Average, daily	4.6	4.5	4.5	4.5	4.5	4.5	4.5		
Sample Std. Dev.	0.22	0.066	0.037	0.049	0.038	0.045	0.027		
Maximum Value	4.9	4.7	4.6	4.6	4.7	4.6	4.6		
Minimum Value	4.3	4.3	4.4	4.4	4.4	4.3	4.4		
JBR ΔP, inches water									
Average, daily	14	14	14	14	14	14	14		
Sample Std. Dev.	0.086	0.086	0.08	0.17	0.071	0.076	0.073		
Maximum Value	14	14	14	15	14	14	14		
Minimum Value	14	14	14	14	14	14	14		
SO ₂ Removal									
Average, daily	93	92	91	90	89	b	ь		
Sample Std. Dev.	1.7	1.8	1.7	3.5	1.4				
Maximum Value	96	97	94	96	92				
Minimum Value	90	89	88	83	86				
Transition Duct PW Flow (Gypsum l	Pond Return,	FT 128), g _i	om						
Average, material balance period					78.6	78.7	7 9.3		
Average, daily	80	79	79	79	79	79	79		
Sample Std. Dev.	0.28	0.49	0.4	0.94	0.58	0.5	0.45		
Maximum Value	80	81	82	81	83	83	83		
Minimum Value	78	78	79	71	77	78	0.12		
Transition Duct MU Water Flow, gp	m								
Average, daily	0.092	0.09	0.12	0.096	0.14	0.11	0.094		
Sample Std. Dev.	0.0055	0.0069	0.23	0.006	0.44	0.15	0.0071		
Maximum Value	0.1	0.11	2.4	0.11	4.3	1.6	0.11		
Minimum Value	0.08	0.073	0.075	71	80.0	0.084	0.066		
Reagent Flow, gpm									
Average, material balance period					35.9	37.3	36.3		
Average, daily	48	35	36	35	36	37	38		
Sample Std. Dev.	36	7.3	2.8	3.0	1.9	2.9	1.7		
Maximum Value	88	61	43	45	39	46	42		
Minimum Value	0.1	0.2	26	28	27	30	34		

Table 6-1 (Continued)

	Date								
<u> </u>	6/21	6/22	6/23	6/24	6/25	6/26	6/27		
JBR Level, ft									
Instantaneous Values (used in accumulation calculations)									
Beginning (t-Δt)					14.1	14.1	14.1		
Ending (t)					14.1	14.1	14.1		
Average, daily	14	14	14	14	14	14	14		
Sample Std. Dev.	0.011	0.017	0.022	0.042	0.026	0.013	0.014		
Maximum Value	14	14	14	14	14	14	14		
Minimum Value	14	14	14	14	14	14	14		
JBR Density, wt% solids									
Average, material balance period					22.8	23.0	23.0		
Instantaneous Values (used in accumulation calculations)									
Beginning (t-at)					22.2	23.7	22.7		
Ending (t)					22.3	23.3	23.5		
Average, daily	23	23	23	23	23	23	23		
Sample Std. Dev.	0.51	0.55	0.55	0.52	0.51	0.56	0.51		
Maximum Value	24	24	24	24	24	24	24		
Minimum Value	22	22	22	22	22	22	22		
Mist Eliminator/Deck Wash PW Flow	(Ash Pond I	Return FT 1	150A), gpu	ıʻ					
Average, material balance period					26.1	25.5	28.8		
Average, daily	25	25	28	28	25	26	26		
Sample Std. Dev.	29	28	32	35	30	32	32		
Maximum Value	110	110	120	130	100	120	120		
Minimum Value	-0.33	-0.33	-0.34	-0.37	-0.37	-0.37	-0.29		
Mist Eliminator Makeup Water Flow	(FT 150B), g	;pm°							
Average, material balance period					6.7	6.6	6.0		
Average, daily	-2	-4	-4 .1	-4.1	-4	-4	-4.2		
Sample Std. Dev.	27	25	25	22	24	28	18		
Maximum Value	180	240	240	210	230	260	140		
Minimum Value	-6.9	-7.2	-7.5	-7.5	-7.3	-7.6	-7.6		
JBR Level Control Line PW Flow (As	h Pond Retu	rn, FT 142), gpm						
Average, material balance period					36.4	29.4	53.4		
Average, daily	44	50	56	54	39	37	48		
Sample Std. Dev.	56	84	86	79	68	66	72		
Maximum Value	200	270	270	250	220	200	210		
Minimum Value	0.27	0.27	0.24	0.24	0.25	0.26	0.3		

Table 6-1 (Continued)

	Date								
	6/21	6/22	6/23	6/24	6/25	6/26	6/27		
Mist Eliminator Differential Pressure,	inches water	•							
Average, daily	0.67	0.65	0.64	0.64	0.63	0.65	0.66		
Sample Std. Dev.	0.014	0.016	0.017	0.022	0.013	0.02	0.013		
Maximum Value	0.7	0.68	0.68	0.7	0.66	0.7	0.68		
Minimum Value	0.62	0.62	0.61	0.52	0.6	0.62	0.64		
Reagent Slurry Density, wt% solids									
Average, material balance period					37.2	37.2	33.9		
Average, daily	33	30	33	37	37	37	34		
Sample Std. Dev.	0.18	2.9	2.1	0.15	0.025	0.045	2.1		
Maximum Value	33	34	38	38	37	37	39		
Minimum Value	32	25	30	37	37	37	32		
Furnace Pressure, inches water									
Average, daily	-0.21	-0.22	-0.22	-0.22	-0.22	-0.22	-0.22		
Sample Std. Dev.	0.017	0.013	0.012	0.016	0.012	0.0095	0.016		
Maximum Value	-0.12	-0.19	-0.19	-0.16	-0.19	-0.19	-0.18		
Minimum Value	-0.24	-0.27	-0.25	-0.28	-0.26	-0.25	-0.26		
JBR Agitator Running									
Average, daily	1	1	1	1	1	1	1		
Sample Std. Dev.	0	0	0	0	0	0	0		
Maximum Value	1	1	1	1	1	1	1		
Minimum Value	1	1	1	1	1	1	1		
Oxidation Air "A", scfm									
Average, daily	2,100	2,100	2,100	2,100	2,100	2,100	2,100		
Sample Std. Dev.	20	40	50	40	30	50	60		
Maximum Value	2,200	2,200	2,200	2,200	2,200	2,200	2,200		
Minimum Value	2,100	2,100	2,000	2,000	2,100	2,000	2,000		
Oxidation Air "B", scfm									
Average, daily	2,100	2,000	2,000	2,100	2,100	2,000	2,000		
Sample Std. Dev.	20	30	50	40	30	40	50		
Maximum Value	2,100	2,100	2,100	2,100	2,100	2,100	2,100		
Minimum Value	2,000	2,000	2,000	2,000	2,000	2,000	2,000		

Table 6-1 (Continued)

	Date								
	6/21	6/22	6/23	6/24	6/25	6/26	6/27		
JBR Blowdown (FT 162A), gpm ^c									
Average, material balance period					73 .7	68.9	92.0		
Average, daily	80	74	83	84	74	78	84		
Sample Std. Dev.	73	75	78	80	73	72	79		
Maximum Value	200	210	210	210	210	210	210		
Minimum Value	-0.36	-0.38	-0.35	-0.49	-0.37	-0.37	-0.41		
FGD MU Water Flow, gpm									
Average, daily	94	90	87	90	200°	120°	77		
Sample Std. Dev.	16	14	13	44	120	140	49		
Maximum Value	180	210	200	450	430	320	190		
Minimum Value	83	83	78	77	78	14	12		
SO ₂ at JBR Inlet Duct, ppm @ 3% O ₂									
Average, daily	2,300	2,100	2,200	2,000	2,100	1,900	1,400		
Sample Std. Dev.	11	220	45	86	38	280	200		
Maximum Value	2,300	2,300	2,300	2,200	2,200	2,300	1,900		
Minimum Value	2,300	1,300	2,100	1700	2,000	1,000	990		
O ₂ at JBR Inlet Duct, %									
Average, daily	7.8	7.7	7.6	7.6	7.4	14 ^f	15 ^f		
Sample Std. Dev.	0.07	0.31	0.086	0.3	0.27	4.1	0.97		
Maximum Value	8	9.6	7.7	8.7	7.7	18	17		
Minimum Value	7.5	6	7.2	7.0	6.9	7.4	14		
JBR Inlet Duct Pressure, inches water									
Average, daily	-11	-11	-10	-10	-10	-10	-10		
Sample Std. Dev.	0.17	0.23	0.13	0.23	0.079	0.19	0.091		
Maximum Value	-9.8	-10	-10	-8.5	-9 .8	-10	-10		
Minimum Value	-11	-11	-11	-10.5	-10	-11	-11		
JBR Inlet Duct Temperature, °F									
Average, daily	280	280	280	280	280	280	280		
Sample Std. Dev.	4.9	4.3	6	4.2	3.6	5.3	5.8		
Maximum Value	280	290	290	290	290	290	290		
Minimum Value	260	270	270	280	280	280	270		

^a A bias in the stack O₂ monitor was found during calibration check on 6/27. However, the average CEM stack O₂ concentrations are not significantly different from the stack gas O₂ concentration determined using the Orsat method.

b These values not reported since they are known to be biased due to faulty inlet O2 monitor readings.

^c Negative values result of instrumentation bias.

^d Value of 1 indicates agitator on, 0 indicates off.

[•] High average due to instrumentation problem.

f Problems with inlet O2 monitor have biased these values.

balance closures were calculated as a check on data representativeness. Since the mass of trace elements must be conserved, an examination of the mass balance can provide clues to sampling and/or analytical deficiencies. Removal efficiencies and emission factors are evaluations of process performance. Removal efficiencies provide an insight into the fate of a substance in power plant processes. Emission factors express plant emissions on a unit-energy basis.

The method used to determine uncertainties in calculated results is based on the ANSI/ASME PTC 19.1-1985, "Measurement Uncertainty" and is consistent with the approach to handling data used in EPRI's Field Chemical Emission Monitoring (FCEM) program. This method, along with an example calculation, is presented in Appendix F. In statistical calculations, a distinction was made between "raw data," such as gas flow rates and concentrations, and calculated data, such as mass balance closures and emission factors. The term "raw" is in quotation marks because some calculations were necessary to obtain these data. The distinction between raw and calculated data was made based on the goal of a particular measurement, i.e., the goal of a Pitot-tube traverse is to determine a gas flow rate, so the flow rate is considered a raw data point and not the individual ΔP measurements. Calculated data are determined using mean raw data. Therefore, calculated data are not presented on a daily or run basis but as mean values for the entire material balance period. Fundamental to obtaining calculated data is the assumption that the power plant processes are reasonably close to steady state. In this project, stream flow rates not directly measured, emission factors, removal efficiencies, and mass balance closures are all treated as calculated data.

Data were reviewed and justifiable eliminations and substitutions made prior to the calculation of material balance closures and removal efficiencies. The following modifications were made to the data set:

- The ESP outlet gas particulate-phase data for Runs 1 and 3 were invalidated for Al, Ba, Be, Cd, Ca, Cr, Co, Pb, Mg, P, K, Na, and Sr due to the filter background concentration comprising greater than 20% of the measured concentration.
- The stack gas particulate-phase data for Run 1 were invalidated for all elements except As, Se, and V due to the filter background concentration comprising greater than 20% of the measured particulate concentration.
- The limestone slurry filtrate Run 3d was substituted for Run 3a. 46% of the detected elements in Run 3a are statistical outliers. An analytical error is suspected to have occurred for Run 3a. No further details are available.
- The ESP inlet gas vapor-phase data for Run 2 were invalidated due to particulate breakthrough into the impinger solutions. This event caused a high bias in the vapor-phase concentrations.
- No flue gas particulate-phase analyses were performed for boron, since boric acid is
 included in the chemicals used to digest the particulate filters. The sluiced fly ash
 analyses were substituted so that mass balances could be performed.

• For As, Cr, and Hg, certain analyses are suspected to be biased and cause poor mass balance closures. For these elements, mass balance closures are also calculated with certain data substitutions made (see Table 6-2 for details).

Mass Balances

The results of mass balance closures, emission factors, and removal efficiencies are presented in the following sections. Following the results section are summaries of the equations used. Example calculations are presented in Appendix I.

Table 6-2 presents mass balance closures for selected elements. Mass balances were performed about the boiler, ESP, JBR, and the total plant. Figure 6-1 depicts the mass balance boundaries. Steady-state process operation was assumed for all vessels but the JBR. Due to the short test periods, significant accumulation of a substance could occur in the JBR. Small fluctuations in the JBR level and solids concentration are part of normal operation.

A general mass balance equation which applies to any system is:

$$\begin{bmatrix} Accumulation of \\ Mass in System \end{bmatrix} = \begin{bmatrix} Mass into \\ System \end{bmatrix} - \begin{bmatrix} Mass out \\ of System \end{bmatrix} + \begin{bmatrix} Mass Generated \\ in System \end{bmatrix}$$
 (6-1)

Over a long period of steady operation, the accumulation in the JBR also could be considered negligible. The following general equation was used to calculate mass balance closures.

For all vessels but the JBR, the accumulation term should be negligible and was assumed to be zero. Development of specific mass balance equations is presented in Appendix I.

The mass balance closure for each element met the project objective if it was between 70 and 130 percent. Poor closures and high uncertainties have their root cause in sampling, analytical, or process problems. Since an analysis of the process showed that process operation was steady and representative of normal operation, problems with mass balance closures for some substances may reflect problems with analytical or sampling techniques.

Concerns with mass balance closures fall into three categories:

- Out-of-range mass balance closure is outside target range of 70-130 percent;
- High uncertainty--uncertainty in closure exceeds ±50 percent; and
- Clear bias--closure ± uncertainty does not encompass 100% closure.

Table 6-2
Mass Balance Closures

	Boi	iler	ES	SP	ЈВІ	R	Pla	nt
•	%	95%	%	95%	%	95%	%	95%
	Closure	CI	Closure	CI	Closure	CI	Closure	CI
Anions								
Chloride	104	25	115	45	76	24	77	25
Fluoride	103	16	105	30	97	33	104	39
Elements				,			:	
Aluminum*	74	17	101	b	65	b	75	6.5
Antimony ^c	67	44	92	52 ^d	91	124°	65	26
Arsenic	214 (103) ^f	94 (43) ^f	136	67ª	38 ^h	28	270 (135) ^f	142 (71) ^f
Barium	69	30	100		76		69	27
Beryllium ⁱ	105	16	107	-	55		111	24
Boron ^m	131	110 ^j	105		109		114	32
Cadmium ^d	100	63	155		109		136	51
Calcium	94	35	76		82		81	31
Chromium	144 (91) ^k	225 (30) ^k	58 (92) ^k		89		83	8.9
Cobalt	98	36	120		80		114	40
Copper	26	24	122	22	74	23	33	30
Iron	89	18	99	21	77	26	87	17
Lead	109	37	106		36		113	44
Magnesium	92	22	104		107		103	21
Manganese	113	19	104	18	101	31	103	27
Mercury	205 (110) ¹	84 (35) ¹	55 (102) ¹	18 (26) ¹	88	13	101	30
Molybdenum	18	20	23	27	111	39	4.5	3.6
Nickel	84	86⁴	63	39	121	357 ^d	55	9.5
Phosphorus ^c	31	19	34		91	-	20	13
Potassium ^e	59	13	104		84		62	9.6
Selenium ^d	65	31	141	81	188	106	145	54
Sodium	91	12	99		100		91	15
Strontium	48	7.9	99		95		59	7.8
Titanium	77	18	103	23	31	10	78	12
Vanadium	87	13	106	17	91	32	92	13

^{*} Spike recovery in ESP inlet gas-phase particulate for aluminum was 62%, indicating possible analytical bias.

^b Since the ESP outlet gas-phase particulate Runs 1 and 3 were invalidated, confidence intervals for the ESP and JBR mass balance closures could not be calculated for many elements.

Table 6-2 (Continued)

- ^c These elements are consistently enriched in the coal ash over the process stream solid-phase concentrations, suggesting that the coal analyses are biased high for these elements.
- ^d High uncertainties for mass balance closure are caused by high variability in the gas particulate-phase concentrations.
- ^e High uncertainty in JBR closure for antimony is the result of high detection limits in liquid-phase samples; antimony was not detected in the JBR blowdown filtrate or limestone slurry filtrate.
- f Values in parentheses are those obtained when INAA coal analyses are substituted for the GFAA data.
- ⁵ High uncertainty in the ESP closure for arsenic is mostly due to high variability in ESP sluiced ash concentration.
- h Arsenic concentration was below detection limit in JBR blowdown solid phase.
- ¹ Spike recovery for beryllium in the performance evaluation ash sample was 147%, indicating possible analytical bias.
- ^j High variability in the boiler closure for boron is caused by high variability in the ESP inlet gas vapor-phase analyses.
- ESP inlet gas-phase particulate Run 2 Cr concentration, at 550 ng/g, is a statistical outlier. In comparison with sluiced ash, hopper ash, and size fractionated particulate data for chromium, this value is likely to be biased high. The mass balance data in parentheses are calculated with this value replaced with the Run 2 ESP sluiced ash concentration.
- ¹ ESP inlet particulate data for mercury are suspected to be biased high based on comparison with sluiced ash hopper ash analyses. This is also supported by the high boiler and low ESP mass balance closures. The mass balance data in parentheses are calculated with the ESP sluiced ash analyses substituted for the ESP inlet gas-phase particulate analyses.
- ^m Gas particulate-phase data are not available. ESP sluiced ash data were substituted for the boron particulate concentration.

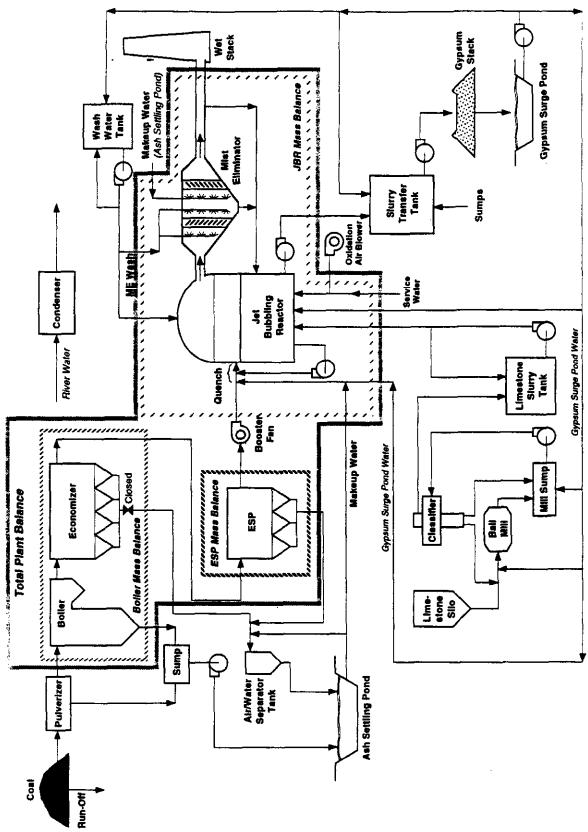


Figure 6-1
Mass Balance Boundaries

Mass Balance Closure (%) = 100 *
$$\left[1 - \frac{\text{Total Mass Out}}{\text{(Mass In - Mass Accumulated)}}\right]$$
 (6-2)

For the boiler closure, 70% of the mass balances performed fell within the target range. The percentage within the target range for the ESP, JBR, and Total Plant were 85%, 78%, and 59%, respectively.

Confidence intervals are not presented for many elements for the ESP and JBR mass balance closures. The precision error for the ESP outlet gas, particulate-phase analyses is unknown for many elements due to the rejection of data from Runs 1 and 3. Discussion of concerns with specific substances is presented in the following paragraphs.

Substitutions. For some elements, both a review of the analytical data and initial mass balance closures suggested that some data were biased. For these elements, data substitutions were made, and the material balances were recalculated. These results are in parentheses on Table 6-2. Specific cases are discussed in the following paragraphs.

- As. The arsenic coal analyses by GFAA yield mass balance closures about the boiler and plant of 214 and 270%, respectively, suggesting a bias in the coal or ash analyses. When the coal concentration for each run was replaced by the corresponding analysis by INAA, the closures about the boiler and plant were 103 and 134% respectively. This suggests that the GFAA analysis performed for coal may have been biased.
- Cr. The ESP inlet gas, particulate-phase Run 2 analysis for Cr at 550 μ g/g is a statistical outlier when compared with all available ash analyses. This value is strongly suspected to be the result of analytical bias or non-representative sampling. This is supported by the boiler mass balance closure, at 144%. When this value is replaced with the Run 2 sluiced ash concentration, the closure is 91%.
- Hg. The ESP inlet, particulate-phase data are suspected to be biased high, based on other ash analyses and prior experience with mercury data. This is also supported by the high mass balance closure about the boiler (205%) and correspondingly lower closure about the ESP (55%). When these data are replaced with the sluiced fly ash analyses, the closures are a much more reasonable 110% about the boiler and 102% about the ESP.

Out-of-Range Mass Balance Closures. Many mass balance closures lie outside the target range. For some of these, poor closure can be attributed to high variability in the concentration in one or more process streams. Other elements have closures which are clearly biased. The following paragraphs provide explanations for poor and clearly biased mass balance closures.

Sb, Cu, Mo, K, P, Sr. Antimony, copper, molybdenum, potassium, phosphorus, and strontium have mass balance closures well outside the target range for two or more devices. The confidence intervals for these closures indicate that a clear analytical or

sampling bias exists or that the mass balance closure model is inadequate for these substances. Problems closing material balances for copper, molybdenum, and phosphorus have been encountered in previous work by Radian. For antimony, copper, potassium, and strontium, the boiler and plant closures are out of range, while the ESP and JBR closures are reasonable. Since the boiler and plant closures are driven by the coal analyses, this suggests a high bias in the INAA analyses for coal for these substances. All of these elements show enrichment in the coal ash over bottom ash, collected ash, and the gas particulate phase at all locations (except phosphorus in the ESP outlet). None of these elements are expected to be in the vapor phase. This pattern suggests that the coal analyses for antimony, copper, molybdenum, potassium, phosphorus, and strontium are biased high in varying degrees. See Section 8 for further details on enrichment.

- Al and Be analytical QA/QC procedures reveal a possible analytical bias in gas particulate-phase analyses for Al. The Al spike recovery for this matrix was 62%, indicating a possible low bias. This could explain the slight bias apparent in the mass balance closure $(74\% \pm 17\%)$. In addition, the spike recovery of Be in the performance evaluation sample for fly ash was 147%. Only the JBR mass balance was outside the target range for Be, however. In addition, QA/QC procedures revealed possible analytical problems with some elements in the gas vapor-phase and limestone samples. For these elements, the limestone and vapor-phase concentrations have a very small effect on mass balance closures, however.
- As. Arsenic was not detected in the JBR blowdown solids. This may explain the 36% mass balance closure.
- Be, Pb, Se, and Ti. These elements have poor closures about the JBR. No cause for these poor closures was determined, with the exception of the previously mentioned possibility for analytical bias for Be in the solid phase.
- High Uncertainties in Mass Balance Closures. Some mass balance closures, both within and outside the target range, have high uncertainties. For those elements outside the target range, high variability in one or more measurements is the usual cause. The causes for high uncertainties in some elements is discussed below.
 - Cd, Ni, and Se. For these elements, uncertainty in the mass balance closure exceeds 50% for most devices. The cause is high uncertainty in the gas particulate-phase analyses. The Ni closure about the JBR, at $120 \pm 357\%$, is especially high because the Run 1 stack gas particulate-phase analyses were invalidated. The cause of the high variability in particulate-phase analyses for these elements in unknown. Insufficient data are available to make a reasonable hypothesis; however, the measurement error associated with the small sample mass collected at the stack is a likely contributor to the data variability.
 - **Sb.** The high uncertainty (95% \pm 120%) in the antimony closure about the JBR is the result of high detection limits in the liquid-phase samples analyzed. Antimony was not detected in the JBR blowdown filtrate or limestone slurry filtrate. The high uncertainty

in the boiler closure is the result of variability in the ESP inlet gas particulate-phase analyses.

- **B.** The high uncertainty $(131\% \pm 110\%)$ in the boron closure about the boiler is the result of variability in the ESP inlet gas-phase analyses.
- As. The high uncertainty in the ESP closure is mostly due to high variability in the ESP inlet gas vapor-phase analyses.

Emission Factors

The emission factor expresses stack emissions on an energy basis. Emission factors for elements are located in Table 6-3. The following general equation was used in calculating emission factors:

Emission Factor =
$$\frac{\text{Mass of Species in Stack Gas}}{\text{Energy of Coal Burned}}$$
 (6-3)

Detailed emission factor equations and an example calculation are presented in Appendix I.

Removal Efficiencies

Removal efficiencies of elements were calculated for the boiler, ESP, and JBR. Results are presented in Table 6-4. Since all elements but B, Hg, and Se should be present primarily in the solid phase, most of the removal of trace species occurs with the removal of fly ash in the ESP. The following equation defines the removal efficiency for a substance:

Removal Efficiency = 100 *
$$\left(1 - \frac{\text{Mass of Species in Gas Stream Exiting System}}{\text{Mass of Species in Gas Stream (or Coal) Entering System}}\right)^{(6-4)}$$

An example calculation of a removal efficiency is provided in the Example Calculations in Appendix I.

Organic Compound Results

The organic compounds detected in the samples from all three gas streams can be grouped into three categories: plasticizers, outside source contaminants, and process

Table 6-3
Emission Factors

	lb/10 ¹² Btu	95% CI
Anions		
Chloride	742	647
Fluoride	122	67
Selected Elements		
Antimony	0.06	0.01
Arsenic	1.2	0.2
Barium	2.8	9.9
Beryllium	0.1	0.1
Cadmium	0.6	2.1
Chromium	5.3	49.5
Cobalt	0.7	0.8
Copper	2.0	2.3
Lead	0.6	0.6
Manganese	7.2	48
Mercury	3.0	0.3
Molybdenum	1.5	2.6
Nickel	40.1	435
Selenium	26.5	58
Vanadium	2.1	0.5
Aldehydes		
Acetaldehyde	8.6	9.2
Formaldehyde	24	36
Volatile Organics ^{b,c}		
Benzene	1.3	0.3
Carbon Disulfide	2.2	1.2
Toluene	2.0	1.0

Table 6-3 (Continued)

	lb/10 ¹² Btu	95% CI
Semivolatile Organics ^d		
2-Methylphenol (o-cresol)	2.9	3.8
4-Methylphenol (p-cresol)	0.95	1.9
Acetophenone	3.2	0.7
Benzoic Acid	120	7
Benzyl Alcohol	2.8	12
Naphthalene	1.5	1.0
Phenol	9.2	8.8

^{*} Run 1 particulate-phase data were invalidated for all elements included here except arsenic, selenium, and vanadium due to the filter background comprising 20% or greater of the measured concentration.

^b Only those compounds with an average concentration above the detection limit are included.

^e Methylene chloride, acetone, and other halogenated hydrocarbons are not included because their presence is strongly suspected to be the result of contamination.

^d Phthalate esters are not included because their presence is suspected to be the results of contamination.

Table 6-4
Removal Efficiencies (Includes Particulate and Vapor Phase)

	Boi	ler	E	SP		JBR		
	% Removal	95% CI	%Removal	95% CI	% Removal	95% CI		
Anions								
Chloride	-7	126	-12	49	99	1		
Fluoride	1.4	15	1.6	37	98	1		
<u>Elements</u>								
Aluminum*	26.0	16.8	98.6	_,	98.4			
Antimony	32.8	45	98.8	0.6	84.1	3.1		
Arsenic	-113.5 (-2.4)°	94.7 (43.6)°	95.9	1.5	92.7	2.1		
Barium	31.5	29.7	98.3	-	96.1	-		
Beryllium	-4.34	18.2	98.1	-	92.6	_		
Boron h	-30.6	114.7	34.3	-	93.5			
Cadmium	0.5	62.9	95.1		46.2			
Calcium	6.9	44.1	98.8		85.3			
Chromium	-43.2 (10.2)°	228.7 (33.3)*	98.7	-	76.6	_		
Cobalt	3.1	35.2	98.2	-	85.3			
Copper ^f	73.8	25.4	97.8	0.3	88.1	13.5		
Iron	12.5	10.1	98.9	0.1	98.0	7.0		
Lead	-9.1	36.9	97.4	-	96.7			
Magnesium	8.5	24.1	98.4	-	93.3	_		
Manganese	-11.4	12.8	98.4		78.4	144		
Mercury	-105 (-10) ²	84.1 (35)#	55.2 (16.5)*	14.4 (20.6)*	45.9	7.4		
Molybdenum ^f	82.5	19.9	97.2	2.2	82.5	27.2		
Nickel	16.4	88.1	98.8	0.7	-75.5	1890		
Phosphorus ^f	69.6	21.3	94.8	-	91.1			
Potassium ^f	41.5	13.9	98.6	-	96.4	-		
Selenium	34.8	30.9	38.1	85.1	66.9	56.1		
Sodium	10.1	11.9	97.6	-	94.0			
Strontium ^f	52.1	7.9	98.5	-	96.6	_		
Titanium	24.0	18.5	98.6	0.4	98.3	0.4		
Vanadium	13.7	12.4	98.0	0.3	96.0	0.9		

^{*} Spike recovery in ESP inlet gas-phase particulate for A1 was 62%, indicating possible analytical bias.

^b Since the ESP outlet gas-phase particulate Runs 1 and 3 were discarded, confidence intervals for the ESP and JBR removal efficiencies could not be calculated for many elements.

^e Values in parentheses are those obtained when INAA coal analyses are substituted for the GFAA data.

⁴ Spike recovery for Be in the PE ash sample was 147%, indicating possible analytical bias.

^{*} ESP inlet gas-phase particulate Run 2, at 550 ng/g, is a statistical outlier. In comparison with sluiced ash, hopper ash, and size fractionated particulate data for chromium, this value is likely to be biased high. The removal efficiency data in parentheses are calculated with this value rejected.

^f These elements are consistently enriched in the coal ash over the process stream solid-phase concentrations, suggesting that the coal analyses are biased high for these elements.

^{*} ESP inlet gas-phase particulate data are suspected to be biased high compared with sluiced ash hopper ash analyses. This is also supported by the high boiler and low ESP mass balance closures. The removal efficiency data in parentheses are calculated with the ESP sluiced ash analyses substituted for the ESP inlet gas-phase particulate analyses.

^h Gas particulate-phase data were unavailable. ESP sluiced ash data were substituted.

related compounds. The phthalate esters detected in the MM5 gas samples are typical plasticizers commonly attributed to plastic bottles, bags, etc. used in the field laboratory environment. Sample and field blank concentrations are comparable; since phthalates are ubiquitous in the terrestrial environment, their presence is most likely due to contamination.

Methylene chloride and acetone are common reagents used in the field for sample recovery, and the detection of these compounds in the VOST samples is attributed to their presence in the field laboratory environment. Also detected in the VOST samples were chloromethane, trichloroethane, tetrachloroethene, and trichlorofluoromethane. These compounds were also found in the field blanks, but not in the trip blanks. Their presence is attributed to an unknown source of solvents or refrigerants in the field environment and they are not considered to be process-generated compounds.

Six semivolatile organic compounds and two volatile organic compounds detected consistently in the three gas streams are likely associated with the coal combustion process. These are benzene, toluene, phenol, 2-methylphenol (o-cresol), 4-methylphenol (p-cresol), acetophenone, naphthalene, and benzoic acid. The average measurable concentrations of these compounds across all three gas streams are less than 1 ppbv except phenol (2.5 ppbv), formaldehyde (8.2 ppbv), and benzoic acid (37 ppbv). (Note that benzoic acid is not included on the Title III list of compounds in the Clear Air Act Amendments.)

Benzene, toluene, and the phenols are known products of coal devolatilization, and their presence indicates partial oxidation of the coal or the possible presence of lower-temperature combustion zones within the boiler. The presence of naphthalene, in addition to being a process related compound, is sometimes attributed to inadequate cleanup of the XAD resin material used as the sorbent in the MM5 sampling train. At this site, however, naphthalene concentrations in the blank resin samples were less than three times the detection limit indicating a relatively clean resin matrix. The gas sample concentrations were all less than eight times the detection limit with most of the measurable naphthalene concentrations near the levels found in the blank samples. Consequently, the confidence intervals around the naphthalene concentrations are large, and any definitive conclusion about the presence of naphthalene in the flue gas is not possible from these data.

Conversely, benzoic acid is present in the flue gas samples at an average concentration of 37 ppbv, over ten times greater than any other process related compound. The presence of benzoic acid in the flue gas may be explained by at least two well known mechanisms:

- Oxidation of naphthalene followed by decarboxylation at 300°C. This route was used commercially to produce benzoic acid until recently, when it was phased out in favor of liquid-phase oxidation of toluene. Naphthalene is oxidized to phthalic acid anhydride then decarboxylated, which takes place spontaneously at 300°C, with about 40% conversion. It is not unreasonable to assume that a similar reaction could occur during the combustion process when naphthalene is present.
- Oxidation of toluene to benzoic acid. The catalytic oxidation of toluene to benzoic acid using V_2O_5 was also used to produce benzoic acid commercially in Germany during

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World War II. Although it has also been replaced by the liquid-phase oxidation mechanism, the fact that the process existed indicates that benzoic acid can be obtained by the oxidation of toluene. The oxidation yields benzoic acid and benzaldehyde, which can also be oxidized to benzoic acid.

Benzoic acid is not on the Clean Air Act list of 189 toxic substances, but it is noteworthy that all of the detected organic compounds are aromatic and share a common toluene or substituted-benzene structure. Although benzoic acid may be a degradation product of XAD resin, there is no evidence confirming this compound is generated as a sampling artifact. Another likely hypothesis is that the semivolatile compounds detected in the flue gas are attributed to various oxidation and substitution products of naphthalene, xylene (detected in only one sample), and toluene, with benzoic acid being the predominant product.

Similarly, the presence of acetaldehyde and formaldehyde in the flue gas may be attributed to the oxidation of ethane and methane possibly produced from the partial oxidation of coal. Gas samples were not analyzed for acetic or formic acid, which are the oxidation products of acetaldehyde and formaldehyde, respectively. The analysis of these organic acids, if detected, could provide some insight into the behavior of acetaldehyde and formaldehyde and the level of oxidation possible in the system.

COMPARISON OF VAPOR AND PARTICULATE COMPOSITION

Most of the substances measured at Plant Yates are distributed between the flue gas (vapor) and particulate matter (bottom ash, collected ESP ash, ash removed in the FGD system, or emitted ash which exits with the flue gas through the stack). Of the organic compounds tested, the semivolatile compounds should be associated with the particulate matter, and the volatile compounds should remain in the vapor phase. (Some of the organic compounds are at least slightly soluble in water and thus may be removed from the flue gas in the wet FGD system.) The sampling and analytical techniques used in the project did not quantify the distribution of the organic compounds between the particulate and vapor phases.

EPA Proposed Method 29 was the primary method used for collecting the trace metals samples at Plant Yates. The anions train used to measure acid gas concentrations is similar to Method 29 in many respects since both are modifications to the Method 5 sampling procedure. In these methods, the particulate and vapor concentrations are analyzed and may be reported separately. However, because of the low vapor-phase concentrations and the high potential for contamination during sampling, sample handling, or analysis, the partitions between particulate and vapor phases should be used cautiously.

Most of the inorganic elements present in the flue gas downstream of the air heater should be in the particulate phase. As is discussed in Section 8, some of the metals will be enriched in the finer particulate sizes, but the vapor pressure of most elements and their compounds is too low for measurable concentrations to be expected in the vapor phase at temperatures of 300°F and below. Exceptions to this include mercury, hydrochloric acid, hydrofluoric acid, and selenium which may have significant vapor concentrations. Selenium may be present either as vaporous compounds such as SeO₂ or as a component enriched in the finer particulate matter.

Tables 7-1, 7-2, and 7-3 show the particulate and vapor-phase distribution of the inorganic substances of interest measured at Yates in the ESP inlet, ESP outlet, and stack streams, respectively. Rather than summing the components of the sampling train, the concentrations of the particulate and vapor phases have been computed and averaged separately. For values reported from the laboratory as below the detection limit, one-half the detection limit was included in the averaging procedure. The average determined in this manner was used to calculate the particulate percentage, even if the average was less than the average detection limit of the non-detected samples. In this event, the average detection limit has also been included in the tables as a less than value in parentheses (<DL). The percentage of the particulate- and vapor-phase concentrations that result from averaging values below detection limits are included in the tables.

Table 7-1
Vapor and Particulate-Phase Distribution at ESP Inlet

Element	Part. Conc. μg/Nm³	% Part. DL*	Vapor μg/N	Vapor Conc. μg/Nm³ •		% of Element in Particulate Phase
Antimony	33	0%	0.56		0%	98.3%
Arsenic	400	0%	0.083	(<0.17)	100%	100.0%
Barium	4,400	0%	1.5		0%	100.0%
Beryllium	93	0%	0.06		0%	99.9%
Boron	4,200 ^d	0%	6,390		0%	39.7%
Cadmium	24	0%	0.11		16%	99.6%
Chloride	6,100	0%	112,000		0%	5.2%
Chromium	2,900	0%	11		0%	99.6%
Cobalt	275	0%	0.34	(<0.74)	55 %	99.9%
Copper	770	0%	1.1		0%	99.9%
Fluoride	1.3	0%	8,300		0%	0.0%
Lead	710	0%	0.103	(<0.21)	100%	100.0%
Manganese	2,120	0%	0.051	(<0.10)	100%	100.0%
Mercury	1.3°	0%	5,5		0%	19.2%
Molybdenum	320	0%	0.66	(<1.4)	52%	99.8%
Nickel	2,000	0%	7		7%	99.6%
Phosphorus	2,100	0%	7.8	(<16)	100%	99.6%
Selenium	133	0%	0.11	(<0.22)	100%	99.9%
Strontium	2,910	0%	2		0%	99.9%
Vanadium	2,760	0%	1.20		0%	100.0%

Note: The Hg concentration in the sluiced ash has been substituted for the ESP inlet ash Hg concentration since the latter is believed to be biased high.

^{*} Percentage of the particulate concentration that results from using measurements below detection limits.

b Note: Run 2 has been excluded from the vapor-phase average because of contamination.

^e Percentage of the vapor concentration that results from using measurements below detection limits.

^d Boron concentrations from the sluiced fly ash have been substituted for the gas stream particulate concentrations. Chemicals containing boron are used in the digestion procedure used for the gas stream particulate samples.

^e The sluiced fly ash mercury concentration was substituted for the mercury concentration measured in the ESP inlet particulate. Material balances around the boiler, ESP, and overall plant support the hypothesis that the ESP inlet particulate mercury concentration is biased high.

Table 7-2 Vapor and Particulate-Phase Distribution at ESP Outlet

Element	Part. Conc. μg/Nm³	% Part. DL^	Vapor Conc. μg/Nm³		% Vapor ND	% of Element in Particulate Phase
Antimony	0.39	0%	0.021		0%	94.8%
Arsenic	16	0%	0.091	(<0.18)	100%	99.4%
Barium	74	0%	1.0		0%	98.7%
Beryllium	1.7	0%	0.093	(<0.16)	57 %	94.9%
Cadmium	1.1	0%	0.10		20%	91.1%
Chloride	45	0%	136,000		0%	0.0%
Chromium	23	0%	0.57	(<0.73)	42%	97.6%
Cobalt	4.5	0%	0.54	(<1.0)	31%	89.2%
Copper	16	0%	1.1		16%	93.9%
Fluoride	0.12	0%	7,900		0%	0.0%
Lead	18	0%	0.37		20%	98.0%
Manganese	34	0%	0.055	(<0.11)	100%	99.8%
Mercury	0.126	0%	5.6		0%	2.2%
Molybdenum	8.1	0%	0.61	(<1.4)	37%	93.0%
Nickel	22	0%	1.54	(<2.9)	59 %	93.6%
Phosphorus	100	0%	8.49	(<17)	100%	92.2%
Selenium	82	0%	0.12	(<0.23)	100%	99.9%
Strontium	43	0%	1.4		0%	96.9%
Vanadium	54	0%	1		12%	98.2%

^{*} Percentage of the particulate concentration that results from using measurements below detection limits.

^b Percentage of the vapor concentration that results from using measurements below detection limits.

Table 7-3 Vapor and Particulate-Phase Distribution at Stack

Element	Part. Conc μg/Nm³	. % Part. DL*		or Conc. g/Nm³	% Vapor DL ^b	% of Element in Particulate Phase
Antimony	0.052	0%	0.012	. 	0%	80.6%
Arsenic	1.1	0%	0.089	(<0.18)	100%	92.5%
Barium	2.8	0%	0.082	(<0.14)	54%	97.2%
Beryllium	0.041	0%	0.061	(<0.17)	82%	40.1%
Cadmium	0.59	0%	0.032	(<0.064)	100%	94.9%
Chloride	214	0%	540		0%	28.4%
Chromium	5.1	0%	0.34	(<0.67)	100%	93.8%
Cobalt	0.25 (<0.	6) 59%	0.39		0%	39.3%
Copper	0.77	0%	1.2		14%	38.2%
Fluoride	0.051	0%	124		0%	0.0%
Lead	0.50	0%	0.11	(<0.22)	100%	82.1%
Manganese	7.2	0%	0.054	(<0.11)	100%	99.3%
Mercury	0.0071	18%	3.0		0%	0.2%
Molybdenum	1.4	0%	0.12		0%	92.3%
Nickel	39	0%	1.8	(<2.6)	46 %	95.7%
Phosphorus	1.3 (<2.	6) 100%	8.2	(<16)	100%	13.6%
Selenium	26	0%	0.8		0%	97.1%
Strontium	1.5	0%	0.022	(<0.045)	100%	98.5%
Vanadium	1.6	0%	0.55		0%	74.5%

^{*} Percentage of the particulate concentration that results from using measurements below detection limits.

^b Percentage of the vapor concentration that results from using measurements below detection limits.

At ESP inlet conditions, more than 99% of the mass of the substances of interest were found in the particulate phase. Exceptions to this are chloride, fluoride, and mercury. Most chloride and fluoride exiting the boiler are in the acid gas form (HCl and HF.) In fact, Title III of the Clean Air Act Amendments of 1990, only lists HCl and HF and not chloride and fluoride salts which would be in the particulate form. However, the particulate measurements are included in this section for completeness.

With the exception of mercury, chloride, and fluoride, the particulate phase contains most of the mass of elements at the ESP outlet and stack as well. The percentage found in the particulate phase decreases for some elements in the stack, primarily because the particulate loading (and therefore the particulate concentration of an element on a gas-phase basis) decreases. The gas-phase concentrations of most elements are reasonably consistent at each of the sampling locations. However, these concentrations, while very low, are above those expected. Since the concentrations of the elements in the liquid impinger samples are extremely low (10 ppb level or below for most), contamination of the impinger solutions is the suspected cause.

Field blank concentrations support the hypothesis that contamination may be the cause of the higher-than-expected vapor-phase concentrations of the elements of interest. Table 7-4 compares the stack vapor measurements to the stack field blank concentrations (calculated on an average stack gas volume basis). For most of the elements, the field blank concentration equals or exceeds the measured stack concentration. Since the reagent blanks are generally much lower than the field blanks, sample handling under field conditions is the expected cause of contamination. Possible sources of contamination include incomplete rinsing of the sampling train glassware or inadvertent contact of the rinse solution with external glassware surfaces. Again, because the concentration of these elements is in the ppb range, very little material is required to cause these levels of contamination.

Mercury and fluoride are almost entirely in the vapor phase at the ESP outlet and stack. Chloride shows a substantial particulate percentage at the stack. This high level of particulate chloride is believed to be caused by a minor amount of absorber liquid being reentrained from the mist eliminator surfaces. Again, this chloride is a calcium salt which is not included on the list of elements and compounds in Title III of the Clean Air Act Amendments of 1990.

Finally, the selenium distribution at Plant Yates is worthy of note. Essentially all of the selenium was found in the particulate phase at Yates, while at most other coal-fired electric utility plants a significant fraction of the selenium has been measured in the vapor phase. (Variability in the selenium data is also high in most cases.) Although the particulate phase contains the selenium, particulate-phase selenium removal efficiency was only 40% (see Table 8-2) compared to greater than 98% removal efficiency for the total particulate matter. All other particulate-phase metals are removed at greater than 90% efficiency. These data indicate that selenium may be reacting or condensing on the particulate filter during gas-phase sampling resulting in a lower-than-expected vaporous selenium concentration. Also note that the spike recovery for the selenium vapor was low, indicating a possible low bias in the vapor-phase selenium concentration.

Table 7-4
Stack Field Blank Versus Vapor Concentration

Element	Vapor Conc. μg/Nm³		Field Blank μg/Nm³	
Antimony	0.012		1.78	
Arsenic	0.089	(<0.18)*	< 0.177	
Barium	0.082	(<0.14)	0.734	
Beryllium	0.061	(<0.17)	< 0.150	
Cadmium	0.032	(<0.064)	0.054	
Chromium	0.34	(<0.67)	3.19	
Cobalt	0.39		1.01	
Copper	1.2		1.66	
Lead	0.11	(<0.22)	1.08	
Manganese	0.054	(<0.11)	10.6	
Molybdenum	0.12		0.073	
Nickel	1.8	(<2.6)	3.59	
Phosphorus	8.2	(<16)	< 16.5	
Selenium	0.8		< 0.228	
Strontium	0.022	(<0.045)	0.513	
Vanadium	0.55		0.821	

^{*} The "<" symbol indicates the average D.L. for these substances.

In Table 7-1, the mercury concentration in the sluiced fly ash has been substituted for the mercury concentration measured in the ESP inlet particulate matter because the ESP value is believed to be biased high. (The ESP inlet ash mercury concentration is significantly higher than that measured at most other coal-fired electric utility plants.) As shown in Table 6-2, material balances for mercury around the boiler (205%) and ESP (55%) indicate that the mercury particulate concentration may be high. The overall balance for mercury (101%) is good. (This balance does not use the ESP inlet data.) Since the ESP sluiced ash includes most of the ash at the ESP inlet, concentrations in this stream should be reasonable estimates for the ESP inlet ash concentrations. When this substitution is made, the mercury balances around the boiler (110%) and ESP (102%) become more reasonable.

DISTRIBUTION OF HAPS AS A FUNCTION OF PARTICLE SIZE IN THE FLUE GAS AND THE PARTICLE SIZE DISTRIBUTION IN THE ESP

Understanding the distribution of trace metals according to particle size is important in understanding and predicting trace metals emissions rates and removal efficiencies across control devices. For example, if an element was enriched (higher concentration than in the bulk ash) in the fine particulate matter, the removal efficiency for that element across an ESP would be expected to be less than that of the bulk particulate matter. (Theoretically, an ESP does not control the fines as well as the larger particle size fractions.)

Prior to the presentation of results from Plant Yates, expected results based on historical data will be discussed. Trace metals in coal can be grouped into three general categories:

- Elements (and compounds) that are not vaporized during the combustion process and, therefore, are assumed to be uniformly distributed in the bottom ash and fly ash. Included in this category are barium, beryllium, manganese, strontium, vanadium, and, sometimes, chromium and nickel.
- Elements that are partially or completely vaporized in the furnace and then condense as the flue gas temperature drops in cooler regions of the boiler and in downstream equipment. This condensation can occur on the surface of ash particles or by homogenous nucleation, so elements in this category tend to be enriched in the finer fly ash particles. Included here are arsenic, cadmium, copper, lead, molybdenum, and, sometimes, chromium, nickel, and selenium. Antimony and phosphorus may also fall in this category, but not much supporting data on these elements are available as yet.
- Elements that are vaporized and remain primarily in the vapor phase at flue gas temperatures in the stack. Mercury and sometimes selenium fall into this category. Selenium may be present either as vaporous compounds, such as SeO₂, or as a component enriched in the finer particulate matter.

Collection and Analytical Methods

The mass particle size distributions around the ESP can be used to characterize its performance. The size distributions were determined by Anderson High Capacity Source Sampler (4 cuts) for the ESP inlet, by Microtracs laser diffraction for the ESP Field 1 hopper catch and the ESP Field 2 hopper catch, and by University of Washington Mark V cascade impactor (11 cuts) at the ESP outlet.

To convert the size distributions from aerodynamic diameter to physical diameter, it is necessary to know the density of the particles. Particle density measurements were made on samples from the ESP from Plant Yates ESP Hoppers 1-4 on 6/23/93. A helium pycnometer was used to measure the porosity and volume of the ash samples. The samples were then weighed to determine the particle density. The average of three measurements was 2.41 g/cm³, and it was assumed that this density was representative for all sizes of particles. This value for density was then used in the impactor data reduction to calculate the physical diameters.

Particle Size Distribution and Fractional Efficiency

Figures 8-1, 8-2, 8-3, and 8-4 show the cumulative and differential particle size distribution measured at the inlet and outlet of the ESP. Specific run data for the ESP inlet and outlet PSD tests are included in Appendix C.

The inertial sampling equipment used for these tests is described in Section 5. Sampling was conducted at a fixed, isokinetic flow rate to yield a constant stage cutpoint. The sampling train utilized is essentially a standard EPA reference Method 17 configuration. Stage cutpoints for the cascade impactors and cyclone samplers are derived from empirical calibrations based on operating flow rates, run conditions, and sampler geometry.

ESP particle size data are presented on a physical basis, rather than aerodynamic, using a measured ash density of 2.4 gm/cm^3 . The ESP inlet particle size distribution is a direct average of triplicate runs at the same cyclone stage cutpoints. The top and bottom end of the distribution are assumed to be $50 \mu m$ and $0.1 \mu m$, respectively. This range was selected to cover the extent of particles which are typical of coal-fired boilers. Mass median diameter and geometric standard deviation of the distribution were estimated graphically, based on the $50 \mu m$ upper size limit, assuming a log-normal distribution. The resulting inlet distribution had a mass median diameter of $13 \mu m$ with a standard deviation of 4.1 This represents a rather wide spread for an inlet size distribution. Since only four data points are available from the cyclones, it is difficult to discern any more details on the inlet distribution. However, the amount of space charge suppression that was observed in the first field of the ESP does indicate large concentrations of fine particles which would also reflect a large standard deviation.

Data reduction for the outlet PSD follows a standard cascade impactor D_{50} calculation method. Outlet particle size was also extrapolated to a 50 μm upper endpoint. Mass fraction and differential distribution were directly averaged from the raw impactor run data, since stage D_{50} cutpoints were nearly identical between runs. The resulting distribution had a mass median diameter of 4.1 μm and a standard deviation of 3.1. This size is representative of the size distribution commonly measured at the outlet of an ESP.

In Figures 8-3 and 8-4, and Table 8-1, the differential mass has been normalized to the level of the Method 5/29 average measured particulate concentration. This corrects for sample fallout and loss in the particle sizing cyclones and cascade impactor. It also accounts for

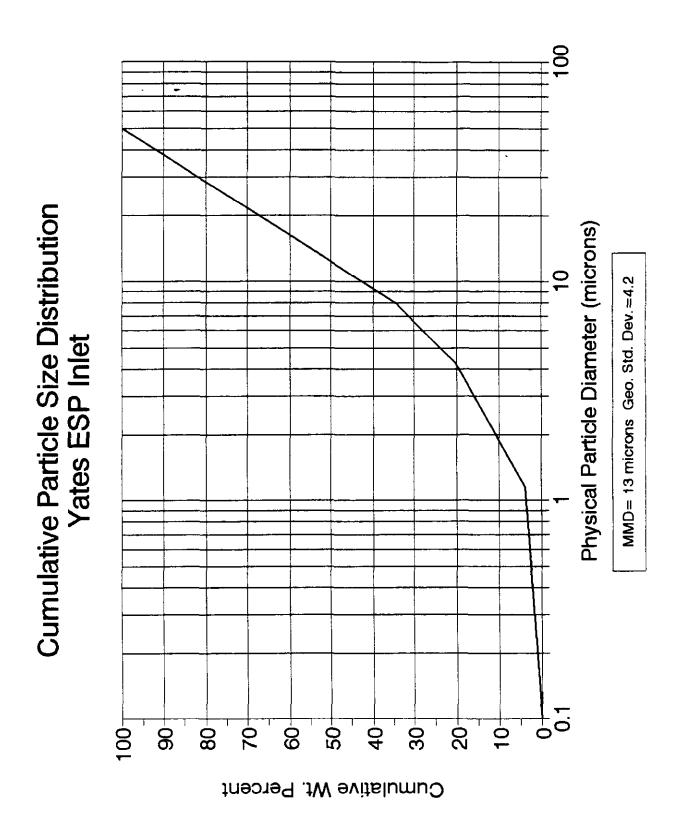


Figure 8-1 Cumulative Particle Size Distribution, Yates ESP Inlet

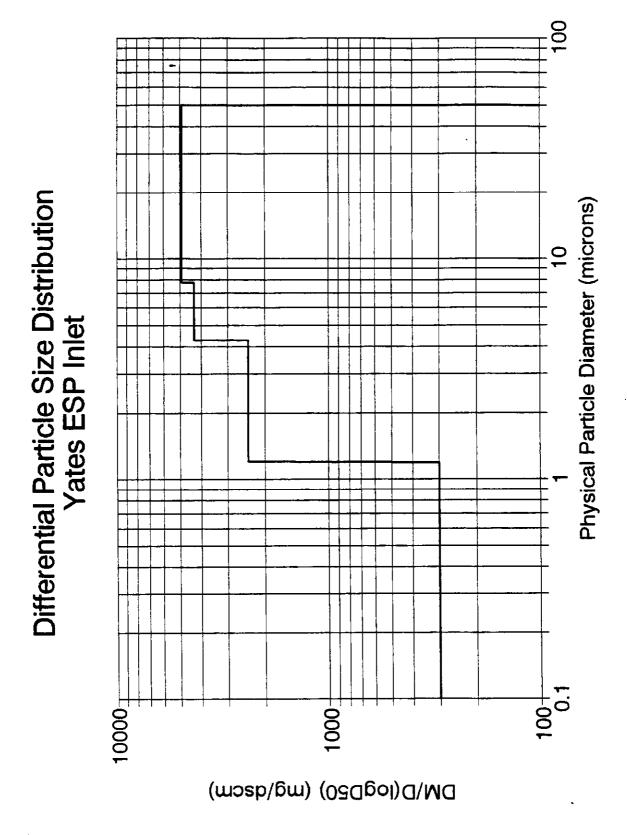


Figure 8-2 Differential Particle Size Distribution, Yates ESP Inlet

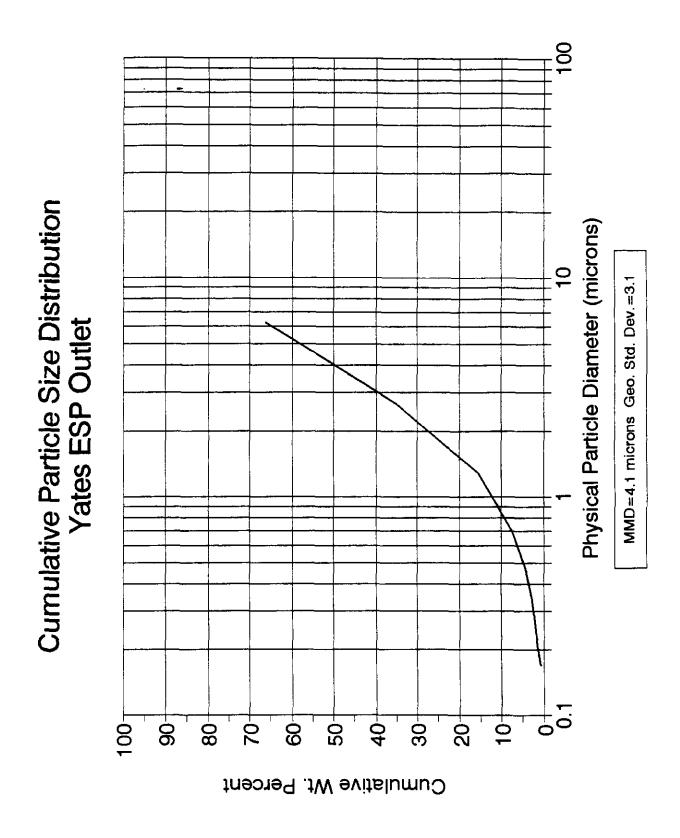


Figure 8-3 Cumulative Particle Size Distribution, Yates ESP Outlet

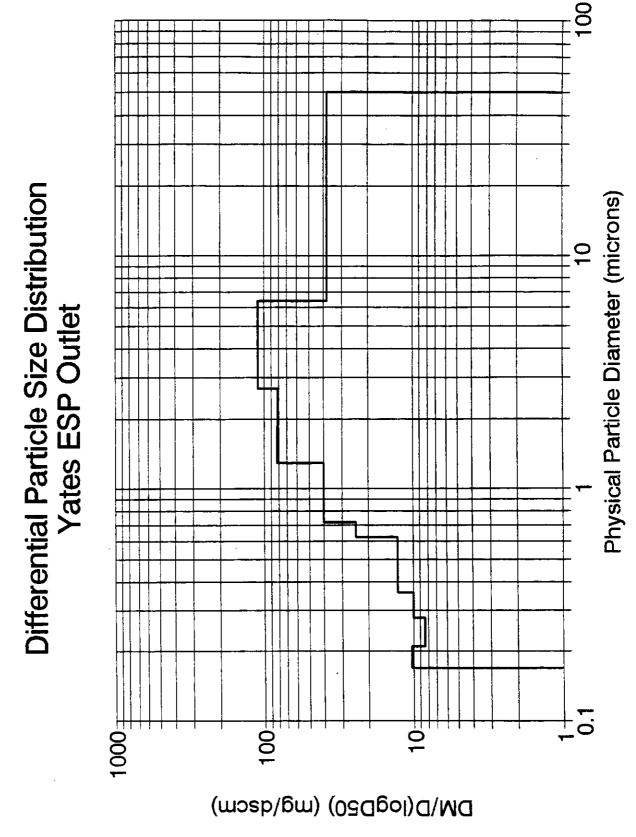


Figure 8-4
Outlet Differential Particle Size Distribution

Table 8-1
Measured Particle Size and Fractional Efficiency

Physical Diameter (microns)	Inlet Cumulative Mass (%)	Inlet DM/d (logD50) (mg/dscm)	Outlet Cumulative Mass (%)	Outlet DM/d(logD50) (mg/dscm)	Fractional Efficiency (%)	Fractional Penetration (%)
0.1 - 1.2	3.8	300	16.0	17.3	94.2	5.8
1.2 - 4.3	20.3	2,413	55.0	81.5	96.6	3.4
4.3 - 7.8	33.8	4,309	78.0	95.5	97.8	2.2
>7.8	100.0	4,927	100.0	51.0	99.0	1.0

Notes:

- 1. Fly ash density = 2.41 gm/cm^3 .
- 2. Inlet differential distribution normalized to average mass test concentration of 8,338 mg/dscm.
- 3. Outlet differential distribution normalized to average mass test concentration of 131.8 mg/dscm.

differences between the single-point impactor and cyclone sampler tests and the multipoint Method 5/29 measurements.

Table 8-1 shows the collection efficiency as a function of physical particle size. The overall collection efficiency for all particles was 98.4 percent. The measured collection efficiency for particles below 1.2 μ m was 94%, while the collection efficiency for particles between 1.2 - 4.3 microns was 96 percent. The mass fraction above 1 μ m represents the majority of particles emitted from the ESP. Although theoretical collection efficiency decreases with the particle diameter, non-ideal effects such as sneakage, gas flow distribution, and reentrainment can have a very significant effect on ESP performance for larger particle sizes. This demonstrates that an ESP can efficiently collect submicron particles and does not emit just fine particles as is commonly believed.

Predicted ESP Performance

ESP performance can be affected by several variables including particle resistivity and the electrical characteristics of the ESP. Both of these conditions can ultimately affect opacity. Each of these are discussed in the following section.

Particle Resistivity. Particle resistivity was measured at the ESP inlet using an extractive resistivity measuring device. In this device, sample collection and resistivity measurement are performed in a chamber external to the duct. The system uses an in-situ probe to isokinetically extract a sample of dust to a temperature-controlled precipitation chamber where a point-plane precipitator deposits the dust onto a disc. Once a suitable layer has been deposited, layer thickness is measured with a precision micrometer. Resistivity is measured

in the presence of flue gas by applying increasing voltage across the dust layer. The resulting current is measured with a picoammeter until the dust layer breaks down electrically and sparkover occurs. The resistivity is then calculated using the ratio of the electric field to the current density just prior to sparkover, as described in ASME Power Test Code Number 28. Measurements are typically made over a range of temperatures for the same dust layer. This allows resistivity to be measured over a range of possible ESP operating conditions.

In addition to the in-situ measurements, resistivity was also calculated using a computer model developed by Bickelhaupt.^{2,3} This model predicts resistivity as a function of temperature, water vapor content, and SO₃ concentration. An as-received ultimate coal analysis is required to run the Bickelhaupt model.

Figure 8-5 shows a plot of the particle resistivity. The solid triangles are in-situ measurements made during the field test program at the ESP inlet. Although the ESP temperature was steady at approximately 280°F, it was possible to make measurements at a range of temperatures from 240°F to 320°F by varying the temperature in the resistivity chamber.

The lines shown in Figure 8-5 are the predicted values based upon the Bickelhaupt empirical model. This model uses coal and ash characteristics to predict particle resistivity. It has been documented that the weakest part of the model is predicting the gas-phase SO₃ concentration. Therefore, the plot contains the predictions for four values of SO₃ from 0-7 ppm.

At 280°F, the measured resistivity was $8 - 10 \times 10^{10}$ ohm-cm, which represents conditions for very good precipitation. The measured values are higher than the predicted values with greater than 1 ppm of SO_3 . The predicted values with no SO_3 match well with the measured values. This means that the amount of SO_3 present in the flue gas was much lower than predicted. This can be caused by conditions in the boiler or by characteristics of the air preheater. Often SO_3 can be scrubbed by the cold surfaces in the heat exchanger.

Another indication that the SO_3 was low was the low dew point that was measured. The resistivity chamber has been modified to allow measurement of acid dew point. A window on the chamber is cooled to a point that condensation occurs on the window face exposed to the flue gas. The window is then heated externally until the mist disappears. A thermocouple attached to the inside of the window is used to determine the temperature of the glass surface. Experience with this system has shown that the dew point can be consistently measured \pm 2°F. During the measurements at Plant Yates, there was no detectable dew point above 220°F. This corresponds to an SO_3 concentration of approximately 0.3 ppm.

Electrical Characteristics. The electrical characteristics are shown in Figure 8-6. The voltage current (VI) characteristics are expressed in the normalized terms of electric field strength (kV/cm) and current density (nA/cm²). All the fields, except Field C, operate at field strengths greater than 3 kV/cm. Cold-side ESPs that are not experiencing problems related to high resistivity will typically operate in the range of 3.0 to 3.5 kV/cm. Therefore, the VI curves shown in Figure 8-6 reflect the moderate particle resistivity levels described previously.

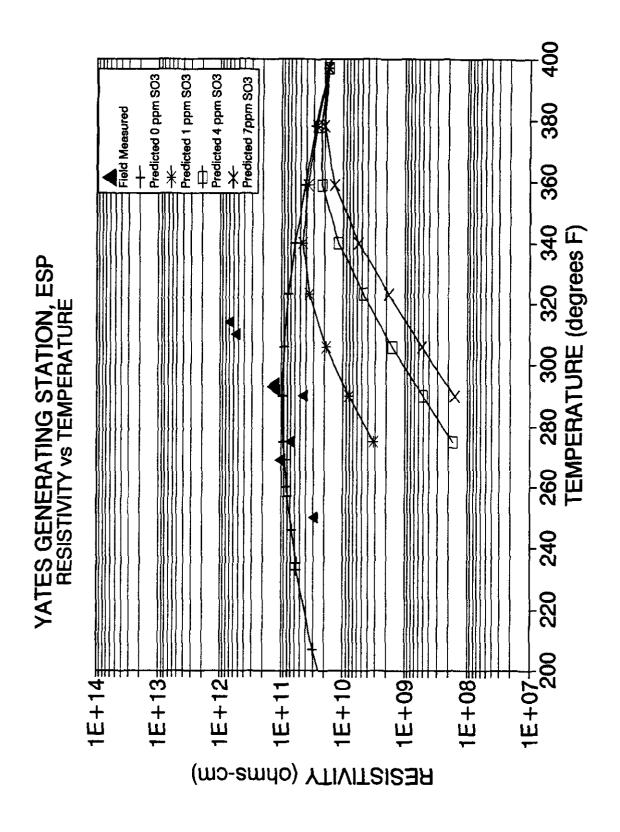


Figure 8-5
Particle Resistivity

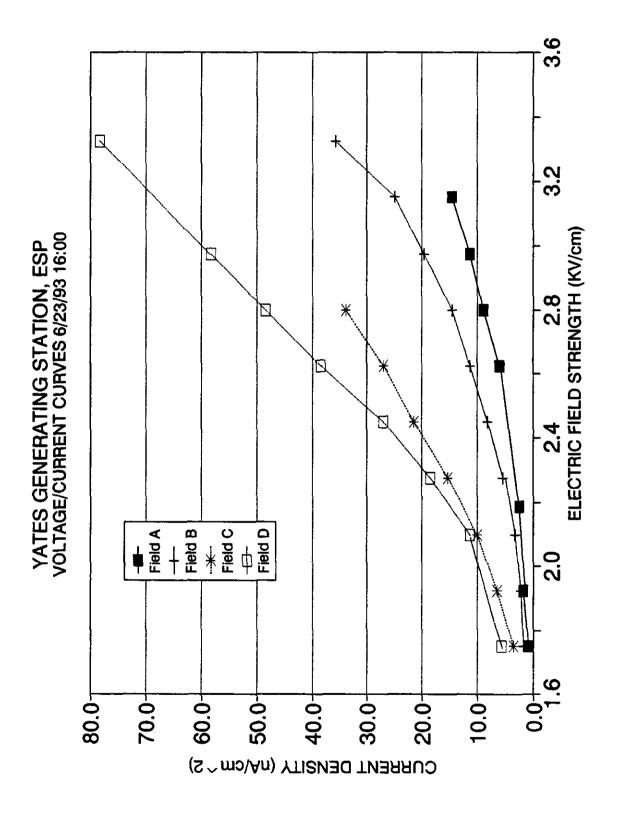


Figure 8-6 Voltage Current Curves

Field C is sparked at 2.8 kV/cm which is lower than the field strengths in Fields B and D which are upstream and downstream of Field C. Since the low voltage sparking is isolated in only one section of the ESP, the problem is probably not related to particle resistivity and is most likely due to some minor misalignment in this field.

Opacity. The opacity over a given period of time is shown in Figure 8-7 which is a plot of 6 minute averages of 15 second readings. During the time period shown in this figure, all sections should have been rapped. The lack of rapping spikes is likely due to the sampling time on the data recorder. However, it could be possible that the rapping spikes are relatively small. The holding force on the collected dust layer is proportional to the square of the particle resistivity. At the resistivity levels measured for this ash, the holding force could be strong enough to inhibit removal of the dust from the plates.

Predicted ESP Performance. The performance of the ESP was predicted using a predictive ESP computer model developed by ADA Technologies for DOE.⁴ The non-ideal factor for gas flow distribution (25%) that has been recommended by EPRI for older ESPs was used in the modeling. The EPRI value for sneakage was modified for this application to take into account the fact that there were four electrical sections but only three mechanical sections.

The results of the predictions are shown in Table 8-2. As can be seen, the predicted performance of the ESP matches well with the measured performance. The model predicted 98.4% for the overall collection efficiency which agrees with the measured results from the total particulate tests. The outlet size distributions are also similar as both show a mass median diameter of approximately $4 \mu m$. The opacity values are a little different, but the exact dimensions of the duct where the opacity is measured is not known. This is important for predicting opacity.

Figure 8-8 is a plot of the measured and predicted penetration as a function of particle size. The measured efficiency is much cruder because only 4 data points are available for the calculation from the inlet measurements. However, the measured and predicted efficiencies as a function of particle size are nearly identical. Both show a maximum penetration for submicron particles of 6 to 7 percent.

From the fact that there is a strong correlation between the measured and modeled performance, it is concluded that the ESP is performing as would be expected for the fly ash and flue gas conditions present. No operational or performance problems are observable.

Metals Removal Across ESP

Table 8-3 shows the removal of particulate metals across the ESP as well as the penetration of particulate metals through the ESP. The average penetration is 1.6% for all particles. As can be seen, most of the metals are removed at approximately the same rate as the total particulate. This would be expected because the metals are associated with all sizes of particles and the ESP is showing very high collection efficiency for even submicron particles. Figure 8-9 shows the distribution of metals as a function of particle size measured at the inlet

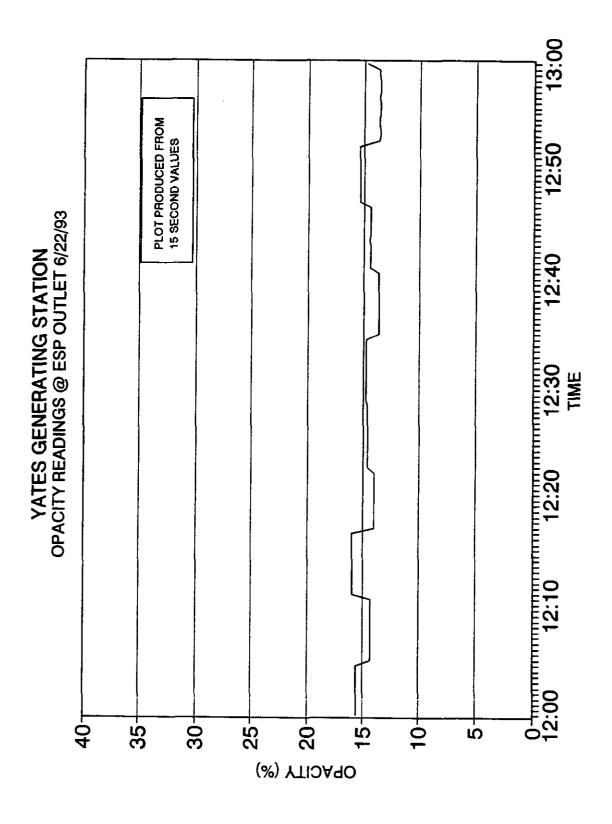


Figure 8-7 Opacity

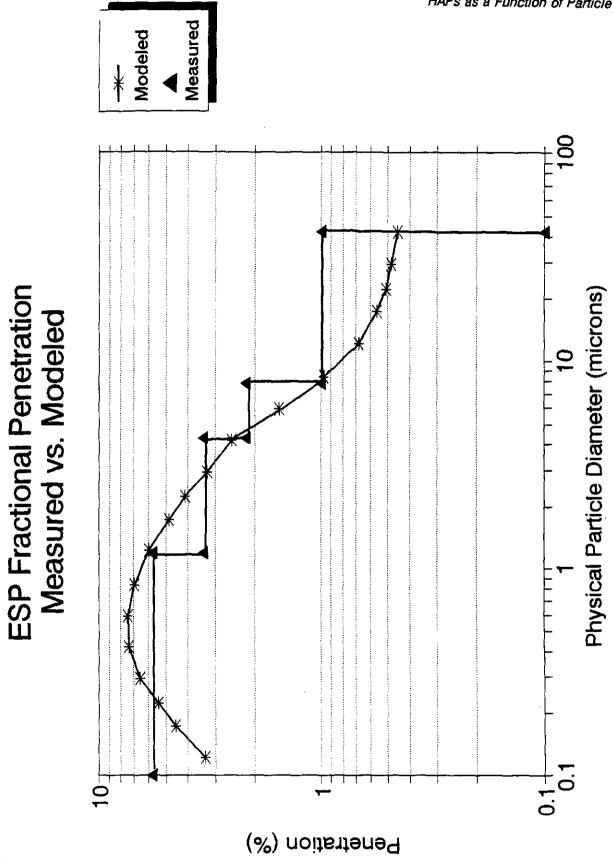


Figure 8-8 ESP Fractional Penetration

Distribution of Metals According to Particle Size at the ESP Inlet

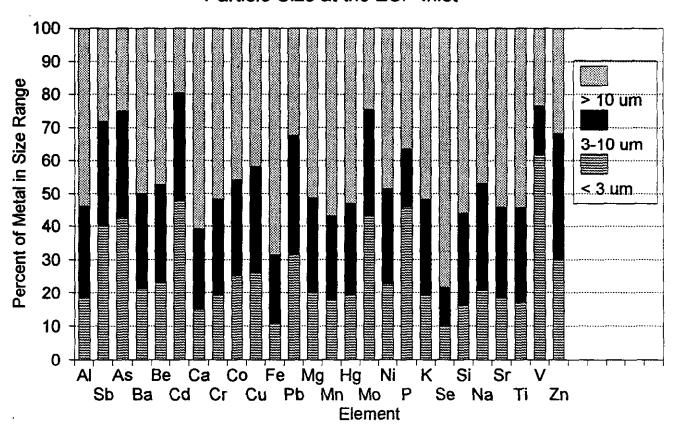


Figure 8-9
Distribution of Metals According to Particle Size at the ESP Inlet

Table 8-2
Comparison of Predicted and Measured ESP Performance

	Predicted	Measured
Collection Efficiency	98.4	98.4
Outlet Size Distribution Mass Median Diameter, mm Standard Deviation	3.9 3.3	4.1 3.1
Opacity	19%	16%

to the ESP. As can be seen, as much as 50 to 70% of all particles are associated with very large particles (i.e., $> 10 \mu m$).

Figure 8-10 is a similar plot of the distribution of the metals measured at the outlet. At the outlet, the highest concentration of mass is in the finest particles (i.e., $<3 \mu m$). This is due to the fact that the efficiency of the ESP drops off slightly as a function of particle size as shown in Figure 8-8.

Four Metals with Higher Penetration than the Average

There are four metals that have penetration values at least twice that of the overall average penetration. The increased penetration in arsenic (3.96%), cadmium (4.46%), and phosphorus (4.83%) [and mercury if substitution of sluiced ash concentration for the ESP inlet is used (10.98%)] are relatively small and could be due to either the low concentrations for arsenic and cadmium, or they could be due to the fact that they might be associated with the submicron particles. Both the measured and the predicted penetration of submicron particles was on the order of 6% so any increased enrichment of the fine particles for these particles could account for the higher penetration. The measured distribution at the outlet also points to an enrichment of the fine particles for these metals. Figure 8-10 shows that for arsenic, cadmium, and phosphorus, there is a greater percentage of the metal in the finest particles.

Selenium is the one metal which cannot be explained by the performance of the ESP. If all the selenium were associated with the most difficult to collect particles, $<1~\mu m$, it would have a maximum penetration of less than 7 percent. However, the measured penetration is greater than 50 percent. In addition, Figure 8-10 shows that nearly 50% of the selenium being emitted is associated with particles greater than 10 μm . This points to an error in sampling and analysis because it would not be physically possible for any particulate-phase material to penetrate the ESP at a rate of 50%, especially very large particles. Previous testing observation indicates that vapor-phase selenium may precipitate on the active sites provided by the filter in the Method 29 train under certain conditions. If this was the case at Plant Yates, the "penetration" could actually be caused by vapor-phase selenium which has been characterized as in the particulate phase.

Table 8-3
ESP Particulate-Phase Metals Collection Efficiency

	ESP	Inlet	ESP (Outlet	Efficiency	Penetration
Metal	$\mu g/Nm^3$	lbs/hr	μg/Nm³	lbs/hr	· (%)	(%)
Aluminum	870,000	926	12,100	12.9	98.60	1.40
Antimony	33	0.035	0.39	0.0004	98.81	1.19
Arsenic	404	0.43	16	0.017	96.04	3.96
Barium	4,440	4.72	74	0.079	99.33	1.67
Beryllium	93	0.10	1.65	0.002	98.23	1.77
Cadmium	24	0.03	1.07	0.001	95.54	4.46
Calcium	161,000	172	1,777	1.9	98.90	1.10
Chromium	2,870	3.05	23	0.024	99.20	0.80
Cobalt	275	0.29	4.45	0.005	98.38	1.62
Copper	768	0.82	16	0.017	97.92	2.08
Iron	808,000	860	8,537	9.1	98.94	1.06
Lead	768	0.82	18	0.019	97.66	2.34
Magnesium	42,100	45	657	0.70	98.44	1.56
Manganese	2,120	2.3	34	0.036	98.39	1.61
Mercury	(1.33)*	0.01	0.13	0.0002	90.2	10.98
Molybdenum	315	0.34	8.09	0.009	97.43	2.57
Nickel	2,030	2.16	22	0.023	98.92	1.08
Phosphorus	2,070	2.20	100	0.11	95.17	4.83
Potassium	157,000	167	2,150	2.3	98.63	1.37
Selenium	133	0.14	82	0.087	38.35	61.65
Sodium	45,800	49	803	0.85	98.25	1.75
Strontium	2,906	3.09	43	0.046	98.52	1.48
Titanium	55,100	57	757	0.81	98.63	1.37
Vanadium	2,761	2.9	54	0.057	98.04	1.96

^{*} As discussed in Sections 6 and 7, the mercury concentration ESP inlet particulate sample appears to be high. The mercury concentration from the sluiced ash sample has been substituted here.

Notes:

- 1. Average inlet flow rate = 284,000 dscfm.
- 2. Average outlet flow rate = 284,000 dscfm.

Distribution of Metals According to Particle Size at the ESP Outlet

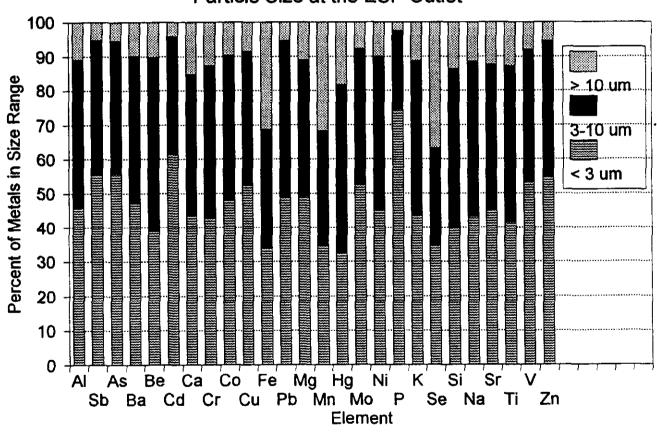


Figure 8-10 Distribution of Metals According to particle Size at the ESP Outlet

Further confusing this issue is the fact that particulate selenium also showed up on particles collected in the cyclones. The flow in the cyclones does not provide the intimate contact between the gas and collected particles that the filter does. However, it does appear that whatever phase shift occurring in Method 29 for selenium is also occurring in the cyclones.

Hopper Distribution

The concentrations of the metals in the hopper ash were also analyzed to determine if any insight could be obtained from this information relative to the performance of the ESP and HAPs. It has been hypothesized that if the metals were concentrated in the finer particles, which are more difficult to collect, then the downstream hopper might have a higher concentration of metals. The concentrations of metals in the particulate collected in the second hopper were divided by the concentrations from the first hopper to verify this hypothesis.

These data are plotted in Figure 8-11. As shown, the metals are distributed about a ratio of 1 with most metals increasing in the downstream hopper (ratio greater than 1). This supports the hypothesis of metals concentrating in the finer particles.

Another way to visualize the interplay between elemental concentration as a function of particle size and elemental enrichment produced by the ESP is to present concentration and enrichment together. Figure 8-12 does this. The vertical scale is enrichment of elements in the particulate material from the ESP inlet to the ESP outlet. The horizontal scale is the ratio of fine particle concentration to coarse particle concentration at the ESP inlet. Note that selenium has been left off the figure. Selenium's coordinates are (0.7, 12.09) which puts it in the far upper left corner of the plot. This implies that selenium is enriched in the ESP outlet particulate but not in the fine fraction of the ESP inlet ash. This result is probably biased by vapor-phase selenium precipitating or reacting on the Method 29 filter as previously discussed. However, the lower selenium concentration in the finer fractions of the ESP inlet ash was also unexpected given the volatile nature of selenium.

The figure shows, with the exception of selenium, a relatively smooth relationship between the two ratios. The plot demonstrates the concept that the elements, which at the ESP inlet have higher concentrations in fine particles than in coarse particles, becomes enriched at the ESP outlet in comparison with the ESP inlet.

Table 8-4 shows enrichment of inorganic elements in the different ash streams at Plant Yates. The factors were determined by dividing the concentration of an element in an ash stream by the coal ash concentration (concentration of an element in the coal divided by the ash fraction). These data generally show the trends expected with the more volatile elements exhibiting greater enrichment ratios in the ESP outlet than in the ESP inlet. (Chloride and fluoride show very little enrichment in the ash streams since the large majority of these elements are in the vapor phase.)

Of particular note is that most elements have significantly lower enrichment ratios in the stack particulate matter than in the ESP outlet ash. Using the major species' (aluminum,

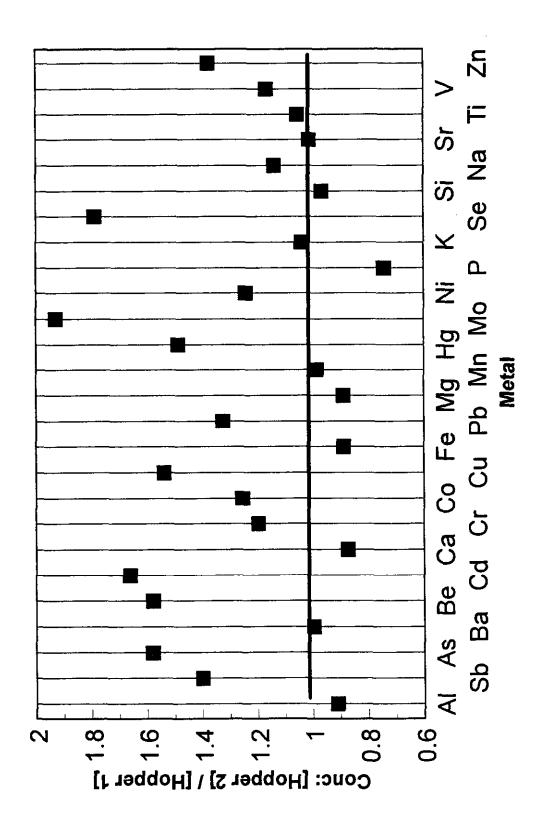


Figure 8-11 Total Metals Collection in Hopper

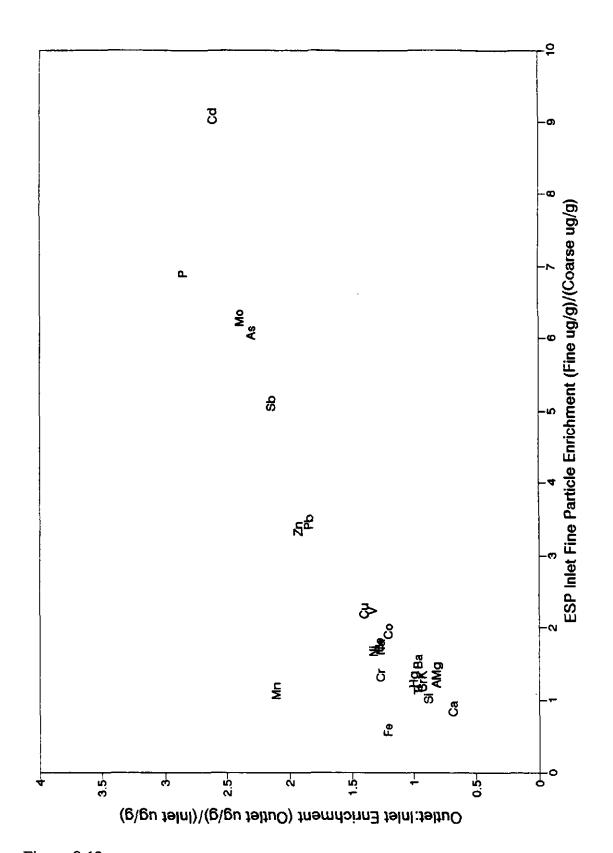


Figure 8-12 Elemental Relationship Between Outlet/Inlet Enrichment and Fine/Coarse Enrichment

Enrichment of Streams in Inorganic Elements Table 8-4

	Coal Ash	Bott	Bottom Ash ESP	ESP	ESP Inlet Ash	Sluk	Sluiced Ash	ESP 0	sh ESP Outlet Ash	Stack Parti	Stack Particulate Matter
Element	(8/8n)	(3/84)	Enrichment	(g/gn)	Enrichment	2/81	Σ	(g/g _m)	Enrichment	(8/Sn)	Enrichment
Aluminum	130,000	76,000	0.58	97,000		98,000		100,000	0.77	13,000	0.10
Antimony	5.50	1.1	0.21	3.6		3.4	_	2.7	0.50	3.8	69.0
Arsenic	21.0	7.2	0.34	45		19		120	5.57	81	3.86
Barium	720	460	0.63	490		200		620	98.0	210	0:30
Beryllium	9.91	7.7	0.77	10	1.05	=		7	1.41	m	0.30
Boron	906	280	0.31	A/N		470		Y/X	A/N	Y/Z	¥/X
Cadmium	2.7	0.32	0.12	2.7		4.1		8.9	3.30	41	15.17
Calcium	19,000	20,000	1.05	18,000		14,000		15,000	0.77	19,000	0.97
Chloride	11,200	130	0.01	089		20		317	0.03	15,000	1.34
Chromium	223	190	0.86	320		8		190	0.86	330	1.47
Cobalt	31.6	32	1.00	31		37		37	1.17	19	0.59
Copper	330	11	0.24	8		9		120	0.36	2 6	0.17
Fluoride	901	32	0.03	0.15		8		0.85	0.00	3.5	0.00
Iron	100,000	130,000	1.27	91,000		84,000		61,000	0.59	12,000	0.11
Lead	72	70	0.28	62		83		150	2.12	36	0.50
Magnesium	5,100	3,600	0.71	4,700		4,900		5,500	1.07	2,800	0.55
Manganese	210	270	1.28	240		250		240	1.15	490	2.31
Mercury	0.72	0.01	0.01	0.79		0.15		6.0	1.25	0.57	0.79
Molybdenum	200	3.04	0.01	35		7.24		58	0.29	73	0.36
Nickel	270	130	0.48	230		140		160	0.58	2,500	9.28
Phosphorus	760	400	0.52	230		89		830	1.09	110	0.14
Potassium	30,000	14,000	0.48	17,000		18,000		18,000	09:0	2,900	0.10
Sclenium	21	0.57	0.03	15		12		570	27.35	3,500	166.50
Sodium	5,700	3,600	9.0	5,100		5,100		6,700	1.18	1,900	0.34
Strontium	670	280	0.41	320		320		360	0.53	110	0.16
Titanium	8,100	2,600	69.0	6,100		6,300		5,400	0.67	910	0.11
Vanadium	350	280	0.78	310		330		380	1.07	110	0.32
Sulfate		1,590		8,900			3,450	30,000		410,000	

• Coal ash concentrations were calculated by using coal concentrations and dividing by the coal ash fraction.
• Denotes an element that is vaporized in the boiler and then condenses and may become enriched on fine particles. Cr & Ni do not always show enrichment.
• Denotes an element that is vaporized and can remain in the vapor phase. Selenium can either be enriched in the fine particles or be in the gas phase.
• The measured concentrations were below detection limit. Numbers shown are half of the detection limit.

iron, magnesium, potassium, sodium, and titanium) concentrations, it appears that only about 25% of the mass in the stack particulate was fly ash. The bulk of the mass (about 65%) can be attributed to sulfuric acid mist (based on the large increase in sulfate), while gypsum carryover accounts for about 5% and liquid chloride carryover accounts for about 3 percent. Note that these results indicate a flue gas SO₃ concentration of 1-2 ppm, which is in the same low range as that measured in the flue gas in the ESP (0.3 ppm).

Elements that show enrichment in the stack particulate matter (other than calcium [from gypsum] and chloride) are selenium, nickel, manganese, chromium, and cadmium. Problems with selenium have been discussed in this section. The nickel and chromium concentrations in the stack include one high concentration which does not appear to be consistent with other ash numbers. Their enrichment ratios become much more reasonable when these values are excluded. The reason for the apparent high manganese and cadmium enrichments is not known.

References

- 1. M. Durham, S. Tegtmeyer, K. Yasmundt, and L. Sparks. "A Microcomputer-Based Cascade-Impactor Data-Reduction System," Third Symposium on the Transfer and Utilization of Particulate Control Technology. EPA-600/9-82-005d, 285 (July 1982).
- 2. R.E. Bickelhaupt and J.E. Sparks. "An Improved Model for Predicting Fly Ash Resistivity." Proceedings: EPA/EPRI Sixth Symposium on the Transfer and Utilization of Particulate Control Technology, EPRI CS-4918, p. 11-1 (November 1986).
- 3. R.E. Bickelhaupt. "Fly Ash Resistivity Precision Improvement with Emphasis on Sulfur Trioxide." EPA-600/7-86-010, NTIS PB 86-178126 (1986).
- 4. D.B. Holstein, D.E. Rugg, and M.D. Durham. "Development of an ESP Model for Dry Scrubbing Applications." EPRI Ninth Particulate Control Symposium, Williamsburg, VA (1991).

MERCURY METHODS COMPARISON AND SPECIATION DETERMINATIONS

This section compares the results of two different methods used to determine the concentrations of total mercury and its various chemical forms in the flue gas streams. The objectives of the mercury sampling were to determine total mercury concentration and individual mercury species concentrations at each of the three flue gas sampling locations. These results will provide information on the emissions and control of mercury. In addition, the speciation results can be used to more accurately assess the possible health risks associated with mercury emissions.

Two different methods were used to measure mercury concentrations in the flue gas. The Bloom mercury speciation train was used to measure the concentrations of individual vapor-phase mercury species: ionic mercury and elemental mercury. Total mercury, including both particulate and vapor phases, was measured using the proposed EPA Method 29 multi-metals train. Although the Method 29 multi-metals train was designed to measure total concentrations of metals and not to provide speciation information, it may still provide some insight into the vapor-phase mercury species present.

Sample Collection and Analysis

This subsection describes the sampling and analytical methods used to measure mercury concentrations. The methods are described in detail in Appendix B, but the important features are discussed here. In addition, the sample collection schedule is presented.

Methods and Conditions

Bloom Speciation Train. The Bloom mercury speciation train was used to collect samples at the ESP inlet, the ESP outlet, and the stack. A quartz-lined probe was inserted into each duct, and flue gas was extracted non-isokinetically at a single point. The flue gas then passed through a series of four solid adsorbent cartridges which were used to trap the various vapor-phase mercury species. The cartridges were maintained at approximately 110°C in a heated jacket outside the duct. The first two cartridges contained KCl-impregnated soda lime, which is designed to capture ionic mercury species (Hg⁺² and Hg⁺). The third and fourth cartridges contained iodated carbon, which is designed to capture elemental mercury. A glass wool plug ahead of the adsorbent cartridges prevented particulate from entering the adsorbents. This plug was not analyzed, because the single-point, nonisokinetic sampling does not provide representative particulate capture. Only vapor-phase species were determined.

The KCl/soda lime traps were dissolved in acetic acid solutions. Ionic mercury was determined by aqueous-phase ethylation, purging onto a carbotrap, cryogenic GC separation, and detection with cold vapor atomic fluorescence spectrometry (CVAFS). This method was used to quantify methyl mercury (MMHg), as methylethyl mercury, however this technique was discovered to produce artifacts (see letter from Frontier Geosciences at the end of this section) due to a reaction during the dissolution of the KCl/soda lime traps. All data for methyl mercury derived using this method is considered in error and has been disregarded. Inorganic ionic mercury (Hg⁺²) was determined as diethyl mercury. Elemental mercury on iodated carbon traps was determined by digesting with a mixture of HNO₃/H₂SO₄ and BrCl, reducing with SnCl₂, purging and preconcentrating on gold, and detecting with CVAFS.

Several QA/QC procedures were used for the Bloom train. Field blanks were collected at each of the three sampling locations to assess the effects of contamination. A trip blank was also analyzed. Laboratory spikes were performed for each type of mercury species to assess analytical efficiency. In addition, the CVAFS instrument was calibrated using certified standards.

Method 29 Multi-Metals Train. The multi-metals trains were used to collect samples at the ESP inlet, the ESP outlet, and the stack. The trains used at the ESP outlet and stack were Method 5 trains, with particulate collected on a quartz filter maintained at constant temperature (approximately 250°F) outside of the duct. Because of the high particulate concentrations at the ESP inlet, a Method 17 train was used, with particulate collected in an in-situ quartz thimble. At all three locations, samples were collected isokinetically while traversing the duct according to Method 1.

The impinger trains, used to collect vapor-phase metals, were identically configured at each location. The first and second impingers contained a 5% $\rm HNO_3/10\%~H_2O_2$ solution. The third impinger was empty, to prevent any mist carryover. The fourth and fifth impingers contained a 10% $\rm H_2SO_4/4\%~KMnO_4$ solution.

Particulate samples were microwave-digested in HF/aqua regia solutions and analyzed for all target metals. Mercury concentrations were determined using cold vapor atomic absorption spectrometry (CVAAS). The HNO₃/H₂O₂ solutions were also analyzed for all target metals, with the mercury determined by CVAAS. The H₂SO₄/KMnO₄ solutions were analyzed only for mercury using CVAAS.

The multi-metals train may provide information on mercury speciation. Ionic forms of mercury are water-soluble and should be readily captured in the HNO_3/H_2O_2 solution. Elemental mercury, on the other hand, should pass through the HNO_3/H_2O_2 impingers, because the solubility of elemental mercury in aqueous solutions is very low and the H_2O_2 cannot efficiently oxidize it. The elemental mercury will be oxidized and captured in the $H_2SO_4/KMnO_4$ impingers.

Several QA/QC procedures were followed for the multi-metals trains. Field blanks, reagent blanks, and method blanks were analyzed to assess the effects of contamination. Matrix-spiked and matrix-spiked duplicate samples were analyzed to assess recovery and precision.

The CVAAS instruments were calibrated using certified standards, and calibration checks were routinely performed.

Samples Collected

Figure 3-2 shows the collection schedule for the Bloom train and multi-metals train samples. Three samples were collected for each train type at each of the three sampling locations. Gas sample volumes were approximately 0.1 Nm³ for the Bloom train and 3 Nm³ for the multi-metals train. Field data sheet summaries are included in Appendix C.

Data Analysis

Table 9-1 shows the mercury concentrations measured with the Bloom train and the Method 29 multi-metals train. The total vapor-phase mercury concentrations measured using the two techniques are in good agreement. Using the mean multi-metals train results, it appears that approximately 99% of the particulate-phase mercury is removed by the ESP, and the removal of total mercury by the scrubber is approximately 46%.

The speciation results from the two methods show similar trends. Ionic mercury is the predominant species in the ESP inlet and ESP outlet gas streams, but the ionic mercury is more efficiently removed by the scrubber, as shown by its markedly lower concentrations at the stack. The removal of ionic mercury by the scrubber can be attributed to a higher solubility in water as compared to elemental mercury.

While the overall trends in the two methods are similar, the detailed speciation results do not appear equivalent. In particular, the levels of elemental mercury measured by the two techniques do not agree well at any of the three locations, and the agreement is poor between the two techniques for ionic mercury concentrations at the stack.

Table 9-2 shows the mercury concentrations found in the blank samples and their significance relative to the actual sample concentrations. Blank contamination does not appear to be significant. Table 9-3 summarized the spike recoveries for the two techniques. All of the recoveries were within the acceptable range of 75 to 125 percent.

While the QA/QC results for the two techniques indicate acceptable quality, they only address the issues of contamination and analytical accuracy. The issue of species conversion during sampling has not been addressed. Therefore, while each method can be considered to give reliable results for the total concentration of vapor-phase mercury, less confidence can be placed in the speciation results. The possibility of conversion of one species to another within the sampling equipment or in the sampling media make it less certain that the species were actually present in the flue gas at the measured levels.

Table 9-1
Mercury Concentrations in Flue Gas

Concentrations, µg/Nm³ % of Component Run 1 Run 2 Mean 95% CI Location Run 3 Vapor Bloom Hg Speciation Train 4.5 3.8 5.0 4.4 1.5 **ESP Inlet** 69 Ionic Hg Elemental Hg 2.4 2.4 1.2 2.0 1.7 31 Total Vapor 6.9 6.2 6.2 6.4 1.0 **ESP** Outlet Ionic Hg 5.8 4.6 4.0 4.8 2.3 66 2.5 2.6 2.4 2.5 Elemental Hg 0.2 34 Total Vapor 8.3 7.2 6.4 7.3 2.4 0.38 0.51 0.63 0.47 0.33 15 Stack Ionic Hg Elemental Hg 3.0 3.1 2.3 2.8 1.1 85 0.9 Total Vapor 3.4 3.6 2.9 3.3 Method 29 Multi-Metals Train **ESP Inlet** Ionic Hgb 4.6 4.9 5.7 5.1 1.5 94 0.51 0.31 0.23 0.35 0.36 Elemental Hg^e 6 Total Vapor 5.1 5.3 6.0 5.4 1.2 5.2 7.1 5.6 Solid 9.6 6.4 10.3 14.8 Total Vapor + Solid 12.4 12.5 5.6 **ESP Outlet** 4.8 4.1 4.9 4.6 1.1 82 Ionic Hg Elemental Hg 1.2 1.1 0.65 0.98 0.73 18 6.0 5.2 5.5 5.6 Total Vapor 1.1 Solid 0.11 0.14 0.04 0.12 0.13 Total Vapor + Solid 6.1 5.3 5.7 5.7 1.1 Stack Ionic Hg 1.1 1.5 1.9 1.5 0.9 50 Elemental Hg 1.8 1.6 1.2 1.5 0.7 **5**0 Total Vapor 2.9 3.1 3.1 3.0 0.3 < 0.0050 0.0116 < 0.0051 0.0056 0.013 Solid Total Vapor + Solid 0.3 2.9 3.1 3.1 3.0

Although MMHg values were originally reported by Frontier Geosciences, a letter from Frontier Geosciences was issued on January 26, 1994 stating, in part, "... we now know that the MMHg we were measuring and reporting is due to an artifact. [this method] ... overestimates the amount of MMHg. The MMHg fraction should tentatively be considered as part of the Hg(II) fraction of the total Hg in flue gas until our ongoing investigations are completed." These investigations are still in progress and, until they are completed, the presence or absence of MMHg in the flue gas cannot be confirmed.

b Mercury collected in the HNO₃/H₂O₂ impingers.

^c Mercury collected in the H₂SO₄/KMnO₄ impingers.

Table 9-2 Summary of Blank Results

Blank Sample Type	No. of Blanks	Range of Blank Levels	Max Contribution to Samples*
Bloom Train			
Ionic Hg			
Field Blanks	6	0.3-0.6 ng	4%
Trip Blanks	2	0.5-0.8 ng	4%
Elemental Hg			
Field Blanks	6	1.3-4.6 ng	4%
Trip Blanks	2	1.1-3.7 ng	3%
Method 29 Multi-Metals Train			
HNO ₃ /H ₂ O ₂ Impingers			
Field Blanks	3	<0.24 μg/L	<5%
Reagent Blanks	1	<0.24 μg/L	<5%
H ₂ SO ₄ /KMnO ₄ Impingers			
Field Blanks	3	<0.24 μg/L	<28%
Reagent Blanks	1	$< 0.24 \mu g/L$	<28%

^{*} Maximum blank value as a percentage of the minimum sample result.

Mercury Methods Comparison and Speciation Determinations

Table 9-3 Summary of Spike and Audit Sample Recoveries

Sample Type	No. of Samples	Range of Recoveries
Bloom Train		
Ionic Hg	2	102 - 103 %
Elemental Hg	2	100 - 102%
Method 29 Multi-Metals Train		
HNO ₃ /H ₂ O ₂ Impingers	2	120%
H ₂ SO ₄ /KMnO ₄ Impingers	2	76 - 78%

The Bloom train is a technique that is still being developed.² Extensive work has been done to improve the capture efficiency of the traps, to increase the analytical efficiency, and to minimize the chance for species conversion. There are no studies that would conclusively demonstrate the validity of the method, such as the spiking of specific mercury compounds into the flue gas ahead of the sampling train. Therefore, the method can be considered unproven.

There is no published information regarding the ability of the multi-metals train to provide mercury speciation information from utility stack gases. The interpretation of the results thus far relies solely on chemical theory. In addition, the extent of species conversion within the train is unknown.

References

- 1. Nicolas S. Bloom, Eric M. Prestbo, and Vesna L. Miklavicic, "Fluegas Mercury Emissions and Speciations from Fossil Fuel Combustion." Published in the proceedings of the Second International Conference on Managing Hazardous Air Pollutants (sponsored by the Electric Power Research Institute) Washington, D.C. (July 1993).
- 2. Ibid.



Discovery of Methyl Mercury Artifact in the Solid Sorbent Speciation (S ³) method for Coal Combustion Fluegas

We have stated in both reports and presentations (Prestbo and Bloom, 1993, Bloom et al., 1993) that monomethyl mercury (MMHg) can be measured and is found in coal combustion flue gas in the range of 5-15% of the total Hg. Because of very recent experiments we have completed in the laboratory, we now know that the MMHg we were measuring and reporting is due to an artifact. Only through painstaking laboratory work were we able to discover the unusual chemical reactions which produce MMHg in solution. We discovered that Hg(II) and S(IV) collected on the KCl/soda lime sorbent, when digested in 10% acetic acid solution will form MMHg on the high pH surface of the dissolving soda lime. The likely mechanism leading to this can be found (in retrospect) in a paper by Lee and Rochelle (1987). This finding was quite surprising considering that SO₂ is known to be a reducing and not an oxidizing compound. The MMHg forms due to the release of methyl groups during the degradation of acetic acid in conjunction with the oxidation of SO₃=.

What we can state convincingly is that all previous flue gas data generated by our laboratory overestimates the amount of MMHg. The MMHg fraction should tentatively be considered as part of the Hg(II) fraction of the total Hg in fluegas until our ongoing investigations are completed. It should also be clearly stated that although the MMHg values are no longer valid, this is not true for Hg(II), Hg^O and especially total Hg. Further, please refrain from stating that MMHg is not present in fluegas until we have a chance to complete some field site studies using a refined methodology.

We are actively pursuing the problem encountered. Initially we will investigate non-methyl containing solutions (i.e. citric acid) for dissolving KCl/soda lime to avoid the artifact. Secondly, we will use several other means of collecting flue gas, including unique impinger solutions to more conclusively determine the presence or absence of MMHg in combustion flue gas.

As you know, speciation of trace metals, and especially mercury is difficult in any matrix. We regret that previous MMHg fluegas data was in error. We will continue to communicate to you any of our new findings as we have with this one.

Please don't hesitate to call us if you have any questions or need further clarification on this issue.

References

Bloom N.S., Prestbo E.M. and Miklavcic V.L. (1993) "Fluegas mercury emissions and speciation from fossil fuel combustion", presented at Conference on Managing Air Toxics: State of the Art, Washington D.C. July 13-15 (withdrawn from publication).

Lee Y.J. and Rochelle G.T. (1987) "Oxidative degradation of organic acid conjugated with sulfite oxidation in flue gas desulfurization: products, kinetics, and mechanism", Env. Sci. and Technol., 21:266.

Prestbo E.M. and Bloom N.S. (1993) "Recent advances in the measurement of mercury species in combustion flue gas using solid phase adsorption and cold vapor atomic fluorescence spectroscopy (CVAFS)", Presented at the AWMA 86th Annual Meeting, June 13-18, (93-TA-32.05).

10

HEXAVALENT CHROMIUM DETERMINATIONS

Introduction

The stack gas at Plant Yates was sampled for the presence of hexavalent chromium and total chromium. Hexavalent chromium samples were analyzed on site at Plant Yates in order to provide results as quickly as possible. Radian's experience has shown that hexavalent chromium is unstable and is reduced to trivalent chromium quite rapidly during the first 24 hours after sample collection. Appropriate blanks were analyzed to minimize the possibility that any contamination would go undetected.

Sample Collection and Analysis

Hexavalent chromium samples were collected on June 25, 26, and 27, 1993. Samples were collected and analyzed using EPA's recirculating caustic solution method.¹ This method uses a recirculating probe system that mixes the total gas sample (vapor and particulate) with the caustic impinger solution immediately after the sample nozzle. This provides a high pH environment to minimize the reduction of Cr⁶⁺. Analysis was performed on site using an ion chromatograph. However, instrument problems were encountered and no useful data could be obtained.

As a result, the samples were returned to Radian's laboratory in Austin and analyzed for hexavalent chromium as well as total chromium. In addition, QA/QC samples were analyzed as follows:

- One matrix spike;
- One performance audit sample;
- Three field blanks: and
- One trip blank (total chromium only).

Although the hexavalent sample collection method was used as specified in the published method, it should be noted that the collection procedure for obtaining Cr⁶⁺ samples from a flue gas matrix containing SO₂ has not been validated.

Data Analysis

As shown in Table 10-1, hexavalent chromium and total chromium were nondetectable in the samples collected after appropriate blank correction had been applied.

Table 10-1
Results for Hexavalent Chromium and Total Chromium

Specie	Units	Run 1	Run 2	Run 3	Average
Chromium VI	μ g/Nm ³	<0.18C	<0.19C	<0.20C	< 0.190
Total Chromium	μ g/Nm ³	< 0.52C	<0.57C	<0.59C	< 0.560

C = Data flag; value was blank-corrected below the detection limit.

Experience has shown that measurement of hexavalent chromium can be very difficult in electric utility flue gas. A brief discussion of the technical implications of determination of chromium (VI) in stack gas and, in particular, in combustion sources and utility sources is included here.

The Cr(VI) method depends on the solubility and stability of chromium (VI) in basic aqueous solution. The method calls for the use of a strong base in a solution contained in the impingers and recycled to the probe tip for early gas contact and flushing to the probe walls. The method is theoretically sound but has some limitations when applied to combustion sources in general and utility flue gases specifically.

As mentioned above, Cr(VI) is stable in a strong alkaline solution (pH > -9). But all combustion gas streams contain large amounts of CO_2 (10-20%), which is an acid gas, and serves to lower the pH of the impinger solution. As a result, the pH may dip lower than desirable during sampling, or the solution must be more alkaline then specified in the method or continually monitored. As a further complication, utility flue gas contains significant levels of SO_2 (100 ppm or more). SO_2 is also an acid gas but is a reductant as well. So the impinger solution designed to absorb Cr(VI) also absorbs CO_2 and SO_2 . The result of this is a lowered pH and a solution which contains an oxidant [Cr(VI)] and a reductant (SO_2/HSO_3^-) . As the pH falls, the redox couple becomes more favorable, and any Cr(VI) present may be reduced by SO_2/HSO_3^- and not detected as Cr(VI).

References

1. 40 CFR 266, Subpart H, Appendix IX, "Methods Manual for Compliance with the BIF Regulations," Section 3.0, "Sampling and Analytical Methods," Subsection 3.2, "Determination of Hexavalent Chromium Emissions from Stationary Sources (Method Cr⁶⁺)," 7-1-91 edition.

DETERMINATIONS OF TOXICS ON PARTICLE SURFACES

The Clean Air Act Amendments of 1990 (CAAA) require that emissions of hazardous air pollutants (HAPs) from coal-fired power plants be evaluated for potential health risks. The 189 hazardous substances listed in the CAAA include numerous inorganic and organic species that remain volatile under the conditions present in flue gas emission control systems at coal-fired power plants. As the flue gas cools downstream of these control devices and is released into the atmosphere, it is hypothesized that many of these substances condense on the surface of the fine particulate matter not removed by the control device.

Fine-particulate emissions in the respirable size range of less than 10 microns are of particular interest in assessing health risks. The environmental and toxicological impacts resulting from these emissions are typically estimated on a "worst case" basis where the total composition of the emitted particles is considered available to biological and ecological systems. The condensed metal species found predominantly on the surface of fly ash particles are more accessible to the environment than those species trapped in the aluminasilica fly ash matrix. More appropriately, the leachability of these toxic substances and their availability relative to the total composition should be considered when assessing the health risks associated with particulate-borne HAPs.

Radian Corporation, under contract with the United States Department of Energy (DOE Contract No. DE-AC22-92PC90367), is conducting a separate test program to collect and analyze size-fractionated stack gas particulate samples for numerous inorganic HAPs. Specific goals of the program include collecting gram quantities of size-fractionated stack gas particulate matter (after a wet scrubber) and determining the relationship between particle size, bulk composition, and extractable (surface-leachable) composition.

At Plant Yates, extractable metal concentrations were determined on bulk, rather than size-fractionated samples of flue gas particulate matter. But in addition to sampling the gas from the JBR-FGD system, samples were also collected from the ESP inlet and outlet. From the data collected, the relationship between extractable metal emissions from both wet and dry particulate control devices is possible.

This section compares the analytical results for bulk composition and surface leachability of metals in flue gas particulate samples collected from the inlet and outlet of the ESP and from the outlet of the JBR-FGD system. Metal concentrations are reported for arsenic, barium, beryllium, cadmium, chromium, copper, cobalt, lead, manganese, molybdenum, nickel, selenium, and vanadium.

Sample Collection and Analysis

The difficulty in characterizing surface species is that there are currently no standard, certified methods documented for determining the leachability of metals from the surface of micron-sized particles. In a previous study, several leaching agents and analytical techniques were applied to standard reference fly ash samples for evaluation; three were selected for use on the entrained fly ash samples collected during this project. The techniques selected for characterizing surface availability involve acid leaching and digestion of the particulate samples followed by inductively coupled plasma-mass spectrometry (ICP-MS) analysis. For comparison, the total composition was derived from the metals analysis of the size-fractionated particulate matter at the ESP inlet and outlet, and from the analysis of the stack gas multimetals train filter samples.

Sample Collection

Sample collection at the ESP inlet was performed according to EPA Reference Method 17¹ (in-stack filtration). Quartz-fiber thimble filters were specified to handle the high particulate mass loading encountered upstream of the ESP and to reduce the background levels of trace elements associated with glass-fiber filters. To avoid introducing filter media into the sample and providing blank analyses for background corrections, sample material was recovered directly from the thimble filters and prepared for analysis.

EPA Reference Method 5² was used to collect particulate matter from the ESP outlet and stack gas streams. Quartz-fiber filters were also specified; however, due to mis-identification, glass-fiber filters were inadvertently used on all extractable metals test runs at the ESP outlet and on Runs 1 and 3 at the stack location. Enough sample mass was collected on the ESP outlet filters to permit ash sample separation from the filter media; however, the small sample mass collected on the stack gas filters precluded this separation.

Sample Preparation and Analysis

Sample material recovered from the filters was split in 0.1 gram portions and prepared by the techniques described in Figure 11-1. Stack gas filters were split into three roughly equal fractions and weighed to determine each segment's percentage of the total filter mass. The particulate sample mass on each fraction was determined by multiplying this percentage by the filter weight gain representing the total sample mass. Uniform distribution of the sample mass and the mass of the filter media is assumed. Glass-fiber filter blanks were not prepared for analysis; however, a blank quartz-fiber filter was prepared and analyzed to assess the background levels of extractable metals specific to the quartz-fiber media.

An overview of the sample preparation and analysis techniques selected for the size-fractionated particulate samples is presented in Figure 11-1. Analysis of nitric acid digestates was used to represent the highest degree of surface availability for metals not bound in the alumina-silica fly ash matrix. A simulated gastric fluid and an acetic acid buffer solution were selected to extract metals representative of ingestion and ground water leaching mechanisms, respectively. ICP-MS was selected as the analytical technique over atomic

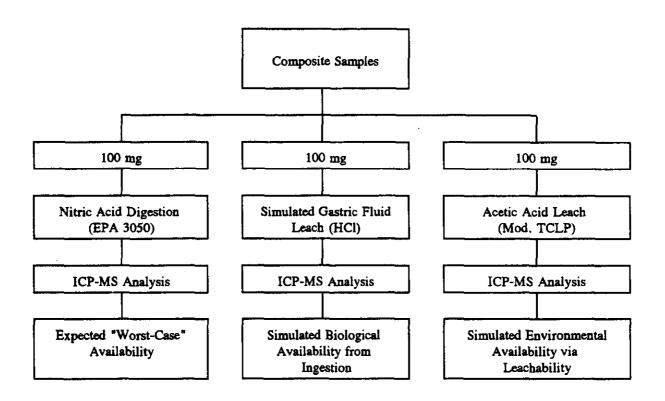


Figure 11-1
Gas Particulate Sample Preparation and Analysis Plan for Extractable Metals

emission and graphite furnace-atomic absorption spectrophotometry since these spectrophotometric techniques failed to provide the sensitivity required to accurately detect the target elements in the low concentration ranges expected.

Total Composition. Total composition analyses were performed on both the size-fraction-ated particulate samples, and on the filtered particulate matter collected with the multi-metals sampling train. Reported sample results were generated by ICP-AES and GFAA analyses in most cases; ICP-MS results were selected where elemental concentrations were below ICP-AES and GFAA detection limits. High background corrections, attributed to the inadvertent use of glass-fiber filters in some of the multi-metals trains invalidated many trace element results.

Therefore, the total composition of the fly ash collected from the ESP inlet and outlet ducts is represented by a composite of the size-fractionated particulate results. This substitution provided triplicate values for determining the average bulk composition for all trace elements. The resulting averages were biased universally low in these cases, so composition data from the multi-metals trains was not used. The exception is at the stack where two of the three filters used in the multi-metals train were quartz fiber, and no other metals composition data were available. The mass collected in each size fraction was determined relative to the sum, and then factored into the sum of the trace element concentrations. As a confirmation of the validity of this approach, the relative percent difference between the calculated values and the results obtained for fly ash collected from quartz-fiber filters was less than 30% for all elements except antimony, and selenium.

Nitric Acid Digestion. The strongest, most aggressive sample leaching technique performed on each particulate sample was a nitric acid digestion using EPA Method 3050. This procedure refluxes the sample in concentrated nitric acid and hydrogen peroxide. Metals present on the surface of the particle and those that may be loosely bound in the particle's matrix are digested. This technique does not totally digest the alumina-silica ash matrix and therefore may not account for some metals detected by total composition techniques.

All particulate samples were prepared by this method. Samples were digested, filtered through a 0.45 micron nitrocellulose membrane filter, and brought to a 100 mL final volume. Prior to analysis by ICP-MS, 1:20 dilutions were made to bring the sample into the linear range of the mass detector. To assess potential matrix interferences, one of the samples was selected as the source for a matrix spike. The sample selected was split to provide a sample for spiking, and the remaining sample was identified for duplicate analysis. The spike was prepared using a SPEX® multi-element ICP-MS calibration solution. Spike levels in the analyzed digestate were 50 ppb for all elements except molybdenum, which was not present in the calibration solution. This spiking level was based on previous results obtained from this procedure applied to standard reference fly ash samples.

Simulated Gastric Fluid Leach. Simulated gastric fluid is a solution of 85 mM hydrochloric acid, the enzyme pepsin, and sodium chloride. The pH of this solution is approximately 1.2. The leachability of metals in this matrix has a toxicological implication since some fly ash particles trapped in the mucous lining of the upper respiratory tract may be swallowed.

The dissolution of fly ash in gastric fluid represents a likely ingestion mechanism for toxic metals into the body.

Particulate samples were placed in a covered beaker with 10 mL of the gastric fluid solution and stirred mechanically for a minimum of 18 hours at room temperature. Using the same recovery procedure as the nitric acid digestates, the leachate was filtered and brought to a 100 mL final volume with DI water. Undiluted aliquots were analyzed by ICP-MS. In addition, a matrix spike was prepared, and the sample selected for spiking was identified for duplicate analysis. Gastric fluid matrix spikes were also prepared using the SPEX® ICP-MS calibrating solution and were prepared at 69 ppb for each of the target analytes except molybdenum. This spiking level was based on previous results obtained from this procedure applied to standard reference fly ash samples.

Because chloride ions pose adverse matrix effects for a number of the target elements analyzed by ICP-MS, calibration standards were prepared from the gastric fluid matrix to provide calibration curves with the same potential bias present in the samples. Arsenic is one of the key elements that is susceptible to mass detection interferences. Argon and chlorine, with atomic weights of 39.95 and 35.45, respectively, tend to form the polyatomic ArCl⁺ ion with a mass of 75.4 amu. The high chloride levels in the gastric fluid, coupled with argon plasma source, generate a signal from ArCl⁺ that can overwhelm the arsenic signal at 74.9 amu.

Acetic Acid Leach. The weakest of the three leaching solutions is an acetic acid solution prepared according to the EPA's Toxicity Characteristic Leaching Procedure³ (TCLP). The TCLP is the regulatory standard procedure used to determine the hazardous nature of solid wastes. The protocol requires leaching of the solid waste in a buffered acetic acid solution that is maintained at a pH of 4.93 throughout the test. The metal concentrations determined in the acetic acid leachate are compared to regulatory standards to determine whether the material is classified as hazardous or nonhazardous.

The TCLP is designed for leaching sample quantities much larger than 100 mg, and to scale down the volumes specified in the method to accommodate the small quantity of particulate sample available was impracticable. Alternatively, 100 mg particulate samples were placed in a covered beaker with 10 mL of the buffered acetic acid solution (pH 4.93) and stirred for a minimum of 18 hours at room temperature. During this time, no additional pH adjustments were made to the acetic acid solution. Sample recovery and spiking were performed in the same manner as the gastric fluid leaching. The digestate was filtered and diluted to a 100 mL final volume before analysis by ICP-MS, and the same matrix spike and duplicate analysis scheme was used. The 69 ppb spiking level was also based on previous results obtained from this procedure when applied to standard reference fly ash samples.

Data Analysis

ESP Fly Ash

The extractability of metals from the surface of fly ash and flue gas particulate matter relates to a combination of factors. Metal solubility, particle surface area, surface concentration, or other matrix effects can influence the leachability of metals from particles. Increasing extractability was generally observed along the flue gas path, and the relationship between surface area, particle size, and surface concentration is considered influential.

For example, the analytical results for the various fly ash samples collected around the ESP all indicate differences in metal concentration as a function of particle size. Specifically, that enrichment of many trace elements increases as particle size decreases. This is evident from the evaluation of size-fractionated particulate samples collected from the ESP inlet and outlet flue gas (Section 8.0). An analysis of the fly ash collected from the first and second ESP fields also indicates this relationship between increasing trace element concentration and decreasing particle size. Trace element enrichment was more prominent in particles collected from the second (downstream) ESP field where the mean particle diameter was < 10 microns, compared to 30 microns in the first field.

Since the samples collected for extraction were filtered, and not size-fractionated, the mean particle diameter of the samples is an important consideration. It is reasonable to expect higher extractable concentrations at the ESP outlet compared to the inlet, based solely on the reduction in the mean particle diameter across the ESP. The increased surface area associated with an equivalent sample mass exposes more material to the leaching solutions. Barium and vanadium are two elements whose total fly ash concentrations remained relatively constant across the ESP. But due to the smaller mean particle diameter of the ESP outlet sample, the extractable percentage by nitric acid digestion jumped from 39-59% for barium and from 35-61% for vanadium.

All of the remaining trace elements had higher bulk concentrations in the ESP outlet samples when compared to the ESP inlet. In this case, the increase in concentration and surface area exposure should produce an increase in the extractable percentage. Except for antimony, manganese, molybdenum, and mercury, this was true for all of the trace elements. Arsenic and selenium, when detected, showed little change. Tables 11-1 and 11-2 present the extractable metal concentrations of the ESP inlet and outlet fly ash, respectively. The total trace element concentration derived from size-fractionated particulate results is also presented along with the extractable percentage under each leaching condition.

Surface availability may be estimated from the extractable percentages between elements in samples from the same stream. Elements exhibiting the highest degree of extractability are likely to be surface oriented, unbound in the particle matrix, or in a form readily dissolved by the leaching agent. However, an analytical bias in the results for any given element may also manifest itself as high (or low) extractability.

Table 11-1 Extractable Composition of ESP Inlet Gas Particulate Matter

Trace	Total Composition	Nitric Acid Digestion (EPA SW 3050)		Simulated Gastric Fluid Leach		Acetic Acid Leach (TCLP)	
Elements	(μg/g)	(μ g /g)	(% Extracted)	(μ g/g)	(% Extracted)	(μ g /g)	(% Extracted)
Antimony	3.18	2.68	84.3	0.709	22.3	0.798	25.1
Arsenic	44.8	42.6	95.1	< 0.678	<1.5	1.02	2.3
Barium	5 60	220	39.2	103	18.4	48.1	8.6
Beryllium	11.2	4.11	36.7	1.14	10.2	0.322	2.9
Cadmium	3.45	2.22	64.5	1.82	52.9	1.65	47.9
Chromium	197	29.0	14.7	27.5	14.0	7.37	3.7
Cobalt	36.5	5.03	13.8	1.80	4.9	1.48	4.0
Copper	108	32.1	29.8	9.96	9.2	10.9	10.2
Lead	76.4	39.3	51.4	9.37	12.3	0.205	0.3
Manganese	236	120	51.1	60.0	25.5	51.4	21.8
Molybdenum	28.5	42.9	151	29.3	103	1.45	5.1
Nickel	134	45.1	33.8	10.3	7.7	8.64	6.5
Selenium	8.51	<23.3	<274	< 0.884	< 10.4	0.221	2.6
Vanadium	421	146	34.6	< 0.359	< 0.1	1.46	0.3

Table 11-2 Extractable Composition of ESP Outlet Gas Particulate Matter

Trace	Total Composition		Acid Digestion Simulated A SW 3050) Gastric Fluid Leach		Acetic Acid Leach (TCLP)		
Elements	(μg/g)	(μg/g)	(% Extracted)	(μg/g)	(% Extracted)	(μg/g)	(% Extracted)
Antimony	6.79	3.21	47.4	0.954	14.1	0.875	12.9
Arsenic	103	98.4	95.4	< 0.660	< 0.6	3.38	3.3
Barium	54 0	318	58.8	125	23.2	44.1	8.2
Beryllium	13.7	5.43	39.6	2.72	19.8	0.981	7.1
Cadmium	9.23	9.79	106	5.86	63.5	9.57	104
Chromium	248	64.3	25.9	54.3	21.8	19.5	7.8
Cobalt	44.3	16.9	38.3	5.47	12.3	6.02	13.6
Copper	152	98.5	64.9	33.5	22.1	17.9	11.8
Lead	141	116	82.3	32.9	23.4	1.50	1.1
Manganese	497	165	33.1	46.2	9.3	39.3	7.9
Molybdenum	69.1	72.2	105	61.4	88.9	4.43	6.4
Nickel	177	83.8	47.5	38.4	21.7	22.7	12.8
Selenium	101	<23.3	<23.1	18.1	18.0	4.07	4.0
Vanadium	448	272	60.7	122	27.3	4.68	1.0

Table 11-3 ranks the overall extractability of the target elements from fly ash in order from highest to lowest using the percent extractable results from all three leaching techniques. Elements with matrix spike recovery results outside the data quality objective range of 75-125% are identified, and as stated previously, may bias the relative extractability information.

To assess the accuracy of the extractable concentration data, matrix spikes were performed for each leachate matrix as indicators of analytical bias. A complete table of matrix spike recoveries for each of the leachate matrices is presented in Table D-2 of Appendix D. Based on the poor matrix spike and blank spike recoveries, mercury results were invalidated. QC sample results for arsenic in the gastric fluid leachates illustrate the difficulty of arsenic analysis by ICP-MS in a high chloride matrix. Molybdenum and antimony were not included in the spiking solution. Consequently, no spike recovery information is available for qualifying the accuracy of their results.

In addition to matrix spike recovery results, additional factors influencing the extractability data include bias in the bulk composition results. For example, the extractable concentrations of molybdenum reported for nitric acid and gastric fluid is above 100 percent. This element may indeed be 100% extractable from the particle surfaces or there could be an analytical bias in the total composition.

Stack Gas Particulate Matter

Particulate emissions from the FGD system were also characterized using extractability percentages to relate particle size, surface area, and surface concentration of the target elements. However, there are additional mechanisms to consider with the potential for scrubber mist carryover, (i.e., salts) and the leachability of the gas-borne particulate matter through the wet FGD system. With an average FGD slurry pH of 4.5, the JBR provides a mechanism for leaching some elements from the incoming fly ash. A shift in mean particle diameter is also observed as the larger sized particles are trapped in the scrubber.

Table 11-4 presents the extractable metal concentrations, the trace element concentration derived from multi-metals train results for test Runs 2 and 3 (quartz filters used), and the extractable percentage under each leaching condition. Only the results from extractable metals test Run 2 were selected for reporting the stack concentrations since glass-fiber filters were inadvertently used to collect particulate matter from the stack gas during test Runs 1 and 3. Data for the omitted test runs are reported in the Appendix.

Several metals were detected in the leachates at concentrations higher than the equivalent total composition value. Metals extracted by nitric acid digestion at percentages greater than 120% of the bulk composition include: beryllium, vanadium, lead, copper, arsenic, barium, and cadmium. Extractable percentages greater than 120% by gastric fluid leaching are reported for lead and beryllium. Clearly a bias exists in the analysis of either the stack gas particulate matter collected by the multi-metals train, the single Run 2 sample for extractable metals, or both.

Table 11-3
Extractability of Elements in Fly Ash*

Extractability (Highest - Lowest)	Average % Extractable	Average Matrix Spike Recovery	Spike Recovery Range
Molybdenum	76%	Not Available	Not Available
Cadmium	73%	96.2%	107% - 88%
Antimony	34%	Not Available	Not Available ^c
Arsenic ^b	33%	80.5%	123% - 0%b
Selenium ^b	30%	117%	138% - 84%
Lead	29%	87.7%	97% - 83%
Barium	26%	89.7%	94% - 85%
Manganese ^b	25%	88.8%	108% - 71% ^b
Copper	25%	98.8%	105% - 92%
Nickel	22 %	95.3%	103% - 81%
Beryllium	19%	93.1%	108% - 79%
Vanadium ^b	19%	71.0% ^b	109% - 0%b
Chromium	15%	97.6%	106% - 88%
Cobalt	15%	97.7%	100% - 92%

^{*} Results consider average extractability of elements from fly ash samples collected from the flue gas at the inlet and outlet of the ESP.

^b Indicates that the spike recovery result obtained is outside the data quality objective range of 75-125 percent. The ranking of these elements may be biased by analytical results indicating higher or lower extractable percentages.

^e Antimony and molybdenum were not present in the SPEX[®] ICP-MS calibration solution used to prepare matrix spikes. No spike recovery information is available to determine the relative accuracy of these results. Consequently, the extractable percentages for these elements could be affected by analytical bias.

Table 11-4
Extractable Composition of Stack Gas Particulate Matter

Trace	Total Composition		Acid Digestion SW 3050)		Simulated ic Fluid Leach		: Acid Leach (TCLP)
Elements	(μg/g)	(μ g /g)	(% Extracted)	(μ g /g)	(% Extracted)	(μ g / g)	(% Extracted)
Antimony	31.5	5.78	18.4	3.37	10.7	< 0.034	< 0.1
Arsenic	81.1	164	202	< 2.46	<3.0	< 0.497	< 0.6
Barium	214	354	165	214	100	17.2	8.0
Beryllium	2.94	10.2	349	4.20	143	2.91	98.9
Cadmium	41.4	67.0	162	12.4	29.9	5.92	14.3
Chromium	329	43.8	13.3	84.7	25.7	36.4	11.1
Cobalt	18.1	< 0.899	<5.0	10.9	60.4	7.47	41.3
Copper	55.8	124	222	51.3	91.9	63.8	114
Lead	35.7	90.8	254	65.8	184	20.0	56.1
Manganese	488	328	67.2	349	71.5	470	96.3
Molybdenum	100	51.4	51.4	48.6	48.6	3.45	3.5
Nickel	2509	392	15.6	169	6.7	66.2	2.6
Selenium	899	< 86.9	<9.7	140	15.6	61.2	6.8
Vanadium	122	385	315	<1.30	<1.1	< 0.185	< 0.2

Results for matrix spikes performed on the extractable metals sample collected at the ESP inlet and the multi-metals train samples are presented in Table D-2 of Appendix D. Since no QC activities were performed specific to the extractable metals Run 2 sample, data quality can only be estimated from relevant matrix and analytical spike data. In addition, the selection of only one sample result for comparison provides a high degree of uncertainty with these results.

Elements that were found in the stack gas particulate matter at concentrations greater than the ESP outlet (FGD inlet) gas are: antimony, cadmium, chromium, molybdenum, nickel, and selenium. Lower concentrations are noted for arsenic, barium, beryllium, cobalt, copper, lead, and vanadium. The concentration of manganese remained relatively constant across the FGD system.

The reduction in elemental concentrations, in spite of the reduction in mean particle diameter, across the JBR suggests that some elements may be leached from the fly ash by the FGD slurry. Some dilution of the fly ash by FGD solids low in certain trace elements may also be occurring; however, a comparison between calcium concentrations in the gas particulate-phase samples across the JBR system revealed only a slight, and statistically insignificant, increase in calcium concentration.

A comparison of trace metal concentrations between limestone slurry and JBR slurry filtrates suggests that the slurry is leaching trace elements from the fly ash. Enrichment is observed (in order of highest to lowest enrichment) for cadmium, lead, manganese, copper, selenium, cobalt, arsenic, nickel, vanadium, beryllium, and chromium at concentration factors much greater than the 6 cycles of concentration observed for soluble silica. In addition to these elements enriched in the aqueous phase, molybdenum, selenium, vanadium, and arsenic are enriched in the JBR slurry's solid phase.

This concentration mechanism plays an important part in the study of extractable metals in gas particulate matter downstream of wet scrubbing systems. As a result, particle surface characterizations based on extractability data may not be feasible without a more thorough understanding of the enrichment and carryover mechanisms taking place in the scrubber system.

References

- 1. 40 CFR 60, Appendix A. Test Methods. "Method 17: Determination of Particulate Emissions from Stationary Sources (In-Stack Filtration Method)."
- 2. 40 CFR 60, Appendix A. Test Methods. "Method 5: Determination of Particulate Emissions from Stationary Sources."
- 3. 55 FR 26986 (Friday, June 29, 1990), "Toxicity Characteristic Leaching Procedure (Method 1311)."

APPENDIX A: QUALITY ASSURANCE AUDITS

The purpose of a quality assurance audit is to provide an objective, independent assessment of a sampling or measurement effort. It ensures that the sampling procedures, data generating, data gathering, and measurement activities produce reliable and useful results. Sometimes inadequacies are identified in the sampling/measurement system and/or the quality control program. In such cases, audits provide the mechanism for implementing corrective action.

A technical systems audit (TSA) is an on-site, qualitative review of the various aspects of a total sampling and/or analytical system. It is an assessment of overall effectiveness and represents an objective evaluation of a set of interactive systems with respect to strengths, deficiencies, and potential areas of concern. The audit consists of observations and documentation of all aspects of the measurement effort.

A performance audit is an independent check to evaluate the data produced by a measurement system. Audit standards and test equipment which are traceable to acceptable reference standards are used to assess the performance of each analytical method and/or measurement device (performance audit). Performance audits are designed to provide a quantitative, point-in-time evaluation of the data quality of the sampling and analytical systems being tested. This is accomplished by addressing specific parts of the overall system. Each performance audit addresses two general measurement categories of a project:

- Chemical analysis of samples; and
- Physical measurements supporting the sampling effort.

Audit activities consist of challenging the various measurement systems with standards and test equipment traceable to accepted reference standards. Laboratories conducting the analytical work on a program are given performance audit samples prepared by spiking representative sample matrices with target analytes at representative concentration levels. Results for these audit samples are tabulated and considered in evaluating the analytical performance and data reporting protocols for each laboratory.

For this program, technical system audits and performance audits were conducted of each of the DOE contractors by Research Triangle Institute (RTI) under contract to EPA. For the

audits of the Radian activities, reports were prepared and subsequently distributed to Radian through DOE detailing the results of the audits. Copies of the RTI audit reports are presented as attachments to this appendix. The following subsections present the Radian response to RTI's findings.

Technical Systems Audit Results

A technical systems audit was conducted of the sampling and on-site analytical activities for this program on June 23-25, 1993. This audit was conducted by J.B. Flanagan and C.O. Whitaker of RTI. Four findings were discussed in the RTI audit report. Each of these findings and RTI recommendations are discussed in the following paragraphs.

Finding 1

Basis due to long sampling lines from the calibration tanks to the probes and nonlinearity of the continuous monitor (CEM) system may go undetected due to infrequent multi-point calibrations. The CEM system at Plant Yates was not a designated part of the Radian effort for the DOE program and was not a negotiated activity between DOE and Georgia Power. Therefore, Radian has no control over and may not initiate any corrective actions related to, the operation of the CEM at Plant Yates.

Finding 2

Aldehyde measurements were performed in accordance with the method; however, acetone (a possible contaminant) was present in the mobile laboratory as a wash bottle under the hood. One or more of the field blanks for the aldehyde sampling trains showed varying concentrations of acetaldehyde and formaldehyde. However, these analytes were not found in the reagent blanks stored in the mobile laboratory. It is not possible with the data available to rule out possible contamination due to the wash bottle of acetone. The concentrations found in the blanks should be considered in the use of the sample data. This precaution was noted in the project QA/QC summary (see Appendix D).

Finding 3

All plant and sampling times are recorded in Central Daylight Savings Time instead of Eastern Daylight Savings Time. Radian has worked on several other Georgia Power projects and is familiar with their timekeeping procedures. In addition, since the field crew was from one of Radian's offices located in the Central Time Zone, the use of CDT was probably less confusing than working on EDT.

Finding 4

Sampling data are hand-entered from field sheets into a portable computer each day, making occasional typographical errors virtually unavoidable. The normal Radian practice is to compare the computer output with the original data sheets to ensure that the information has been input correctly. This is generally done once the field crew has returned to the office

and the summary report of field activities is prepared. In addition, the Radian QA coordinator or his/her designee checks a percentage of the data sheets, logbooks, and calculations.

In addition to the technical systems audit, a number of performance evaluation audits were performed during the on-site effort. The greater part of the performance audit was directed toward the off-site analyses and a lesser part to the on-site activities. The results of the off-site performance audit samples are discussed in the next section. The results of the on-site performance audit are discussed in the following paragraphs.

Orsat Determinations

A duplicate analysis of oxygen was performed using a test gas supplied by RTI. The results of the analysis of test gas BLM002689 was 9.0% oxygen which calculates out to a 97.8% recovery as compared to the theoretical concentration of 9.2 percent.

Source Sampling Consoles

An audit of the dry gas meters in four source sampling consoles was performed by RTI using a standard orifice. Audit results calculated as relative percent difference between the dry gas volume measurement and the calculated volume based on the RTI orifice were within the $\pm 10\%$ acceptance criteria for three of the four meters tested. The result for the fourth meter (-11.7%) was just slightly below the criteria. The auditor noted that the audit data set for this meter did not include a meter run stop time. It is not known if a more exact run time would have resulted in this measurement being within the criteria.

Continuous Emissions Monitors

Audit of the continuous emissions monitors was not an negotiated activity between Georgia Power and DOE for this program. Therefore, Plant Yates would not permit RTI to audit the CEM. Any change in the frequency of the calibration approach would have to be decided between DOE and Georgia Power (The yearly calibration is actually a yearly certification or performance audit).

In the RTI audit report five recommendations are discussed. Since the majority of these recommendations were not discussed at the audit wrap-up meeting conducted at Plant Yates, limited corrective action was initiated. A summary of the RTI recommendations and the Radian corrective actions are discussed in the following paragraphs:

Recommendation 1

Due to the unusually large differences seen between the RTI standard orifice and the sampling consoles used for source testing, it is recommended that the average of the pre- and post- test calibrations be used in the emission estimates. Only one of the consoles audited by RTI was outside the acceptance criteria given. The theoretical value for this audit run is not certain because the meter run stop time was not recorded. Therefore, it is not known if the result for this console was actually outside the acceptance criteria. A QA check of the post-

test calibration for the consoles used on the project showed that the difference between the pre-test and post-test calibrations was less than 5% as required by the method (RPD-1.38% ± 1.08 , Range 0.1%-3.47% per Radian QA coordinator).

Recommendation 2

Mass flow rates for solids such as bottom ash and ESP ash are calculated based on coal feed rates and percentage ash in the coal obtained by proximate/ultimate analysis. One or more independent, direct methods of measuring or estimating the amount of ash produced should be attempted. The ESP collected ash flow rate was determined using the measured particulate loadings at the ESP inlet and outlet and the measured gas flow rate, not the coal feed rate and coal ash concentration. The bottom ash was calculated using the ESP inlet particulate loadings and coal feed rate and ash concentration. Radian considered obtaining representative bottom ash and ESP collected ash flow rates using the method described by RTI. However, the level of effort required, particularly for the ESP collected ash flow rate would have required additional sampling personnel and, given the physical design of the ash sluice system, additional information gained in this manner would also have a very large degree of uncertainty as to its accuracy.

Recommendation 3

Because RTI auditors were not allowed to take any completed data sheets off-site, a data audit should be conducted in which raw data sheets, computer-logged data, logbooks, validation procedures, and calculations are examined. Data quality audits of the raw data, logbooks, calculations, and computerized data are checked and counter checked by various project personnel (including the Radian QA coordinator) throughout the progress of the project. The overall project is then peer- reviewed by senior engineers and scientists at least twice prior to the final reporting process.

Recommendation 4

CEMs at Plant Yates are not scheduled for multi-point calibration until the fall of 1993 which will result in a one-year interval since the last multi-point calibration. The interval between multi-point calibrations of the CEM should be changed from yearly to every six months. This recommendation is outside of the scope of the present project and is out of the control of Radian.

Recommendation 5

The major elements for mass balance determinations should be discussed and finalized between DOE and Radian. Elements for the mass balance determinations were finalized between DOE and Radian and are presented in Section 6 of this Document.

Performance Audit Results

At the time of the technical systems audit conducted by RTI in June 1993, a series of performance audit samples were prepared and presented to the Radian sampling team to be submitted to the various analytical laboratories along with the investigative samples. The audit samples were prepared by spiking the impinger solutions or other analytical matrices provided to the auditors by Radian.

VOST

Two sets of Tenax cartridges were spiked with 18 compounds. These were analyzed for 16 of the 18 compounds by Radian's subcontractor, Air Toxics, Limited. In the RTI audit report, the results for these analyses were compared to the wrong set of recovery objectives. Tables A-1 and A-2 show the results and the recovery objectives for volatile organics as presented in Table 9-4 (page C9-9) of the project OAPP. The OC objectives were met for 10 of the 16 analytes in sample Y194 and 9 of the 16 analytes in sample Y195. Of the analytes with recoveries outside the QC objectives, toluene, methylene chloride, 1,1,1trichloroethane, trichlorofluoromethane, benzene, chloroform, and carbon tetrachloride were recovered high in one or more of the samples and chlorobenzene was recovered low in one sample. A portion of the methylene chloride recovery may be due to contamination, since this analyte was found in varying concentrations in most of the field and laboratory blanks analyzed with the samples. The high toluene recoveries were also attributed to contamination in the RTI audit report. In this case, the contamination appears to be in the audit cylinder, since this analyte was not found in any of the field or laboratory blanks and the concentration in Y195 is approximately twice the concentration in Y194. This concentration ratio matches the relationship for the RTI theoretical concentrations for other analytes in the two samples.

Semivolatile Organics

Two XAD-2 modules, a train rinse, and a probe rinse were spiked with 16 analytes. Each module was combined with a rinse and reported as a combined sample. The analytical results for the 16 spiked compounds were within the project objectives for sample Y173-177 and 14 of the 16 spiked compounds were within the QC objectives in sample Y178-182. Anthracene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene results were outside the QC objectives. These compounds were spiked at or near the approved detection limits stated in the project QAPP.

Aldehydes

Two DNPH impinger solutions were spiked with formaldehyde. The recovery for this analyte showed recoveries above the stated project QC objectives. RTI attributed these apparent enhanced recoveries to possible contamination. Formaldehyde was found in several of the field blanks and at the detection limit in one laboratory blank but was not found in the reagent blanks. Laboratory control samples and matrix spiked samples showed good recoveries for both formaldehyde and acetaldehyde.

Table A-1 Analysis of Vost Sample ID Y194 by Air Toxics Limited

Analyte	Detection Limit (ng)	Theoretical Concentration (ng)	Analyzed Concentration (ng)	% Recovery	QC Objectives % Rec.	QC Objectives Met?
Benzene	10	63.73	74	116	37-151	yes
Chlorobenzene	10	177.43	53	30	37-160	low
Ethylbenzene	10	153.86	120	78	37-162	yes
Toluene	10	151.68	2300	1520	47-150	high
o-Xylene	10	159.30	71	45	NS	NA
Bromomethane	10	125.33	130	104	D-242	yes
1,3-Butadiene	NA	25.94	NA	-	-	NA
Chloroform	10	87.60	110	126	51-138	yes
Carbon tetrachloride	10	123.28	140	114	70-140	yes
1,2-Dichloroethane	10	74.04	53	72	49-155	yes
1,2-Dibromoethane	NA	300.37	NA	-	-	NA
1,2-Dichloropropane	10	192.00	160	83	D-210	yes
Methylene chloride	10	112.98	5700	5040	D-221	high
Tetrachloroethylene	10	141.40	120	85	46-157	yes
Trichloroethylene	10	103.69	120	116	71-157	yes
1,1,1-Trichloroethane	10	148.77	230	155	52-150	high
Trichlorofluoromethane	10	217.11	470	216	17-181	high
Vinyl chloride	10	40.10	48	120	D-251	yes

Table A-2 Analysis of Vost Sample ID Y195 by Air Toxics Limited

Analyte	Detection Limit (ng)	Theoretical Concentration (ng)	Analyzed Concentration (ng)	% Recovery	QC Objectives % Rec.	QC Objectives Met?
Benzene	10	125.29	190	152	37-151	high
Chlorobenzene	10	348.80	170	49	37-160	yes
Ethylbenzene	10	302.47	420	139	37-162	yes
Toluene	10	298.18	4000	1340	47-150	high
o-Xylene	10	313.17	290	93	NS	-
Bromomethane	10	246.38	180	73	D-242	yes
1,3-Butadiene	NA	51.00	NA	-	-	NA
Chloroform	10	172.22	250	145	51-138	high
Carbon tetrachloride	10	242.36	360	148	70-140	high
1,2-Dichloroethane	10	145.55	150	103	49-155	yes
1,2-Dibromoethane	NA	590.50	NA	-	-	NA
1,2-Dichloropropane	10	377.45	410	109	D-210	yes
Methylene chloride	10	222.11	5800	2610	D-221	high
Tetrachloroethylene	10	277.98	350	126	46-157	yes
Trichloroethylene	10	203.84	320	157	71-157	yes
1,1,1-Trichloroethane	10	292.47	550	188	52-150	high
Trichlorofluoromethane	10	426.22	660	155	17-181	yes
Vinyl chloride	10	78.83	98	124	D-251	yes

NA = Not analyzed.

NS = Not specified.

Appendix A: Quality Assurance Audits

RTI analyzed the spike solution (about two months later) and found reduced recoveries based on the nominal concentration. It appears that the true concentration of the spike solution is not known. Formaldehyde standards prepared from the commercially available 37% solutions may vary since these reagents may vary in actual concentration from 36-41 percent. Standards prepared as nominal concentrations can be analyzed by a titration procedure to obtain a known concentration for a standard. It is not known if this procedure was used by RTI to assign a theoretical concentration for the spike solution.

Metals

Performance audit samples were prepared by RTI for the filter, the nitric acid-peroxide impingers, and the permanganate impingers of the multi-metals sampling train. Arsenic, cadmium, lead, and selenium were recovered within the QC objectives in the nitric acid/peroxide impinger solutions. However, mercury showed a slightly high recovery in this solution. Metal recoveries for the two spikes onto blank filters showed good recoveries except for one arsenic spike with a high recovery and one cadmium, selenium, and mercury spike with slightly low recoveries on the other filter. Mercury spiked into the two permanganate impinger solutions showed low recoveries (21-40%). The performance audit sample prepared by the Radian QA Coordinator also showed low recovery (33%) for the permanganate solution sample.



Department of Energy

Pittsburgh Energy Technology Center P.O. Box 10940 Pittsburgh, Pennsylvania 15236-0940

November 10, 1993

Barbara J. Hayes Radian Corporation 8501 Mo-Pac Blvd. P.O. Box 201088 Austin, TX 78720-1088

Dear Barbara:

Enclosed are clean copies of the Field Sampling Report and the PE Sample Analysis information prepared by Research Triangle Institute. Please include these documents in the External Audit Section of the Draft Final Report to be submitted to the DOE on December 10, 1993. In addition, provide a response to RTI's finding in the Draft Final Report.

If you have any questions, please call me at (412) 892-4691.

Project Manager

Environmental Control Division

Enclosures

CC: Hollis Flora, Radian



Center for Environmental Measurements and Quality Assurance

October 4, 1993

Mr. Tom Brown PETC, U.S. Department of Energy P.O. Box 10940, M.S. 922-206 Pittsburgh, PA 15236

Subject: Radian PE sample analysis during the Yates Plant Audit

Dear Tom:

Enclosed are the analysis results for 10 sets of performance evaluation (PE) samples given to Radian Corporation during the audit of the Yates plant. Of particular concern are the mercury and the formaldehyde analyses.

After encountering a serious problem with the aldehyde analysis, we recalculated the PE sample concentrations and analyzed the samples in our laboratory. In the analytical procedure, there are still some undetermined factors such as the percent conversion of aldehyde into the DNPH-derivatives. Even though the molar ratios of DNPH to aldehyde were sufficiently high to drive the conversion reaction to completion, the aldehyde analysis results are lower than expected. The further laboratory work may resolve this issue.

Volatiles

RTI spiked two sets of Tenax cartridges in a VOST train with 18 compounds. The cartridges were analyzed by Radian's subcontractor, Air Toxics, Limited. The laboratory analyzed for 16 of the 18 compounds spiked into the cartridges. Of the compounds quantitated, 10 of 16 were recovered within the data quality objectives (DQOs) set by Radian for sample Y194, and 9 of 16 were recovered within the DQOs for sample Y195. Of the compounds particularly relevant to this project (benzene, toluene, ethylbenzene, and o-xylene), recoveries were mixed. Benzene was recovered well within range on sample Y194, but slightly out of range on sample Y195. Toluene was recovered completely out of range on both samples due to apparent contamination. Ethylbenzene was recovered within range on both samples. O-xylene was recovered out of range on sample Y194, but within range on sample Y195.

<u>Semivolatiles</u>

RTI spiked two XAD-2 modules, a train rinse, and a probe rinse with 16 PAHs in solution. Each module was combined with a rinse and reported by Radian as a combined

Post Office Box 12194 Research Triangle Park, North Carolina 27709-2194

Radian PE Samples Yates Plant Audit Page 2 of 9 October 4, 1993

sample. Radian performed satisfactorily on 28 of the 32 analyses. One undetected analyte was spiked at below the reported detection limit. This occurred because the detection limits reported were much higher than the 1 ng/m³ required by DOE for the project.

Metals on Filters

Several metals were spiked onto two filters of the M-29 trains to simulate metals in the particulate catch. Radian recovered 6 of the 10 metals concentrations within the limits of their DOOs.

Metals in Impinger Solutions (HNO₂/H₂O₂)

Several metals were spiked into the first impinger of the metals train. Radian recovered eight of the nine metals within the limits of their DQOs.

Metals in Impinger Solutions (KMnO₄)

Mercury was spiked into two acidic KMnO₄ solutions. Neither was recovered in the range of their DQOs (75 to 125%).

Formaldehyde in Impinger Solutions (DNPH)

RTI spiked two DNPH impinger solutions with a solution containing a nominal concentration of 0.4068 μ g/ μ l. Radian's recoveries calculated based on this concentration are higher indicating possible contamination. RTI has analyzed the spiking solution and our recovery based on the nominal value is 67.6% (average concentration of 0.275 μ g/ μ l). RTI is continuing verification analyses on the spiking solution.

If I can be of further assistance, please call me at 541-5919.

Sincerely,

Shri Kulkami, Ph.D.

Manager, Quality Assurance and Technology Assessment Department

Shi Kulkami

SVK:dmh

cc:

S.J. Wasson

J. McSorley

File:

5960-193/4805

91A-04

Radian PE Samples Yates Plant Audit Page 3 of 9 September 30, 1993

METALS IN IMPINGER SOLUTIONS (HNO $_2$)

SAMPLE ID: Y276

METAL	RTI AMOUNT (µg)	RADIAN AMOUNT (µg)	PERCENT RECOVERY	RECOVERYI DQO (%)	DQO MET
As	50	52.10	104.2	75-125	Yes
Cd	30	37.00	123.3	75-125	Yes
Pb	20	19.79	98.9	75-125	Yes
Se	40	41.60	104.0	75-125	Yes
Hg	10	12.68	126.8	75-125	No

METALS IN IMPINGER SOLUTIONS (HNO₂/H₂O₂)

SAMPLE ID: Y279

METAL	RTI AMOUNT (µg)	RADIAN AMOUNT (µg)	PERCENT RECOVERY	RECOVERY¹ DQO (%)	DQO MET
As	15	15.03	100.2	75-125	Yes
Cd	60	68.26	113.8	75-125	Yes
Pb	40	42.34	105.9	75-125	Yes
Se	80	90.72	113.4	72-125	Yes

These values are taken from Radian's QA plan (page C9-7).

Radian PE Samples Yates Plant Audit Page 4 of 9 September 30, 1993

METALS ON FILTERS

SAMPLE ID: Y278, filter 966

METAL	RTI AMOUNT (µg)	RADIAN AMOUNT (µg)	PERCENT RECOVERY	RECOVERY ¹ DQO (%)	DQO MET
As	40	84.4	211.0	75-125	No
Cd	10	9.59	95.9	75-125	Yes
Pb	15	15.3	102.0	75-125	Yes
Se	25	22.3	89.2	75-125	Yes
Hg	10	10	100.0	75-125	Yes

METALS ON FILTERS

SAMPLE ID: Y281, filter 974

METAL	RTI AMOUNT (µg)	RADIAN AMOUNT (µg)	PERCENT RECOVERY	RECOVERY¹ DQO (%)	DQO MET
As	25	27.9	111.6	75-125	Yes
Cd	15	10.6	70.7	75-125	No
Pb	25	25.3	101.2	75-125	Yes
Se	35	23.4	66.9	75-125	No
Hg	20	14.6	73.0	75-125	No

These values are taken from Radian's QA plan (page C9-7).

Radian PE Samples Yates Plant Audit Page 5 of 9 September 30, 1993

MERCURY IN IMPINGER SOLUTIONS (KMn04)

SAMPLE ID	RTI AMOUNT (µg)	RADIAN AMOUNT (µg)	PERCENT RECOVERY	RECOVERY ³ DQO (%)	DQO MET
Y277¹	20	4.18	20.9	75-125	No
Y280 ²	50	19.75	39.5	75-125	No

FORMALDEHYDE IN IMPINGER SOLUTIONS (DNPH)

SAMPLE ID	RTI AMOUNT (µg)	RADIAN AMOUNT (µg)	PERCENT RECOVERY	RECOVERY ⁴ DQO (%)	DQO MET
Y187	24.4	76	311	50-150	No
Y188	34.2	90	263	50-150	No

¹ Also spiked with 30 µg Pb.

² Also spiked with 20 µg As.

These values were taken from Radian's QA plan (page C9-7).

These values were taken from Radian's QA plan (page C9-8).

SVOC RECOVERIES FROM XAD-2 MODULES

SAMPLE ID: Y178-182 (Combined)

ANALYTE	RTI VALUE (µg)	Radian VALUE (µg)	PERCENT RECOVERY	RECOVERY¹ DQO (%)	DQO MET
Naphthalene	10	9.98	99.8	21-133	Yes
Acenaphthylene	20	17.3	86.5	33-145	Yes
Acenaphthene	10	8.22	82,2	47-145	Yes
Fluorene	2	1.19	59.5	59-121	Yes
Phenanthrene	1	0.853	85.3	54-120	Yes
Anthracene	1	ND²	0.0	27-133	No
Fluoranthene	2	1.44	72.0	26-137	Yes
Pyrene	1	0.634	63.4	52-115	Yes
Chrysene	1	0.844	84.4	17-168	Yes
Benzo(a)anthracene	1	0.694	69.4	33-143	Yes
Benzo(b)fluoranthene	2	1.4	70.0	24-159	Yes
Benzo(k)fluoranthene	1	0.713	71.3	11-162	Yes
Benzo(a)pyrene	1	0.484	48.4	17-163	Yes
Indeno(1,2,3-cd)pyrene ³	1	ND ²	0.0	D-171	No
Dibenz(a,h)anthracene	2	ND²	0.0	D-227	No
Benzo(g,h,i)perylene	2	ND²	0.0	D-219	No
Other Compounds Repor	ted				
Acetophenone	0	0.694	7-		
Benzoic Acid	0	14,2			
Diethylphthalate	0	0.689			

Recovery DQOs (%) were taken from Radian's QA plan (Page C9-10).

 $^{^2}$ ND = not detected.

This compound was spiked at a concentration below the reported detection limit of 1.33 µg.

Radian PE Samples Yates Plant Audit Page 7 of 9 September 30, 1993

SVOC RECOVERIES FROM XAD-2 MODULES

SAMPLE ID: Y173-177 (Combined)

ANALYTE	RTI VALUE (µg)	RADIAN VALUE (µg)	PERCENT RECOVERY	RECOVERY ¹ DQO (%)	DQO MET
Naphthalene	35.0	30.1	86.0	21-133	Yes
Acenaphthylene	70.0	62.8	89.7	33-145	Yes
Acenaphthene	35.0	28.7	82.0	47-145	Yes
Fluorene	7.0	4.53	64.7	59-121	Yes
Phenanthrene	3.5	2.54	72.6	54-120	Yes
Anthracene	3.5	2.5	71.4	27-133	Yes
Fluoranthene	7.0	4.42	63.1	26-137	Yes
Pyrene	3.5	2,13	60.8	52-115	Yes
Chrysene	3.5	1.52	43.4	17-168	Yes
Benzo(a)anthracene	3.5	1.65	47.1	33-143	Yes
Benzo(b)fluoranthene	7.0	2.82	40.3	24-159	Yes
Benzo(k)fluoranthene	3.5	1.62	46.3	11-162	Yes
Benzo(a)pyrene	3.5	1.33	38.0	17-163	Yes
Indeno(1,2,3-cd)pyrene	3.5	1.33	38.0	D-171	Yes
Dibenz(a,h)anthracene	7.0	2.14	30.6	D-227	Yes
Benzo(g,h,i)perylene	7.0	2.19	31.3	D-219	Yes
Other Materials Recovered	<u> </u>				
Benzoic Acid	0	60.3	•		

Recovery DQOs (%) were taken from Radian's QA plan (page C9-10).

VOLATILE ORGANICS ON TENAX (VOST)

SAMPLE ID: Y194

COMPOUNDS	RTI AMOUNT (ng)	RADIAN AMOUNT (ng)	PERCENT RECOVERY	RECOVERY¹ DQO (%)	DQO MET
Vinyl Chloride	40.10	48	119.7	50-150	yes
Chloroform	87.60	110	125.6	50-150	yes
Carbon Tetrachloride	123.28	140	113.6	50-150	yes
Methylene Chloride	112.98	5700	5045.1	50-150	no
1,2 Dichloroethane	74.04	53	71.5	50-150	yes
Trichlorethylene	103.69	120	115.7	50-150	yes
Benzene	63.73	74	116.1	50-150	yes
Tetrachloroethylene	141.40	120	84.9	50-150	yes
1,3-Butadiene ¹	25.94			50-150	
Bromomethane	125.33	130	103.7	50-150	yes
Trichlorofluoromethane	217.11	470	216.5	50-150	no
1,1,1-Trichloroethane	148.77	230	154.6	50-150	no
1,2-Dichloropropane	192.00	160	83.3	50-150	yes
1,2-Dibromoethane ²	300.37			50-150	
Toluene	151.68	2300	1516.4	50-150	no
Chlorobenzene	177.43	53	29.9	50-150	no
Ethylbenzene	153.86	120	78.0	50-150	yes
Ortho-Xylene	159.30	71	44.6	50-150	no
Other Compounds Reported					
Acetone	0	120			

Recovery DQOs (%) were taken from Radian's QA plan (page C9-10).

This compound was not identified or analyzed by Radian's subcontractor, Air Toxics Limited.

VOLATILE ORGANICS ON TENAX (VOST)

SAMPLE ID: Y195

COMPOUNDS	RTI AMOUNT (ng)	RADIAN AMOUNT (ng)	PERCENT RECOVERY	RECOVERY¹ DQO (%)	DQO MET
Vinyl Chloride	78.83	98	124.3	50-150	yes
Chloroform	172.22	250	145.2	50-150	yes
Carbon Tetrachloride	242.36	360	148.5	50-150	yes
Methylene Chloride	222.11	5800	2611.3	50-150	no
1.2 Dichloroethane	145.55	150	103.1	50-150	yes
Trichlorethylene	203.84	320	157.0	50-150	no
Benzene	125.29	190	151.6	50-150	no
Tetrachloroethylene	277.98	350	125.9	50-150	yes
1,3-Butadiene ¹	51.00			50-150	
Bromomethane	246.38	180	73.1	50-150	yes
Trichlorofluoromethane	426.82	660	154.6	50-150	по
1,1,1-Trichloroethane	292.47	550	188.1	50-150	no
1,2-Dichloropropane	377.45	410	108.6	50-150	yes
1.2-Dibromoethane ²	590.50	••		50-150	
Toluene	298.18	4000	1341.5	50-150	no
Chlorobenzene	348.80	170	48.7	50-150	no
Ethylbenzene	302.47	420	138.9	50-150	yes
Ortho-Xylene	313.17	290	92.6	50-150	yes
Other Compounds Reported					
Acetone	0	160			

Recovery DQOs (%) were taken from Radian's QA plan (page C9-10).

This compound was not identified or analyzed by Radian's subcontractor, Air Toxics Limited.



RESEARCH TRIANGLE INSTITUTE RTI/5960/193 - 04D

August 6, 1993

QA/QC AUDITS ON DOE UTILITY BOILER TEST PROGRAM

FIELD SAMPLING AUDIT REPORT

Site: Yates Station Unit 1, Newnan, GA

DOE Contractor: Radian Corporation

DOE Project Officer: Janice Murphy

Performed for

Joseph A. McSorley
EPA Work Assignment Manager
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Prepared by

Research Triangle Institute
P.O. Box 12194
Research Triangle Park, NC 27709

RTI Work Assignment Leader: Shirley J. Wasson

Under EPA Contract No. 68D10009 Work Assignment No. I-193

Field Audit of:

Yates Station Unit 1 Georgia Power Company Newnan, Georgia

Contractor: Radian Corporation

Dates: June 23-25, 1993

RTI Personnel: J. B. Flanagan and C. O. Whitaker

Introduction

The Yates Station Unit 1 is a bituminous coal-fired steam-electricity-generating unit with a net generating capacity of 105 megawatts. The station is located near Newnan, Georgia, and is owned and operated by Georgia Power Company. Unit 1 has a tangentially fired boiler manufactured by Combustion Engineering in 1949. During this test, the unit was fueled with 2.5% sulfur blend of Illinois No. 5 and Illinois No. 6 bituminous coals. The feed coal is a 50:50 blend mined from the "Arch Captain" and "Old Ben Franklin" mines.

The plant uses electrostatic precipitators for particulate control. Unit 1 currently controls sulfur dioxide (SO₂) using a Jet Bubbling Reactor (JBR) supplied under the CT-121 demonstration project. Sampling for the hazardous air pollutants (HAP) study is being carried out by Radian Corporation, which also operates the CT-121 demonstration project in cooperation with Georgia Power and DOE. The JBR process combines conventional limestone flue gas desulfurization (FGD) chemistry, forced oxidation, and gypsum crystallization in one reaction vessel. It is designed to operate in a medium-acid solution, where limestone is completely soluble and where the sulfite resulting from SO₂ absorption can be oxidized completely to sulfate. Attrition of gypsum crystals and problems of poor sludge quality and chemical scaling are also eliminated due to improvements of the second generation FGD process. The process is not specifically designed to destroy pollutants such as NO₂ or organics.

Findings

1. Finding: Basis due to long sampling lines from the calibration tanks to the probes and nonlinearity of the continuous emission monitor (CEM) system may go undetected due to infrequent multipoint calibrations. Line losses and multipoint calibrations are not normally measured and multipoint calibrations are not performed during the demonstration program; the next scheduled full calibration is scheduled for the changeover to Phase II of the demonstration program some time this fall. Daily zero-span checks are conducted for all CEMs.

1 A-23

Effect on Data: If there is loss of calibration gas in the 300 to 600 feet of tubing running from the cylinders to the probes, the span result will be biased. Sulfur dioxide is particularly sensitive to decomposition reactions on surfaces. The potential for nonlinearity is unknown in the absence of regularly scheduled multipoint calibrations.

2. Finding: Aldehyde measurements were performed in accordance with the method; however, acetone, (a possible contaminant) was present in the mobile laboratory as a wash bottle under the hood.

Effect on Data: Any acetone that might be found in the samples would be suspect.

3. Finding: All plant and sampling times are recorded in Central Daylight Savings
Time instead of Eastern Daylight Savings Time. The central power grid is
controlled by Georgia Power's headquarters in Alabama, which is in the Central time
zone. Yates plant personnel have adopted Central time to coordinate with the central
operations. To avoid confusion, Radian also adopted Central time in conducting the
HAP project.

Effect on Data: Radian and plant personnel were all well-aware of this situation; however, special care should be taken to cross-check data to avoid confusion in sampling times during data validation.

4. Finding: Sampling data are hand-entered from field sheets into a portable computer each day, making occasional typographical errors virtually unavoidable.

Effect on Data: Data validation procedures such as duplicate keying or 100% comparison with original sheets should be used to minimize these errors.

Observations

This section includes general observations for which no adverse effect on the data could necessarily be predicted, but which had the potential to differentiate results at this site from results at other sites.

1. Radian sent an analyst and a high performance liquid chromatography (HPLC) instrument to the site for Cr^{IV} measurements. Having the analyses performed on-site provides faster results: a 1/2- to 2-hour turnaround versus 24 hours or more when samples are sent back to an off-site laboratory. This conscientious effort to obtain more timely analyses of this unstable material should be taken into account when comparing Radian's results for Cr^{IV} with those from other contractors.

2. The "Nick Bloom" method for sampling vapor phase mercury differed from that of another contractor on this project in that differently sized charcoal tubes were used and different methods of analysis will be used. Radian also used a soda-ash tube in conjunction with the charcoal tube which was intended to allow discrimination between oxidation states of mercury. Results of different contractors may not be comparable if different implementations of this method are employed.

Activities

1. Meetings

Audit activities included three meetings between RTI, DOE, Georgia Power, and Radian personnel. An initial meeting was held on 6/22 and an exit meeting on 6/24. Additionally, there was a meeting on the afternoon of 6/22 in which the Georgia Power representatives expressed concerns about data security for the JBR project and misgivings about having "EPA representatives" on-site. Dr. Flanagan called Ms. Wasson, the RTI Project Leader, to inform her of this development immediately after this meeting. Dr. Kulkarni of RTI and Mr. Brown of DOE were contacted later the same day. No further concerns were expressed, however, and the remainder of the audit proceeded normally. Mr. Roy Clarkson, a representative of Georgia Power, reviewed all data to be taken from the site at the exit meeting on 6/24. This information consisted only of the auditor's logbooks and checklists and some blank data forms obtained from Radian. Mr. Al Williams, the Radian Project Manager, made the decision not to release copies of any completed data sheets requested by the auditors based on Georgia Power's concerns.

During one of the meetings with Radian personnel, it was learned that the "major" element(s) for independent mass balance determination had not been selected. This was presumably under negotiation between Radian and DOE as a change in scope.

2. Performance Evaluation Audit

a) Orsat Determination - Mr. Tom Peters of Radian was observed by Mr. Craig Whitaker of RTI while performing the Orsat procedure using test gas supplied by RTI. The audit gas concentration for tank ID number BLM002689 was 9.21% oxygen in dry nitrogen. Correct procedures appeared to be followed. The following data were taken. Acceptable agreement was found for oxygen. Neither carbon dioxide nor carbon monoxide was present in the tank, and none was found.

Replicate	<u>Orsat</u>	Result (mL oxygen)
1		9.0
2		9.0
	Average:	9.0

Initial volume was 100 mL

9.0 mL/100 mL x 100 = 9.0% found by Orsat.

Percent Difference =
$$\frac{9.0\% - 9.2\%}{9.2\%}$$
 X 100 = -2.17%

b) Performance Audit of Source Sampling Consoles - Mr. Whitaker provided a standardized orifice (ID number 117) to the sampling console operators. They were instructed to set a constant flow using the orifice and to measure the volume indicated by the console's dry gas meter during a 10- or 20-minute sampling period. Operators reported a pressure drop across the RTI orifice, dry gas meter volume, and temperature. Results are tabulated in the following table. "Calculated Volume," the fifth column in the table, was calculated by RTI based on the orifice constant and pressure drop, multiplied by the run time.

CONSOLE (DRY GAS METER VOLUME) PERFORMANCE AUDIT RESULTS*

Radian console serial number	Console location	Run time (min)	Radian console dry gas meter volume (scf)	Calculated volume based on flow using RTI orifice (scf)	Relative Percent difference
A161362	Stack	20	13.98	15.450	- 9.5
A161394	Stack	21	16.59	16.404	1.1
161364	ESP outlet	10	7.89	7.711	2.3
A161395**	ESP outlet	10**	7.50	8.495	- 11.7

^{*} Acceptance criteria ± 10%.

^{**} This audit data set did not include a meter run stop time; however, runs were requested for 10 minutes and the data appear consistent with a 10-minute run time.

- c) VOST Sampling The operator demonstrated extensive knowledge in the operation and process. Cartridges were inscribed with flow directions and encapsulated before and after use. Two sets of tenax and tenax/charcoal were exposed to measured flows of test gas supplied by RTI. Exposure periods were 10 and 20 minutes. Because analytical results must be received before these audit samples can be evaluated, the tube numbers, compounds, and concentrations will be reported in a separate memorandum.
- d) Continuous Emissions Monitors (CEMs) The facility would not allow RTI to audit the installed monitors, but the system functions were explained by the operator, Mr. Jeff Nelms. The cylinders used for daily zero and span checks were found to be Protocol No. 1 gases. Serial numbers and concentrations for these zero/span gases are provided in the following table.

CEM SPAN GAS SUMMARY

Vendor	Cylinder	Compound	Concentration	Expiration date
Scott	AAL-13190	Nitric oxide Sulfur dioxide Nitrogen	360 ppm 1791 ppm balance	5-18-95
Scott	AAL-17497	Oxygen Nitrogen	20.9% balance	5-18-96
Scott	AAL-4472	Sulfur dioxide	241 ppm	1-4-95

Two locations are being monitored by the CEMs: the ESP outlet (immediately upstream of the JBR) and the stack (downstream of the JBR). The following information is being acquired at each location:

ESP outlet (upstream of JBR):

- Temperature
- Opacity
- Oxygen
- NO.
- SO₂

Stack (downstream of JBR):

- Temperature
- Oxygen
- SO₂

Because different gases are being monitored at the two locations, different span gas combinations and concentrations were used for the span checks. For the stack gas analyzers, cylinder AAL-4472 (SO₂ in N₂) and cylinder AAL-17497 (O₂ in N₂) were used. On the ESP outlet upstream of the JBR, cylinder AAL-13190 (NO and SO₂ in N₂) and cylinder AAL-17497 (O₂ in N₂) were used. Cylinders of zero air were also present for zero determination. According to site personnel, tanks are replaced at intervals of approximately 1 to 2 months. This rather rapid turnover of standard gases is due to the large volume required to fill and purge the hundreds of feet of tubing between the tank, the sampling point, and the analyzers, as described in the next paragraph.

Heated sample lines are used to carry the calibration gas to the probes. The calibration gas then flows back to the CEMs through the same lines that are used acquire gas samples. As part of the audit, the heated sample lines were traced and verified by the operator, who estimated that the fetch (one-way distance from the probe to the CEMs) was 300 to 350 feet. The fetch to the ESP outlet duct probe was estimated to be approximately 600 feet.

3. Technical Systems Audit

The following table summarizes the activities observed by the auditors.

OPERATIONS OBSERVED DURING TSA

Medium	Location	Auditor	Comment
Coal, 1/4" feed	boiler building	Flanagan, Whitaker	Periodic grab samples collected into plastic bucket
Coal, pulverized	boiler building	Flanagan, Whitaker	Cyclone used to capture high-pressure suspension of coal powder prior to burner
Pyrite reject	boiler building	Flanagan, Whitaker	All material caught in plastic buckets
Boiler bottom ash (slurry)	sluice pipe outlet at ash pond	Flanagan, Whitaker	Dipper samples alternately filling two glass carboys

OPERATIONS OBSERVED DURING TSA (continued)

Medium	Location	Auditor	Comment
Condenser water inlet	boiler building	Flanagan	From spigot tube allowed to run before sampling
Condenser water outlet	boiler building	not being sampled	Sample point inaccessible
Flue gas	ESP inlet	Whitaker	
Flue gas	ESP outlet	Whitaker	
Stack gas (JBR out)	Stack	Whitaker	
ESP hopper ash (slurry)	sluice pipe outlet at ash pond	Flanagan	Dipper samples alternately filling two glass carboys
JBR makeup water	JBR area	Flanagan	
JBR slurry density	JBR area density meter slip stream	Flanagan	Nuclear density meter out of service
Limestone	limestone silo	not observed	
Coal pile runoff	coal pile	not observed	No rain during audit
Cr ^{IV} measurement	JBR Project Laboratory	Flanagan	Actual samples not seen; calibration only
XAD-2 cartridge spike for semi- volatiles	laboratory trailer	Flanagan	
Metals train spikes	laboratory trailer	Flanagan	
VOST challenge	stack sampling area	Whitaker	
Orsat procedure (oxygen)	laboratory trailer	Whitaker	Acceptable results.

Recommendations

- 1. Unusually large differences were seen when RTI's standard orifice was used to test some of the sampling consoles used for source testing. These consoles are scheduled to be re-tested after their return to the laboratory and the results compared with the calibrations prior to the site test. Because of the discrepancies observed with the RTI orifice, the calibration results should be reported to DOE as soon as they are available. The pre- and post-test calibrations must agree within 5% or the data must be corrected. For regulatory purposes, the factor giving the higher emission estimate would be applied; however, for the research work under this project, an average of the two factors would probably be more appropriate.
- 2. Mass flow rates for solids such as bottom ash and ESP ash are calculated based on coal feed rates and percentage ash in the coal obtained by proximate/ultimate analysis. One or more independent, direct methods of measuring or estimating the amount of ash produced should be attempted. For example, one such method for independently calculating ash production rates would involve multiplying the ash slurry average mass concentration by the length of time the slurry flows and by the flow rate out of the pipe. Ash concentration in the slurry can be obtained by taking representative, time-proportional samples throughout the length of time the slurry flows. Flow rates can be measured at the outfall or obtained from the plant. Intercomparison of different estimates will increase the confidence in the validity of the mass balance calculations. This is a problem common to all contractors at all sites.
- 3. Because auditors were not allowed to take any completed Radian data sheets off-site, a data audit should be conducted in which raw data sheets, computer-logged data, logbooks, validation procedures, and calculations are examined.
- 4. A multi-point calibration has not been conducted on the CEMs used for the demonstration project since November 17-20, 1992. The CEMs are not scheduled for another calibration until the next phase of the JBR project, which begins in the fall. This would result in more than a year between calibrations. It is recommended that Georgia Power and Radian make provision to conduct multipoint calibrations at intervals of no more than six months for SO₂, NO_x, and O₂. If possible, line losses between the span gas cylinders and the probes should also be determined at this time.
- 5. It is recommended that the major elements for mass balance determination be discussed and finalized between DOE and Radian, if this has not already been done.

Personnel Present During Site Visit

Name	Organization	Telephone
Chuck Schmidt	DOE	(412)892-4690
Tim McIlvried	DOE	
Dave Burford	Georgia Power	(404)253-2111
Roy Clarkson	Georgia Power	
Jeff Nelms	Georgia Power	
Al Williams	Radian	(512)454-4797
Ira Pearl	Radian	(512)454-4797
Barbara Hayes	Radian	(512)454-4797
Renee Cravin	Radian	(512)454-4797
Dave Virbick	Radian	(512)454-4797
Dave Maxwell	Radian	(512)454-4797
Benji Cox	Radian	(512)454-4797
Tom Peters	Radian	(512)454-4797
Ed Zabasaija	Radian	(512)454-4797
Tom Baraga	Radian	(512)454-4797
Jim McGee	Radian	(512)454-4797
Jim Hand	Radian	(512)454-4797
Lori Rodriquez	Radian	(512)454-4797
Jim Flanagan	RTI	(919)541-6417
Craig Whitaker	RTI	(919)541-5988

APPENDIX B: SAMPLING PROTOCOL

Radian used established sampling methods, where possible, to collect representative samples from the various sampling locations within the Yates plant site. The sampling locations at Plant Yates Boiler No. 1 and the various plant processes included:

- Boiler inlet, outlet, and sluice streams;
- ESP inlet, outlet, and ash streams;
- FGD system inlet, outlet, and slurry streams; and
- Stack gas.

For most of the sources, the sampling methods used were standard methods with known performance characteristics, specific for the collection of a representative sample according to the stream matrix. These methods, summarized in Table B-1, provide data for comparisons with industry standards.

Gas Streams

The following section presents the methodology to collect samples from gaseous streams.

Particulate Loading

EPA Reference Method 5¹ or EPA Reference Method 17² was performed to determine particulate loading at the selected sampling locations at Plant Yates. Method 5 was used at the stack and ESP outlet locations and Method 17 was used at the ESP inlet sampling location. These methods provided isokinetic extraction of particulate matter on a glass fiber filter. However, since particulate loading determinations were performed in conjunction with the sampling for particulate and vapor-phase metals, quartz fiber filters were used in place of glass. The particulate mass, which included all material that condenses at or above the filtration temperature, was determined gravimetrically, after the removal of uncombined water.

Table B-1 Summary of Sampling Methods

Stream Type	Parameter	Frequency	Sampling Method
Solids	Ali	Grab sample hourly to com- posite per test run (time- averaged composite) ^a	EPA Method S007 ³ (trowel/scoop)
Liquids	All	Grab sample hourly to com- posite per test (time-averaged composite) ⁴	EPA Method S007 (trowel/ scoop) EPA Method S004 ⁴ (tap)
Gases	Volatile Organics	4 pairs of VOST traps over 2-hour time period	VOST (SW-846 Method 0030) ⁵
	Semivolatile Organics	Integrated sample over 4- to 6-hour time period	Modified Method 5 (SW-846) Method 0010 ⁶
	Vapor-Phase Inorganic/ Organic Species	Integrated sample over 4- to 6-hour time period	Various impinger solutions sampling trains
	Trace Elements (Metals)	Integrated sample over 1- to 2-hour time period	Multi-metals sampling train ⁷
	Particulate	Integrated sample over 1- to 2-hour time period	EPA Methods 5 ^s and 17 ^s sampling trains
	Particle Size Distribution	Fixed point sample over appropriate time period	In-stack cascade impactor

^{*} Solid and liquid samples for volatile organics analyses were sampled only once per day, per test run.

The RM5 sampling system incorporated a calibrated glass nozzle, heated glass lined probe, heated oven (housing the filter holder and substrate), a condenser assembly, and a calibrated extraction system. The Method 17 sampling system was similar except an in-stack filtration system was used as opposed to the hot box and heated filter holder configuration of Method 5. Both systems operated under vacuum for extraction of effluent gas through leak free components. Both systems were leak checked before and after each individual test.

An extraction (sampling) rate was determined based upon preliminary measurements of temperature, flow rate, pressure, and moisture collected prior to the sampling program. The sampling rate was calculated from these variables to assist in providing and maintaining isokinetic sampling throughout the entire test period. At isokinetic conditions, the velocity of the stack gas entering the nozzle of the extraction system is equal to the effluent velocity at the sample point. The extraction system allowed manual adjustment of the sample rate when changes occurred in any of the variables that would affect isokinetic collection.

The individual stream gas velocities and the selection of the proper sample nozzle dictated the required sample time. The sampling was conducted at equal time intervals along the selected traverse points as determined by EPA Reference Method 1.¹⁰

After each test sequence, the particulate samples were recovered. For Method 5, the collected sample included the particulate deposited inside the extraction nozzle, heated probe, and filter holder (designated as the front half probe and nozzle rinse, PNR), as well as the particulate collected on the filter substrate. The Method 17 collected sample included the particulate deposited inside the nozzle and collected on the in-stack filter.

Particulate Metals and Vapor-Phase Metals

Sampling for the collection of particulate and vapor-phase metals was performed in conjunction with Method 5 and 17 using the procedures detailed in EPA Conditional Method 29. Method 29 is similar to Method 5 with a few sample train modifications. Modifications to Method 5 included replacing the stainless steel nozzle and probe liner with glass components. Method 17 was modified to operate with a glass nozzle and a teflon coated thimble holder to reduce the possibility of metal contamination due to the sampling system. The particulate material was collected on quartz fiber substrates, replacing the standard glass fiber filters normally used with Methods 5 and 17. Vapor-phase metals were collected in a series of impinger solutions. The first two impingers contained a dilute nitric acid and hydrogen peroxide solution. The third impinger was empty. The next two impingers contained acidic potassium permanganate solution for mercury collection. These impingers were followed by one dry impinger, and an impinger filled with silica gel. A minimum of 100 dry standard cubic feet of gas was collected isokinetically.

Sample recovery was performed in the on-site laboratory. An outline of the sample recovery procedure is detailed below:

Appendix B: Sampling Protocol

- 1 Petri dish plastic filter
- 1 500 mL glass Acetone PNR. Rinse front half of filter holder with acetone into PNR bottle.
- 1 500 mL glass HNO₃ PNR. Rinse front half of filter holder into PNR bottle.
- 1 1000 mL plastic 1st & 2nd Imp.

 Rinse back half of filter holder and impingers with 0.1N HNO₃ into sample bottle.
- 1 1000 mL glass 3rd, 4th, & 5th impingers. Rinse impingers with 0.1N HNO₃ into sample bottle.
- 1 250 mL glass. Rinse 3rd, 4th & 5th impingers with 8N HCl.

Preservation - None

Particle Size Distribution

The particle size distribution of material in the sample gas was measured using cascade impactors. These impactors classify particulate matter with respect to aerodynamic particle size.

The impactor separated the particulate matter into seven size fractions (six impacted fractions and one fraction collected on the back-up filter). The isokinetic flow rate through the sampling nozzle was determined based on velocity data obtained during earlier sampling (EPA Method 5). Operation of the impactor required the flow rate through the impactor be kept constant. This requirement eliminated the possibility of adjusting the flow rate if variations in stack gas velocity occurred. After sampling, the impactor was unloaded and the collected particulate material weighed. The weight gains were used to calculate the particle size distribution. The recovery outline is presented below:

- 10 Petri dishes plastic filters
- 1 250 mL glass acetone PNR. Rinse pre-cutter with acetone into PNR bottle.

Preservation - None

Anions

A Method 5 train was used to collect vapor-phase and solid-phase (particulate) acid gas species of hydrochloric, hydrofluoric, sulfuric and phosphoric acids along with sulfur dioxide and sulfur trioxide. The two sorbing impinger solutions for the acid gases were 200 mL of a carbonate/bicarbonate solution containing hydrogen peroxide followed by a dry impinger and an impinger filled with silica gel. The sample train was operated according to the procedures detailed in EPA Reference Method 5.

Recovery procedures for the Anions train are presented below:

- 1 Petri dish Plastic filter
- 1 500 mL plastic H_2O PNR. Rinse front half of filter holder with H_2O into PNR bottle.
- 1 1,000 mL plastic Impinger contents. Pour the contents of the first three impingers into sample bottle. Rinse back half of filter holder, connecting glassware and impingers with H₂O into sample bottle.

Preservation - Keep cold (< 4°C)

Volatile Organics

The volatile component determinations were performed using a volatile organic sampling train (VOST). In VOST, volatile organics were removed from the sample gas by sorbent traps maintained at 20°C. The first resin trap contained Tenax and the second trap contained Tenax followed by petroleum-based charcoal. A dry gas meter was used to measure the volume of gas passed through the pair of traps. Sample volumes of 20 liters were collected on separate pairs of traps with a 0.5 liter per minute sampling rate. The samples were collected at a fixed point in the stack where the velocity matches the average gas velocity.

The VOST consisted of a quartz probe, water-cooled condensers, sorbent traps, and sample gas metering system. During sample collection, the Tenax traps were maintained at 20°C. To further increase the collection efficiency, the sample gas was cooled and dried by passing it through a water-cooled condenser prior to its contact with the sorbent trap.

Before the initial assembly of the sampling train, all sample-contacting components were cleaned with non-ionic detergent, rinsed in HPLC-grade distilled water, and dried at 100°C. The resin traps were stored in clean glass containers with Teflon-lined screw caps, the condensers and other glassware were covered with appropriate end caps prior to use.

Before use, the traps, the Teflon-filled ceramic ferules, and the hardware used in connecting the traps, were conditioned. The virgin Tenax and the charcoal were Soxhlet extracted with methanol. After the resins were dried under infrared lamps, they were placed in a vacuum oven for six hours at 50°C. The tubes were packed individually and thermally conditioned for 12 hours at 200°C with organic free nitrogen at a rate of 40 mL/min. To check for emissions of volatile organic compounds, a tube from each batch was tested as a blank.

Leak checks were performed before and after collection of each pair of resin traps. After the post-collection leak check had been completed, the traps were sealed with end caps and returned to their respective glass containers for storage and transport. During storage and transportation, the traps were kept cool (< 4°C).

Aldehydes

Aldehydes were collected using a 2,4-dinitrophenylhydrazine (DNPH) train according to EPA Method 0011.¹² Sample collection was performed isokinetically following the procedures

detailed in EPA Method 5. The impinger solutions were combined into one sample along with the methylene chloride glassware rinse. The solutions were sealed in amber glass containers with Teflon closures and stored at 4°C.

Semivolatile Compounds

Semivolatile organics (SVs) determinations were performed using a Modified Method 5 (MM5)¹³ sampling train. The probe washes, filter catches, XAD sorbent traps, and aqueous condensates were extracted and analyzed for SVs according to SW-846 Method 8270 protocol. The MM5 sampling system consisted of a heated probe, heated filter, sorbent module, and pumping and metering unit. A gooseneck nozzle of an appropriate diameter to allow isokinetic sample collection was attached to the probe. S-type Pitot tube differential pressure was monitored to determine the isokinetic sampling rate.

From the heated filter, sample gas entered the sorbent module. The sorbent module consisted of a water-cooled condenser followed by the XAD-2 resin trap. After the resin trap was a dry, modified Greenburg-Smith impinger which collected the aqueous condensate. The stem of this impinger was short to reduce carryover of collected aqueous condensate. Following the condensate trap were two water impingers that collected any mist carryover from the condensate trap, and a final impinger containing silica gel to dry the sample gas before metering. A pump and dry gas meter were used to control and monitor the sample gas flow rate.

Sampling of the stack gases was conducted in accordance with the published MM5 protocol. The sampling rate for each train was between 0.5 and 1.0 dscfm. A minimum of 106 dscf was collected by each train over a minimum sampling period of two hours.

Sampling train preparation and sample retrieval were performed in a controlled environment to reduce the possibility of sample contamination. Prior to assembly, each component of the sampling train was thoroughly rinsed with methylene chloride.

After sample collection, the ends of the sampling train were sealed with solvent-rinsed foil and returned to the clean-up area for sample retrieval. The filter was recovered and placed in a methylene chloride-rinsed glass petri dish. Aqueous condensate collected in the first two impingers and in the sorbent trap was transferred to methylene chloride-rinsed amber glass bottles with Teflon-lined screw cap closures. All components of the sampling train, from the nozzle through the sorbent module, including the probe, filter glassware, and impinger glassware were rinsed thoroughly with a solution of methylene chloride. The probe was cleaned using a nylon brush followed by rinsing with a methylene chloride. The probe rinse and glassware rinses were combined with the recovered condensate sample. The XAD-2 resin cartridges were sealed and transferred to the laboratory intact. The recovery procedures are outlined below:

- 1 Petri dish glass filter
- 1 500 mL glass MeCl₂ PNR. Rinse front half of filter holder with MeCl₂ into PNR bottle.

- 1 XAD Resin Cartridge
- 1 500 mL glass Condensate. Pour the contents of the first two impingers into bottle. Discard third impinger H₂O₂ solution.
- 1 500 mL glass MeCl₂ Train Rinse. Rinse back half of filter holder, condenser, connecting glassware and impingers 1 and 2 with MeCl₂ into sample bottle.

Preservation - Keep cold (< 4°C)

Dioxins and Furans

Sampling for the collection of dioxins and furans present in the selected gas stream was performed using EPA Reference Method 23.¹⁴ Sample collection procedures specified in Method 23 were followed with the following exception:

All train component rinses were performed with methylene chloride and acetone. An
additional toluene rinse was then performed and added to the respective front half and
back half acetone/methylene chloride rinse samples.

Sample rate, volume and procedures were identical to the MM5 procedures described above.

Ammonia

Sample collection for the determination of ammonia present in the gas streams was performed in conjunction with the anions sampling train. Similarly as with the anions sample train, gas was extracted isokinetically through a glass fiber filter then directed to an impinger train which contains the collection solution. For the collection of ammonia, dilute sulfuric acid was placed in the first two impingers of the condenser assembly. Recovery procedures for the ammonia train are presented below:

1 - 1,000 mL plastic - Impinger contents. Pour the contents of the first three impingers into sample bottle. Rinse connecting glassware and impingers with H₂O into sample bottle.

Hydrogen Cyanide

Sample collection for the determination of hydrogen cyanide present in the gas streams was performed in conjunction with the ammonia sampling train. Gas was extracted isokinetically through a glass fiber filter then directed to an impinger train which contains the collection solution. For the collection of cyanide, dilute zinc acetate solution was placed in the third and fourth impingers of the ammonia train. Recovery procedures for the hydrogen cyanide portion of the train are presented below:

1 - 1,000 mL glass - Impinger contents. Pour the contents of the first three impingers into sample bottle. Rinse connecting glassware and impingers with H₂O into sample bottle.

Radionuclides

Flue gas particulate samples for radionuclide analysis were collected using the approach defined by EPA Reference Methods 5 and 17 with one exception. The samples were collected at a single point in the duct representative of the average flue gas velocity. Filter samples were stored and transported in plastic petri dishes and thimbles were contained in plastic bottles.

Extractable Metals

Separate samples for extractable metals content were also collected using the single point isokinetic approach described for radionuclide sample collection. Quartz-fiber filter media was used to reduce the background metals contribution associated with glass fiber filters. Filter samples were stored and transported in glass petri dishes and thimbles were contained in glass bottles.

Vapor-Phase Mercury by Charcoal Sorption

Sampling for mercury speciation was performed using a sample train designed by Nicolas Bloom. The sampling train consists of a quartz probe, tandem pair of soda-lime traps, tandem iodated carbon traps, drierite cartridge and mass flow metering system. The sample train was assembled outside of the stack and leak checked to verify the sample integrity. The probe tip was placed at a single point in the stack that was determined to be representative of normal flow, based upon preliminary velocity measurements. The sample was extracted from the source with the sample rate adjusted to provide a 100 Liter sample collected over a minimum of two hours. At the completion of sampling, the train was leak checked and the sorbent tubes and probe liner recovered. Sorbent tubes were segregated based upon run and location and sealed in plastic bags for transport to the laboratory.

Chrome VI

Samples were collected via the BIF method for chromium (VI).¹⁶ This method used a nozzle, teflon lines, peristaltic pump for recirculating solution and impinger solutions. The impinger contained a known volume of 10 N potassium hydroxide. Samples were collected isokinetically from the outlet stack using the sampling procedures detailed in EPA Reference Method 5. At the completion of the sample collection period, the sample train was purged with ultrapure nitrogen prior to the recovery of the sample. The impinger solutions were recovered from the sample train, filtered, then transported to the on-site laboratory for analysis. All of the train components were rinsed with 0.1N nitric acid and the rinse was retained for total chromium analysis.

Solid Sampling Procedures

Dry solid stream samples (raw coal, boiler feed coal, pulverizer rejects, limestone, and ESP hopper ash) were collected using grab sampling techniques. Individual grab samples of each stream were collected hourly throughout each test run and composited to generate a represen-

tative, time-averaged composite sample. Composite samples of raw coal, boiler feed coal, pulverizer rejects, and raw limestone were riffled and split to produce a 1 kilogram (minimum) sample which was placed in a plastic bag and sealed for transportation to the laboratory.

Two composite samples of dry fly ash, one for each ESP field, were prepared from individual grab samples collected from ESP hoppers 1-4, and 5-8. For purposes of compositing, the mass distribution and removal efficiency were assumed to be uniform across the ESP inlet duct and across each bank of ESP ash hoppers. Consequently, the ash collected from each of the four hoppers in the same field were composited equally. Each composite sample was thoroughly mixed and stored in pre-cleaned glass bottles (for analysis of organic compounds), or in plastic bottles. Samples collected for organic compound analyses were refrigerated at 4°C and kept cool during transportation to the laboratory. No preservation was needed on samples for inorganic analyses.

Sluiced ash stream samples (bottom ash and ESP fly ash) were also collected using grab sampling techniques. Bottom ash, which is normally sluiced once per shift at Plant Yates, was sluiced prior to the beginning of each daily test run to remove accumulated ash material that was non-representative of the test period. Bottom ash sluicing operation was then secured immediately before, and throughout each daily test period. At the conclusion of each test period, sluicing operations were resumed while a sampler collected multiple grab samples with a polyethylene dipper. Samples were collected as long as there was visual evidence of bottom ash in the sluice water at concentrations high enough to warrant continued sampling.

These samples were composited directly into a large bucket where the ash was allowed to settle. After the ash had settled, the sluice water component was siphoned off to avoid disturbing the ash fines, and the wet ash mixed and bottled for storage and transportation to the laboratory. Samples for analysis of organic compounds were split from the composite sample and preserved in pre-cleaned, amber-glass containers by cooling to 4°C.

Sluiced fly ash from the ESP hoppers was collected in a manner similar to bottom ash, except sluicing operations were performed continuously to avoid ash buildup in the ESP. Since the ESP ash sluicing system was combined with the sluiced economizer and air preheater ash, the systems were isolated before the start of the test run to avoid bias in the ESP ash composite. Grab samples were collected hourly from the sluice water discharge pipe to the ash pond. Like bottom ash, the fly ash was allowed to settle, and the sluice water component siphoned off to avoid disturbing the ash fines. The wet ash was mixed and bottled for storage and transportation to the laboratory. Samples for analysis of organic compounds were split from the composite sample and preserved in pre-cleaned, amber-glass containers by cooling to 4°C.

Limestone and FGD slurry samples were collected using grab-tap sampling procedures. Sample taps were opened and allowed to purge immediately prior to collecting the process samples to insure representative sample collection. Hourly grab samples of limestone slurry were composited directly to a large container, and FGD slurry was filtered directly from the

tap through a filter press. The limestone slurry composites were filtered after mixing. The recovered filter cakes were bottled for storage and transportation to the laboratory. Samples for analysis of organic compounds were split from the composite samples and preserved in pre-cleaned, amber-glass containers by cooling to 4°C. Sub-samples of the FGD solids composite were also taken for the on-site analysis of sulfite and sulfate ions.

Liquid Sampling Procedures

Liquid samples were collected from both filtered and unfiltered sources. Raw, unfiltered water streams consisted of ash pond water, recycled gypsum pond water, coal pile run-off, and cooling water at the inlet of the steam condenser. Filtered streams consisted of bottom ash and fly ash sluice water, and limestone and FGD slurry filtrates.

Raw water samples were sampled by grab-tap sampling techniques. Hourly grab samples were composited into appropriate sample containers and preserved as soon as possible after sample collection. In some cases the sample was added directly to sample bottles containing the preservative in order to reduce the loss of the more volatile species (e.g. NH₃, CN⁻). Table B-2 presents the liquid sample preservation techniques for specific analytes.

Filtrate samples were collected as described in the corresponding sluice water or slurry stream. Sluice water that was siphoned from the settled ash material was filtered in its entirety, split into the appropriate sample containers, and preserved according to the techniques presented in Table B-2. Slurry filtrates were also split into appropriate containers and preserved in the same manner as sluice water filtrates.

Sluice water and slurry filtrate samples collected for the analysis of volatile organic compounds and aldehydes present the only exception to the sample collection procedures described above. Due to the volatility of these analytes, bottom ash sluice water, ESP fly ash sluice water, limestone slurry, and FGD slurry samples were collected for volatile organics directly into VOA vials without filtration, and chilled to 4°C.

References

- 1. 40 CFR 60, Appendix A. Test Methods. "Method 5: Determination of Particulate Emissions from Stationary Sources."
- 2. 40 CFR 60, Appendix A. Test Methods. "Method 17: Determination of Particulate Emissions from Stationary Sources (In-Stack Filtration Method)."
- 3. U.S. Environmental Protection Agency. "Method S007: Solid Grab Sample, Trowel (Scoop)," Sampling and Analysis Methods for Hazardous Waste Combustion. EPA-600/8-84-002 (February 1984).
- 4. U.S. Environmental Protection Agency. "Method S004: Liquid Grab Sample, Tap," Sampling and Analysis Method for Hazardous Waste Combustion. EPA-600/8-84-002 (February 1984).

- 5. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 0030: Volatile Organic Sampling Train," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed., Washington, D.C. (November 1986).
- U.S. Environmental Protection Agency, Office of Solid Waste. "Method 0010: Modified Method 5 Sampling Train," Test Methods for Evaluating Solid Waste. SW-846, 3rd. ed. Washington, D.C. (November 1986).
- 7. 40 CFR 266, Subpart H, "Method 29: Determination of Metals Emissions in Exhaust Gases from Hazardous Waste Incineration and Similar Combustion Processes: Proposed Method."
- 8. 40 CFR 60, Appendix A. Test Methods. "Method 5: Determination of Particulate Emissions from Stationary Sources."
- 9. 40 CFR 60, Appendix A. *Test Methods*. "Method 17: Determination of Particulate Emissions from Stationary Sources (In-Stack Filtration Method)."
- 10. 40 CFR 60, Appendix A. *Test Methods*. "Method 1: Sample and Velocity Traverses from Stationary Sources."
- 11. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 0030: Volatile Organic Sampling Train," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed., Washington, D.C. (November 1986).
- 12. 40 CFR 266, Appendix IX, Section 3.5. Methods Manual for Compliance with the BIF Regulations. "Sampling for Aldehyde and Ketone Emissions from Stationary Sources (Method 0011)."
- 13. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 0010: Modified Method 5 Sampling Train," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed., Washington, D.C. (November 1986).
- 14. 40 CFR 266, Appendix IX: Methods Manual for Compliance with the BIF Regulations. "Determination of Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans from Stationary Sources (Method 23)."
- 15. Bloom, Nicolas S., Eric M. Prestbo, and Vesna L. Miklavicic. "Fluegas Mercury Emissions and Speciations from Fossil Fuel Combustion." Published in the proceedings of the Second International Conference on Managing Hazardous Air Pollutants. Sponsored by the Electric Power Research Institute. Washington, D.C. (July 1993).
- 40 CFR 266, Appendix IX: Methods Manual for Compliance with the BIF Regulations.
 "Determination of Hexavalent Chromium Emissions from Stationary Sources (Method Cr⁶⁺)."

Table B-2
Preservation, Storage, and Holding Time Requirements for Liquid Samples

Analytical Parameter	Preservation and Storage Requirements	Maximum Holding Time (Days)
Volatile Organics	Cool 4°C; amber glass VOA vial	7 analyze
Semivolatile Organics	Cool 4°C; amber glass	14 extract, 40 analyze
Formaldehyde	Cool 4°C; amber glass	5 derivitize, 3 analyze
Soluble Metals	Filter on-site; HNO ₃ pH < 2	6 months analyze
Total Metals	HNO ₃ pH <2; plastic	6 months analyzea
Anions	Cool 4°C; plastic	28 analyze
Phosphate	Cool 4°C; H ₂ SO ₄ to pH <2	28 analyze
Sulfite	None; plastic	Analyze immediately
Ammonia	Cool 4°C; H ₂ SO ₄ to pH <2	28 analyze
Cyanide	Cool 4°C; NaOH to pH > 12	14 analyze

[•] Maximum holding time for Hg is 28 days.

Appendix C: SAMPLE CALCULATIONS

C-1

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A brief discussions of the data reduction procedures required to support this program is provided below. All calculations and data reduction procedures are compiled from 40 CFR Part 60, Appendix A for the specific Reference Methods. Included with each calculation is a brief definition of terms and general nomenclature utilized in the data reduction process.

Flow Rate Determination

The average gas velocity is determined from the gas density and from measurements of the average velocity head with a Pitot tube and inclined manometer.

Nomenclature

A = Cross sectional area of the stack or duct, (ft^2)

 C_n = Pitot tube coefficient, dimensionless

MW_{drv} = Molecular weight of gas, dry basis, lb/lb-mole

MW_{wet} = Molecular weight of gas, moisture corrected, lb/lb-mole

P_{ber} = Uncorrected barometric pressure at test site, "Hg

P_e = Static pressure of gas, "Hg

P. = Absolute pressure of gas, "Hg

ACFM = Effluent flow in actual feet per minute

SCFM = Effluent flow in standard cubic feet per minute

DSCFM = Effluent flow in dry standard cubic feet per minute

T_{*} = Average gas temperature, °F

Vel = Average gas velocity in feet per second

 ΔP = Velocity Head of gas, "H₂O

ave ΔP = Average square root of the velocity head, " H_2O

% CO₂ = Percent carbon dioxide by volume, dry basis

 $\% O_2 = Percent oxygen by volume, dry basis$

% H₂O = Percent moisture of gas stream

Appendix C: Sample Calculations

Calculations

Stack Pressure:

$$P_{g} = P_{bar} + \left(\frac{P_{g}}{13.6}\right) \tag{C-1}$$

Molecular Weight - Dry Basis:

$$MW_{dry} = 0.44 (\% CO_2) + 0.32 (\% O_2) + 0.28 (100 - \% CO_2 - \% O_2)$$
 (C-2)

Molecular Weight - Wet Basis:

$$MW_{wet} = MW_{dry} \times \left[\frac{(1 - \% H_2O)}{100} \right] + 0.18 \times (\% H_2O)$$
 (C-3)

Velocity (fps):

VPS = 85.49 x C_p x (ave
$$\sqrt{\Delta P}$$
) x $\sqrt{\frac{T_s + 460}{P_s \times MW_{wet}}}$ (C-4)

Flow Rate (ACFM):

$$ACFM = (VPS) \times (A) \times 60$$
 (C-5)

Flow Rate (SCFM):

SCFM = 17.64 x
$$\left[\frac{P_s}{(T_s + 460)}\right]$$
 x ACFM (C-6)

Flow Rate (DSCFM):

DSCFM = 17.64 x
$$\left[\frac{100 - \% H_2O}{100}\right] x \left[\frac{P_s}{(T_s + 460)}\right] x ACFM$$
 (C-7)

Moisture Determination

A gas sample is extracted from the source and moisture is removed from the sample stream and determined gravimetrically.

Nomenclature

 B_{wo} = Water vapor in gas stream, proportion by volume

P_{bar} = Uncorrected barometric pressure at test location, "Hg

 $T_m = Average dry gas meter temperature, °F$

 $V_m = Volume of gas sampled as measured by dry gas meter, acf$

V_{mstd} = Volume of gas sampled, corrected to standard conditions, dscf

 $V_{\rm H2O}$ = Volume of condensate collected in the condenser system, (mL)

 $V_w = Volume of water vapor$

 Y_d = Dry gas meter calibration factor

DH = Average pressure differential, "H₂O

Volume of Water Vapor:

$$V_w = 0.04707 \times (V_{H2O})$$
 (C-8)

Standard Sample Volume:

$$V_{MSTD} = 17.64 (Y_d) (V_m) \times \left[\frac{P_{ber} + (\Delta H/13.6)}{T_m + 460} \right]$$
 (C-9)

Appendix C: Sample Calculations

Water Vapor Fraction:

$$\mathbf{B}_{wo} = \frac{\mathbf{V}_{w}}{\langle \mathbf{V}_{w} \rangle + \langle \mathbf{V}_{mstd} \rangle}$$
 (C-10)

Percent Moisture:

% Moisture =
$$B_{wo} \times 100$$
 (C-11)

Particulate Emission Determination

Particulate matter is extracted isokinetically from a source and collected on a heated substrate and condensed in the impinger train. The particulate mass is determined gravimetrically after removal of uncombined water.

 $A_n = Area of nozzle (ft^2)$

 B_{wo} = Water vapor in gas stream, proportional by volume

C_{part} = Particulate mass collected, mg

DH = Average orifice pressure drop, "H₂O

DSCFM = Effluent flow, dry standard cubic feet per minute

 $P_{bar} = Uncorrected barometric pressure at test location, "Hg$

P_i = Absolute pressure of gas, "Hg

T = Total sample time, minutes

 $T_m = Average dry gas meter temperature, °F$

 $T_s = Average gas temperature, °F$

 V_{H2O} = Volume of condensate collected, mL

 V_m = Volume of gas sampled as measured by dry gas meter, acf

 V_{mstd} = Volume of gas sampled, corrected to standard conditions, dscf

Vel = Average duct velocity, feet per second

 Y_d = Dry gas meter calibration factor

% I = Isokinetic sampling rate

Calculations

Dry Gas Volume:

$$V_{MSTD} = 17.64 (Y_d) (V_m) \times \left[\frac{P_{ber} + (\Delta H/13.6)}{T_m + 460} \right]$$
 (C-12)

Percent Isokinetic:

% I = 0.09450 x
$$\frac{[(T_s + 460) \times (V_{mstd})]}{(T) \times (V_s) \times (P_s) \times (A_n) \times (1 - B_{wo})}$$
 (C-13)

Particulate Concentration:

$$gr/dscf = \frac{C(part) \times 0.0154}{V_{mstd}}$$
 (C-14)

Particulate Emission:

$$1b/hr = \frac{(gr/dscf) \times DSCFM \times 60}{7000}$$
 (C-15)

PLANT YATES
ESP INLET/ALDEHYDES

Run No.		2	3	Average
Date	6/21/93	6/22/93	6/23/93	Avelage
n				- 1
Time Start	1310	0735	0720	•
Time Finish	1345	0805	0750	-
Operator	MKO	MKO	MKO_	
Initial Leak Rate	0.008	0.008	0.009	-
Final Leak Rate	0.009	0.006	0.007	-
Duct Dimensions (ft)	8.5 x 57	8.5 x 57	8.5 x 57	-
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	-
Dry Gas Meter Calibration (Yd)	1.009	1.009	1.009	-
Nozzle Diameter (inches)	0.2750	0.2750	0.2750	-
Barometric Pressure ("Hg)	29.51	29.40	29.39	29.43
Static Pressure ("H2O)	-6.4	-6.2	-6.0	-6.2
Meter Volume (acf)	12.281	10.395	10.275	10.984
Average square root of delta p	0.3230	0.3580	0.3132	0.3314
Average delta H (" H2O)	0.39	0.48	0.37	0.41
Average Stack Temperature (F)	315	311	314	313
Average DGM Temp (F)	79.9	76.9	77.7	78.2
Test Duration (minutes)	35.0	30.0	30.0	31.7
% CO2	10.5	10.2	10.8	10.5
% O2	8.5	8.6	8.3	8.5
% N2	81.0	81.2	80.9	81.0
Meter Volume (dscf)	11.964	10.148	10.009	10.707
Flue Gas Moisture (%)	7.9	8.0	8.3	8.1
Gas Molecular Weight (Wet) (g/g-mole)	29.07	29.02	29.06	29.05
Absolute Stack Pressure (" Hg)	29.04	28.94	28.95	28.98
Absolute Stack Temperature (R)	775	<i>7</i> 71	774	<i>7</i> 73
Average Gas Velocity (f/sec)	22.22	24.63	21.57	22.81
Avg Flow Rate (acfm)	645,978	716,039	627,156	663,058
Avg Flow Rate (dscfm)	393,345	436,243	379,432	403,007
Isokinetic Sampling Rate (%)	102.10	91.10	103.31	98.83

PLANT YATES
ESP INLET/MODIFIED METHOD 5

Run No.	1	2	3	Average
Date	6/21/93	6/22/93	6/23/93	· -
Time Start	1255	0729	707	- [
Time Finish	1815	1341	1250	-
Operator	JWM	JWM	JWM	-
Initial Leak Rate	0.012	0.010	0.008	-
Final Leak Rate	0.015	0.018	0.014	
Duct Dimensions (ft)	8.5 x 57	8.5 x 57	8.5 x 57	- 1
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	
Dry Gas Meter Calibration (Yd)	0.999	0.999	0.999	-
Nozzle Diameter (inches)	0.3580	0.3580	0.3580	-
Barometric Pressure ("Hg)	29.51	29.40	29.39	29.43
Static Pressure ("H2O)	-6.4	-6.2	-6.0	-6.2
Meter Volume (acf)	103.779	115.043	111.153	109.992
Average square root of delta p	0.2399	0.2651	0.2470	0.2507
Average delta H (" H2O)	0.74	0.85	0.74	0.78
Average Stack Temperature (F)	295	304	300	300
Average DGM Temp (F)	85.4	84.7	87.1	85.7
Test Duration (minutes)	240.0	240.0	240.0	240.0
Condensed Water (g)	180.8	202.6	203.5	195.6
% CO2	10.5	10.2	10.8	10.5
% O2	8.5	8.6	8.3	8.5
% N2	81.0	81.2	80.9	81.0
Meter Volume (dscf)	99.183	109.693	105.460	104.779
Flue Gas Moisture (%)	7.9	8.0	8.3	8.1
Gas Molecular Weight (Wet) (g/g-mole)	29.07	29.02	29.05	29.05
Absolute Stack Pressure (" Hg)	29.04	28.94	28.95	28.98
Absolute Stack Temperature (R)	755	764	760	760
Average Gas Velocity (f/sec)	16.30	18.15	16.86	17.10
Avg Flow Rate (acfm)	473,726	527,730	490,232	497,230
Avg Flow Rate (dscfm)	295,838	324,601	301,800	307,413
Isokinetic Sampling Rate (%)	96.84	97.61	100.93	98.46

PLANT YATES ESP INLET/PSD

Run No.	1	2	3	Average
Date	6/21/93	6/22/93	6/23/93	
Time Start	1555	0925	0935	_ ;
Time Finish	1740	1145	1130	-
Operator	МКО	MKO	MKO	•
Initial Leak Rate	0.015	0.018	0.016	-
Final Leak Rate	NA	NA	NA	•
Duct Dimensions (ft)	8.5 x 57	8.5 x 57	8.5 x 57	•
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	•
Dry Gas Meter Calibration (Yd)	0.988	0.988	0.988	-
Nozzle Diameter (inches)	0.2750	0.2750	0.2750	-
Barometric Pressure ("Hg)	29.51	29.40	29.39	29.43
Static Pressure ("H2O)	-6.4	-6.2	-6.0	-6.2
Meter Volume (acf)	30.730	43.462	40.653	
Average square root of delta p	0.2650	0.2828	0.2915	0.2798
Average delta H (" H2O)	0.27	0.31	0.31	0.30
Average Stack Temperature (F)	318	320	318	319
Average DGM Temp (F)	84.8	85.0	94.0	87,9
Test Duration (minutes)	105.0	140.0	115.0	120.0
% CO2	10.5	10.2	10.8	10.5
% O2	8.5	8.6	8.3	8.5
% N2	81.0	81.2	80.9	81.0
Meter Volume (dscf)	29.041	40.910	37.631	35.861
Flue Gas Moisture (%)	7.9	8.0	8.3	8.1
Gas Molecular Weight (Wet) (g/g-mole)	29.07	29.02	29.06	
Absolute Stack Pressure (" Hg)	29.04	28.94	28.95	
Absolute Stack Temperature (R)	778	780	778	779
Average Gas Velocity (f/sec)	18.27	19.57		
Avg Flow Rate (acfm)	531,075	568,922	585,210	561,736
Avg Flow Rate (dscfm)	322,049	342,614	352,234	338,966
Isokinetic Sampling Rate (%)	100.90	100.20	109.14	103.42

PLANT YATES ESP INLET/VOST

Run No.	¥1	18	10	2A	2B	30	3A	38	30	Average
Date	6/21/93	6/21/93	6/21/93	6/22/93	6/27/93	6/22/93	6/23/93	6/23/93	6/23/93	•
Time Start	1400	1455	1550	0742	0160	1001	0742	0840	0932	
Time Finish	1440	1535	1630	0822	0950	돌	0822	0920	1012	ı
Operator	RVW	RVW	RVW	RVW	RVW	RVW	RVW	RVW	RVW	
ak Rate	0.00 @ 17"	0 00 @ 15	0.00 @ 18	0.00 @ 17	0.00 @ 16	0.00 @ 15	0.00@16	0.00 @ 16 0.00 @ 15	0.00 @ 18	
Final Leak Rate	0.00 @ 16" 0.00 @ 17	_	0.00 @ 15	0.00@15	0.00 @ 16	0.00@16	0.00@15	0.00 @ 15	0.00 @ 16	•
Duct Dimensions (ft)	8.5 x 57	8.5 x 57	8.5 x 57	8.5 x 57	8.5 x 57	8.5 x 57	8.5 x 57	8.5 x 57	8.5 x 57	
Dry Gas Meter Calibration (Yd)	1.0113	1.0113	1.0113	1.0113	1.0113	1.0113	1.0113		1.0113	ſ
Barometric Pressure ("Hg)	29.51	29.51	29.51	29.40	29.40	29.40	29.39	29.36	29.36	29.45
Static Pressure ("H20)	-6.4	4.9	-6.4	-6.2	-6.2	-6.2	-6.0	-6.0	-6.0	-6.3
Meter Volume (al.)	20.235	20.150	20.115	20.045	20.030	20.050	20.040	20.075	20.080	20.095
Average delta H (" H2O)	1.40	1.40	1.50	1.40	1.40	1.40	1.50	1.40		1.43
Average Stack Temperature (F)	295	295	295	304	304	304	300		300	300
Average DGM Temp (C)	26.3	28.5	29.7	24.0	26.7	29.3	25.6	29.4		27.2
Test Duration (minutes)	40.0	40.0	40.0	40.0	40.0	40.0				40.0
% C02	10.5	10.5	10.5	10.2	10.2	10.2	10.8	10.8	10.8	10.4
% 02	8.5	8.5	8.5	8.6	8.6	8.6				8.5
% N2	81.0	81.0	81.0	81.2	81.2	81,2				81.1
Meter Volume (dsL)	19.845	19.615	19.503	19.731	19.542	19.391	19.621	19.400	.61	19.607
Flue Gas Moisture (%)	7.9	7.9	7.9	8.0	8.0	8.0	8.3	6,3	8.3	8.0
Gas Molecular Weight (Wet) (g/g-mole)		29.07	29.07	29.02	29.02	29.02	29.06	29.06	29.06	29.05
Absolute Stack Pressure (" Hg)		29.04	29.04	28.94	28.94	28.94	28.95	28.92	28.92	28.99
Absolute Stack Temperature (R)	755	755	755	764	764	764	760	760	760	760

PLANT YATES
ESP INLET/MULTI-METALS - PARTICULATE

Run No.	1	2	3	Average
Date	6/25/93	6/26/93	6/27/93	-
Time Start	0800	0935	0848	-
Time Finish	1405	1611	1405	- 1
Operator	JWM	JWM	JWM	
Initial Leak Rate	0.014	0.006	0.017	_
Final Leak Rate	0.016	0.012	0.015	_ [
Duct Dimensions (ft)	8.5 x 57	8.5 x 57	8.5 x 57	-
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	· -
Dry Gas Meter Calibration (Yd)	0.999	0.999	0.999	-
Nozzle Diameter (inches)	0.3580	0.3580	0.3580	- 1
Barometric Pressure ("Hg)	29.55	29.56	29.40	29.50
Static Pressure ("H2O)	-5.8	-5.8	-5.9	<i>-</i> 5.8
Meter Volume (acf)	111.213	110.002	111.690	110.968
Average square root of delta p	0.2403	0.2490	0.2524	0.2472
Average delta H (" H2O)	0.77	0.74	0.76	0.76
Average Stack Temperature (F)	301	299	303	301
Average DGM Temp (F)	84.0	87.0	90.0	87.0
Test Duration (minutes)	240.0	240.0	240.0	240.0
Condensed Water (g)	201.0	244.0	252.2	232.4
Filter Weight Gain (g)	21.4931	24.9809	26.2059	24.2266
PNR Weight Gain (g)	1.8780		0.3098	1.0939
% CO2	10.1	10.5	11.8	10.8
% O2	9.9	8.8	7.0	8.6
% N2	80.0	80.7	81.2	80.6
Meter Volume (dscf)	106.704	104.991	105.454	105.716
Flue Gas Moisture (%)	8.2	9.9	10.1	9.4
Gas Molecular Weight (Wet) (g/g-mole)	29.03	28.84	28.93	28.94
Absolute Stack Pressure (" Hg)	29.12	29.13	28.97	29.07
Absolute Stack Temperature (R)	761	759	763	761
Average Gas Velocity (f/sec)	16.37	16.99	17.29	16.89
Avg Flow Rate (acfm)	475,917	494,021	502,740	490,893
Avg Flow Rate (dscfm)	295,051	301,434	302,524	299,670
Isokinetic Sampling Rate (%)	104.46	100.61	100.69	101.92
Particulate Concentration (gr/dscf)	3.38E+00	3.67E+00	3.88E+00	3.64E+00
Particulate Concentration (lbs/dscf)	4.83E-04	5.25E-04	5.54E-04	5.21E-04
Particulate Emission (grams/sec)	1,077	1,196	1,268	1,180
Particulate Emission (lbs/hour)	8,550	9,489	10,064	9,367

PLANT YATES ESP INLET/ANIONS

Run No.	1	2	3	Average
Date	6/25/93	6/26/93	6/27/93	/svolage
Time Start	1225	1108	0715	_
Time Finish	1405	1213	0837	_ '
Operator	MKO	MKO	MKO	_
Initial Leak Rate	0.010	0.004	0.009	
Final Leak Rate	0.004	0.009	0.005	_
Duct Dimensions (ft)	8.5 x 57	8.5 x 57	8.5 x 57	-
Pitot Tube Correction Factor (Cp)	0.5 7.57	0.84	0.5 7.57	_
Dry Gas Meter Calibration (Yd)	1.003	1.003	1.003	•
Nozzle Diameter (inches)	0.3750	0.3750	0.3750	_
Barometric Pressure ("Hg)	29.55	29.56	29.40	29.50
Static Pressure ("H2O)	-5.8	-5.8	-5.4	-5.7
Meter Volume (acf)	64.816	44.245	45.140	51.400
Average square root of delta p	0.3161	0.3201	0.2783	0.3048
Average delta H (" H2O)	1.36	1.41	0.99	1.25
Average Stack Temperature (F)	290	282	310	294
Average DGM Temp (F)	85.0	88.0	76.0	83.0
Test Duration (minutes)	100.0	65.0	82.0	82.3
% CO2	10.1	10.5	11.8	10.8
% O2	9.9	8.8	7.0	8.6
% N2	80.0	80.7	81.2	80.6
Meter Volume (dscf)	62.414	42.391	43,933	49.579
Flue Gas Moisture (%)	8.2	9.9	10.1	9.4
Gas Molecular Weight (Wet) (g/g-mole)	29.03	28.84	28.94	28.94
Absolute Stack Pressure (" Hg)	29.12	29.13	29.00	29.09
Absolute Stack Temperature (R)	750	742	770	754
Average Gas Velocity (f/sec)	21.38	21.59	19.14	20.71
Avg Flow Rate (acfm)	621,544	627,741	556,462	601,915
Avg Flow Rate (dscfm)	390,837	392,000	332,388	371,741
Isokinetic Sampling Rate (%)	100.90	105.11	101.84	102.62

PLANT YATES
ESP INLET/AMMONIA-CYANIDE

Run No.	1	2	3	4	Average
Date	6/25/93	6/26/93	6/26/93	06/27/93	-
Time Start	1450	0930	1420	0920	- }
Time Finish	1650	1035	1520	1040	- [
Operator	MKO	MKO	MKO	MKO	
Initial Leak Rate	0.010	0.009	0.009	0.006	- 1
Final Leak Rate	0.009	0.006	0.006	0.004	
Duct Dimensions (ft)	8.5 x 57	8.5 x 57	8.5 x 57	8.5 x 57	- "
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	0.84	- jj
Dry Gas Meter Calibration (Yd)	1.003	1.003	1.003	1.003	-
Nozzle Diameter (inches)	0.3750	0.3750	0.3750	0.3750	-
Barometric Pressure ("Hg)	29.55	29.56	29.56	29.40	29.56
Static Pressure ("H2O)	-5.8	-5.8	-5.8	-5.9	-5.8
Meter Volume (acf)	46,663	41.622	41.654	46.885	43.313
Average square root of delta p	0.3122	0.3122	0.3077	0.2871	0.3107
Average delta H (" H2O)	1.33	1.31	1.34	1.09	1.33
Average Stack Temperature (F)	289	283	284	315	285
Average DGM Temp (F)	88.0	80.0	94.0	83.0	87.3
Test Duration (minutes)	70.0	65.0	60.0	80.0	65.0
% CO2	10.1	10.5	10.5	11.8	10.4
% O2	9.9	8.8	8.8	7.0	9.2
% N2	80.0	80.7	80.7	81.2	80.5
Meter Volume (dscf)	44.684	40.459	39.470	45.054	41.538
Flue Gas Moisture (%)	8.2	9.9	9.9	10.1	9.3
Gas Molecular Weight (Wet) (g/g-mole)	29.03	28.84	28.84	28.94	28.90
Absolute Stack Pressure (" Hg)	29.12	29.13	29.13	28.97	29.13
Absolute Stack Temperature (R)	749	743	744	775	745
Average Gas Velocity (f/sec)	21.10	21.08	20.79	19.82	20.99
Avg Flow Rate (acfm)	613,466	612,867	604,440	576,283	610,258
Avg Flow Rate (dscfm)	386,272	381,939	376,181	341,573	381,464
Isokinetic Sampling Rate (%)	104.41	102.97	110.49	104.17	105.95

PLANT YATES ESP INLET/RADIONUCLIDES

Run No.	1	2	3	Average
Date	6/25/93	6/26/93	6/27/93	-
Time Start	0745	1540	1120	-
Time Finish	0907	1700	1240	-
Operator	MKO	MKO	MKO	
Initial Leak Rate	0.009	0.010	0.007	•
Final Leak Rate	0.006	0.009	0.004	<u> </u>
Duct Dimensions (ft)	8.5 x 57	8.5 x 57	8.5 x 57	-
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	-
Dry Gas Meter Calibration (Yd)	1.009	1.009	1.003	- 1
Nozzle Diameter (inches)	0.3750	0.3750	0.3750	•
Barometric Pressure ("Hg)	29.55	29.56	29.40	29.50
Static Pressure ("H2O)	-5.8	-5.8	- 5.9	-5.8
Meter Volume (acf)	53.605	45.950	45.096	48.217
Average square root of delta p	0.3300	0.2905	0.2737	0.2981
Average delta H (" H2O)	1.48	1.10	0.96	1.18
Average Stack Temperature (F)	301	317	316	311
Average DGM Temp (F)	82.0	97.0	93.0	90.7
Test Duration (minutes)	82.0	80.0	80.0	80.7
% CO2	10.1	10.5	11.8	10.8
% O2	9.9	8.8	7.0	8.6
% N2	80.0	8 0.7	81.2	80.6
Meter Volume (dscf)	52.231	43.540	42.537	46.103
Flue Gas Moisture (%)	8.2	9.9	10.1	9.4
Gas Molecular Weight (Wet) (g/g-mole)	29.03	28.84	28.94	28.94
Absolute Stack Pressure (" Hg)	29.12	29.13	28.97	29.07
Absolute Stack Temperature (R)	761	777	776	<i>7</i> 71
Average Gas Velocity (f/sec)	22.48	20.06	18.91	
Avg Flow Rate (acfm)	653,616	583,171	549,740	595,509
Avg Flow Rate (dscfm)	405,064	347,529	325,421	359,338
Isokinetic Sampling Rate (%)	99.35	98.94	103.23	100.51

PLANT YATES
ESP INLET/S.F. PARTICULATE

Run No.	1	2	3	Average
Date	6/25/93	6/26/93	6/27/93	-
Time Start	0800	0915	0740	-
Time Finish	1020	1125	0955	-
Operator	MKO	MKO	RVW	
Initial Leak Rate	0.009	0.017	0.014	-
Final Leak Rate	NA	NA	NA	-
Duct Dimensions (ft)	8.5 x 57	8.5 x 57	8.5 x 57	-
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	-
Dry Gas Meter Calibration (Yd)	0.988	1.009	1.009	-
Nozzle Diameter (inches)	0.2750	0.2750	0.2750	_
Barometric Pressure ("Hg)	29.55	29.56	29.40	29.50
Static Pressure ("H2O)	-5.8	-5.8	-5.9	-5.8
Meter Volume (acf)	41.161	43.983	42.677	42.607
Average square root of delta p	0.2826	0.3289	0.2871	0.2995
Average delta H (" H2O)	0.31	0.41	0.32	0.35
Average Stack Temperature (F)	288	311	313	304
Average DGM Temp (F)	81.0	83.8	82.0	82.3
Test Duration (minutes)	130.0	120.0	135.0	128.3
% CO2	10.1	10.5	11.8	10.8
% O2	9.9	8.8	7.0	8.6
% N2	80.0	80.7	81.2	80.6
Meter Volume (dscf)	39.229	42.615	41.253	41.032
Flue Gas Moisture (%)	8.2	9.9	10.1	9.4
Gas Molecular Weight (Wet) (g/g-mole)	29.03	28.84	28.94	28.94
Absolute Stack Pressure (" Hg)	29.12	29.13	28.97	29.07
Absolute Stack Temperature (R)	748	771	773	764
Average Gas Velocity (f/sec)	19.09	22.62	19.80	20.50
Avg Flow Rate (acfm)	554,932	657,618	575,539	596,030
Avg Flow Rate (dscfm)	349,883	395,047	342,015	362,315
Isokinetic Sampling Rate (%)	101.33	105.61	104.97	103.97

PLANT YATES ESP INLET/EXTRACTABLE METALS

	يستقسيسام			
Run No.	1 1	2	3	Average
Date	6/25/93	6/26/93	6/27/93	- 1
Time Start	0945	1345	1300	-
Time Finish	1045	1505	1410	-
Operator	MKO	RVW	MKO	
Initial Leak Rate	0.001	0.010	0.009	•
Final Leak Rate	0.004	0.007	0.006	
Duct Dimensions (ft)	8.5 x 57	8.5 x 57	8.5 x 57	
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	- 1
Dry Gas Meter Calibration (Yd)	1.009	1.009	1.003	- [
Nozzle Diameter (inches)	0.3750	0.3750	0.3750	-
Barometric Pressure ("Hg)	29.55	29.56	29.40	29.50
Static Pressure ("H2O)	-5.8	-5.8	-5.9	-5,8
Meter Volume (acf)	43.420	43.280	44.144	43.615
Average square root of delta p	0.3606	0.2676	0.3081	0.3121
Average delta H (" H2O)	1.75	0.96	1.22	1.31
Average Stack Temperature (F)	296	323	316	312
Average DGM Temp (F)	85.0	92.9	94.0	90.6
Test Duration (minutes)	60.0	80.0	70.0	70.0
% CO2	10.1	10.5	11.8	10.8
% O2	9.9	8.8	7.0	8.6
% N2	80.0	80.7	81.2	80,6
Meter Volume (dscf)	42.102	41.299	41.591	41.664
Flue Gas Moisture (%)	8.2	9.9	10.1	9.4
Gas Molecular Weight (Wet) (g/g-mole)	29.03	28.84	28.94	28.94
Absolute Stack Pressure (" Hg)	29.12	29.13	28.97	29.07
Absolute Stack Temperature (R)	756	783	776	772
Average Gas Velocity (f/sec)	24.49	18.55	21.29	21.44
Avg Flow Rate (acfm)	711,874	539,201	618,835	623,303
Avg Flow Rate (dscfm)	444,085	318,945	366,321	376,451
Isokinetic Sampling Rate (%)	99.83	102.26	102.48	101.52

PLANT YATES
ESP OUTLET/MODIFIED METHOD 5

Run No.	1	2	3	Average
Date -	6/21/93	6/22/93	6/23/93	-
Time Start	1249	0753	0712	- 1
Time Finish	1812	1247	1129	-
Operator	TJB	TJB	TJB	-
Initial Leak Rate	0.005	0.003	0.002	-
Final Leak Rate	0.005	0.005	0.005	
Duct Dimensions (ft)	11.3 x 11.3	11.3 x 11.3	11.3 x 11.3	-
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	
Dry Gas Meter Calibration (Yd)	0.997	0.997	0.997	- 1
Nozzle Diameter (inches)	0.1970	0.1970	0.1970	-
Barometric Pressure ("Hg)	29.51	29.40	29.36	29.42
Static Pressure ("H2O)	-11	-11	-11	-11
Meter Volume (acf)	126.423	127.680	118.467	124.190
Average square root of delta p	0.9096	0.9306	0.8958	0.9120
Average delta H (" H2O)	0.93	0.94	0.82	0.90
Average Stack Temperature (F)	280	280	275	278
Average DGM Temp (F)	86.5	84.6	83.5	84.9
Test Duration (minutes)	240.0	240.0	240.0	240.0
Condensed Water (g)	207.6	212.4	211.2	210.4
% CO2	11.1	11.2	10.6	11.0
% O2	8.0	7.9	8.5	8.1
% N2	80.9	80.9	80.9	80.9
Meter Volume (dscf)	120.387	121.556	112.827	118.256
Flue Gas Moisture (%)	7.5	7.6	8.1	7.8
Gas Molecular Weight (Wet) (g/g-mole)	29.19	29.19	29.06	29.14
Absolute Stack Pressure (" Hg)	28.70	28.59	28.55	28.61
Absolute Stack Temperature (R)	740	740	735	738
Average Gas Velocity (f/sec)	61.39	62.93	60.55	61.62
Avg Flow Rate (acfm)	470,365	482,150	463,880	472,132
Avg Flow Rate (dscfm)	297,590	303,573	292,059	297,741
Isokinetic Sampling Rate (%)	101.70	100.67	97.12	99.83

PLANT YATES ESP OUTLET/ALDEHYDES

Run No.	1	2	3	Average
Date	6/21/93	6/22/93	6/23/93	-
Time Start	1232	0719	0655	- 1
Time Finish	1447	0928	0909	-
Operator	APE	APE	APE	ii
Initial Leak Rate	0.010	0.002	0.007	•
Final Leak Rate	0.005	0.002	0.005	
Duct Dimensions (ft)	11.3 x 11.3	11.3 x 11.3	11.3 x 11.3	-
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	-
Dry Gas Meter Calibration (Yd)	0.992	0.992	0.992	-
Nozzle Diameter (inches)	0.1900	0.1910	0.1910	-
Barometric Pressure ("Hg)	29.51	29.40	29.36	29.42
Static Pressure ("H2O)	-11	-11	-11	-11
Meter Volume (acf)	66.723	66.100	67.250	66.691
Average square root of delta p	0.8750	0.9583	0.9487	0.9273
Average delta H (" H2O)	0.78	0.89	0.81	0.82
Average Stack Temperature (F)	280	275	270	275
Average DGM Temp (F)	82.0	87.8	87.9	85.9
Test Duration (minutes)	135.0	129.0	135.0	133.0
% CO2	11.1	11.2	10.6	11.0
% O2	8.0	7.9	8.5	8.1
% N2	80.9	80.9	80.9	80.9
Meter Volume (dscf)	63.719	62.240	63.213	63.0 5 7
Flue Gas Moisture (%)	7.5	7.6	8.1	7.7
Gas Molecular Weight (Wet) (g/g-mole)	29.19	29.19	29.06	29.15
Absolute Stack Pressure (" Hg)	28.70	28.59	28.55	28.61
Absolute Stack Temperature (R)	740	7 35	730	735
Average Gas Velocity (f/sec)	59.06	64.58	63.90	62.51
Avg Flow Rate (acfm)	452,448	494,802	489,582	478,944
Avg Flow Rate (dscfm)	286,337	313,723	310,413	303,491
Isokinetic Sampling Rate (%)	106.92	98.71	96.82	100.82

PLANT YATES ESP OUTLET/VOST

Run No.	YI I	18	10	2A	2B	3C	3A	3B	3C	Average
Date	6/21/93	6/21/93	6/21/93	6/22/93	6/22/93	6/22/93	6/23/93	6/23/93	6/23/93	•
Time Start	1238	1323	1408	0736	0822	6060	0720	6080	0856	•
Time Finish	1318	1403	1444	9180	0902	0949	0800	0849	0936	•
Operator	OHO	OHO	DHD	DHD	DHD	DHD	DHD	DHD	DHD	•
Initial Leak Rate	0.0 @ 22"	0.0 @ 21"	0.0 @ 18"	0.0 @ 21"	0.0 @ 21"	0.0 @ 20"	0.0 @ 20"	0.0 @ 22"	0.0 @ 22"	;
Final Leak Rate	$0.0 \ @ 14$ "	0.0 @ 12"	0.0 @ 24"	0.0 @ 11"	0.0 @ 9"		0.0 @ 11"	0.0 @ 17"	0.0 @ 11"	•
(f)	11.3×11 .	11.3 x 11.	11.3 x 11.	11.3 x 11.3	11,3 x 11.	11.3 x 11.	11.3 x 11.	11.3×11 .	11.3×11 .	r
Dry Gas Meter Calibration (Yd)	1.036	1.036	1.036	1.036	1.036	1.036	1.036	1.036	1.036	1.036
Barometric Pressure ("Hg)	29.51	29.51	29.51	29.40	29.40	29.40	29.39	29.39	29.39	29.44571
Static Pressure ("H2O)	-11	-11	-1	=	-11	-11	-11	-11		-11
Meter Volume (aL)	20.120	20.000	23.000	20.050	20.000	20.000	20.000	20.000	20.000	20.453
Average delta H (" H2O)	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Average Stack Temperature (F)	280	280	280	280	280	280	275	275	275	279
Average DGM Temp (C)	23.9	25.4	26.1	25.7	26.9	28.1	25.0	27.9	29.4	25.9
Test Duration (minutes)	40.0	40.0	40.0	40.0	40.0	40.0	40.0			40.0
% CO2	11.1	11.1	11.1	11.2	11.2	11.2	10.6			11.1
% 02	8.0	0.8	0.8	7.9	7.9	7.9	8.5	8.5	8.5	8.0
% N2	80.9	80.9	80.9	80.9	80.9	80.9	80.9			80.9
Meter Volume (dsL)	19.874	19.647	22.544	19.609	19.480	19.400	19.596	19.409	19.309	20.021
Flue Gas Moisture (%)	7.5	7.5	7.5	9.7	7.6	9.7	8.1	8.1	8.1	7.6
Gas Molecular Weight (Wet) (g/g-mole)	29.19	29.19	29.19	29.19	29.19	29.19	29.06	29.06	29.06	29.17
Absolute Stack Pressure (" Hg)	28.70	28.70	28.70	28.59	28.59	28.59	28.58	28.58	29.39	28.64
Absolute Stack Temperature (R)	740	740	740	740	740	740	735	735	735	739

PLANT YATES ESP OUTLET/PSD

Run No.		2	3	
	1] ~	Average
Date	6/21/93	6/22/93	6/23/93	-
Time Start	1436	1003	0907	-
Time Finish	2236	1550	1407	-
Operator	TJB	DD	DD	-
Initial Leak Rate	0.01	0.009	0.010	-
Final Leak Rate	NA	NA NA	NA	-
Duct Dimensions (ft)	11.3 x 11.3	11.3 x 11.3	11.3×11.3	-
Pitot Tube Correction Factor (Cp)	0.84	0,84	0.84	-
Dry Gas Meter Calibration (Yd)	1.007	1.007	1.007	-
Nozzle Diameter (inches)	0.1910	0.1910	0.1910	-
Barometric Pressure ("Hg)	29.51	29.40	29.36	29.42
Static Pressure ("H2O)	-11	-11	-11	-11
Meter Volume (acf)	254.680	180.019	154.960	196.553
Average square root of delta p	0.9920	0.9460	0.9550	0.9643
Average delta H (" H2O)	0.95	0.90	0.86	0.90
Average Stack Temperature (F)	280	285	282	282
Average DGM Temp (F)	84.4	88.4	93.9	88.9
Test Duration (minutes)	480.0	350.0	300.0	376.7
% CO2	11.1	11.2	10.6	11.0
% O2	8.0	7.9	8.5	8.1
% N2	80.9	80.9	80.9	80.9
Meter Volume (dscf)	245.909	171.888	146.280	188.026
Flue Gas Moisture (%)	7.5	7.6	8.1	7.7
Gas Molecular Weight (Wet) (g/g-mole)	29.19	29.19	29.06	29.15
Absolute Stack Pressure (" Hg)	28.70	28.59	28.55	28.61
Absolute Stack Temperature (R)	740	745	742	742
Average Gas Velocity (f/sec)	66.95	64.17	64.85	65.32
Avg Flow Rate (acfm)	512,947	491,597	496,867	500,470
Avg Flow Rate (dscfm)	324,624	307,714	309,938	314,092
Isokinetic Sampling Rate (%)	101.30	102.44	100.98	101.57

PLANT YATES
ESP OUTLET/MULTI-METALS - PARTICULATE

Run No.	Ī	2	3	Average
Date	6/25/93	6/26/93	6/27/93	
Time Start	0758	0925	0746	_
Time Finish	1316	1410	1210	_
Operator	TJB	TJB	ТЛВ	_
Initial Leak Rate	0.010	0.005	0.008	-
Final Leak Rate	0.015	0.007	0.007	
Duct Dimensions (ft)	11.3×11.3	11.3 x 11.3	11.3 x 11.3	-
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	-
Dry Gas Meter Calibration (Yd)	0.997	0.997	0.997	-
Nozzle Diameter (inches)	0.1970	0.1970	0.1970	-
Barometric Pressure ("Hg)	29.55	29.42	29.30	29.42
Static Pressure ("H2O)	-11.0	11.0	-11 <u>.0</u>	-11.0
Meter Volume (acf)	118.957	121.053	125.534	121.848
Average square root of delta p	0.8758	0.9165	0.9210	0.9044
Average delta H (" H2O)	0.79	0.86	0.90	0.85
Average Stack Temperature (F)	279	281	281	281
Average DGM Temp (F)	85.8	_88.5	89.8	88.0
Test Duration (minutes)	241.0	240.0	240.0	240.3
Condensed Water (g)	243.4	258.9	277.2	259.8
Filter Weight Gain (g)	0.3241	0.2829	0.3586	0.3219
PNR Weight Gain (g)	0.1157	1 :	0.1338	0.1099
% CO2	11.2	11.1	11.4	11.2
% O2	7.6	7.5	7.6	7.6
% N2	81.2	81.4	81.0	81.2
Meter Volume (dscf)	113.537	114.483	117.971	115.330
Flue Gas Moisture (%)	9.2	9.6	10.0	9.6
Gas Molecular Weight (Wet) (g/g-mole)	28.98	28.91	28.92	28.94
Absolute Stack Pressure (" Hg)	28.74	28.61	28.49	28.61
Absolute Stack Temperature (R)	739	741	741	741
Average Gas Velocity (f/sec)	59.25	62.30	62.74	61.43
Avg Flow Rate (acfm)	456,368	479,816	483,235	473,140
Avg Flow Rate (dscfm)	284,170	295,247	294,874	291,430
Isokinetic Sampling Rate (%)	100.56		101.11	99.89
Particulate Concentration (gr/dscf)	5.98E-02	1 110	6.44E-02	5.77E-02
Particulate Concentration (lbs/dscf)	8.54E-06		9.20E-06	8.25E-06
Particulate Emission (grams/sec)	18.35	15.61	20.52	18.16
Particulate Emission (lbs/hour)	145.63	123.85	162.83	144.11

PLANT YATES ESP OUTLET/ANIONS

Run No.	1	2	3	Average
Date .	6/25/93	6/26/93	6/27/93	- 1
Time Start	1015	1113	0915	-
Time Finish	1152	1243	1038	- [
Operator	APE	APE	TJB	
Initial Leak Rate	< 0.001	0.005	0.010	-
Final Leak Rate	0.007	0.003	0.004	-
Duct Dimensions (ft)	11.3 x 11.3	11.3 x 11.3	11.3 x 11.3	•
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	-
Dry Gas Meter Calibration (Yd)	0.992	0.992	0.992	-
Nozzle Diameter (inches)	0.2230	0.2230	0.2290	-
Barometric Pressure ("Hg)	29.55	29.42	29.30	29.42
Static Pressure ("H2O)	-11.0	-11.0	-11.0	-11.0
Meter Volume (acf)	65.200	62.150		62.654
Average square root of delta p	0.9574	0.9558	0.9327	0.9486
Average delta H (" H2O)	1.50	1.53	1.60	1.54
Average Stack Temperature (F)	282	283	280	282
Average DGM Temp (F)	96.3	96.5	99.7	97.5
Test Duration (minutes)	97.0	90.0	83.0	90.0
% CO2	11.2	11.1	11.4	11.2
% O2	7.6	7.5	7.6	7.6
% N2	81.2	81.4	81.0	
Meter Volume (dscf)	60.855	57,738	55.768	58.121
Flue Gas Moisture (%)	9.2	9.6	10.0	9.6
Gas Molecular Weight (Wet) (g/g-mole)	28.98	28.92	28.92	28.94
Absolute Stack Pressure (" Hg)	28.74	28.61	28.49	28.61
Absolute Stack Temperature (R)	742	743	740	742
Average Gas Velocity (f/sec)	64.89	65.04	L	
Avg Flow Rate (acfm)	499,777	500,985	488,928	496,563
Avg Flow Rate (dscfm)	310,071	307,637	298,858	305,522
Isokinetic Sampling Rate (%)	95.78	98.72	100.92	98.47

PLANT YATES
ESP OUTLET/AMMONIA-CYANIDE

				A
Run No.	1	2	3	Average
Date	6/25/93	6/26/93	6/27/93	•
Time Start	0741	0930	0725	•
Time Finish	0930	1104	0856	•
Operator	TJB	APE	TJB	•
Initial Leak Rate	0.010	0.007	0.010	-
Final Leak Rate	0.015	0.006	0.007	
Duct Dimensions (ft)	11.3 x 11.3	11.3 x 11.3	11.3 x 11.3	-
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	-
Dry Gas Meter Calibration (Yd)	0.992	0.992	0.992	-
Nozzle Diameter (inches)	0.2230	0.2230	0.2290	•
Barometric Pressure ("Hg)	29.55	29.42	29.30	29.42
Static Pressure ("H2O)	-11.0	-11.0	-11.0	-11.0
Meter Volume (acf)	73.525	64.150	63.443	67.039
Average square root of delta p	0.9680	0.9589	0.9434	0.9568
Average delta H (" H2O)	1.55	1.52	1.60	1.56
Average Stack Temperature (F)	280	279	279	280
Average DGM Temp (F)	_87.3	88.2	91.5	89.0
Test Duration (minutes)	109.0	95.0	91.0	98.3
% CO2	11.2	11.1	11.4	11.2
% O2	7.6	7.5	7.6	7.6
% N2	81.2	81.4	81.0	81.2
Meter Volume (dscf)	69.762	60.496	59.242	63.167
Flue Gas Moisture (%)	9.2	9.6	10.0	9.6
Gas Molecular Weight (Wet) (g/g-mole)	28.98	28.92	28.92	28.94
Absolute Stack Pressure (" Hg)	28.74	28.61	28.49	28.61
Absolute Stack Temperature (R)	740	739	739	740
Average Gas Velocity (f/sec)	65.52	65.10	64.18	64.93
Avg Flow Rate (acfm)	504,628	501,391	494,303	500,108
Avg Flow Rate (dscfm)	313,927	309,385	302,430	308,581
Isokinetic Sampling Rate (%)	96.51	97.43	96.63	96.86

PLANT YATES ESP OUTLET/ S.F. PARTICULATE

Run No.	1	2	3	Average
Date .	6/24-6/25/93	6/25-6/26/93	6/26-6/27/93	- 1
Time Start	0740	1130	1218	-
Time Finish	0700	0636	0627	-
Operator	DHD	DHD	DHD	-
Initial Leak Rate	0.012	0.005	0.005	•
Final Leak Rate	NA	NA NA	NA NA	-
Duct Dimensions (ft)	11.3 x 11.3	11.3 x 11.3	11.3 x 11.3	~
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	-
Dry Gas Meter Calibration (Yd)	1.007		1.007	-
Nozzle Diameter (inches)	0.2110		0.2110	-
Barometric Pressure ("Hg)	29.53	29.55	29.42	29.5
Static Pressure ("H2O)		-11.0	-11.0	-11.0
Meter Volume (acf)	852.132	i	711.797	750.516
Average square root of delta p	0.9581	0.9954	1.0651	1.0062
Average delta H (" H2O)	1.35	1.42	1.54	1.43
Average Stack Temperature (F)	281	279	281	280
Average DGM Temp (F)	89.8		92.9	91.3
Test Duration (minutes)	1375.8	1108.7	1055.5	1180.0
% CO2	11.2		11.4	11.2
% O2	7.6	!	7.6	7.6
% N2	81.2	81.4	81.0	81.2
Meter Volume (dscf)	816.056		675.646	716.325
Flue Gas Moisture (%)	9.2	9.6	10.0	9.6
Gas Molecular Weight (Wet) (g/g-mole			28.92	28.94
Absolute Stack Pressure (" Hg)	28.72	28.74	28.61	28.69
Absolute Stack Temperature (R)	741	739	741	740
Average Gas Velocity (f/sec)	64.92		72.36	68.22
Avg Flow Rate (acfm)	500,013	519,062	557,350	525,475
Avg Flow Rate (dscfm)	310,378	322,050	341,884	324,771
Isokinetic Sampling Rate (%)	101.05	97.33	99,00	99.13

PLANT YATES ESP OUTLET/RADIONUCLIDES

Run No.	1	2	3	Average
Date ·	6/24-6/25/93	6/25-6/26/93	6/26-6/27/93	Average
Time Start	1040	1050	1055	-
Time Start Time Finish		1		•
	0700	0640	0619	-
Operator Table 1	APE	ТЛВ	DHD	
Initial Leak Rate	< 0.001	0.005	0.005	• 1
Final Leak Rate	0.007	0.003	0.005	
Duct Dimensions (ft)	11.3 x 11.3	11.3 x 11.3	11.3 x 11.3	•
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	- 1
Dry Gas Meter Calibration (Yd)	1.005	1.005	1.005	- 1
Nozzle Diameter (inches)	0.1970	0.1970	0.1970	-
Barometric Pressure ("Hg)	29.53	29.55	29.42	29.50
Static Pressure ("H2O)	-11.0		-11.0	-11.0
Meter Volume (acf)	718.510		667.090	681,226
Average square root of delta p	1.1124	1.0092	1.0217	1.0478
Average delta H (" H2O)	1.27	1.10	1.20	1.19
Average Stack Temperature (F)	283	283	282	283
Average DGM Temp (F)	94.7	93.9	96.9	95.2
Test Duration (minutes)	1166.7	1182.4	1137.7	1162.3
% CO2	11.2	11.1	11.4	11.2
% O2	7.6	7.5	7.6	7.6
% N2	81.2	81.4	81 .0	81.2
Meter Volume (dscf)	680.531	624.352	626.886	643.923
Flue Gas Moisture (%)	9.2	9.6	10.0	9.6
Gas Molecular Weight (Wet) (g/g-mole)	28.98	28.92	28.92	28.94
Absolute Stack Pressure (" Hg)	28.72	28.74	28.61	28.69
Absolute Stack Temperature (R)	743	743	742	743
Average Gas Velocity (f/sec)	75.46	68.51	69.48	71.15
Avg Flow Rate (acfm)	581,204	527,706	535,180	548,030
Avg Flow Rate (dscfm)	359,951	325,606	327,622	337,726
Isokinetic Sampling Rate (%)	98.29	98.37	102.02	99.56

PLANT YATES ESP OUTLET/EXTRACTABLE METALS

Run No.	i	2	3	Average
Date	6/24-6/25/93	6/25-6/26/93	6/26-6/27/93	-
Time Start	1300	1040	1137	-
Time Finish	0700	0636	0621	-
Operator	TJB	TJB	ТЈВ	•
Initial Leak Rate	0.015	0.009	0.010	_
Final Leak Rate	0.014	0,006	0.010	-
Duct Dimensions (ft)	11.3 x 11.3	11.3 x 11.3	11.3 x 11.3	•
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	-
Dry Gas Meter Calibration (Yd)	0.998	0.998	0.998	-
Nozzle Diameter (inches)	0.2300	0.2290	0.2290	-
Barometric Pressure ("Hg)	29.53	29.55	29.42	29.50
Static Pressure ("H2O)	-11.0	-11.0	-11.0	-11.0
Meter Volume (acf)	906.500	948.750	812.605	889.285
Average square root of delta p	1.1008	1.0954	0.9840	1.0601
Average delta H (" H2O)	2.49	2.30	1.90	2.23
Average Stack Temperature (F)	282	283	285	283
Average DGM Temp (F)	90.9	92.6	94.5	92.7
Test Duration (minutes)	1101.0	1103.1	1125.0	1109.7
% CO2	11.2	11.1	11.4	11.2
% O2	7.6	7.5	7.6	7.6
% N2	81.2	81.4	81.0	81.2
Meter Volume (dscf)	861.084	898.627	762,923	840.878
Flue Gas Moisture (%)	9.2	9.6	10.0	9.6
Gas Molecular Weight (Wet) (g/g-mole)	28.98	28.92	28.92	28.94
Absolute Stack Pressure (" Hg)	28.72	28.74	28.61	28.69
Absolute Stack Temperature (R)	742	743	745	743
Average Gas Velocity (f/sec)	74.63	74.35	67.06	72.01
Avg Flow Rate (acfm)	574,833	572,664	516,473	554,657
Avg Flow Rate (dscfm)	356,389	353,488	314,897	341,592
Isokinetic Sampling Rate (%)	97.65	_103.45	96.67	99.26

PLANT YATES
STACK/MODIFIED METHOD 5

Run No.	1	2	3	Average
Date	6/21/93	6/22/93	6/23/93	
Time Start	1240	0655	0645	- [
Time Finish	1755	1115	1118	-
Operator	EZ	ΕZ	EZ	-
Initial Leak Rate	< 0.001	< 0.001	0.002	_
Final Leak Rate	< 0.001	< 0.001	< 0.001	-
Stack Diameter (ft)	13.00	13.0	13.0	-
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	-
Dry Gas Meter Calibration (Yd)	0.994	0.994	0.994	-
Nozzle Diameter (inches)	0.1960	0.1960	0.1950	- 1
Barometric Pressure ("Hg)	29.31	29.34	29.19	29.28
Static Pressure ("H2O)	-0.5	-0.5	-0.5	-0.5
Meter Volume (acf)	121.788	127.049	125.624	124.820
Average square root of delta p	0.8230	0.8251	0.7944	0.8142
Average delta H (" H2O)	0.85	0.85	0.77	0.82
Average Stack Temperature (F)	127	128	128	128
Average DGM Temp (F)	89.6	94.7	94.5	92.9
Test Duration (minutes)	240.0	240.0	240.0	240.0
Condensed Water (g)	390.2	409.4	398.0	399.2
% CO2	10.2	10.8	10.2	10.4
% O2	8.8	8.6	8.5	8.6
% N2	81.0	80.6	81.3	81.0
Meter Volume (dscf)	114.171	118.129	116.237	116.179
Flue Gas Moisture (%)	13.9	14.1	13.9	14.0
Gas Molecular Weight (Wet) (g/g-mole		28.37	28.31	28.33
Absolute Stack Pressure (" Hg)	29.27	29.30	29.15	29.24
Absolute Stack Temperature (R)	587	588	588	588
Average Gas Velocity (f/sec)	49.73	49.83		49.24
Avg Flow Rate (acfm)	396,063	396,819	383,500	392,127
Avg Flow Rate (dscfm)	300,017	299,801	288,743	296,187
Isokinetic Sampling Rate (%)	100.47	104.02	107.37	103.95

PLANT YATES STACK/METHOD 23

Run No.	1	2	3	Average
Date	6/21/93	6/22/93	6/23/93	•
Time Start	1400	0812	0810	<u>-</u>
Time Finish	1933	1236	1249	_
Operator	DJV	DΙV	DJV	•
Initial Leak Rate	0.008	0.001	0.002	•
Final Leak Rate	0.001	< 0.001	< 0.001	-
Stack Diameter (ft)	13.0	13.0	13.0	•
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	-
Dry Gas Meter Calibration (Yd)	1.029	1.029	1.029	-
Nozzle Diameter (inches)	0.1950	0.1950	0.1950	•
Barometric Pressure ("Hg)	29.31	29.34	29.19	29.28
Static Pressure ("H2O)	-0.5	- 0.5	-0 .5	-0.5
Meter Volume (acf)	114.442	118.294	115.263	116.000
Average square root of delta p	0.7956	0.8141	0.7932	0.8010
Average delta H (" H2O)	0.79	0.82	0.78	0.80
Average Stack Temperature (F)	123	128	129	127
Average DGM Temp (F)	80.6	86.9	87.3	84.9
Test Duration (minutes)	240.0	240.0	240.0	240.0
Condensed Water (g)	392.0	390.6	387.5	390.0
% CO2	10.2	10.8	10.2	10.4
% O2	8.8	8.6	8.5	8.6
% N2	81.0	8 0.6	81.3	81.0
Meter Volume (dscf)	112.896	115.477	111.851	113.408
Flue Gas Moisture (%)	14.1	13.8	14.1	14.0
Gas Molecular Weight (Wet) (g/g-mole	28.30	28.41	28.29	28.33
Absolute Stack Pressure (" Hg)	29.27	29.30	29.15	29.24
Absolute Stack Temperature (R)	583	588	589	587
Average Gas Velocity (f/sec)	47.93	49.13	48.14	48.40
Avg Flow Rate (acfm)	381,724	391,287	383,360	385,457
Avg Flow Rate (dscfm)	290,495	296,622	287,675	291,598
Isokinetic Sampling Rate (%)	103.65	103. 8 3	103.70	103.73

PLANT YATES

THE NA	٧	61	DI.	5	VZ	87	20	3,4	25	×	Auman
Doto	6/21/93	6/21/93	6/21/93	6/21/93	672793	6427/93	6/22/93	673393	673763	100.09	
These Start	5261	5141	1515	1615	06.50	0745	0840	\$500	offine.	0.00	
The Fight	\$0*1	1455	1555	1655	07.70	Š					
-				}	\$	ì	2762	6/10	ŝ	88	•
	TEN.	Har I	Har	JEH	H	ЭЕН	ÆН	лен	JEH	Ж	
Initial Louis Ruto	0.004@20*	0.011@ 22	0.005@ 20-	0.012@ 20*	0.010 @ 20"	0.002 @ 20"	0.005 @ 21"	0.000 @ 21*	0.007@21"	0.004@10*	
Final Loak Rate	0.010 @ 22*	0.011 @ 20"	0.000@15*	0.010 @ 17-	0.007 @ 22*	0.004@ 23"	0.009 @ 22*	0.004@ 25*	0.000 @ 10"	0 000 0	
Starth Diseases (ft)	13.0	13.0	13.0	13.0	13.0	13.0	0.52	2	130	021	
Dry Ges Motor Calibration (Y4)	110.1	11011	110:1	101	101	10:1	110:1	1.011	1101		=
Decomatric Pressure ("Hg)	29.35	29.35	29.35	29,35	19.34	29.34	29.34	29.23	3	20,21	20
Statte Processe ("H2O)	6.5	-0.5	-0.5	-0.5	0.5	20-	6	50.5	200	* 4	*
Motor Volume (al)	76.485	20.210	20.250	20.200	20.260	20.240	20.640	20.200	20,200	20.00	21.061
Average delta H (" H2O)	2.40	2.10	2.30	2.20	2.20	2.20	2.20	2.20	3.38	9.0	
Average Stack Temperature (F)	721	127	127	721	128	138	**	361			9 9
Average DCM Temp (F)	20.7	24.5	26.3	26.5	20.8	27.0	70.3				97
Tost Duration (minutes)	0.04	0.04	9	9	g	3		0.47	6.07	203	0.53
£(20)		5			ř	•	9.0	9.0	0.0	0.04	0.0
	70	701	7:01	10.7		1 01	10.8	10.2	10.2	10.2	10.4
70 X		66	90 96	60	9.8	9:	9.8	8.5	2.8	8.5	1.1
% N.3	81.0	01.8	0.18	81.0	90.6	90.6	908	81.3	8	en .	ş
Moder Volume (del.)	26.389	19.864	19.793	19.775	20.164	19.71	19.965	19.759	19.662	19 662	2,00
Plus Cas Melatura (%)	13.9	13.9	13.9	13.9	191	<u></u>	14.1	13.9	110	9	-
Can Melecular Weight (West (g/g-mels)	28.32	28.32	28.32	28.32	28.37	28.37	28.37	26.38	78.20	2	74.04
Absolute Stack Pressure (" Hg)	18.81	29.31	29.31	29.31	20.00	29.30	25	30 10	9 90	F 2	X 5
Abrelete Stack Temperature (R)	287	287	**	- R	<u> </u>		\$	3	3	A	Q

PLANT YATES STACK/ALDEHYDES

Run No.	1	2	3	Asiamaa
	(/21/02	_	_	Average
Date	6/21/93	6/22/93	6/23/93	-
Time Start	1340	0715	0700	-
Time Finish	1408	0745	0730	-
Operator	DJV	DJV	DJV	•
Initial Leak Rate	0.001	< 0.001	0.007	-
Final Leak Rate	0.001	0.001	0.002	•
Stack Diameter (ft)	13.0	13.0	13.0	-
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	-
Dry Gas Meter Calibration (Yd)	1.006	1.006	1.006	-
Nozzle Diameter (inches)	0.1747	0.1747	0.1747	
Barometric Pressure ("Hg)	29.31	29.34	29.19	29.28
Static Pressure ("H2O)	-0.5	-0.5	-0.5	-0.5
Meter Volume (acf)	10.707	11.086	10.929	10.907
Average square root of delta p	0.7680	0.7681	0.7461	0.7607
Average delta H (" H2O)	0.46	0.45	0.43	0.45
Average Stack Temperature (F)	127	133	131	130
Average DGM Temp (F)	81.0	81.5	79.6	80.7
Test Duration (minutes)	28.0	30.0	30.0	29.3
% CO2	10.2	10.8	10.2	10.4
% O2	8.8	8.6	8.5	8.6
% N2	81.0	80.6	81.3	81.0
Meter Volume (dscf)	10.310	10.676	10.507	10.498
Flue Gas Moisture (%)	13.9	14.1	13.9	14.0
Gas Molecular Weight (Wet) (g/g-mole	28.32	28.37	28.31	28.33
Absolute Stack Pressure (" Hg)	29.27	29.30	29.15	29.24
Absolute Stack Temperature (R)	587	593	591	590
Average Gas Velocity (f/sec)	46.41	46.57	45.32	46.10
Avg Flow Rate (acfm)	369,602	370,850	360,938	367,130
Avg Flow Rate (dscfm)	279,942	277,918	270,646	276,169
Isokinetic Sampling Rate (%)	104.90	102.12	103.21	103.41

PLANT YATES STACK/PSD

Run No.	ı	2	3	Average
Date	6/21-6/22/93	6/22-6/23/93	6/23-6/24/93	- "
Time Start	1330	1500	1553	-
Time Finish	0945	0953	1000	-
Operator	DΙV	DJV	DJV	
Initial Leak Rate	0.008	0.002	0.004	-
Final Leak Rate	NA	NA	NA NA	-
Stack Diameter (ft)	13.00	13.0	13.0	-
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	-
Dry Gas Meter Calibration (Yd)	0.994	0.994	0.994	-
Nozzle Diameter (inches)	0.1960	0.1960	0.1960	-
Barometric Pressure ("Hg)	29.31	29.34	29.19	29.28
Static Pressure ("H2O)	-0.5	-0.5	-0.5	-0.5
Meter Volume (acf)	519.949	609.370	557.093	562.137
Average square root of delta p	0.8000	0.8367	0.8367	0.8245
Average delta H (" H2O)	0.80	0.87	0.87	0.85
Average Stack Temperature (F)	125	128	128	127
Average DGM Temp (F)	96.0	95.7	94.9	95.5
Test Duration (minutes)	987.0	1133.0	1080.0	1066.7
% CO2	10.2	10.8	10.2	10.4
% O2	8.8	8.6	8.5	8.6
% N2	81.0	80.6	81.3	81.0
Meter Volume (dscf)	481.761	565.595	515.177	520.844
Flue Gas Moisture (%)	13.9	14.1	13.9	14.0
Gas Molecular Weight (Wet) (g/g-mole)	**			28.33
Absolute Stack Pressure (" Hg)	29.27		1	
Absolute Stack Temperature (R)	585	588	588	587
Average Gas Velocity (f/sec)	48.26			
Avg Flow Rate (acfm)	384,346	402,434	403,909	396,896
Avg Flow Rate (dscfm)	292,105	303,896	304,155	300,052
Isokinetic Sampling Rate (%)	105.88	104.08	99.37	103.11

PLANT YATES
STACK/MULTI-METALS - PARTICULATE

Run No.	1	2	3	Average
Date	6/25/93	6/26/93	6/27/93	- "
Time Start	0641	0921	0653	- 1
Time Finish	1152	1356	1106	-
Operator	DJV	DJV	DJV	
Initial Leak Rate	0.002	0.001	0.001	•
Final Leak Rate	0.001	0.002	0.001	-
Stack Diameter (ft)	13.0	13.0	13.0	-
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	-
Dry Gas Meter Calibration (Yd)	1.029	1.029	1.029	-
Nozzle Diameter (inches)	0.1950	0.1950	0.1950	- 1
Barometric Pressure ("Hg)	29.33	29.36	29.21	29.30
Static Pressure ("H2O)	-0.5	-0.5	-0.5	-0.5
Meter Volume (acf)	114.190	113.406	115.002	114.199
Average square root of delta p	0.8017	0.7958	0.7974	0.7983
Average delta H (" H2O)	0.77	0.75	0.76	0.76
Average Stack Temperature (F)	128	130	130	130
Average DGM Temp (F)	75.1	83.0	90.4	82.8
Test Duration (minutes)	240.0	240.0	240.0	240.0
Condensed Water (g)	403.5	399.5	416.7	406.6
Filter Weight Gain (g)	0.0461	0.0326	0.03∋2	0.0380
PNR Weight Gain (g)	0.0117	0.0023	0.0016	0.0052
% CO2	10.9	11.4	11.6	11.3
% O2	7.8	7.4	7.4	7.5
% N2	81.3	81.2	81.0	81.2
Meter Volume (dscf)	113.874	111.558	111.039	112.157
Flue Gas Moisture (%)	14.3	14.5	15.0	14.6
Gas Molecular Weight (Wet) (g/g-mole		28.37	28.32	28.34
Absolute Stack Pressure (" Hg)	29.29	29.32	29.17	29.26
Absolute Stack Temperature (R)	588	590	590	590
Average Gas Velocity (f/sec)	48.47	48.13	48.40	48,33
Avg Flow Rate (acfm)	386,045	383,297	385,419	384,920
Avg Flow Rate (dscfm)	290,497	287,454	285,491	287,814
Isokinetic Sampling Rate (%)	104.55	103.51	103.74	103.93
Particulate Concentration (gr/dscf)	7.83E-03	4.83E-03	5.12E-03	5.93E-03
Particulate Concentration (lbs/dscf)	1.12E-06		7.31E-07	8.47E-07
Particulate Emission (grams/sec)	2.46	1.50	1.58	1.84
Particulate Emission (lbs/hour)	19.51	11.90	12.52	14.64

PLANT YATES STACK/ANIONS

Run No.	1	2	3	Average
Date	6/25/93	6/26/93	6/27/93	•
Time Start	0940	1325	0845	-
Time Finish	1155	1536	1055	-
Operator	EBZ	EBZ	EBZ	
Initial Leak Rate	< 0.001	< 0.001	< 0.001	- 1
Final Leak Rate	< 0.001	< 0.001	< 0.001	
Stack Diameter (ft)	13.0	13.0	13.0	-
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	- 1
Dry Gas Meter Calibration (Yd)	1.006	1.006	1.006	- 1
Nozzle Diameter (inches)	0.1950	0.1950	0.1950	- 1
Barometric Pressure ("Hg)	29.33	29.36	29.21	29.30
Static Pressure ("H2O)	-0.5	-0.5	-0.5	-0.5
Meter Volume (acf)	62.495	60.363	61,975	61.611
Average square root of delta p	0.7874	0.7681	0.8183	0.7913
Average delta H (" H2O)	0.72	0.67	0.74	0.71
Average Stack Temperature (F)	132	133	133	133
Average DGM Temp (F)	91.1	104.5	100.3	98.6
Test Duration (minutes)	134.0	131.0	130.0	131.7
CO2%	10.9	11.4	11.6	11.3
02%	7.8	7.4	7.4	7.5
% N2	81.3	81.2	81.0	81.2
Meter Volume (dscf)	59.157	55.834	57.465	57.486
Flue Gas Moisture (%)	14.3	14.5	15.0	14.6
Gas Molecular Weight (Wet) (g/g-mole	28.33	28.36	28.33	28.34
Absolute Stack Pressure (" Hg)	29.29	29.32	29.17	29.26
Absolute Stack Temperature (R)	592	593	593	593
Average Gas Velocity (f/sec)	47.76	46.57	49.78	48.04
Avg Flow Rate (acfm)	380,391	370,917	396,432	382,580
Avg Flow Rate (dscfm)	284,451	276,630	292,426	284,503
Isokinetic Sampling Rate (%)	99.35	98.63	96,76	98.25

PLANT YATES STACK/AMMONIA-CYANIDE

Date 6/25/93 6/26/93 6/27/93 -	crage		3	-		
Time Finish 0904 1315 0809 - Operator EBZ EBZ EBZ - Initial Leak Rate < 0.001 < 0.001 < 0.001 - Final Leak Rate < 0.001 0.001 < 0.001 - Stack Diameter (ft) 13.0 13.0 13.0 - Pitot Tube Correction Factor (Cp) 0.84 0.84 0.84 - Dry Gas Meter Calibration (Yd) 1.006 1.006 1.006 - Nozzle Diameter (inches) 0.1950 0.1950 0.1950 - Barometric Pressure ("Hg) 29.33 29.36 29.21 29 Static Pressure ("H2O) -0.5 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5	'	Avera	_	2	1	· ·
Time Finish 0904 1315 0809 - Operator EBZ EBZ EBZ - Initial Leak Rate < 0.001 < 0.001 - 0.001 - Final Leak Rate < 0.001 0.001 < 0.001 -	1	•	1			
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Stack Diameter (ft) 13.0						
Stack Diameter (ft) 13.0 13.0 13.0 - Pitot Tube Correction Factor (Cp) 0.84 0.84 0.84 - Dry Gas Meter Calibration (Yd) 1.006 1.006 1.006 - Nozzle Diameter (inches) 0.1950 0.1950 0.1950 - Barometric Pressure ("Hg) 29.33 29.36 29.21 29 Static Pressure ("H2O) -0.5 -0.5 -0.5 -0.5 -0.5 Meter Volume (acf) 61.781 41.312 43.505 48.3 Average square root of delta p 0.7550 0.7681 0.7874 0.7 Average Odelta H (" H2O) 0.68 0.69 0.72 0 Average DGM Temp (F) 86.3 97.4 85.4 8 Test Duration (minutes) 137.0 90.0 94.0 10 % CO2 7.8 7.4 7.4 % N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.5 </th <th>,</th> <th>-</th> <th></th> <th> 1</th> <th></th> <th></th>	,	-		1		
Pitot Tube Correction Factor (Cp) 0.84 0.84 0.84 - Dry Gas Meter Calibration (Yd) 1.006 1.006 1.006 - Nozzle Diameter (inches) 0.1950 0.1950 0.1950 - Barometric Pressure ("Hg) 29.33 29.36 29.21 29 Static Pressure ("H2O) -0.5 -0.5 -0.5 -0.5 Meter Volume (acf) 61.781 41.312 43.505 48.3 Average square root of delta p 0.7550 0.7681 0.7874 0.7 Average delta H (" H2O) 0.68 0.69 0.72 0 Average Stack Temperature (F) 132 133 135 Average DGM Temp (F) 86.3 97.4 85.4 8 Test Duration (minutes) 137.0 90.0 94.0 10 % CO2 7.8 7.4 7.4 % N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.3	,					
Dry Gas Meter Calibration (Yd) 1.006 1.006 1.006 - Nozzle Diameter (inches) 0.1950 0.1950 0.1950 - Barometric Pressure ("Hg) 29.33 29.36 29.21 29 Static Pressure ("H2O) -0.5 -0.5 -0.5 - Meter Volume (acf) 61.781 41.312 43.505 48.3 Average square root of delta p 0.7550 0.7681 0.7874 0.77 Average delta H (" H2O) 0.68 0.69 0.72 0 Average Stack Temperature (F) 132 133 135 Average DGM Temp (F) 86.3 97.4 85.4 8 Test Duration (minutes) 137.0 90.0 94.0 10 % CO2 7.8 7.4 7.4 % N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.3		-	_			` '
Nozzle Diameter (inches) 0.1950 0.1950 0.1950 - Barometric Pressure ("Hg) 29.33 29.36 29.21 29 Static Pressure ("H2O) -0.5 -0.5 -0.5 -0.5 Meter Volume (acf) 61.781 41.312 43.505 48.8 Average square root of delta p 0.7550 0.7681 0.7874 0.7 Average delta H (" H2O) 0.68 0.69 0.72 0 Average Stack Temperature (F) 132 133 135 Average DGM Temp (F) 86.3 97.4 85.4 8 Test Duration (minutes) 137.0 90.0 94.0 10 % CO2 10.9 11.4 11.6 1 % O2 7.8 7.4 7.4 % N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.3	1	-	0.84	0.84	0.84	Pitot Tube Correction Factor (Cp)
Barometric Pressure ("Hg) 29.33 29.36 29.21 29 Static Pressure ("H2O) -0.5 -0.5 -0.5 -0.5 Meter Volume (acf) 61.781 41.312 43.505 48.3 Average square root of delta p 0.7550 0.7681 0.7874 0.77 Average delta H (" H2O) 0.68 0.69 0.72 0 Average Stack Temperature (F) 132 133 135 Average DGM Temp (F) 86.3 97.4 85.4 8 Test Duration (minutes) 137.0 90.0 94.0 10 % CO2 10.9 11.4 11.6 1 % O2 7.8 7.4 7.4 % N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.3	,	-		1.006	1.006	Dry Gas Meter Calibration (Yd)
Static Pressure ("H2O) -0.5 -0.5 -0.5 -0.5 Meter Volume (acf) 61.781 41.312 43.505 48.3 Average square root of delta p 0.7550 0.7681 0.7874 0.77 Average delta H (" H2O) 0.68 0.69 0.72 0 Average Stack Temperature (F) 132 133 135 Average DGM Temp (F) 86.3 97.4 85.4 8 Test Duration (minutes) 137.0 90.0 94.0 10 % CO2 10.9 11.4 11.6 1 % O2 7.8 7.4 7.4 % N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.3		-	0.1950	0.1950	0.1950	Nozzle Diameter (inches)
Meter Volume (acf) 61.781 41.312 43.505 48.3 Average square root of delta p 0.7550 0.7681 0.7874 0.77 Average delta H (" H2O) 0.68 0.69 0.72 0 Average Stack Temperature (F) 132 133 135 Average DGM Temp (F) 86.3 97.4 85.4 8 Test Duration (minutes) 137.0 90.0 94.0 10 % CO2 10.9 11.4 11.6 1 % O2 7.8 7.4 7.4 % N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.3	29.30	29.	29.21	29.36	29.33	Barometric Pressure ("Hg)
Average square root of delta p 0.7550 0.7681 0.7874 0.77 Average delta H (" H2O) 0.68 0.69 0.72 0 Average Stack Temperature (F) 132 133 135 Average DGM Temp (F) 86.3 97.4 85.4 8 Test Duration (minutes) 137.0 90.0 94.0 10 % CO2 10.9 11.4 11.6 1 % O2 7.8 7.4 7.4 % N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.3	-0.5		-0.5	-0.5	-0.5	Static Pressure ("H2O)
Average delta H (" H2O) 0.68 0.69 0.72 0 Average Stack Temperature (F) 132 133 135 Average DGM Temp (F) 86.3 97.4 85.4 8 Test Duration (minutes) 137.0 90.0 94.0 10 % CO2 10.9 11.4 11.6 1 % O2 7.8 7.4 7.4 % N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.3	3.866	48.8	43.505	41.312	61.781	Meter Volume (acf)
Average Stack Temperature (F) 132 133 135 Average DGM Temp (F) 86.3 97.4 85.4 8 Test Duration (minutes) 137.0 90.0 94.0 10 % CO2 10.9 11.4 11.6 1 % O2 7.8 7.4 7.4 % N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.3	7702	0.77	0.7874	0.7681	0.7550	Average square root of delta p
Average Stack Temperature (F) 132 133 135 Average DGM Temp (F) 86.3 97.4 85.4 8 Test Duration (minutes) 137.0 90.0 94.0 10 % CO2 10.9 11.4 11.6 1 % O2 7.8 7.4 7.4 % N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.3	0.70	0.	0.72	0.69	0.68	Average delta H (" H2O)
Average DGM Temp (F) 86.3 97.4 85.4 8 Test Duration (minutes) 137.0 90.0 94.0 10 % CO2 10.9 11.4 11.6 1 % O2 7.8 7.4 7.4 % N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.3	133	1	135	133	132	-
Test Duration (minutes) 137.0 90.0 94.0 10 % CO2 10.9 11.4 11.6 1 % O2 7.8 7.4 7.4 % N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.3	89.7	8	85.4	97.4	86.3	Average DGM Temp (F)
% O2 7.8 7.4 7.4 % N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.3	107.0	10	94.0		137.0	Test Duration (minutes)
% N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.3	11.3	1	11.6	11.4	10.9	% CO2
% N2 81.3 81.2 81.0 8 Meter Volume (dscf) 58.984 38.698 41.440 46.3	7.5		7.4	7.4	7.8	% O2
Meter Volume (dscf) 58.984 38.698 41.440 46.2	81.2	8	81.0	81.2	81.3	
Flue Cos Moisture (%) 14.3 14.5 15.0 1	5.374	46.3	41.440	38.698	58.984	Meter Volume (dscf)
	14.6	1	15.0	14.5	14.3	Flue Gas Moisture (%)
	28.34	28	28.33	28.36	28.33	7 7
	29.26	29	29.17	29.32		4 • • • •
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	46.78	_				<u>-</u>
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	00.34				,	• • •

PLANT YATES STACK/RADIONUCLIDES

Run No.	1	2	3	Average
Date	6/24-6/25/93	6/25-6/26/93	6/26-6/27/93	
Time Start	1223	0840	1357	•
Time Finish	0153	0331	0614	-
Operator	Љ Н	JEH	JEH	•
Initial Leak Rate	< 0.001	0.010	< 0.001	
Final Leak Rate	< 0.001	0.009	< 0.001	
Stack Diameter (ft)	13.0	13.0	13.0	•
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	•
Dry Gas Meter Calibration (Yd)	0.994	0.988	0.988	-
Nozzle Diameter (inches)	0.2400	0.2400	0.2400	-
Barometric Pressure ("Hg)	29.33	29.33	29.36	29.34
Static Pressure ("H2O)	-0.5	-0.5	-0.5	-0.5
Meter Volume (acf)	599.556	654.007	696.609	650.057
Average square root of delta p	0.8459	0.8370	0.8524	0.8451
Average delta H (" H2O)	1.94	1.87	1.96	1.92
Average Stack Temperature (F)	130	129	131	130
Average DGM Temp (F)	97.3	93.0	97.7	96.0
Test Duration (minutes)	816.0	893.0	908.0	872.3
% CO2	10.9	11.4	11.6	11.3
% O2	7.8	7.4	7.4	7.5
% N2	81.3	81.2	81.0	81.2
Meter Volume (dscf)	556.184	607.560	642.493	602.079
Flue Gas Moisture (%)	14.3	14.5	15.0	14.6
Gas Molecular Weight (Wet) (g/g-mole)		28.36	28.33	28.34
Absolute Stack Pressure (" Hg)	29.29	29.29	29.32	29.30
Absolute Stack Temperature (R)	590	589	591	590
Average Gas Velocity (f/sec)	51.21	50.61	T '	51.15
Avg Flow Rate (acfm)	407,813	403,033	411,204	407,350
Avg Flow Rate (dscfm)	306,199	302,339	305,914	304,817
Isokinetic Sampling Rate (%)	94.07	95.09	97.74	95.63

PLANT YATES STACK/EXTRACTABLE METALS

Run No.	r	2	3	Average
Date	6/24-6/25/93	6/25-6/26/93	6/26-6/27/93	Average
Time Start	1150	1246	1442	-
Time Finish	0725	0331	0616	-
Operator	EBZ		EBZ	•
Initial Leak Rate	< 0.001	EBZ < 0.001	< 0.001	-
Final Leak Rate	< 0.001	0.001	< 0.001	•
Stack Diameter (ft)	13.0		13.0	
Pitot Tube Correction Factor (Cp)	0.84	13.0 0.84	0.84	•
Dry Gas Meter Calibration (Yd)	0.84		1 1	•
•		1.029	1.029	-
Nozzle Diameter (inches)	0.2400	0.2400	0.2400	20.24
Barometric Pressure ("Hg)	29.33	29.33	29.36	29.34
Static Pressure ("H2O)	-0.5	-0.5	-0.5	-0.5
Meter Volume (acf)	818.991	600.910	618.386	679.429
Average square root of delta p	0.7874	0.8000	0.7616	0.7830
Average delta H (" H2O)	1.78	1.75	1.58	1.70
Average Stack Temperature (F)	129	125	126	127
Average DGM Temp (F)	97.6	89.1	90.6	92.4
Test Duration (minutes)	1112.0	857 .0	880.0	949.7
CO2 %	10.9	11.4	11.6	11.3
02%	7.8	7.4	7.4	7.5
% N2	81.3	81.2	81.0	81.2
Meter Volume (dscf)	759.081	585.462	601.172	648.572
Flue Gas Moisture (%)	14.3	14.5	15.0	14.6
Gas Molecular Weight (Wet) (g/g-mole)	28.33	28.36	28.33	28.34
Absolute Stack Pressure (" Hg)	29.29	29.29	29.32	29.30
Absolute Stack Temperature (R)	589	585	586	587
Average Gas Velocity (f/sec)	47.63	48.22	45.93	47.26
Avg Flow Rate (acfm)	379,362	384,045	365,815	376,407
Avg Flow Rate (dscfm)	285,223	289,842	274,469	283,178
Isokinetic Sampling Rate (%)	101.14	1	105.18	101.97

PLANT YATES STACK/CHROME VI

Ruo No.	1	2	3	Average
Date	6/25/93	6/26/93	6/27/93	
Time Start	1147	1041	0800	-
Time Finish	1434	1445	1150	-
Operator	JEH	JEH	ÆН	
Initial Leak Rate	< 0.001	< 0.001	0.007	-
Final Leak Rate	< 0.001	0.002	0.008	
Stack Diameter (ft)	13.0	13.0	13.0	
Pitot Tube Correction Factor (Cp)	0.84	0.84	0.84	: -
Dry Gas Meter Calibration (Yd)	0.994	0.994	0.994	- 1
Nozzle Diameter (inches)	0.1950	0.1950	0.1950	-
Barometric Pressure ("Hg)	29.33	29.36	29.21	29.30
Static Pressure ("H2O)	-0.5	-0.5	-0.5	-0.5
Meter Volume (acf)	68.563	66.971	69.589	68.374
Average square root of delta p	0.7658	0.7689	0.7868	0.7738
Average delta H (" H2O)	0.69	0.69	0.71	0.70
Average Stack Temperature (F)	127	130	130	129
Average DGM Temp (F)	90.5	90.7	87.5	89.6
Test Duration (minutes)	144.0	144.0	146.0	144.7
CO2 %	10.9	11.4	11.6	11.3
02%	7.8	7.4	7.4	7.5
% N2	81.3	81.2	81.0	81.2
Meter Volume (dscf)	64.184	62.738	65.242	64.054
Flue Gas Moisture (%)	14.3	14.5	15.0	14.6
Gas Molecular Weight (Wet) (g/g-mole)		28.36	28.33	28.34
Absolute Stack Pressure (" Hg)	29.29	29.32	29.17	29.26
Absolute Stack Temperature (R)	587	590	590	589
Average Gas Velocity (f/sec)	46.24	46.50	47.74	l i
Avg Flow Rate (acfm)	368,270	370,354	380,212	372,945
Avg Flow Rate (dscfm)	277,922	277,614	281,887	279,141
Isokinetic Sampling Rate (%)	102.66	100.46	101.47	101.53



VOST FIELD DATA SHEET

ASSUMED MOISTURE %	METER BOX NO. $1/3$	METER FACTOR 1.0355	PROBE HEATER SETTING 2.50 - 300	COMMENTS			
PLANTPlant Yates Station Boiler No. 1	DATE (123/93	SAMPLING LOCATION ESP DUTLET	RUN NO. 3 TEST NO.	OPERATOR SALL	AMBIENT TEMPERATURE	BAROMETRIC PRESSURE 29.39	BLANK TUBE NUMBERS T. 1 45 16 A TIC. 14516 P.

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1st Condensor 2nd Condensor Pump Vacuum	Temp	80	&	8	80	مح	1/2	15	h	1,	5	5	4	5	1	Ŋ			
2nd Candenson	Outlet Temp.	28	શ્કુ	Sign	23	28	23	8,3	ટ્રેડ	8	58	25	58	85	B	85			
1st Condensor	Outlet Temp.	28	25	<i>چې</i>	85	28	58	28	28	\$\$	53	26	ام)	an	23	ŲŠ			
Probe	Temp	118	428	762	273	hc7	210	300	293	180	78٢	260	273	277	283	189			
DGM	Temp	73	75	78	66	୧୨	8(82	8.7	83	જ્ઞ	84	\$2	85	85	a १			
Stack	Temp																		
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Gas Meter	Reading	0.00	5,05	10.0	15.05	CO.OI	0.00	5.0	10,02	15.05	20.00	0.00	5.06	86.6	15.01	20.00			
Clock	Time	0110	0130	0140	07.86	açoc	0809	0819	०४३५	0839	े8 पे9	0856	1060	9160	0924	नद्भव			
Sampling	(min)	0	Q	20	30	Oħ	0	10	90	30	Oh	0	01	70	<i>0</i> γ.	40	0		
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Leak Check ("Hg)	Pre	000					0020 CON					001700							
Test	Number	3 A					36					7							

VOST FIELD DATA SHEET

ASSUMED MOISTURE % 7	METER BOX NO.	METER FACTOR (a 3 5 5	PROBE HEATER SETTING 300	COMMENTS			
PLANT Plant Yates Station Boiler No. 1	DATE V/22/93	SAMPLING LOCATION \$5P Out	RUN NO. 7 TEST NO.	OPERATOR	AMBIENT TEMPERATURE 70	BAHOMETRIC PRESSURE 29.40	BLANK TUBE NUMBERS T: 14533 4 T/C: 145336

Number	•	1											The second secon
<	P.	Post	(Lab)	(min)	Time	Reading	Pressure	Temp	Temp	Temp	Oullet Temp	Outlet Temp.	Lomp
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VOST FIELD DATA SHEET

ASSUMED MOISTURE % METER BOX NO. V 9 METER FACTOR 1, 0355 PROBE HEATER SETTING COMMENTS	er Meter Stack DGM Probe 1st Condensor 2nd Condensor Pump Vacuum
	Gas Meter
PLANT Plant Yates Station Boiler No. 1 DATE (c/31/43) SAMPLING LOCATION EST. O.L. RUN NO. 1 TEST NO. OPERATOR RESTURE 80 BAROMETRIC PRESSURE 1.9.5.1 BLANK TUBE NUMBERS T: 1450 74 T/C: 1450 78	Tare Lead Chank ("Ma) Tribe N Sembling Clock

232 55 52 122 232 247 55 55 51 1 2 254 575 55 55 51 1 2 254 575 55 55 51 1 2 254 575 55 55 51 1 2 254 575 55 55 51 1 2 254 575 55 55 51 1 2 254 575 55 51 1 2 254 575 51 1 2 255 51 1 2 254 575 51 1 2 255 51 1 2	Sampling Clock Gas Meter Meter Stack (min) Time Reading Pressure Temp	Tube N Sampling Clock Gas Meter Stack Stack (Lab) (min) Time Reading Pressure Temp	Clock Gas Meter Meter Stack (min) Time Reading Pressure Temp	Sampling Clock Gas Meter Meter Stack (min) Time Reading Pressure Temp	Gas Meter Meter Stack	r Meter Stack	Stack		בֿ בֿ	Temp	Probe	lat Condensor Outlet Temp	2nd Condensor Outlet Temp.	Outlet Temp. Outlet Temp. Femp.
25 25 25 25 25 25 25 25 25 25 25 25 25 2	2 con 1 0 1238 0.00 1.1 190	T 0 1238 0.00 1.1 190	0 1238 0.00 1.1 190	0.00 1.1 190	0.00 1.1 (90)	1.1	190		1	77	201	\$5	ડ્સ	ā
232 553 240 555 53 241 565 53 254 57 58 254 57 53 254 57 53 254 57 53 254 57 53 254 57 53 254 57 53 254 57 53 255 553 257 553	06A 10 1248 49 1.1	06A 10 1248 49 1.1	1.1 6.7 846 0.	1.1 6.4 846	1.1	1.1			1	<u>)</u>	816	55	10	11
210 555 53 221 555 53 224 57 53 224 57 53 225 57 53 227 555 53 227 55 53 228 55 55 228 55 55 229 55 55 220 55 55 220 55 55 220 55 55 220 55 2	7/C 20 1258 109:602 1.1	7/C 20 1258 109:602 1.1	20 1258 109-107-11	1258 109,402	109-62	1.1	1.1			75	232	55	53	11
21.) 555 453 254 57 58 254 57 58 2254 57 58 236 58 248 58 53 248 58 58 248 58 58 248 58 58 248 58 58 248 58 58 248 58 58 248 58 58 58	30 1308	066 30 1308	30 1308	13.08		1.1 0.51				75	210	55	3	=
254 57 53 254 57 53 254 57 58 248 58 53 227 55 53 237 55 53 23 51 24 53 53 25 53 25 53 25 53 26 53 51	40 (318 JO.12 1.1	1318 30.12	1318 30.12	1318 30.12	20.12				l	76	717	SS	S	11
254 57 58 256 55 53 248 54 53 227 55 53 227 55 53 237 55 53 237 55 53 236 53 53 237 53 53 237 53 53 237 53 53 237 53 53 237 53 53		T 0 1323 0.00	1323 0.00	1323 0.00	0.00	-	1.0		ł	77	120	ار 6	53	t
256 55 53 248 54 53 227 53 53 23, 55 53 24, 53 53 24, 53 53 24, 53 53 26, 53 53	13 13 13 13 13	11A 10 1343 52	11A 10 1343 52	13 43 5.2	5.2		۱. ۵		3	L	254	57	2	3
248 SH 53 227 S3 S3 230 S5 S3 230 S3 S1 240 S3 S3 241 S3 S3 25 S1 261 S3 S3	1/6 20 1343 9.9	1/6 20 1343 9.9	1/6 20 1343 9.9	1343 9.9	6.		0,1			78	255	55	S.	t
227 53 53 23, 55 53 23, 53 51 24, 53 53 26, 53 53	30 1353 14.96	30 1353 14.96	30 1353 14.96	1353 14.96	14.96		061 04	190		28	845	S	53	٦,
23. 55 53 23, 53 24, 53 51 26, 53 53 26, 53 53 26, 53 53	40 1403	40 1403 20.00	40 1403 20.00	1403 20.00	20.00		0.1			79	227	5'3	53	7
236 53 51 273 53 273 53 281 53 51	-	T 0 1908 0.00	00.0	00.0	0.00	 	0:-			78	237	55	53	ずら
2719 S3 221 S53 281 S3	\$131 OI \$150X77	6.1 0.2 1191 or A2	6.1 6.2 1.9 01	0.1 0.5 8191	5.0 1.3	(.0		191		78	236	53	<u>[]</u>	4
213 5.3 181 53	82h1 cv	1 166 8241 62	1 166 8241 62	1 66 8241	1 6.9	ן ן	1.0			28	3719	S	53	و
281	30 (438	30 (438 15	30 (438 15	1438 15	12		1.6			79.	373	5.3	15	و
	40 140 144 23.00 1.8	40 EZ 44 Ch	40 EZ 44 Ch	CO. 5.2 14 14 1	23.00		0.1			79	181	Ŋ	D	و
							50 Car 050 000 access 0.000 0.000 0.000	3000000000		* 1 () () () () () () () () () (
	0 1	0 1	0 1	0										
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	1/0	1/0	1/0											

93

PLANT NAME Plant Yates Station Boiler No. 1	Page of
SAMPLING LOCATION BORD OF OUT LET RUN NO. DATE 6/21/93 TIME START 1249 TIME FINISH 18/2 DUCT DIMENSIONS 1.4 x /1.4 DIAMETER PTCF 84 DGMCF 997 NOZZLE DIA. 197 inches BAR PRESS 21.51 "Hg	TEST DURATION 320 240 min. INITIAL LEAK RATE .005012" cfm FINAL LEAK RATE .005010" cfm
STATIC PRESS -11.0 "H2O OPERATOR TJ13	

Traverse	Clock	Dry gas meter	^ P	^ Н	Stack	Dry gas me	ter temp.	Hot box	Probe	Last	Vacuum	Cond.
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Тетр	Impinger	in. Hg	Exit
		_										Temp. F
						· · · · · · · · · · · · · · · · · · ·	_		1			
1- /	1249	376.471	. 439	1.1	187	71	70	254	254	6	V.0	65
27	12.54	340.3	. 83	.96	173	71	70	245	24)		5.0	63
3	1259	#42, I	.61	. 745	192	73	70	247	255	46	5.0	53
4	1304	384.5	<u>ო</u>	.31	190	74	70	245	251	<u>ل</u> ل	4.0	52
5	1309	386.15	. 34	40	171	74	7 l	257	250	46	4.5	54
6	1314	387.9	.58	67	181	75	71	252	253	77	5.5	54
7	1319	389.9	71	85	161	77	72	246	249	45	6.0	51
४	1324	393.0	.75	-96	137	79	75	254	2:50	45		51
STOP	1329	395.012	Port	chan	e Lex	Y V.	7	5 🛋	10"			
2-1	1343	395.9	.9	NI	187	79	78	733	252	47	7.0	56
Z	1348	398.74	. 7	.83	195	81	78	252	255	मन	6.0	43
3	1354	401.8	-75	.49	197	83	78	245	245	50	6.0	49
4	13.59	404.35	.4	1./	198	89	78	255	249	50	7.0	42
5	1404	407.05	. 7	.81	194	85	79	215	247	50	7.0	41
6	14089	409.65	. 65	.76	182	46	80	252	260	50	6.0	41
7	1414	411.95	.73	1885.9	160	86	81	Z45	244	51	6.0	41
8	1419	414.7	.5	.63	153	87	82	249	261	51	5.0	41
STOP	1424	416-85	Port	Change	LCGK	1						
3-1	1517	417.9	54	.56	280	P 82	82	253	246	53	5.0	SI
Z	1522	420.5	95	.98	280	83	82	254	255	56	6.5	51
3	1527	422.6	1.2	1.25	280	84	82	249	249	55	6.5	48
4	1532	125.3	1.3	1.35	281	87	83	253	255	56	6.5	43
5	1537	428.20	1.0	1.05	279	87	84	254	246	56	7.0	42
6	1532	431.35	.92	.96	279	90	84	245	245	58	7.0	45
1	1547	433.91	73	.76	278	90	84	255	763	60	7.0	43
8	1552	136.45	.52	.57	276	90	85	Z45	264	63	5.0	42
576P	1557	438.56				, _		 			"	-
1		1-0.20					1			-		
		J J	1140	1	ASSUMO	*						
Ave	Por	15 54 C	0.835		180		1.8	001				· */
Avg.		59 711	124 D-12	N.		/						
Check'd	-		parasanak bilan bi	Contraction		ungsch (2019) der	Anna Santa Baran	Property of Allendary				

CONSOLE # 161364	Velocity 6/
FILTER #	% Moisture 7. 9
AMBIENT TEMP.	Flowrate (DSCFM)_
PROBE LENGTH 12	Isokinetic (%)
TIMED MATERIAL GLASE	

REMARKS

Nozzle IDIII

18.10 \$ STACK TEMPIN Error during first 20.95 \$ 1/3 due to ELEC gr. Dioblems WAW C-43

PLANT	NAME	Plant Yates St	ation Boiler	No. 1						Page 1	$\angle_{\text{of}} \underline{Z}$	
SAMPLI	NG LOCAT	MON OUT	Let			RUN NO	. }					
DATE (21 93	TIME START			TIME FI	VISH	 -	TEST DU	RATION		n	in.
DUCT D	MENSION	DGMCF Hg	- ×	N0771 F	DIAMET	ER	inches	INITIAL	LEAK RA EAK RAT	TE	c	ព្រា cím
BAR PR	ESS	Hg "Hg		HOLLEL	DIA			LINAL D	LAIC IOTI			*4114
STATIC	PRESS		H2O		OPERAT	OR						
Traverse	Clock	Dry gas meter	^ P	ÅΗ	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	Cond.
Point	Tim≄	reading fi3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit
•						,						Temp. F
4-1	1604	439.270	.85	.88	281	91	87	251	261	66	6,0	44
7	1609	441.88	1.	1.15	281	91	87	253	267	63	7.0	46
3		444.76	1			92	87		245			
	1614		1.0	1.58	282			264 253		62	810	45
4	1619	448.1	1.5	1.58	28	93	87		246	60	8.0	
5	1624	451.46	1.3	1.4	280	25	४९	251	246	55	7.5	39
6	1629	454.75	1.1	1.2	280	95	88	248	245	54	7.0	40
7	1634	457.86	.9	.95	279	96	90	252	258	55	6.0	41
8	1639	460.68	.48	.51	274	96	90	253	251	55	5.0	42
STOP	1644	462,950		Leak	✓	.005	Q 15	bj				
5-1	1648	463.40	1.1	1-16	281	96	92	250	251	<i>5</i> 7	7.0	42
2	1653	466.39	.70	. 75	280	96	9,	256	253	54	6.0	42
3	1658	468 87	1.2	1.3	242	96	92	249	252	54	7.0	41
4	1703	471-8	14	1.5	282	47	92	247	252	54	4.0	4-1
5	1708	474.93	17	1.3	281	99	93	250	748	54	8.6	40
3	1713	478.12	.74	.78	279	99		259	257	55	6.0	43
		480.8	83	.89	279	98	93	264	247		60	42
-	1718	483.4								55		
8	1723		168	.72	263	97	93	<u>252</u>	263	55	5.0	42
 _	1728	485-97		LEAK	1 OK	.005	@ 0					
6-(1732	486.49	1.	1-2	281	96	93	242	250	57	8.0	
7	1737	489.49	.91	.97	241	97	93	243	257	55	7.0	43
3	1742	492.27	.64	68	281	96	92	246	248		5.0	94
+	1747	494.69	.63	.67	185	96	92	250	258	58	4.7	47
5	1752	497.15	.63	.67	280	96	12	244	262	59	5.0	46
ط	1757	499.1	.72	.76	280	95	92	255	262	60	6.0	47
7	1802		.86	-91	280	96	92	262	245	60	6.0	47
४		504.1	.75	8	278	96	92	255	260		6.0	99
		506.952				, , , , , , , , , , , , , , , , , , , 	, - -					
7100	70.	67.682	0.964	 		93.7	7			 		
-	<u> </u>		7,101		 	19.4						
ļ		184491	n Gin	.93	280	21						
Avg.		126.123	W 111	7/3	400	860						
Check'd		149.145	l de la company				lette manage		1	_		
CONSO	1 E #				100 Maries - 200			21443 + 201 4459 000	:			
					C Main	Jre						
					Flores	(DSCFM)						
					1, 2, 10, 0000, 200, 1000	(%)						
		·			- DVALIFOLL	(A.797)	puntage (lighted)		ŝ			
PEMAR	Ke											

SAMPLING LOCATION OUTLET RUN NO. 2 DATE 4/27/93 TIME START 0753 DIVINE FINISH 1247 TEST DURATION 240 min.	
DUCT DIMENSIONS 11.4 // 3 X 11.4 // 3 DIAMETER INITIAL LEAK RATE .003 DIO" cfm PTCF .94 DOMCF 29.99 NOZZLE DIA19 inches FINAL LEAK RATE .005 DIZ" cfm BAR PRESS 70.4 Hg STATIC PRESS -11.2 "H20 OPERATOR TTB	

Traverse	Clock	Dev cas meter	^ P	^ H	Stack	Dry gas m	****	Hot box	Probe	Last	Vacuum	Cond.
Point	Time	Dry gas meter reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit
1000	I tuk		LI 1120				Outer	10114	10.24		ui. rig	Temp. F
										1		10
46-1	0753	523.3	0	1.1	278	79	78	Z70	241	54	5	54
2	0758	526.5	. 83	.88	281	437	78	265	260	60	4.0	46
3	0803	528.92	.58	.61	279	٦,	77	152	247	56	4.0	41
4	०४०४	531.07	.34	.4	275	83	71	250	262	55	9-0	42
5	0813	≤32.87	36	.42	278	83.	79	261	<i>25</i> 3	54		41
6	0318	534.60	61	.65	279	83	79	247	248	53	4.0	41
7	0823	536.7	,73	.77	279	84	80	253	246	51	5.0	41
3	0828	534.04	.74	.78	272	85	80	263	252	49		47
STOP	0433	541.45		LEAK	1	-005	@) 0"			,		
2-1	0858	542.025	.94	.99	278	79	78	257	253	64	5.0	55
2	0903	544.7	. 🕏	.84	283	75	77	248	250	44	5, =	49
3	0908	547.17	. 8	.44	280	18	77	755	252	44	5.0	49
વ	0913	550.1	96	1.0	283	83	78	265	244	43	5.0	48
5	0918	551.79	.82	. 46	240	83	78	254	251	48	5.0	43
6	0923	554.92	. 77	.76	241	84	79	244	245	45	5.0	50
7	0928	3 <i>5</i> 7 . 7	.69	.72	781	94	79	257	244	47	5.0	50
8	0933	559.77	.57	.57	272	85	80	256	247	UB	5.0	50
500	0938	561.91	тв	LEAK	1 .00	5@10"						
3-1	6941	562.401	79575		283	83	80	246	250	48	5.0	52
Z	0951	565.0	1.5	1.15	285	85	82	253	251	49	6.0	50
3	0956	567.77	1.2	1.25	785	87	82	247	248	49	6.2	48
4	1001	576.77	1.4	1.5	284	87	82	250	251	47	7.0	51
5	1006	574.0	1.2	1.25	283	87	82	250	254	48	6.0	50
6	1011	577.14	1.1	1.15	282	88	82	247	246	48	6.0	50
7	1016	58.13	-8	. 84	281	99	83	265	255	50	5.0	50
8	1021	582.6	.57	.62	241	युव	83	261	250	51	Ì	49
5769	1026	584-95				<u> </u>						
			ंठ									
					¥201	~~			\			
Avg.		+4.7/	Gr = .90		200	84	80	,	10-/			
Check'd	_				400.12			1				
	·	بن در زین د خد کا او دوا										

CONSOLE # 161364	Velocity	n=24
FILTER #	% Moisture	,
AMBIENT TEMP.	Flowrate (DSCFM)	(0.15
PROBE LENGTH 12	Isokinetic (%)	. 94
LINER MATERIAL 6655		17.00

REMARKS

TEST DURATION min. INITIAL LEAK RATE cfm FINAL LEAK RATE cfm

Traverse	Clock	Dry gas meter	^P	Ť Ĥ	Stack	Dry gas m	elec lemp	Hot box	Probe	Last	Vacuum	Cond.
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit
					•			,	•	. •		Temp. F
								.				
4-1	1029	585.751	.85	. 89	283	85	83	245	247	54	5.0	49
2	1034	587.9	1.)	1-15	285	29	84	245	252	52	6.D	51
3	1039	590.79	1.4	1.45	284	89	84	251	256	51	6.0	50
4	1044	593.9	1.5	1.57	284	90	84	250	246	51	7.0	51
53	1049	597.15	1.45	1.52	283	91	85	265	251	53	7.0	51
42	1054	600.5	1.2	1.25	782	41	85	262	7.5 <u>2</u>	53	6.5	50
7_	25	603.59	.85	.90	281	91	86	256	25)	55	5.0	51
8	1204	606.35	.56	-53	277	91	86	244	246	58	4,0	51
STOP	1209	608.53		Lenk	1	.005	@10°					
5-1	1113	609.643	. 91	.96	285	90	86	257	245	60	5.0	48
2	1118	612.3	.85	. 89	284	91	86	256	275	58	5.0	48
3	1123	615.0	1.0	1-1	285	91	85	254	256	57	5.0	47
4	1128	617.74	1.5	1.6	284	91	86	762	250	54	7.0	47
5	1133	621.08	1-3	1.36	783	93	86	264	249	56	7-0	47
6	1138	624.4	.74	.78	283	94	87	259	254	52	5.0	45
7	1143	627.3	.81	.85	281	94	87	263	248	50	5.0	47
8	1148	629.55	71	.75	279	92	86	256	255	50		46
5768	1153	632.18	Leak	1	.010	2000						
6-1	1267	632.55	1.1	1.15	285	86	84	254	256	58	6.0	52
7	1212	635.52	.95	1.0	288	87	84	262	249	49	5.0	48
3	1217	638.4	.6	.63	287	88	84	247	257	50	4-0	48
4	1222	640.77	60	.63	287	89	85	254	253	51	4.0	49
5	1227	642.99	.69	73	287	88	85	254	244	52	4.0	49
6	1232	645.38	75	.78	Z86	87	84	246	254	52	5.0	48
7	1237	647.9	,82	86	285	88	85	257	244	53	5.0	SZ
8	1282	650.3	. 83	-87		87	84	262	257	25	50	78
STOP	1247	653.96	-	•							-	
			 	- :- - :	 -		 	 		 		
	200925	Ab	5		<u> </u>					 		
Avg.	F-1	15046	0.4306	626	280	84.	2 8 2 3					
Check d		127.640										
CHECK O			F 35000 C C C C C C C C C C C C C C C C C C		All the state of the state of	* 1490/09/07 (09808)	4 20 MA COM	* 38 A (30 H - 38 A)	10.000.000		3 (4) (1)	•

CONSOLE #	Velocity
FILTER #	% Moisure
AMBIENT TEMP.	Flowrate (DSCFM)
PROBE LENGTH	Isokinetic (%)
LINER MATERIAL	
REMARKS	

Plant Yates Station Boiler No. 1		Page \ of _2
SAMPLING LOCATION OUTLOT DATE 6/23/93 TIME START 67/2 DUCT DIMENSIONS 11 4 X 11 4 PTCF B4 DGMCF 1997 NOZZLE BAR PRESS 29.36 "Hg STATIC PRESS 11.0 "H20	RUN NO. 5 TIME FINISH 1129 DIAMETER E DIA. 197 inches OPERATOR TSB	TEST DURATION 240 min. INITIAL LEAK RATE -0020/K ff cfm

Traverse	Clock	Dry gas meter	^ P	H	Suck	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	Cond.
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit
!						•						Temp. F
1-1	0712	668.7	.95	.94	280	15	72	247	255	68	В	<i>5</i> 5
2	0117	671.5	.80	-80	275	77	73	242	253	59	6	41
3	0722	673 83	.51	.56	274	81	75	259	245	56	5	43
4	0727	675.97	.35	.35	272	84	77	246	256	55	4	45
5	0732	677.65	. 33	33	274	84	77	246	244	56	4	50
6	0737	679.15	60	.60	274	83	78	246	255	58	6.	51
7	0742	681.17	.64	.64	273	85	79	253	244	51	4	48
8	0747	683.50	.75	.75	269	85	79	254	257	50	7	47
STOP	0752	685.15	Leak	1	.003	@15	71					
2-1	0756	686.25	.86	.86	277	85	80	241	255	54	7	4.7
2	0801	68B.B	1.09	.69	278	86	80	265	244	48	7	47
3	0806	691.0	17،	.71	277	86	80	260	243	47	7	4
4	0811	694.0	.95	.95	277	85	79	259	254	47	7	44
5	0816	695.77	.69	.69	274	85	79	264	247	47	7	45
6	082)	698.15	60	.60	275	85	80	246	250	47	7	45
7	0826	700.27	.71	·71	274	85	80	252	260	48	7	46
8	0831	702.64	.57	· <i>5</i> 7	264	85	BD	256	249	49	6	48
STOP	0836	704 79		Leak	\$.00	5 ©	1511					
3-1	08397	705.235	.61	.61	278	83	80	240	251	58	7	51
2	0844	707.62	.96	.96	780	85	80	245	254	53	9	SZ
3	0849	709.9	1.2	1.2	279	85	80	248	262	5Z	100	53
4	0854	712.88	1.3	1.3	280	85	80	254	245	52	10.0	50
5	0859	716.0	. 99	.99	277	85	80	746	254	56	4.0	53
6	0904	718.9	.91	.91	276	85	81	247	259	57	8.0	54
7	0909	721.8	.70	.70	276	84	80	258	246	59	7.0	55
8	0914	723.7	.51	.51		85	81	246	254	59	6.0	55
570P	A19	725.744										
Avg.	_											
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CHECKO		r mednog best it, och i	100000118000111100	grada designimi	t directous descriptions (i.e.,	31.000.0004.6340	es investigate in con-	ir normo vis 198		\$45,898.000 (\$6)		

REMARKS	(07 0279	10.09 Buc
LINER MATERIAL 6/55		
PROBE LENGTH 12	Isokinetic (%)	
AMBIENT TEMP.	Flowrate (DSCFM)	
FILTER #	% Moisure	
CONSOLE # 16364	Velocity	

			MODIA	IED ML	пнои	5 FIEL	J DAT	'A SHE	ET			
PLANT	NAME	Plant Yates St	ation Boilei	No. 1						Page 2	_ of _Z	_
SAMPLI	ING LOCA	TION OU	tlet			RUN NO	3 M	m- 3	5			
DATE	23/93	TIME START		····	TIME FI	VISH	·	TEST DU	RATION		m	in.
DUCT I	IMENSIO	NS DOMCE	_ ×	N0771 E	DIAMET	ER	inobes	INITIAL	LEAK RA	TE	cf	m
BAR PR	ESS	"Hg		NOZZLE	DIA		niches	FINALL	EAR RAI	·		:Itu
STATIC	PRESS	TION OUTIME START NS DGMCF Hg	H2O		OPERAT	OR						
Traverse	Clock	Dry gas meter	Ŷ	^ н	Stack	Dry gas m	eler lemp.	Hot box	Probe	Last	Vacuum	Cond.
Point	Time	reading ft3	in F	in H2O	Temp. F	injet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit
Ì		Ì					}				1	Temp. F
7	2622	25502	0	-	200	01	12 1		361	<u> </u>	-	 _
4-1	0922	725.92	.85	.85	280	84	81	250	25	55	8.0	51
	0927	728.67	1.0	1.0	280	84	80	252	249	53	9.0	12
3	0932	731.41	1.3	1.3	281	84	80	243	260	51	10.0	49
4	0937	734,37	1.3	1.3	280	85	80	254	2 <i>55</i>	51	10.0	51
5	0932	737.7	1.3	1.3	280	87	81	245	257	52	10.0	51
6	0947	740.5	1.1	1.1	277	87	81	252	251	53	10.0	51
7	0952	743.7	.79	.79	277	86	81	248	261	55	7.0	51
8	0957	746.05	48	.48	277	86	81	252	249	56	7.0	52
STOP	9002	748.052		LEAK	1	.005	@15					
3-1	1005	748 368	.98	.98	280	85	81	256	259	57	9.0	51
2	1000	750.19	.72	72	282	86	81	249	244	57	70	<u>\$3</u>
3	1015	753.3	10	10	282	86	82	261	254	57	90	53
4				1.2							9.0	
	1020	11984 75L4			282	87	82	757	253	57	9.0	<u>53</u>
5	1025	758.30	1.2	1.2	201	88	82	258	214	56		52
ی	1030	762.3	.71	7/	280	89	83	254	258	57	8.0	51
	1035	764.55	.75	.75	280	88	83	246	245	58	7.0	52
8	1040	767.3	.68	.68	174	89	84	245	262	58		50
500	1045	769.243	38		\ 		<u> </u>			<u> </u>	Ll	
6-1	1047	769.6	.88	. 88	283	90	86	255	255	62	8.5	54
Z	1054	772.18	.91	91	284	91	87	262	258	55	9.0	50
	1059	774.79	.62	.62		72	87		246	52	7.0	46
4	1/04	716.65	.68	.68	283	92	88	266	250	52	7.0	47
5	1109	779.35	.65	.65			88	250	263	51	7.0	यंड
6	1114	781.64	.67	. 67	281	91	छ	245	255	50	7.0	47
7	1119	784.05	-85		282	91	89	246	245	50	8.0	44_
ं	1124	786.5	82		283)		89	251	251	पंव	8.0	48
510P	1129	746 961	- 22	سع ب		├───	21	2-1		 `- -	<u> </u>	رع -
3/ <i>0/</i> 2	11-1	100.76			?			 -	 	 	 	
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Avg.			0.8958	.82	2115	#3	.54					
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_		_			7.58800000000000000000000000000000000000	Secretários de la composição de la composiç	p#(0401.780kp0.000kp1000.70		- "			
					Velocity_	20000000000000000000000000000000000000						
FILTER			-		% Moista	The second second second						
AMBIE	NT TEMP.				Flourate	(DSCFM)						

CONSOLE #	Velocity
FILTER #	% Moisture
AMBIENT TEMP.	Flowrate (DSCFM)
PROBE LENGTH	Isokinetic (%)
LINER MATERIAL	
REMARKS	
C-48	

PLANT	NAME	Plant Yates St	ation Boiler	No. 1	<u> </u>		FE) 7.		Page	_ of	-
DATE (DUCT E PTCF - BAR PR STATIC	()/20/93 DIMENSION SESS_Z9. PRESS_=	Plant Yates St. TION 5 F TIME START NS (H2O	NOZZLE	TIME FII DIAMET DIA E OPERAT	NISH/	030 inches JB	TEST DUINITIAL FINAL L	IRATION LEAK RA EAK RAT	30m TE <u>- 0</u>	15 °	iin. fm ofm
Traverse Point	Clock Time	Dry gas meter reading ft3	n H2O	n H2O	Stack Temp. F	Dry gas me Inlet	Outlet	Hot box Temp.	Probe Temp	Last Impinger	Vacuum in. Hg	Cond. Exit Temp. F
	10:15 10:30	356.3 357.12										
										·	-	
					-000 300						300080000000000000000000000000000000000	
Avg. Check'd	-											
FILTER AMBIEN PROBE	LE# 161 # NA NT TEMP. LENGTH MATERIAL				% Moisu	ire (DSCFM) (%)						

Page _/_	_ of	

ampline	Lesstion	Plant OUT (<u> ۲</u>		Train		 .ldehvde	ç	Run	No. /		
ate 6	12/93	Time Start	1332		Time Fini	sh 1447)	Test Dura	tion 13	35	 min	
act Din	3/A	Time Start X	11/4	111	Diameter	<u> </u>	A	initial Les	k Rate	ol/mi-a	in cim	
TCF 0	64	DGMCF 0.9	92	Nozzie D	ia. 0./1	O inch		Final Lea	k Rate '	00540	ofm	
		Hg		11022102	•			. 416			<u> </u>	
tatic Pre	ess <u>-//</u>	# H20	0		Operator		<u></u>					
ravers	Clock	Dry gas meter	^ P	^ Н	Stack 17	Dry gas m	ter temp.	Hot box		Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
	1232	417.052	.79	73.7	185	75	72	155250	259	58	45	
			0976	0.18	183	81	73		258	35	4.5	
	13/6	440.9	0.76	0.77	178	814	75		258	59	4-5	
	1392	448.54	0.77	0.78	147	87	78	25%	259	13	4.5	
	1345	45514	1.77	1.79	170	DCT	80	255	257	14	4-5	
	165	460.00	0.76	0.79	186	30	8)	258	254	19	7.5	
	11111	467 50	0.75	0.18	181	91	87	255	257	17	4.5	
	1428	476.41	0.76			92	84	257	253	10		
		485.776	U-10	0. //	180	70	87	100/	207	68	7.5	
	1447	482.110	 		 			ļ.——				
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			VAP	-	1/-			 	 -	-	 	 -
		46.723	0.815		182	86	78					
vg. heck'd		V 78	CO 13		Parties and the	110		1				
ILTER MBIEN ROBE I	# IT TEMP. LENGTH	102	/ 		4	Velocity % Moistus Flowrate (Isokinetic	DSCFM)_ (%)	28 10	7			
EMAR	KS ⊀	Thex ral	les ure	buser	(huch	grow	lg of	Herma	coole l	eels. &	chalte	4 app 29

		Plant					<u> </u>				· ·	
Sampling	Location	OUTLET			Train _		Aldehyde	s	Rur	1 No. 👱		
Date LA	5465	Time Start	0710		Time Fin	ish 👩 🤉	25	Test Dura	ition	129	min.	9
Duct Dim	ensions	X	117"		Diameter		ft	Initial Lea	ak Rate/24	155 6000	cfm .	/
PTCF	190 84	DGMCF 7	92_	Nozzle D	ia/94	incl	nes	Final Lea	k Rate	5, 4002	∑_cfm	93
		<i>Ю</i> * Нg							*	۵	8"	<u> </u>
Static Pre	ss <u>-//</u>	" H20)		Operator	AP	<u> </u>					,
Travers	Clock	Dry gas meter	^ P	^H	Stack	Dry gas m	eter temp	Hot box	Probe	Last	Vacuum	-
Point Point Point	Time	reading ft3	1	i e	Temp. F		Outlet	Temp.	Temp	Impinger	l 1	
TMer					<u> </u>			<u> </u>	<u> </u>	<u> </u>		
	0719	4951	088	0.89	273	77	13	256	256	70	40	
68				0-89	273	82	74	267	254	7/	4	
21.3		50614	0-88	0.87	27/	90	77	256	258	62	4	
3/0		511-25	0.89	0.89	215	72	8/	257	258	64	4	
44.0		518.15	6,93	0.90	275	93	83	257	255	57	4	
53.0		522.92	a 85	0.89	275	93	84	256	259	56	K	
63.5		528.16	0.91	6.89	275	85	85	258	253	56	4	
73.0		533.50	0.91	0.88	276	28	87	259	253	58	4	
011						97			257	58	 	
846		5392	0.74	,	276		88	256			4	
75.4		545.4/	0.93		276	96	88	256	254		2/	
062		551.15		0.89	276	96	33		254	58	4	
17.2		557.23	0.95	0.87	277	96	88	258	259	60	4	
1753		T61.2	0.93	0.86	227	15	88	258	259	62	4	
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Avg.		66.100	0.15/15	0.885	2752	81	8					
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CONSOL	.E #	16140									<u>.</u>	
TILTER	#			<u>-</u>		1905.000000.044.000.0	re	1000000000000000000000000000000000000	0004000000000000000000		ă Ĉ	
AMBIEN	T TEMP.						DSCFM)_					
PROBE I	ENGTH	10	<u> </u>			Isokinetic	(%)				9 0 0 0	
LINER N	1ATERIAI	will	55									

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<u>م</u> بوج	FSP OU+ Time Start //'4" X DGMCF9 73 "Hg 29	0654 92	<u>T"</u>	Time Fini	ish og	\ <u>^</u>		_			
<u>م</u> بوج	1/14" X DGMCF Y	92	9"			107	Test Dura	tion	135	min.	_
<u>م</u> بوج	DGMCF	92		Diameter		ft	Initial Lea	k Rate	1007	cfm	
29. 11	93 . Hg 29		Nozzie D	ia. <u>'/</u> 9	/ inc	hes	Final Leal	k Rate _	1005	cfm	
_ 11		1.36 DJ1	/		,				E.	511	
	" H2C)		Operator		<u> </u>	_				
lock	Dry gas meter	^ D	^ н	Stack	Dry one r	neter temp.	Hot box	Probe	Last	Vacuum	
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					84						
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								260	63	3.75	
4:45	607.23			<u> </u>	97	89	257	259	65	3.75	
1	45.80	8,90	0.80	270	96	89	253	254	56	375	
2-2	621.60			271	25	89	258	253	53	3.75	
		0.90	0.80	272_	96	89		256	53		
9:45											
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	55:30 03 11 20:30 1:45 16 4:45 1:30 9:45	55:30 572.6 03 576.79 11 580.78 20:20 585.48 2:45 591.60 46 598.22 4:45 607.23 1 45.80 2:30 621.60 1:30 626.16	55:30 572.6 0.89 03 576.79 6.87 11 580.78 0.89 20:30 585.15 0.7/ 2:45 59/.60 0.90 4:45 607.23 0.92 1 45.80 0.90 2:56 621.60 0.90 9:45 635-33 0.97 8:43 639.85	55:30 572.6 0.89 0.8/ 03 576.79 0.87 0.8/ 11 580.78 0.89 0.8/ 20:20 585.18 0.7/ 0.80 1:45 59/.60 0.90 0.80 1:45 607.23 0.92 0.8/ 1 45.80 0.90 0.80 1:30 626.16 0.90 0.80 1:30 626.16 0.90 0.80 1:45 635.33 0.97 0.8/ 131 639.85	55:x0 \$72.4 0.89 0.8/ 269 03 576.79 0.87 0.8/ 269 11 580.78 0.89 0.8/ 269 20:x0 585.48 0.7/ 0.80 269 21:45 591.60 0.90 0.80 269 21:45 607.23 0.92 0.80 269 21:45 621.60 0.90 0.80 270 21:46 635-33 0.92 0.80 271 21:5 635-33 0.97 0.80 277 21:5 639.85	55:30 \$72.4 0.89 0.81 269 77 03 576.19 0.87 0.81 269 84 11 580.78 0.87 0.81 269 88 120:20 585:15 0.71 0.80 269 92 12:49 591.60 0.90 0.80 269 97 12:49 507.13 0.92 0.80 269 97 12:49 607.13 0.92 0.80 270 96 12:30 621.60 0.90 0.80 270 96 1:30 626.16 0.90 0.80 271 95 1:30 626.16 0.90 0.80 272 96 1:31 639.80	55:30 572.4 0.89 0.81 269 77 72, 03 576.79 0.87 0.81 269 84 74 11 550.78 0.89 0.81 269 88 77 10:20 585.48 0.71 0.80 269 92 80 1:45 591.60 0.90 0.80 269 97 97 1:45 607.23 0.92 0.80 270 97 1:45 607.23 0.92 0.80 270 96 1:45 621.60 0.90 0.80 270 96 1:30 626.16 0.90 0.80 271 95 87 1:30 626.16 0.90 0.80 272 96 1:45 635.33 0.97 0.91 277 96 1:45 639.85	55:30 572.4 0.89 0.8/ 269 77 72, 263 03 576.79 0.87 0.8/ 269 84 74 266 11 580.78 0.87 0.8/ 269 88 77 259 03.6 583.75 0.7/ 0.80 269 92 80 260 0:45 57/.60 0.90 0.80 267 95 63 258 16 578.22 0.90 0.80 267 97 87 257 17.45 607.23 0.92 0.80 270 96 89 253 2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-	55:30 572.4 0.89 0.81 269 77 72, 263 255 03 576.75 0.87 0.81 269 84 74 266 260 11 580.78 0.81 0.81 267 88 77 259 261 03:45 591.60 0.90 0.80 269 92 80 260 256 16 576.22 0.90 0.80 269 77 87 251 260 17.45 607.23 0.92 0.80 270 76 89 257 259 18.45 621.60 0.90 0.80 270 76 89 253 254 2-2-2-6-2-1-6-2-2-1-6-2-2-1-6-2-2-2-1-6-2-2-2-1-6-2-2-2-2	55.36 \$77.4 0.89 0.8/ 269 77 72, 263 253 62 03 576.77 0.87 0.88/ 269 84 74 266 260 62 11 5\$0.78 0.87 0.88 269 88 77 259 261 60 12.18 5\$1.78 0.7/ 0.80 267 72 80 260 256 61 13.19 5\$7/.60 0.90 0.80 267 72 80 260 256 61 14.19 5\$7/.60 0.90 0.80 267 77 87 251 260 63 14.19 607.13 0.92 0.80 267 77 87 251 260 63 14.19 607.13 0.92 0.80 270 76 89 253 254 56 12.26 62/.60 0.90 0.80 270 76 89 253 254 56 130 626/.60 0.90 0.80 272 96 89 258 256 53 130 626/.60 0.90 0.80 272 96 89 258 256 53 130 626/.60 0.90 0.80 272 96 89 258 256 53 130 626/.60 0.90 0.80 272 96 89 258 256 53 130 626/.60 0.90 0.80 272 96 89 258 256 53 130 626/.60 0.90 0.80 272 96 89 258 256 53 130 626/.60 0.90 0.80 272 96 89 258 256 53 130 626/.60 0.90 0.80 272 96 89 258 256 53 130 626/.60 0.90 0.80 272 96 89 258 256 53 130 626/.60 0.90 0.80 272 96 89 258 256 53	55:30 572.4 0.89 0.81 269 77 72, 263 255 62 3.5 03 576.75 6.87 0.81 269 84 74 267 260 62 3.5 11 550.78 0.81 0.81 269 88 77 259 241 40 3.5 02:555.45 0.71 0.80 269 92 80 260 256 61 3.75 02:555.45 0.71 0.80 269 92 80 260 256 61 3.75 02:45 591.60 0.90 0.80 247 95 63 258 241 40 3.25 03 578.22 0.90 0.80 249 97 87 251 260 63 3.75 045 607.23 0.92 0.80 270 98 89 257 259 45 5.75 045.80 0.90 0.80 270 98 89 253 254 56 3.75 045.80 0.90 0.80 271 95 87 258 273 53 3.75 045.15 0.90 0.80 272 96 89 258 256 53 3.75 045.15 0.90 0.80 272 96 89 258 256 53 047 635.33 0.97 0.91 271 96 89 258 258 53 3.75 045 635.33 0.97 0.91 271 96 89 258 258 53 3.75 045 637.33 0.97 0.91 271 96 89 258 558 53 3.75

Page of Plant Yates Station Boiler No. 1 Plant Name ____ Sampling Location <u>FSPOUT/eT</u> Train <u>Aldehydes</u> Run No. <u>FS</u>
 Date 6-20-93 Time Start
 Time Finish
 Test Duration
 min.

 Duct Dimensions
 X
 Diameter
 ft Initial Leak Rate
 cfm
 PTCF DGMCF Nozzle Dia. inches Final Leak Rate _____ cfm Bar Press 29.56 Hg Operator ITB Static Press _____ " H2O ^ H Travers | Clock | Dry gas meter Stack Dry gas meter temp. Hot box Probe Last Vacuum Impinger in Hg Point Time reading ft3 in H2O in H2O Temp. F Inlet Outlet Temp Temp. Avg. Check'd Velocav CONSOLE # % Moisture FILTER # Flowrate (DSCPM) AMBIENT TEMP. Isokinetic (%)_____ PROBE LENGTH _____ LINER MATERIAL REMARKS

										·		
		Plant							_	_		
Sampling	Location_	ESP OL	<u> 17/e/</u>		Train_	<u>F</u>	<u>'SD</u>			10. <u> </u>		
Date 6/	21/93	Time Start	1300 L		Time Fini	sh <u>& * 1</u>	ما	Test Dura	tion	FHKU	min.	
Duct Dir	mensions	DGMCF 1.6	<u>₩.</u> E	— – Norsla D	Diameter	1 isob	п	Initial Lea	K Kale _	01001	S cim	
PICP_	. 7 T	5/_" Hg			=				K Rate W	uch He.	2106 a	
Static Pr	ess//.	<u>д</u> н20)		Operator	IZ	B		ω _β .	ough the	7	
Travers	Clock	Dry gas meter	^ P	^ H	ļ			•i :	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Iniet	Outlet	Temp.	Temp	Impinger	in. Hg	
0"	1436	62.07	.95	.98								
35		82.85	98	35	278	85	78					
15"		88.12	38	.95	278	84	78			.520	m@94	780
867		86.01	99	.95	277	87	90					
86"		106.42	97	.55	278	85	80					
120		137.35	97	.95	276	82	18					
140		138.0	,97	R	281	85	90				3	
180"		158.87	.99	.92	281	88	86				9	
210"		174.70	.98	91	282	88	84				9	
240		190.38	.98	91	282	8,8	PS				Ā	
249"		195.0	.98	.91	282	88	83				9	
210		706.08	.98	91	282	87	83	<u> </u>			গ	
310	1946	225.73		0.43	3 3	86	81				9	
257	2027	247.52		0.97	287	25	81	 			á	
3	2104	267.27	100	0.97		46	81				9.5	
419	2/15	283.62	100	0.97	283	82	81	i —		 	10	
453	5504	302.04	1.00	1 98	383	88	82	+			10	-
	2236	316.850		0.98		ŝů	83	 - -		+	10	
1480	<u> </u>	10000	100	0.78		70	0.7				3	
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	 	254.68	030	nt	30-	OL I						
Avg.	 =	(A) (A)		112	200	DIT						
Check'd		V						1		l e		ı
CONSO	LE#	161396				Velocity	NG 850 : NG 2000000 86236 - 1000					
	* set					% Moistu	A STATE OF THE PARTY OF THE PAR	- A CANADA MARKA A NA				
	NT TEMP.			-		Flowrate (AMO TO THE STATE					-
PROBE	LENGTH	7'				- 현존 유리 하네 아니다 하는데				040000000000000000000000000000000000000	8: 8: 2:	
LINER	MATERIA	L <u>5.6</u> .									- ,	4
REMAR	uks	16.620	c. 14	LAP	.5 W	NOZ	zle				_	
r	C-54	<u>16.6 sa</u> .5 acfm	D) ma	ter							_	
•		~ ~~ v										

(In. H2O) Vacuum Pump Diagram of Duct 0 Impinger Page 1 of 5/5° 2 3 6 25. chall 90,75 2200 Outlet (*F) Temperature 1 Dry Gas Meler **8**17 86 Talet 112 9 4.9 : 34 86 emperature Assumed Moisture (%)
02 (%)
CO2 (%)
O2/CO2 Method Filter £ Height of Location (ft) **Duct Dimmensions** Final Leak Check Filter Number 286 emperatur 288 282 284.5 G. क्रिक्र Orifice Minutes FIELD DATA 4 H (in. H20) 0.009@10 4.1835 L Differential 12/04 150525 Pressure 200 1007 715 **80**5 8 191 Read and Record All Data Every 0,1517 (ln. H2O) 997 A Ps 75 Probe Length and Type 97 8 Probe Heater Settling Heater Box Settling Meter Box Number Iniai Leak Check Nozzte ID (in.) 180.019 Gas Meter 500.605 Meter A H@ 329.05 430.6R +53.05 Reading Vm (R2) 474.5 K Factor 2 12493 120 Out 1003 (24-hr) 1000 Clock Time 1550 1518 29.4 -Sampling 11me (mm) 520 45.5 857 350 Ambient Temperature 17 RADIAN لا Barometric Pressure 0 Sampling Location Static Pressure Sample Type **Run Number** Step Traverse Number Point Operator Plant Date

Comments:

9.946

Page ____ of ___ Plant Name Plant Yates Station Boiler No. 1 Sampling Location 25 POUTLET Train PSD Run No. 3

Date 4(23/93) Time Start 0907. Time Finish Test Duration 300 min.

Duct Dimensions 11.4 X 11.4 Diameter ft Initial Leak Rate 0.0/ \(\omega /7 \) cfm

PTCF \(\delta \delta \) DGMCF \(\delta .007 \) Nozzle Dia. \(\delta /9 \) inches Final Leak Rate \(\delta /4 \) cfm Final Leak Rate N/A cfm Bar Press 25.39 "Hg Operator Dade Static Press __// H2O ^ P ^ H Travers | Clock | Dry gas meter Stack Dry gas meter temp. Prooc Last Hot box Vacuum in H2O in H2O Temp. F Impinger in Hg Point Time reading ft3 inlet Outlet Temp Temp. 276 78 26.6 81 8 276 778 53.24 9 Z 72.15 283 20.70 88,85 94 285 105 1394 . 93 Z86 100 101 56.6 286 166 168.3 287 107 102 674.55 300 154.960 0955 0.863 282 939 > Avg. Check'd Velocity % Mousture____ FILTER # Set 5 Flowrate (DSCFM) AMBIENT TEMP. PROBE LENGTH 5 lsokinetic (%)____ REMARKS

C-56

Plant N	lame , TV	Plant	Yates St	ation Bo	iler No.	1							
Sampling	Location	ESP Out	le t		Train	Partic	— culate / N	Tetals	Rui	n No.	/		4
Date (a)	246-23	Time Start 0	758		Time Fini	sh 13/6	,	Test Dura	ition	241	min. "		
Duct Din	nensions	11.4" X_	11'4"		Diameter		ft	/Initial Lea	ik Rate	24178	51 Cfm 47	,	
PTCF_	.84	Time Start	97	NOZZLE	DIA.	97_i	nches	⊁inal Lea	k Rate . c	21500XS	" cfm		
Don Desc	. Z5 S	S " II a					1						
Static Pro	ess <u>~ // . C</u>	2 H2C)		Operator	130	Are						
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum		1
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg		
		827.24	.83	8	274	72	7 (246	244	66	5.0		
Z		830.3	.70	.78	278	72	7	248	254	62	4.0		Į.
3	0808	832.12	.40	.38	278	75	72	249	242	61	3.0		İ
4	0813	833.9	, 26	.25	277	77	73	253	261	62	3.0		
1	0818	935.35	1723	126	278	77	73	266	255	63	3.0		ł
9	0823	836.35	<i>5</i> 0	.48	278	77	73	244	258	63	4.0		1
	0828	838.7	.62	.60	278	78	74	254	266	62	40]
8	0823	841.0	. 68	.66	276	79	75	244	264	60	4.0] '
Sich	0838	893.02		LEGK	1	.010	10"]
		843.675	.89	.97	282	81		756	266	59	5,0		1
2	0848	846.14	.68	.67	782	87	76	256	254	59	5.0]
3	0853	443.8	68	.67	282	83	77	245	247	58	4.0		1
4		850 iel	.92	.92	281	84	78	255	260	59	5.0]
5	0903	853 B	.66	.66	281	85	78	246	260	60	5.0		ļ
م	0908	855.53	.60	.60	280	86	78	253	267	60	5.0		j
<u></u>	0913	857.73	.76	.76		86	79	249	247		5.0		1
8	0918	45907	.62	.62	277	86	80	250	246	60	5.0]
STOP	0923	4LZ.38		LPAKI	.007	@ 10"			ļ				1
3.8		862.99	.48		275	85	83	244	247		4.0		1
<u> </u>		465.5		.67		86	82	246	257	61	3.5		1
<u> </u>		467.65	.93	.93	286	1 -	82	254	264	56	5.0		1
	-	870.90	1.0	1.0	280		83	250	245	56	5.0		
4		873.1	1.3	1.3	282		84	254	265	57	5.0		1
3	1009	475.7	1.2	1.2	243		84	266	246	5.5	5.0		1
2	1014	879.0	.92		283	92	86	246	244	54	5.0		4
	1019	841.53	10	1.0	283	43	87	257	243	53	5.5		_[
STOP	1024	481.372						<u> </u>		 		:	4
		£92£87											
Avg. Check'd		125.5340		مفكو	-92C		89.8						1
ß		A	r (W)	20-0-57-58	1.00		1 97 0	F	g ang anggaragaga Ng		-	p. 000000000000000000000000000000000000	3
CONSO	LE #	61364				Velocity_					ist N CAUGH RINSE	MRIC	RINSE
FILTER				-		% Moistu	Contract (1000000000000000000000000000000000000				r 402	u w	HESTAN
						Flowrate (A 686 - 408 - 500				Ausse	104	1
PROBE	LENGTH _					Isokinetic	(%)				≅ KIM>S		り 、

197 NOZZIE NOZZIETDI K= 973

W Sampled PTG @ Smin. 04 Started Sampleing at point &

REMARKS

LINER MATERIAL

C-57

SELDIND EINSE PERFORMED.

Plant N	Name	Plant	Yates St	ation Bo	iler No.	1						
		ESP Ou					culate / N	I etals	Rur	ı No		
		Time Start										
Duct Din	nensions	X_		·········	Diameter		ft	Initial Lea	ık Rate		cfm	
		DGMCF										
		" Hg			· · · · · · · · · · · · · · · · · · ·		J					
		" H2C)		Operator	17)	<u> </u>					
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	icter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger		
4-8	1028	884.641	,60	60	276	90	87	248	247	59	4.0	
7	1033	887.00	.82	.82	278	92	88	253	261	56	5.0	
6	1038	869.3	1-10	110	279	93	89	249	246	52	5.0	
5	1043	892.07	1.3	1.3	280		89	253	267	52	5.5	
4	1048	895.14	1.4	14	280		90	250	250	52	6.0	
3	1053	898.27	1.3	1.3	282	96	90	252	256	52	6.0	
2	1058	9018	1.1	1.1	283	t	91	248	245	52	5.5	
1	1103	904.3	.81	81	283		91	256	241	53	5.0	
5100	110B	907.000		<u> </u>	LTAK		010	15 11				
	1151	907.516	.71	.75		92	90	244	246	65	4.5	
7	1156	910.0	.82	.82	278	93	90	753	249	54	50	
6	1201	912-6	-68	.68		94	90	214	251	55	5.0	<u> </u>
5	1206	214.75	.90	.90	280		90	253	266		5.0	
4	1211	918.0	1.3	1.3	282	94	90	250	253		5.0	
	1216	720.32	1-1	1.1	283	95	90	254	257	49	5.0	
	1221	923 25	.68		283	96	.90	251	263		55	
	1226	925.62	.69	.69	283	96	91	248	246	52	> -	
STOP		928.021	.0,	Leak	1	.067	@ 15"		210			├
	1235	928.27	.80		279	96	92	250	255	52	5.0	
7					279	96	_			· · · · ·		
	1246	931.64	.85				92	257	244	48	5.0	
		934.22	.75		280	98	92		Z45		5.0	
 }	1251	936.7	.64		281	98	92	254	246		4.0	-
T	1256	938.95	65		282	98	93	249	267		4.0	ļ
	1301	441.19	.57	,	282	98	93	257	264		4.0	
	1306	943.32	.89		283		94	249	252	<u> </u>	5.0	<u> </u>
	1311	945.8	.96	.96	284	98	94	265	249	48	5	
7108	1316	948.490										
A=						. *** . ****						
Avg.		1100		001	000	छ। न						
Check'd	<u> </u>	//9.957	C 38.10	(), () 1	1000	16.	4 · · · · · · · · · · · · · · · · · · ·	l	l e		1	
CONSO	LE#	C> Do	ES NOT	INCLE	c Leek	CKS-WA	~				}	
FILTER		· · · · · · · · · · · · · · · · · · ·					re	######################################				
				-			(DSCFM)				•	
							(%)					
		L				STATE OF THE STATE	: 74 T.				\$	
				•								
REMAR	ve											

Page of 2

Plant N	Name	Plant	Yates St	ation Bo	iler No.	1	<u></u>				_	
Sampling	Location	outlet			Train _	Partic	ulate / N	letals	Rui	1 No. 2	<u>'</u>	
Date 6	26/93	Time Start	925			sh <u>1131</u>		Test Dura	ition Z5	60	min.	
Duct Din	nensions	11:1	11/1		Diameter		ft	Initial Les	ık Rate 😶	00 SE)12	rt cfm	
PTCF _	84	DGMCF <u>.99</u>	<u>) </u>	NOZZLE	DIA	<i>97</i> i	nches	Final Lead	k Rate <u>.0</u>	0700/0	∉ _cfm	
Bar Pres	s <u>794</u>	11.9 X _ DGMCF <u>.99</u> 2 Hg				D						
Static Pro	ess <u>"// · C</u>	" н20)		Operator	IJB		_	K =	.915		
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas me	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F		Outlet	Temp.	Temp	Impinger	in. Hg	
1-8	0925	959.3	.65	.65	270	75	75	254	262	58	4.0	
1 7	0930	9614	.81	81	277	75	15	255	248	49	4.0	
6		963.85	.60	.58	278	15	75	249	266	47	4.0	
5	0940	965.87	. 35	. 34	219	78_	76	251	259	51	4.0	
4	0945	967.48	, 34	.33	276	79	16	249	261	51	3.6	
2	0950	969.1	.60	-58	280	80	77	252	266	53	40	
ا خ	0955	971.0	.82	.81	281	80	77	247	247	<u> </u>	4.0	
	1000	473-8	.86	.84	280	81	78	245	258	51	5.0	
(75.0	1005	976.065	.00		1	.007	<u>"</u> D 12"		230	21	3.0	
570P		976.5	<u></u>	LEAK 52	214	84		253	767	-0	4-	
2-0	1008		. 53				86		752	58	4.0	
 /	1013	918.53	.80	.79	278	86	81	256	255	\$7	4.0	
6		980.91	.62	.62	279	86	81	244	248	53	4.0	
5	1023	983.01	.73	.73	281	86	81	254	264	55	4.0	
4	1028	985.5	.99	.99	282	86	82	249	245	53	5.0	
3	1033	988.2	,78	.78	283	89	83	264	253	52	4.0	
2	1038	990.36	.70	.70	283	90	84	250	254	53	4.0	
1	1043	992.70	.98	.98	284	91	84	249	249	54	4.0	
STOP	1048	995.32		Leak	1	.010	15"		<u> </u>			
3-8	105	996.0	.63	.63	278	92	86	254	259	<i>5</i> 7	4.0	
7	1056	998.3	1.0	1.0	279	93	27	253	247	55	5.0	
6	1101	1001.02	1.2	1.2	281	93	81	247	251	54	5.0	
5	1106	1103.15	1.3	1.3	282	95	88	246	248	56	50	
4	1111	1606.75	1.3	1.3	283	95	87	248	246	54	5.5	
3	1116	1009.7	1.1	1.1	283	95	88		263		6.0	
2	1121	1012.7	.72	.72		95	88	252	235		5.0	
	1126	1015.05	.70	.70		94	88	253	260		5.0	
STOP	1131	1017.40		,								
Avg.		/21.053	911.5	8400	281.1		285					
Check'd					talia degli	f. (c) (c)						
		m 1.5	<u> </u>				1		-		•	***************************************
CONSO	LE # 16	1264				Velocity_						
FILTER	#					% Moistur	1 2					
							DSCFM)_	77.549.54644.60000000000	000000000000000000000000000000000000000	100 - 1		
						Isokinetic	(%)				<u>.</u>	
LINER	MATERIA	L										
DE1 () =												
REMAR	KKS										_	

Page Z of Z

Plant N	Name	Plant	Yates St	ation Bo	iler No.	1					_	
		OUTION					cul <u>ate</u> / N	fetals	Run	No.	2.	
		Time Start										
		x_										
PTCF		DGMCF		NOZZLE	DIA.		inches	Final Lea	k Rate		cfm	
		" Hg										
		#20)		Operator			_				
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp	Hot box	Probe	Last	Vacuum]
Point	Time	reading ft3	in H2O		Temp. F		Outlet	Temp.	Temp	Impinger	1 1	İ
4-8	1133	17.885	.44	.44	277	93	88	253	261	63	4.0	
7	1138	19.66	.80	.80	279	93	88	255	25 ⁴	62	5.0	
6	1143	22.15	1.20	1.20	281	93	89	251	263	61	6.0	
5	1148	25.13	1.30	1.30	185	93	89	247	25)	60	6.0	
4	1153	28.2	1.4	14	Z83	95	89	252	262	61	6.0	
_3	1158	31.39	1.4	1.4	284	96	90	247	255	63	6.0	
2	1203	34.75	1.1	1.)	284	97	90	256	258	6+	6.0	
Ţ	1208	37.77	. 86	.86	285	98	11	252	254	64	5.0	
STOP	1213	40.41	Leak	1	.015	@15"						
5-8	1248	41.30	.15	75	280		89	246	248	60	4.0	
7	1253	43.77	81	.81	281	91	89	247	263		4.0	
6	1258	46.25	.70	.70	28	92	89	256	266		4.0	
5	1303	48.56	1.10	1.10	283		90	247	258		4.0	
4		51.35	1.2	1.12		93	90			<u>55</u>		——]
7	1308				284	94		255	253	56	5.5	
<u> - 3</u>	1373	54.4	.93	.93	285		90	248	2A7	58	5.0	
-	1318	57.00	.71	.71	285	91	91	256	248		4.0	
	1323	59.35	.98	.98	785	96	91	254	255	60	 	
STOP	1328	WZ-05	LEAK	1	.007	@ 9.0°						
6-8		62.367	.87	.87	276	76	93	252	257	63	5.0	
7	1335	65.0	.86	.86	281	97	92	246	255	61	5.0	
		37.65	.72	.73	281	97	92	256	264	60	5.0	
5	1345	70.15	.66	.67	283	91	92	252	247	60	4.0	
4	1350	72.43	74	-75			92	256	258	62	5.0	
3	1355		.60	.61			92	246	257	62	5.0	
2	1400	77.15	.94	.95	285		92	246		6Z	55	
	405	79.88	1.1	1.2	185		93	248	253	63		
570P		83.16			1							
1-/:	7 7 1 2				ļ <u>.</u>	ļ	 	 				
Avg.					8,000,000,000							
Check'd												
CHECK U			s were the second as		Pagarasi as							<u></u>
CONSOL	LE#					Velocity						
						- Company - Comp	re.			10000000000000000000000000000000000000	4.400	
							DSCFM)_					
						\$1000000000000000000000000000000000000	(%)	Control of the Contro			**************************************	
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REMAR	KS						·				_	

Flue-Gas Sampling Log

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Sample Run#	လ	Iodated Carbon #	Pump	Probe#:	Filter ID
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700	1: \Arts	\$ (2) (2) (1)	~##C	trol: 550	חלב השתובר
700	001: \\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \	6 (26/43	1483	introl: £5¢	int owier
700	tion: Apres	(4 (26) 43	7-402	Control: 15P	Point autet
700	ation: Agres	6 (26/43	3: capt	Control: 150	Point nater
ne Doc	Scation: Agres	6 (25/43	De: cont	in Control: 136	ng Point autlet
Jed 20	Location: Agres	6 186143	ype: coff.	ion Control: £5P	ing Point Dutlet
Jed Host	t Location: Arres	1: 4 [26] 9.3	Type: coff.	ıtion Control: 1:30	pling Point outlet
Jed nosuc	nt Location: Arres	te: 4 lacks	l Type:	lution Control: 1:36	npling Point Outlet
donsor: 000	Plant Location: Vares	ate: Lizeles	Fuel Type:	ollution Control: 136	Sampling Point Butt

			_	-	_	 	_
mean	flow (1/min)	,26					
тевп	zero (I/min)	۵					
1	time (min)	1 (
	flow (1/min)	.243					TOTALS:
stop	zero (1/min)	0.00/1"	,				
	time (hh:mm)	1323					
	flow (1/min)	.28-3					
start	zero (1/min)	"S/00.0					
	time (hh:mm)	0/80					

Integrator Volume (I):	COMMEN
Offset Correction (1):021(2) Box,0/6/20/6/20	In. 40/ 650
Total Integrator Volume:	
CO ₂ Mass Flow Correction:	1
Actual (dry STP) volume (1):	metal Vi
$\% 0_2$: 7, 8	Frank so
% CO ₂ : 11.2	o WI C
$\% \text{ H}_2\text{O}$: 10%	
$ppm SO_2$:	

Flue-Gas Sampling Log

int Location: 1/475 Soda-Lime Tra le: U/2/1/43 Iodated Carbon I Type: CO/L Pump#: Intion Control: 5SP Probe#:	tion: VATES Colored: ESP Points Outles	tion: VATES (126,193 Control: ESP Points Doubles	tion: VATES (126,193 Control: ESP Points Doubles	tion: VATES (126,193 Control: ESP Points Doubles	tion: VATES tion: VATES (126/193 Control: ESP Point	tion: \$475.5 (\$126.193 Copt. Copt. I Control: \$56	tion: VATES tion: VATES Control: ESP Points Control: ESP	tion: \$475.5 (\$126.193.2004). Control: \$286.7	tion: VATES tion: VATES (126/193 Control: ESP Point	tion: VATES (126,193 Control: ESP Points Doubles	tion: VATES (126,193 Control: ESP Points Doubles	tion: VATES (126,193 Control: ESP Points Doubles	tion: VATES (126,193 Control: ESP Points Doubles	tion: VATES (126,193 Control: ESP Points Doubles	tion: VATES (126,193 Control: ESP Points Doubles	tion: VATES (126,193 Control: ESP Points Doubles	tion: VATES (126,193 Control: ESP Points Doubles	tion: VATES (126,193 Control: ESP Points Doubles	tion: VATES (126,193 Control: ESP Points Doubles	tion: VATES (126,193 Control: ESP Points Doubles	tion: VATES (126,193 Control: ESP Points Doubles			
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	time (hh·mm)	1434				
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Total Integrator Volume: CO ₂ Mass Flow Correction: Actual (dry STP) volume (1): % 0 ₂ : 4
٥ (C): '\

Flue-Gas Sampling Log

Spansor: 1888	Sample Run #: 3
Plant Location: YAT-CS	Soda-Lime Trap#: 409
Date: 6(10)93	
Fuel Type:	Pump#:
Pollution Control:	Probe#:
Sampling Point Outle	Filter ID:

1	_	_		_		 		
	mean	flow	(1/min)	1885				
	mean	zero	(1/min)	0				
	elapsed	time	(mim)	7404	,.0બેર			
			- 1	386				TOTALS:
	stop	zero	(1/min)	\mathcal{O}				,
		time	(hh:mm)	1126				
		flow	(1/min)	704.				
	start	zero	(1/min)	91/0				
		time	(hh:mm)	7000				

COMMENTS:	20'0" 10' 10' 11'	0.00.0	0	142 0Ket = 050	Q			
Integrator Volume (1): ©.O	Offset Correction (1): 919 - 049	ıme:	CO ₂ Mass Flow Correction:	Actual (dry STP) volume (1):	% 0 ₂ :	% CO ₂ :	% ӊ20ы	ppm SO ₂ :

Flue-Gas Sampling Log

onsor: <i>10e-44765</i>	Sample Run #: 1/600 BLACK	
ant Location: 650 OLT CET	Soda-Lime Trap#: 420	
16: 6 /62/47	Iodated Carbon #: U2@	
el Type:	Pump#:	
llution Control: 🚓	Probe#:	
mpling Point Fer outlet	Filter ID:	

	start			stop		elapsed	mean	mean
time (hh:mm)	zero (l/min)	flow (1/min)	time (hh:mm)	zero (1/min)	flow (1/min)	time (min)	zero (1/min)	flow (1/min)
1300	0	0						
				·				
					TOTALS			

COMMENTS:	40 INSTEA FLOW OF	362 UPA THEN LEAK						
Integrator Volume (I):	Offset Correction (1): -070	Total Integrator Volume:	CO ₂ Mass Flow Correction:	Actual (dry STP) volume (I):	% 0 ₂ :	% CO ₂ :	% H ₂ O:	ppm SO ₂ :

40 JUSTED FLOW FOR

			SOURC	E SAM	PLING	FIELD	DATA:	SHEET		j		
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Plant N	iame	Plant Out let Time Start Illy X DGMCFD. Hg	Yates St	ation Bo	iler No.	1						
Sampling	Z Location	outlet	· · · · · · · · · · · · · · · · · · ·		Train		Anions		Run Ne	o.)		
Date 6	25/13	Time Start)	Time Fini	sh (152		Test Dura	tion	97	min.		
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PTCF _	0.84	DGMCFO.	792	Nozzie D	ia. <u>. ZZ</u>	うinch	ies	Final Lea	k Rate •	007@1	<u>O^U</u> cfm	
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Static Pr	css	-1/_* H20	, 		Operator		2 //	5/S 				
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
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Check'd		jamasa na sanajab -	1 A-4 1 1778 1	I I o do codo	18:50 J. T.		I make in 1997	Beach state of	I rokumposii	I	1	
CONSO	LE#	12140	23			Velocity						
	* 722					 A transition of the factor 						
				•		 Undirect 1000 1000 123 	DSCFM)		CONCONDENSIONAL			
	LENGTH						(%)				į L	
LINER	MATERIA	L									•	
REMAR	KS											

* Thermosph not const upon ingition of probe

Page ____ of ___

Plant Name Plant Yates Station Boiler No. 1 Sampling Location O LALT Train Anions Run No. 2 Date \$\frac{126}{95}\$ Time Start 3 Time Finish \frac{1243}{1243} Test Duration 90 m Duct Dimensions \frac{1}{12} \frac{1}{1	nin. Im	
Date # 243 Time Start Time Finish # 243 Test Duration 90 m Duct Dimensions # X # Diameter ft Initial Leak Rate 0.0050/0 c PTCF 94 DGMCF 0.797 Nozzle Dia. 0.223 inches Final Leak Rate 0.003@9 c Bar Press 29.42 Hg Nozzle Dia. 0.003@9 c 0.003@9 c	in. Im	
Duct Dimensions // X // Diameter ft Initial Leak Rate 0.0050/0 c PTCF 0-84 DGMCF 0.992 Nozzle Dia. 0-223 inches Final Leak Rate 0.00309 c Bar Press 29.42 "Hg	fm	
PTCF 0-84 DGMCF 0.997 Nozzle Dia. 0-223 inches Final Leak Rate 0.003@9 o		
Bar Press* Hg	îm	
Static Press H2O Operator ASIT SB K = 1.63		
Travers Clock Dry gas meter ^ P	num	
	Hg]	
	.0	
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	.O	
1142 96,07 .92 1.55 283 101 91 241 253 62 5.	0	
	0	
1207 933.3 199 155 483 101 92 246 242 63 5		
1231 949.9 ,88 1.55 283 102 93 245 245 63 5	6	
1240 956,1 0.90 1.55 283 104 93 251 254 63 5	-0	
7243 956-85		
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	+	
Avg 62.150 1758 15313 2830 9 96.5		
Check'd		
<u> </u>		
CONSOLE # 16/403 Velocity		
FILTER # 93 4 S Moisture		
AMBIENT TEMP Flowrate (DSCFM)		
PROBE LENGTH lsokinetic (%)		
LINER MATERIAL		
C-70 + take 1 some constant at single point		

Page _____ of ____

Plant N	Name	Plant	Yates St	ation Bo	oiler No.	1				0		
Sampling	Location_	OLT 104 Time Start <u>D9</u> 11.4 X			Train _	A	Anions		Run No	ر. ک		
Date C	127/53	Time Start D9	15		Time Fini	sh 1038		Test Dura	tion	8.3	min.	
Duct Din	nensions_	11.4 X	11.4		Diameter			Initial Lea	k Rate	61013	cfm	
PTCF _	84	DGMCF1	92	Nozzle D	ia. <u>. 2</u> 7	19 inch	es	Final Leal	k Rate 👱	00421	O" cfm	
		Hg										
Static Pro	<u>ت. ۱۱ - ess</u>	• H20)		Operator	TJB	<u> </u>	_				
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	[Temp. F		Outlet	Temp.	Temp	Impinger		ı
	0915	47.70	.87				94	· · ·				
 	0920		.87	1.6	280		94	247	250	65	5.0	
	0930					103			256		50	
		50.30	.87		280		95	258	252	_	5.0	
		69.04	.87		230		95	253	260	58	5.0	
-4	1015	91.28	.87	1.6	2	108	97	253			50	- i
10	1020		62-	<u> </u>	2015	98	9.82	751	752		11B	`
	1027		.81	1.6	280	108	97	255	251	65	5.0	
	1038	108.301							<u>-</u>		<u> </u>	
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Avg.		1,0,611	14327	1,000	280.0	1 1913.41 2	99.7					
Check'd				2 Mil 14	100000000							
CONSO	LE# 16	1403				A STATE OF		`}***************			i	
FILTER		901				- 100 6 6 886 NOTE	•	12. 12.000.000.0000.0000.0000] [
						- 100 \$44 - 454 \$450 \$400 \$400 \$40	DSCFM)_					
							(%)				<u>.</u>	
	-	•				TORK TORK	# 10.4 _1_1_1		5564.66		i	
REMAR	KS											
											•	

Page ____ of ____

Plant N	lame _	Plant 55P	Yates St	ation Bo	iler No.	1			Dun M			
Date I. In	H/a 3	Time Start	1830		Time Figi	<i></i>	7110112	Test Du-	ron Nun 140	⊑. <u>τ</u> []	r min.	
Duct Din	nensions	_ Time StartX _	1370		Diameter			Initial Lea	k Rate		cfm	
PTCF		DGMCF		Nozzle D	ia	inch	es	Final Leal	k Rate		cfm	
		" Hg										
Static Pre	:65	" H20)		Operator			_				
Travers	Clock	Dry gas meter	^ P	^H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	ļ.	Temp. F		Outlet	Temp.	Temp	Impinger		
	_	34.100	-	 	· · · ·			,				
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		2 0000000000000000000000000000000000000				<u> </u>		7 .				***************************************
Avg.												
Check'd												
FILTER AMBIEN PROBE	# IT TEMP LENGTH	A (61-30				% Moistur Flowrate (e DSCFM)					
REMAR											-	

Page ____ of ___

Plant N	lame 43	Plant	Yates St	ation Bo	<u>iler No.</u>	1						
Sampling	Location	I ESP OU	tlet		Train _	Ammon	ia/Hydro	gen Cya	nide	Run No	. <u>/</u>	
Date	129 93	Time Start 6	741	·	Time Fini	sh <u>0938</u>		Test Dura	tion	109	min.	
Duct Din	nensions_	<u> н'ч"</u> х_	<u> </u>		Diameter		ft	Initial Lea	k Rate <u>-</u>	<u>010)12'</u>	cfm	
PTCF	84	DGMCF9						Final Lea	k Rate 🚣	0.0150	125 cfm	
		<u>5 </u>			Operator	75B/	APE	_	,	r=1.63		
Travers	Clock	Dry gas meter	^ P	^н	Stack	Dry gas m	ter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F		Outlet	Temp.	Temp	Impinger	in. Hg	
	5741	674-000	.95	1.55	278	75	74	267	271	63	8.0	
	0810	6935	.95	155		14	80	25%	245	60	8.0	
	0816	697.43	.95	1-50	270	95	81	254	262		80	$\overline{}$
	0825	703.5	824	1,50	280	95	83	266	249	56	8.0	
	0836	710.7	.95	1.58	280		83	265	254		8.0	
	0855	723.34	0.91	1.55	287		85	257	244	51	8-0	
		736,40	0.90	160	278	99	87	257	242	-57	800	
	042013	0 747.525										
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Avg.	_	73.525	09680	1.547	280	81.3						
Check'd	540	73,525	(2004)		Para day	1 1916 5 16						
				<u> </u>	<u> </u>	11 10 100000000000000000000000000000000	vananta susu susu su es es		and the second			
	LE # <u>16</u>	1405					gesegen tote protes years soon of the Costop of the social and the social social				: > 8	
FILTER				-		% Moistur	e					
						100 miles (100 miles (DSCFM)_				\$	
	_	 -				Isokinetic	(%)	8000 (80 8886) <u>(</u>	45.048.998.800		į	
EUIER I	"A I ERIAL	· 										
REMAR	KS										-	

Page of Plant Name 10 93 Plant Plant Yates Station Boiler No. 1 Train Ammonia/Hydrogen Cyanide Run No. Z Sampling Docation Dutet Date Time Start Time Finish 110 Test Duration 95 Duor Dimensions !! X !!- Diameter ft Initial Leak Rate : 00702 cfm PTCF _84 DGMCF 1-857 Nozzle Dia. .223 inches Final Leak Rate 6.006 (2) 12 cfm Bar Press 29.92 " Hg 0.992 APEN K=1.63 @75 Tm =1.69@ Operator Static Press _____ " H2O ^ H Stack Dry gas meter temp. Hot box Probe Vacuum Travers Clock Dry gas meter in H2O in H2O Temp. F Inlet Outlet Point Time reading ft3 Temp. Temp Impinger in Hg 2*54* 856 59 864.57 6.75 84 258 283 258 87 0.96 1.60 88 881.05 284 7-0 489 78 0.12 1.60 278 90 7-0 894-0 094 1.50 894.45 1.9587 1.5182 2794 88.2 Avg. Check'd CONSOLE # 161403 % Moisture FILTER # ____ Flowrate (DSCFM)____ AMBIENT TEMP. lackinetic (%)____ PROBE LENGTH LINER MATERIAL REMARKS

Page ____ of ____

Plant !	Name	Plant	Yates St	ation Bo	iler No.	1						
Sampling	Location_	ESP Q	11/e+		Train _	Ammon	ia/Hydro	gen Cya	nide	Run No	. <u>೨</u>	-
Date 6	127 93	Time Start	<u> 725</u>		Time Fini	sh <u>085</u>	6	Test Dura	tion	91	min.	
Duct Dir	nensions_	<i>11.4"</i> x	11.4		Diameter		ft	Initial Lea	k Rate <u>. 4</u>	01010	tt_cfm	
PTCF _	84	Time Start	7	Nozzle D	ia! >2 Z	3 . 211 inch	c s	Final Leaf	k Rate <u>. C</u>	07012	cfm_cfm	
Bar Pres Static Pr	ess - 11.0) "Hg) "H20)		Operator	<u> </u>	3	_		K 1.8	35	
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas me	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Iniet	Outlet	Temp.	Temp	Impinger	in. Hg	
	0725		.89	1.6	280		77	254	263		6.0	
	6733	988.45	.89	1.6	280	90	79	253	260		6.0	
	0741	993.96	89	1.6	280	96	81	262	258	54	6.0	
	0753	1001.28	.89	1.6	277	99	84	253	255		60	
	0803	1002.26	.85	1.6	278	101	87	754	25%	53	60	
		1019.65	.89	1.6	279	162	89	255	249	54	6.5	
	0830	1028.04	.89	1.6	280	106	92	256	257		65	
		1034.58			280	107	93	258	253			
		1046.443	- 01		200	(0)	• •	7.36	250	5		
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Avg.		63 443	10000	77.00	2-93	40-8. Disk 844 A	915					
					OK (TAU	2000 - 1200 - 1200 - 1200 - 1200 - 1200 - 1200 - 1200 - 1200 - 1200 - 1200 - 1200 - 1200 - 1200 - 1200 - 1200 -						
Check'd	1	Faust schools and res		s resignating that	130 30 5	Least Page 1		I		ı		
CONSO	LE# /	61403				Velocity						
FILTER	" 9	<u>()</u>				% Moister						
	T-			•		Flowrate /	DSCFM)					
							(%)	- Commence (Commence (Comm				
	MATERIA					ः। प्रशासन्तरः सम्बद्धाः ।	.+. >> ₹2 <u></u>		<u> </u>		•	
REMAR	RKS	Broke	NOZZ	k 6	efore	run	swife	hto .	9.22	-9	_	

Page ____ of ____

Plant Name	
Date 6-29-25 Time Start Time Finish Test Duration min. Duct Dimensions X Diameter ft Initial Leak Rate cfm PTCF DGMCF Nozzle Dia. inches Final Leak Rate cfm Bar Press "Hg Static Press "H2O Operator Travers Clock Dry gas meter P A Stack Dry gas meter temp. Hot box Probe Last Vacuum Point Time reading ft3 in H2O in H2O Temp. F Inlet Outlet Temp. Temp Impinger in. Hg	
PTCF DGMCF Nozzle Dia inches Final Leak Rate cfm Bar Press " Hg Static Press " H2O Operator Quelle Travers Clock Dry gas meter ^ P	
PTCF DGMCF Nozzle Dia inches Final Leak Rate cfm Bar Press " Hg Static Press " H2O Operator Quelle Travers Clock Dry gas meter ^ P	
Bar Press "Hg Static Press "H2O Operator Qulle Travers Clock Dry gas meter ^P ^H Stack Dry gas meter temp. Hot box Probe Last Vacuum Point Time reading ft3 in H2O in H2O Temp. F Inlet Outlet Temp. Temp Impinger in. Hg	n
Travers Clock Dry gas meter P H Stack Dry gas meter temp. Hot box Probe Last Vacuum Point Time reading ft3 in H2O in H2O Temp. F Inlet Outlet Temp. Temp Impinger in. Hg	
Travers Clock Dry gas meter ^ P	n
Point Time reading ft3 in H2O in H2O Temp. F Inlet Outlet Temp. Temp Impinger in Hg	
1325 90183 90.350	1
90.350	
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Avg. —	
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CONSOLE # A 6 7,4 Velocity	
CONSOLE # A 16134 Velocity FILTER # 654 SMoisture	
AMBIENT TEMP. Flowrate (DSCFM)	
PROBE LENGTH lsokinetic (%)	
LINER MATERIAL	
REMARKS	

ESP OUTLET

Date //	Location	700	Yates St	D(Train		Particula	ا مرو ate-Radio	muclide	s 1	Run No.	1
	24/93	Time Start	1040		Time Fin			Test Dur	ation	198 **		
Duct Din	nensions	Time StartX	11/40		Diameter			Initial Le				
PTCF (84	DGMCF /	709	Nozzle D						2.009	cím	
		53 · Hg				/ *****			<u></u>			
	ess/		0		Operator		of E					
Travers	Clock	Det one mater	^ P	^ H	Stack	D				1		
Point	1	Dry gas meter reading ft3	in H2O	in H2O	i	Dry gas m		Hot box	Probe	Last	Vacuum	
Point	(MIN)		<u> </u>		Temp. F	 -	Outlet	Temp.	Temp	Impinger		
-	10¢ 0	509.48	1.70	1-26	283	97	89	257	277	7/	5-75	
	22.6	517.92	1.10	120	184	157	94	259	275	92	5-5	
	46.8	532.23	110	1-15	286	107	99	255	21/	フユ	5-25	
	63.0	541.725	1.20	1.25	285	108	/2/	256	2/8	79	5.25	
	38 9	557.17	1.25	1.30	288	113	106	258	277	クフ	5-5	
	110.5	575.05	1.20	1.32	284	100	107	277	253	70	5.5	
	202	625 UN	1-2	1.3	287	112_	104	252	260	62	6	
i	2/.4	10102.61	1.2	1.2	788	115	108	253	281	67		
	30/1	688.28	1.20	1.23	289	108	103	253		63	6	
*	329.0	702.5	1:6	1-5/	601	100	//	مدرع	266	-0-	5.5	
			1.7	1 2 3	 		 	 	 	 	 	
*	321.0	702.5	1.2	1.23				 	}	 	 	
مورد		145.9	1 0	7 3	7	Cont			1		<u> </u>	
3/20-4		749.45	1.2	1-2	282	88	80	257	254	47	2.5%	
	7014		<u> </u>		<u> </u>		177	-	22.	ļ		
	7/2.4	765-80 1	25	/35	3/3	90	82	255	27/	69		
7	4610	75.07	1.25	1.35	977	91	86	251	231	64	2.5	
	522.0	831.80	1.25	135	284	88	183	33	266	62	2,5	
	592.4	873.94	1125	1.35	283	52	85	253	270	66	2.5	
	646,6	906.48	1.25	1,35	283	93	86	252	271	68	2.5	
	7095	955.17	1,25	1/35	282	91	84	254	272		25	
	748.3		1,25	1,35	r	84	82	251	282	66	2.5	
	412.11	1024.10	1125	125	279	53	86	251	271	(F	25	
	913.5	67.13	1,25	1:35	280	94	86	2 6 3	272	25		
ļ-—	971.9	103,91	1,25	1,35	279	94	87	200			215	
		138.97	1 2	1:2-				25	271	127	2.5	
	1027.9	T	11045	1:35	28/	56	188	253	271	62	2.5	
م السو	1077.2	169.17	1.35	1	275	+	87	353	374		3.5	
14.4M	1137.1	205.40	1.20	1. 25	279	93	86	252	276	2451	2.5	
	166.7	12257	Salatanian 2	10000000000000000000000000000000000000	1	-	 	1 20 od 30. s 1 od 1	3 (3): 000 (3): 000		<u> </u>	800.000.000.000
							1					
Avg. Check'd								1 (20000) 1 (400 1 (2000) 1 (400) 1 (2000) 1 (400)				

ESP OUTLET

Duct Dir	nensions_//	Time StartXXXX	11'4'	Nozzle D	Diameter	sh <u>06</u> inch	ft	Test Dura Initial Lea Final Lea	ik Rate Q	005D1		
		ng H20)		Operator	AGORGE	o Me	<u>s</u> fits		K	= (.06	,
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
1050	1050	243.171	1.0	1.1	283	83	84	258	280	70	2	
(15"	252.04	1.0	1.1	283	87	84	245	270	72	5-	
	59"	2258Le	40	1.1	784	96	89	254	282	70	5	
	104	300,44	110	1.2	284	97	92	254	275	68	5	-
	124,4	317.23	1.1	1.35	285	100	74	254	284	7)	45	
	150	327.64	1.0	1.1	285	102	96	251	270	75	5	
į	211	362.32	1.0	1,)	786	102	98	252		69	4	
	265.1	392-19	1.05	11/	286	105	100	253	255	7/	4	
*	312	417.51	, <u>, , , , , , , , , , , , , , , , , , </u>									
7	3120	417.6	1.0	1.1	287	103	100	253	261	68	2.0	
1720		458.20	1.0	1.1	788	112	105	252	249	67	4.0	
7	474,5	508.98	1.0	1.1	284	107	101	953	255	68	4,0	
	534.5	544.55	15	14	285	101	96	253	260	65	4.0	
	606.0	584.01	1.0	111	280	99	93	252	353	61	4.0	**
	6515	60860	140	1.1	280	59	85	253	251	63	4:0	
	653.6	632,72	10	1.1	28 H		92	252	260	18	4.0	
	74572	661.67	1.0	111	282	97 53	85	253	255	55	40	
	799.0	691.64	ارن	1.1	182	91	86	252	258	₹ 7	4.0	
	887-3	739.44	1.0	1.1	280	94	58	253	264	61	4.0	
	94050	768.28	1.0	1.0	279	92	87	252	255		HIA	
	1021.9	813.06		101	275	85	84	253	250	63	4.0	
	1074,2	841,93	1.0	1.1	279	88	87	253	25		4.5	
	112113	866.48	10	1. (279	91	85	253	252	50	415	
	1170	8 94. 38	1.0	1.1	260	90	85	2532	201		5	
	1182.4	701-34					<u> </u>					
Avg.		<i>45</i> 8.079	J 0092	1.1	2828		93.9					
Check'd												
FILTER AMBIEN PROBE	LE# # NT TEMP. LENGTH _	10'6				% Moistu Flowrate	ne_ DSCFM)_ (%)_				•	
		Stop to some ash	•	c. t	av Fn	T	л Д 4	inel	lov			

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ESP OUTLET Page ____ of ____ Plant Name Plant Yates Station Boiler No. 1 EXP OUT Train Bulk Particulate-Radionuclides Run No. 3 Sampling Location Time Finish 06/9 Test Duration 6/9 min. Diameter ft Initial Leak Rate 0.0076/10 cfm PTCF 84 DGMCF 1.005 Nozzle Dia. . 197 inches Final Leak Rate 1005 0106 cfm Bar Press 2942 "Hg K=1.09 Nous_ -//.*D*_* H2O Operator Static Press ^ P Clock Dry gas meter Stack Dry gas meter temp. Hot box Probe Travers Vacuum reading ft3 in H2O in H2O Temp. F Inlet Point Time Outlet Temp. Temp Impinger in Hg 278 1.2 260 1.05 24 927.0 249 1.05 280 94 89 255 250 105 1.2 284 1.05 105 101 1.05 105 109 104 246 1/2 1.45 103 104 251 101 367 286 101 58 **286** 284 TMS 104 105 257 261 105 1.05 1,05 2811 1.95 1.2 280 280 1.05 88 105 11.2 86 279 11377 56577 1.05 1.2 275 627 580.3 0619 667.090 1.0217 1.200 2820 Avg. Check'd CONSOLE # 4/1/400 Velocity % Mousture FILTER # _____ 928 Flowrate (DSCFM) AMBIENT TEMP. lsokinetic (%)_____ PROBE LENGTH 10' 66455 LINER MATERIAL REMARKS

10f1

ESP OUTLET	
1	. /

Plant N	Name _	Plant	Vates St	ation Bo	iler No.	1				Page Z	_ of	
Samelina	Location	OU/cf			Train		 Particula	ite-Ex. N	letals	Run	No. /	
Date 4/2	24/47	Time Start			_	sh CD70						_
Duct Din	nensions	11'4" X	11'4"	_	Diameter		ft	Initial Le	ak Rate	0.015	cfm	
PTCF_	184	// // X _ DGMCF 9	98	Nozzle D	ia	inch	es	Final Lea	k Rate 2	-014	cfm	
Bar Press	s <u>29.5</u>	Hg			-2	30					,	3.4
Static Pro	eus <u>-//</u>	/" H20)		Operator							
Travers	Clock	Dry gas meter	^ P	^ н	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F		Outlet	Teinp.	Temp	Impinger	in. Hg	
	0	11/20	1.30	260	287	99	9/	257	252	67	12	
	9. i	420.67	1-30	2.58	256	100	92	256	25 3	12.	12	
 _	41.3	497.85	1.30	2.61	285	102	94	259	248	84	11.8	
<u> </u>	121.9	566.92	1.3	2.6	282	109	47	259	253	76	12	
	184	620.24	1.3	2.6	288	1/4	102	26/	20	70	12	
	226.1	656.70	1,15	2.65	289	106	9-1	261	25/	53	11.5	
X	253	1,40.1	1//	400		100	 	1	 -/-	<u>ر ر ر</u>	1.00	
 	253	680.1	1,15	2.65			 	 	 	 	 	
	377.6	734.0-	1.10		282	89	-1	257	249	49	10.5	
र्भग	333.7	745.75	1.10		20	86	8/	100	4.1	1//	10.3	
		746.3	 	:		<u> </u>				· · · · · · · · · · · · · · · · · · ·	 	
+a.r		757.75	1.20	2.45	283	89	80	258	249	50	7.5	
73.63	3594	798.16	1.20	2.45		93					7-5	
7192	4080		1.20		Ţ	91	85	257	257	56	7.5	
¥	539.8		1,20	2.45	_	93	83	257	249	49	7 — _ 1	
		946,30	 			54	84	258	353	47	7.5	
Ì			1,20	2,45		91	1	258	350	5-	7.5	
	1	1016.18	1:20		ł .		80	255	251	50	80	
<u></u>	7421	70:38	1120	T		93	83	258	350	52-	8.0	
		108.30	120	T -	378	92	81	260	350	46	810	
	275	213,46	1,20	2,45	10	91	82	258	257	48	8.0	
 	 		 		+	42	6.2			50	· · · · · · · · · · · · · · · · · · ·	
}	471.9	25719	1,20	2.45	279	22	183	355	251		8.0	-
12.8hr	10235	343.67	1.15	2,48	279	91	82	257	250	45	8,0	
11.00		3695	1, /3	2.35	274	91	06	257	210	72	8-0	
ļ	111110	367/5	 		 				┼	<u> </u>	+	
 	 	 	 	 	<u>;</u> 	1	 	+ ,	+	 	+	
 	-	 	 _	}	1		 	-}	1	} 	}	
Ava	 		1/00			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			1			
Avg.		906.5	1.100 8	7 UA	282	90.9						
Check'd		7/273	(4. 10 - V. Hr.)	A Contraction on	160		e de la companya de la companya de la companya de la companya de la companya de la companya de la companya de		• 1	a transcriber		, i
CONSO	LE#	1/6/395				Velocity_	Section 15				&	
	# 910	929		-		% Moistu		, A BOOK WAS			S. ≅	
AMBIEN	NT TEMP.	90					DSCFM)_					
	LENGTH	10'				Isokinetie	(%)				<u> </u>	
LINER	MATERIAI	L <u>'</u>										
REMAR	.K.c	MIZZIETO	000	,	230	.230	230					
CT-IAI W.								Alla	1	1		
C-8	0	Lost Permission	w 🕙	16100	mento m	וויים	590)	- priva	اد لممه	100 AB ()	as H	$\gamma \sim \varphi$
		resions 6	1620)			**	54517	eut 10	-8MM	125 T	71/2 /Y

ESP OUTLET

C . 1"	lame	Plant 550 00			Train		Particula	to Ev. N	Matals	D 1	No. 2	
Sampling	7 10 QZ	Time Start	1040		_	ish <u>66.</u>					10. <u>←</u> min.	_
Duct Din	nensions 1	$\frac{1.4}{x}$	11.4					Initial Lea	nk Rate 4	0.0096		
PTCF	8	DGMCF 0.94					ies			.060		
		5 " Hg					ι Δ			6	///	
Static Pro		1/* н2с)		Operator	Assorted	ll state	<u> </u>	K=1.	9		
Travers	Clock	Dry gas meter	^ P	^н	Stack	Dry gas in	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading f13	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
	1040	390.40	1.7	2,3	282	18	77	278	254	63	8	
	22"	407.91	1.2	2.3	283	92	81	269	253	62	8	
	70"	446.06	1.2	2,3	284	100	88	257	254	64	8	
	116	483.1	1.2	2.3	284	101	91	260	252	23	S	
	1325	496-2	1.2	2-3	285	183	17	259	250	34	8	
	162	570.08	1.2	23	286	104	94	262	253	56	ક	
	223	569.59	1.2	2.3	286	105	95	259	253	20	ક	
	276.6	612-07	1-25	2,35	286	108	91	259	250	53	8	
STUP	3160	644.78										
Shit	00.00	644.92	1.2	2.3	286	104	97	261	253	54	5	
1225	00.00	116.50										
	· 80.9	¥2.04	1,2	2.3	386	106	17	261	250)	57	5	
	143.0	520,60	112	2,3	284	101	94	255	252	52	5	
	212.5	585,76	1,2	2.3	281	99	51	696	250	49	5	
	258.0	921.51	1,2	23	281	98	90	260	251	51	5	
	300.0	955.15	1.2	2,7	284	98	ዩ ና	A 745	એ તસ	47	5	
	357.8	996:15	1,2	3,3	281	95	86	259	251	48	5	
	405,5	1038.30	1,2	2,3	280	92	83	255	<i>3</i> 50	48	6	
	493.7	1108.81	1.2	2.3	279	95	85	258	251	30	6	
	546.9	1150.79	1.2	2.3	278	93	84	25>	250	47	6	
		1214.88	1,2	2.7	279	90	82	257	250	\mathcal{C}_{0}	T)	
		1255.44		2.3	275	85	80	257	i	50	6	
		1291.96	1.2	2.7	280	92	82	259	289	44	6.5	
	778	1232.13	1.2	23	280	92	४३	258	255	44	7	
	787,1	1339.29										
Avg.		948.750	11.08	2,300	2125	926	ise i iir					
Check'd					Agar a		4 () ()					

Page ____ of ___

Plant Name Plant Yates Station Boiler No. 1

Sampling Location For Out For Train — Particulate Metals Run No.

Date 6/21/23 Time Start 1/37 Time Finish 0621 Test Duration 1/25 min. Duct Dimensions (1'7' X 11'4" Duct Dimensions 1/4" X 1/4" Diameter ft Initial Leak Rate -010 10" cfm PTCF 084 DGMCF 1.999 NOZZLE DIA. . 229 inches Final Leak Rate 010 6" cfm Bar Press Z9.42 "Hg Operator <u>ND/TM/TJB</u> Static Press -// "H2O K=1.97 Travers | Clock | Dry gas meter ^ P ^ H Stack Dry gas meter temp. Hot box Probe Last Vacuum in H2O in H2O Temp. F Point Time reading ft3 Inlet Outlet Temp. Temp Impinger in Hg 97 347 00 271 94 20 361.15 283 85 245 253 394.7 250 104 2.53 474.01 109 253 102 255 106 101 259 106 249 202 96 103 98 250 635.3 97 292 164 259 95 260 TAD 102 249 249 257 249 255 250 284 44 1149 349 45 121.4 1014,22 85 260 l 249 46 275 85 257 250 45 51 257 249 42 1097.0 135.63 0.57 378 55 158 247 42 2621 1125 812.605 19890 1.900 285 Check'd Velocity____ FILTER # ____ % Moisture Flowrete (DSCFM) AMBIENT TEMP. PROBE LENGTH Isokinetic (%) LINER MATERIAL REMARKS

ESP OUTLET

Plant Name ____ Plant Yates Station Boiler No. 1 Sampling Location SSP OUTLET Train Size Fract. Particulate Run No. 82 Date 2/26/93 Time Start 1/30 Time Finish 0636 2/27 Test Duration 1/09 min.

Duct Dimensions 1/4" X 1/4" Diameter ft Initial Leak Rate 0506 2/20 PTCF .84 DGMCF 1.007 Nozzle Dia. .2// inches Final Leak Rate ___ cfm Bar Press 29,55 " Hg Operator Works Static Press -// ^ H ^ P Stack | Dry gas meter temp. Travers | Clock | Dry gas meter | Hot box Probe Last Vacuum in H2O Temp. F Point Time reading ft3 in H2O Inlet Outlet Temp. Temp linpinger in Hg 5708.850 70_ 2 84 2_ 100 101 286 2 235.0 .0 2 8 D 2 281 70 TheD 2 104110 85 Slo 2 * stopset 592,5 11260,72 85 80 2 82 1103 1253.08 11087 1256.47 687.620 1384 1.450 278.7 Avg. Check'd console # #16/396 FILTER # 1258 (Thimble Velocity % Moisture Flowrate (DSCFM) AMBIENT TEMP. lsokinetic (%) PROBE LENGTH LINER MATERIAL REMARKS AHD 1.775 * ampty silver jul

ESP OUTLET

1"		Plant Outle			Train	Size Fra	 ict. Parti	culate	Run	Page /	I	
ampung	Location	Time Start If Y X DGMCF 1.6	6140		Time Fini	sh 270	0 415	Test Dum	1376	2	لب min	
uet Di-	174195	Thire Start Y	1	144	Diameter		- <u>4 2-2</u>	Initial Lea	ik Rate	0017	12. cfm	
	kη γη	^	07	Nozzie D	ia21(inch	es	Final Leaf	k Rate	<u> </u>	cfm	
ar Press	-07 29 T	3" Hg	<u> </u>	. TO LEEU D				,				Kal
tatic Pre	ee -1	3" Hg [" H20)		Operator	Mou	le stal					
ravers	J	Dry gas meter			i .	Dry gas m		† i		Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	<u> </u>
	0	715.378	.78	1.288	278	81	78			70	2	
ĺ	9	720-37	સ્ટ્ર	14125	278	83	78			66	2	
	40	739.96	1.0	1,94	279	54	85			68	2	
	64	75427	1.0	1.4	281	35	88			69	2_	
	30	270.55	7.0	13	282	100	92			65	2_	
	131	795.60	1.0	1.3	283	101	55			64	1_	
	163	815.04	1.0	1.3	284	104	97			67	2_	
	188	831.18	/, 0	1.3	284	102	96	 	_	59	2	
1			.95	1.3		 					7	
 	2/1	846.38	94	1.2	285	104	96	 		61	2	
	254	872.89			286	96				68		
-	290	394.6	1.0	1.4	283		93			57	2.0	 -
		948,25	_	1,4	287	100	93			62		<u> </u>
		989.68	1.0	1.4	290	105	99	ļ		45	2	
		860 883										
	624-8	1107.82	,93	1.7	28/	87	80			55	2	
	6740	1.138.68	0.93	1.4	282	89	83			Ω	2	
		173,00	0.53	1.4	282	89	82			56	ূ	
		217.31	0193	1,4	282	₹0	8 1			57	2.5	†
	857.1	251.94		T	279	89	83			62	2,5	1
		304.910			-							
12 12/	9/1/10	305.125	0.43	1.14	279	84	74	<u> </u>		61	2.5	
	103.0	34417	0.53		277	90	82			64	2,5	
				1,3		8-8	81					
	101A.O	372.63	0.86		279	· ·		 		54	2.5	\vdash
	1118.2	416,54	0.86	1.3	278	89	82	 	<u> </u>	52	2.5	1
	1177.5	451.70	0.86		278		\$1	 	 	5(3.5	
		184110	0.86		278	90	83	-	 	53	3.5	-
-1.		513.84	0.86		278	84	83	<u> </u>		50,	3.5	1
	1257.3	554.81	0.84	1.2	278	88	82	<u> </u>	5 12 m 2 m 2 s	5-1	25	
vg.		н осново з угурыя по соятаяцью с			10,000		gartan					
heck'd		852.132	9581	13455	281.1		89.8					
	•_	116/38/				Later Living 193	rativit iz	n viitti tittaaase	cupustassan basar t	:::::::::::::::::::::::::::::::::::::::	t:	
		A 16/396		\		- 1 120 (2) [7]		and the second second second				
	#		<u>h.mble</u>	.)			18					
	' -	 					DSCFM)_					
	LENGTH _					Isokinetic	(%)	2 300 M	e unan Lugari (Sa) (Sa)	o (1990) (1990)	<u> </u>	
INEK N	ATERIAL	′ 										

ESP OUTLET Page of Plant Name Plant Yates Station Boiler No. 1 Sampling Location 25P OWLET Train Size Fract. Particulate Run No. 3 Sampling Location Control Time Finish DGL / rest Duration

Date L 26 93 Time Start 12/8 Time Finish DGL / rest Duration

Diameter ft Initial Leak Rate 7.005 66 cfm

Time Finish DGL / rest Duration

Time Finish DGL / rest Duration

Time Finish DGL / rest Duration Bar Press 29, 42 - Hg Operator Leve Static Press - 1/- 0 " H2O R=101.3 ^ H Travers | Clock | Dry gas meter | ^ P Stack Dry gas meter temp. Hot box Probe Last Vacuum in H2O in H2O Temp. F Inlet Outlet Point Time reading ft3 Temp Impinger in Hg Temp. 284 258.76 1-6 214.7 282 92 1.2 1.6 1.6 282 63 300.7 1.2 160 92 128 286 :05 330.67 101 104 215 415.7 103 503.1 350 397.7 +31.78 286 <u>ሙ</u> 1.6 84 52 2 461.0 578112 281 2 50 129 49 4 2 47 49 2_ 771.07 1.0 278 48 125 93 88 49 130 44 1.0 274 87 122 1.0 48 10 91 86 122 274 45 1.4 274 84 125 1055 5 950.42 1.0 47 1 970 557 0627 1090 Avg. Check'd CONSOLE # 4161394 FILTER# 1255 (Thimble) % Moisture Flowrate (DSCFM)____ AMBIENT TEMP. Isokinetie (%)_ PROBE LENGTH LINER MATERIAL

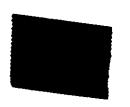
REMARKS

	UTLET	Station Boiler N	_				
Run No	<u>/</u> 5/21/63		<u> </u>		Operator	TB	
	•						
Sorbing Reag	gents:	(Cb2)	(O2)_	(CC))		
Replicate	Original	(CO2)	(CO2)	(02)	(O2)	(CO)	(CO)
Number	Volume	Reading 2	Volume	Reading 3	Volume	Reading 4	Volume
	Reading	(ml)	(2-1)	(ml)	(3-2)	(ml)	(4-3)
		<u> </u>	(ml)		(ml)		(ml)
1	0	6.0	6.0	19.4	13.4		
2	υ	6.2	6.2	19.0	12.8		
3	0	6.6	6.6	19.6	13.0		
<u> </u>							
							y
					<u> </u>		
			. 4				
			*		*		
			65	g 02	131		
Averaged Re	sults:	% CO2					
Averaged Re	esults:			%		252	
Averaged Re	esults:	% CO2			Y-2	,	ESP
-	sults: ar Weight, M	% CO				,	ESP O
-	ar Weight, M	% CO	Rur	n #Trai	Y-2	t	ESP O
-	ar Weight, M	% CO	Rur	n #Trai	Y-2	t	ESP O
-	ar Weight, M	% CO	Rur Cor Dat	n # Trai mponent te	Y-2 n <u>O1AO</u> 2 9 Time	Sm	PIT TJE
-	=0.44_ (%C	% CO	Rur Cor Dat D2) Lat	$\frac{1}{n} # \int_{-\infty}^{\infty} Train$ $\frac{1}{n} ponent have \frac{1}{n} = \frac{1}{n} + \frac{1}{n} = \frac{1}{n} \frac{1}{n} = \frac{1}{n} + \frac{1}{n} = \frac{1}{n} + \frac{1}{n} = \frac{1}{n} = \frac{1}{n} + \frac{1}{n} = \frac{1}$	Y-2 n_O_L\O\Z QTime Analysis	Sm (62 Oz	plr 7JB
-	=0.44_ (%C	% CO	Rur Cor Dat D2) Lat	$\frac{1}{n} # \int_{-\infty}^{\infty} Train$ $\frac{1}{n} ponent have \frac{1}{n} = \frac{1}{n} + \frac{1}{n} = \frac{1}{n} \frac{1}{n} = \frac{1}{n} + \frac{1}{n} = \frac{1}{n} + \frac{1}{n} = \frac{1}{n} = \frac{1}{n} + \frac{1}{n} = \frac{1}$	Y-2 n_O_L\O\Z QTime Analysis	Sm	plr 7JB
Dry Molecul	=0.44(%C	% CO	Rur Cor Dat (D2) Lat + Tar	n # Train mponent	Y-2 n_O_L_NO2 QTime AnalysisFinal	Sm (62 Oz	plr 7JB

ASSUME 02= 8.0 (0,= 11.1



	_	Station Boiler N			Comments _		
Location	ST UUT	Het		 			·
Date 6	- /22/93				Operator	TTB / 1.	MP
						·····	
Sorbing Reas	gents:	(CO2)	(02)_	(CC))		
Replicate	Original	(CO2)	(CO2)	(O2)	(O2)	(CO)	(CO)
Number	Volume	Reading 2	Volume	Reading 3	Volume	Reading 4	Volume
	Reading	(ml)	(2-1)	(ml)	(3-2)	(ml)	(4-3)
			(ml)		(ml)		(ml)
/	0,0	11.2	11,2	19.0	7.8		
2	0.0	11.1	1/11	19.0	7.9		
	<u> </u>						
Averaged Re	sults:	% CO2	11.2	% O2_	7.9		
•				-			
		% CO		% N2_	80.9	7-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	
Dry Molecul	ar Weight, M	W (dry) =					
	=0.44	+0.32	+(0.28			
		O2) (%0					
•	=	_+	+		Y-2	54	
			Run	#2 Train			ESP
				ponent Do			_ESP C
					LAT		
							. — _ ^
			Date	6-22-6	Time_	Smp	11JB



		Station Boiler N			Comments _		
		Het					
Run No.	 23 93	···			Operator	TMO	
Date	127117	·····			Operator	77-4	
Sorbing Reas	gents:	(CO2)	(O2)_	(CC))		
Replicate Number	Original Volume Reading	(CO2) Reading 2 (ml)	(CO2) Volume (2-1) (ml)	(O2) Reading 3 (ml)	(O2) Volume (3-2) (ml)	(CO) Reading 4 (ml)	(CO) Volume (4-3) (ml)
1	0.0	10.6	10.6	19.0	8.4		
<u>/</u>	0.0	10.6	10.6	19.1	8.5		

	1						
							
Averaged Re	esults:	% CO2	10.6	% O2 % N2_	8.5		
		% CO		% N2_	80.9		
Dry Molecul	lar Weight, M	W (dry) =					
	=0.44	+0.32_	+(0.28			
		(%02)					
	=	+	 Run # 3	Train 60	Y-255 Sat	٥	ESP Inlet
				nt boug		· · · · · · · · · · · · · · · · · · ·	Stack
			=	23-93	Time	Smplr 7	TB
				site Anal			
					C		C-



Plant	Plant Yates S	tation Boiler No	o. 1	_	Comments _	<u> </u>	
Location	FSP C	Sutlet					
Run No.	Run	2-1 R	in 1 bp	ase2		_	
Date	06	25-93			Operator	DJV	
Sorbing Reag	ents:	(CO2)	(O2)	(CO)		
Replicate	Original	(CO2)	(CO2)	(O2)	(O2)	(CO)	(CO)
Number	Volume	Reading 2	Volume	Reading 3	Volume	Reading 4	Volum
	Reading	(mi)	(2-1)	(ml)	(3-2)	(ml)	(4-3)
			(메)		(ml)		(ml)
	0.0	11.2		18.8	7.6		
2	0.0	11.2	11.2	18.8	7.6		
Averaged Re	sults:	% CO2	11,2	% O2	7.6		
		% CO	· · · · ·	% N2		9114E -	
Dry Molecula	ar Weight, M	W (dry) =					
	=0.44	+0.32	+0	.28			
	(%C	02) (%0	2) (%C	CO + % N2)			
					Y-329)	
	=	_+	_+ Run #	Train			EZP O
			Compon	ient bag			
N.			- .		Time /54	Smplr 7	JB
-			_				
			Lab ∩ſ) Sute	Analys	is (0 > 0)	7

Plant	Plant Yates S	station Boiler N	10. 1	_	Comments _		<u> </u>
Location <u>2</u>	-SP Cut	He t	·				
Run No	shase 2	Non 2				_	
Date	6/26/93	run 2			Operator	TMP	
	/ /	/		-			
Sorbing Reag	ents:	(CO2)	(O2)_	(CC	D)		
	,						
Replicate	Original	(CO2)	(CO2)	(02)	(O2)	(CO)	(CO)
Number	Volume	Reading 2	Volume	Reading 3	Volume	Reading 4	Volume
	Reading	(ml)	(2-1)	(ml)	(3-2)	(ml)	(4-3)
			(ml)		(ml)	<u> </u>	(ml)
/	0.0	1100	11.0	18,6	7.6		
2	00	11.2	11.2.	18,6	7.4		
				1	11.		
						† · · · · · · · · · · · · · · · · · · ·	
·		<u> </u>		 		 	
	<u> </u>			<u> </u>			
					<u> </u>		
	<u> </u>	<u> </u>		<u> </u>	<u> </u>		
	14	<i>«</i> cos	11.1	g 02	7.0		
Averaged Re	suits:	% CO2		%_O2	1/3		
				% N2			
		π co					`
Dry Molecul	ar Weight, M	W (drv) =					
Diy Molocul	ar worgh, m	··· (aly)					
	=0.44	+0.32	+1	0.28			
	(%0						- - -
	(,,,,	(11	,		Y-40	1 6	
	=	+	+ <u>.</u>	2	,		_ESP Inle
	-		Run #	Train_	ONat	•	ESP Outle
				_	wez-	Brig	Stac
			-				720
	•			6-26-2			IJB
			'Lab <u>c</u>	nsite		rsis <u> </u>	Z
			Tare '	WT(g) <u>//b</u>	Fin	al Wt(g)	<u>a</u>

		Station Boller N		_	Comments _		
		tkt					
Run No	<u> 2-3</u>					-	
Date	6/27/	<i>53</i>			Operator	TMP	
	•	(CO2)					
Sorbing Reas	gents:	(CO2)	(O2)_	(CC	D)		
Replicate	Original	(CO2)	(CO2)	(O2)	(O2)	(CO)	(CO)
Number	Volume	Reading 2	Volume	Reading 3	Volume	Reading 4	Volume
• • • • • • • • • • • • • • • • • • • •	Reading	(ml)	(2-1)	(ml)	(3-2)	(ml)	(4-3)
		(/	(ml)	(/	(ml)	, , ,	(ml)
/	0.0	11.4	11.4	19.0	7.6		
2	0,0	11.4	11.4	19.0	7.6		
		 "' 	77.7	77.0	7.0	1	
···· <u> </u>		<u> </u>				+	
		 					
		<u> </u>		 			
				 	 		
						 	
	<u> </u>	<u> </u>	<u> </u>	!		11	
Averaged Re	sults:	% CO2	11.4	% O2_	7.6		
-							
		% CO		% N2_	_ 		
Dry Molecul	ar Weight, M	W (dry) =					
	=0.44	. 0. 33		n 10			
		+0.32_ (%0) (%0		U.28			
	(200	.02) (70)	•			Y-452	
	=	+	+ 1	Run # 2-3 T	:	1-432	
				"	ain orsi	7	ECD
				omponent_	ORSAT		ESP
			T.	ate 6/27	13 Time	1300 Sn nalysis Co. Final Wt(a)	
			L	ab Dn Si	ke A	no luc	npir_738
			Ta	are WT(g)		nalysis 2	1002
						Final Welol	

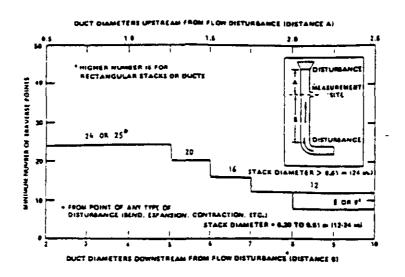
TRAVERSE FIELD DATA SHEET

Plant Name Plant Yates Station Boiler Nol Stack Diameter 11 4" x 11 4"

Sampling Location_ ESP DUTLET Sample Port Diameter 4"

Date 06-19-93 Sample Port Depth 18"

Operator RVW | TWM Distance Upstream Distance downstream



averse Point Number	1			Мип	iber Tri	werse i	Points	On A D		•		
	2	4	6	a	10	12	14	16	18	20	22	24
	14.6		4.4	<u> </u>	1 28	2.1	1,8	1.6	1.4	1.3		
												1,1
5		25.0										3.2
<u> </u>		j 7 5. 0									6.6	
4	1	82.3	70.4	32.3	22.6	17.7	14.6	12.5	10.5	9.7	8.7	7.9
5	1	,	85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6	ı		95.6	80.6	45.8	35.6	26.9	22.0	18.8	16.5	14,6	13.2
7	1	·	1	19.5	77.4	64.4	36.6	28.3	23.4	20.4	18.0	16.1
ð			i	96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
Ģ		,			91.6	82.3	73.1	62.5	34.2	30.6	26.2	23.0
10	ŀ	i		i	97.4	88.2	79.9	71.7	61.4	38.4	31.5	27.2
:1	1	<u> </u>	i	ı		93.3	85.4	78.0	70.4	61.2	39.3	32.3
12	1	!	i	1	:	97.9	90.1	1421	78.4	69.4	80.7	39.8
13	1	1	i	i	!		₽4.3	47.5	81.2	75.0	60.5	60.2
14	:		i		,		94.2	01.5	85.4	79.6	73.8	67.7
· š	i		i	:	Ī			95,1	80.1	1.58	78.2	72.1
`6	-	1			[1	98.4	92.5	57,1	82.0	77.0
17						:	,	1	95.6	96.3	1 85.4	80.6
18			1			<u>. </u>			P8.6	93.3	38.4	83.0
:9			:				-	·	!	86.1	91.3	84.4
20	1		.		;	· :	ī	:		94.7		
21	1	;		;							90.5	
22	i		-	1						<u> </u>	94.9	.
73				<u></u>		.	i					94.4
24		1		 				'		:		64.

	Traverse Points
No.	Distance From Wall
	PORT DEDTH INCOM
1	126.5
2	143.5
3	60.5
4	77.5
5	194.5
6	111.5
7	128.5
8	1145.5
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	1
21 22	!
23	<u> </u>
	<u> </u>



0-1-	Location	1140000	Time Of	100	٠. ا ١١ ١٨	46.00 T'-	- Elejah	11 20	
Duct Dim	ensions .		<i>f</i> "	x //	' 4"	ft or Dia	ameter _		······································
PTCF	2.84			^	%но ≫	- 7. <i>0</i>			 '
Bar Press.	ensions	48		″ Ha	% CO	7	- - % !	V	
Static Pres	ss	10		_ " H ₃ O	% CO, _2	≈ 9.0	% F	1,	
Operator i	nitiais	IWM R	vw_	_ '	% O,	7.4	%(й, <u> </u>	
	all fle				4			•	
	Sta	sck Temp. °F		Veid	city Pressure	* H ₂ O		Other ()
Pt.	#1	#2	Ave.	#1	#2	Ave.	#1	#2	Ave.
WI-1	207			0.88					
2_	205			0.75	0.90				
3,	207	_		0.58	0.66				<u> </u>
4	207			0.36	ļ ļ	· · · · · · · · · · · · · · · · · · ·	· · · · · ·	<u> </u>	
	206			0,35	ļļ			<u> </u>	
6	200			0.57	<u> </u>				
7,	197		· · · · · · · · · · · · · · · · · · ·	0.69					
	192			0.68					
W2-1	2.00			0.85					
2_	209			0.46					
3,	2.09			0.74		·	<u> </u>		
4/	209		 .	0.92					
	205			0.62	<u> </u>		<u> </u>		
-6	203			0,56	<u> </u>		<u> </u>	-	
7/	194			0.7				 	
8	194			0.77	 	· · · · ·		 	
	<u> </u>			<u> </u>	 		<u> </u>		
<u> </u>	L	j		<u> </u>	<u> </u>		<u> </u>	<u> </u>	

 $12\% co_{2} + 7.40_{2} + 80.6 W_{2} = 30.23$ 29.36 wet 57.11 ft/s $c.94 = \frac{7.11 \text{ ft}}{5} = \frac{1422 \text{ ft}^{2}}{5} = \frac{445,320.9 \text{ ft}^{2}}{5} = \frac{315,910 \text{ dscf}}{5}$

VELOCITY PROFILE FIELD DATA

	10				-				
									
									(HH MM)
									ft.
PTCF					% H ₂ O _	<u> </u>	_		
Bar Press.				" Hg	% CO		_ % 1	N ₂	
Static Pres	is	<u>-</u>	 .	_ " H ₂ O	% CO ₂ .		% F	¹ 2	
Operator I	nitials	. <u>. </u>			% O ₂ _		% (CH ₄ ——	
	St	ack Temp. *I	f	Veic	city Pressure	* H ₂ O		Other (}
Pt.	#1	#2	Ave.	#1	#2	Ave.	# 1	#2	Ave.
W3-1	20/			0.85					
2	210	260		0,94					
7	218 2	thermone	اح	1.1					
4	202			1.15					
	189	_		1.1					
6	181			0,93					
	180			0.73					
4	180			0,43					
W4-1	203			0.88					
ک	192			0.99					
3	191			1,03					
7	215			1.25					
5	211			1.3					
6	199			1.1					
7	191			0.80					
8	191			0.47					
Weather									
Remarks	·								

VELOCITY PROFILE FIELD DATA

Plant Nam									
Sampling	Location				Sample	Ident			
Date	(N	(YYQQMI	Time St	art	(НН	MM) Tim	e Finish		(HHMM)
Duct Dime	ensions		ر	<u> </u>		_ft. or Di	ameter _		ft.
PTCF					% H,O _		-		
Bar Press.	-		····	" Hg	% co _		_ % 1	l ₂	
Static Pres				_ " H ₂ O	% CO,		<u> </u>		
	nitials				% O, _		% C	Н <u>. </u>	
					-				
	St	ack Temp. °f		Ve	ocity Pressure	1 H ₂ O	<u> </u>	Other ()
Pt.	#1	#2	Ave.	#1	#2	Ave.	#1	#2	Ave.
W5-1	219			0.99					
2	221			0.97			_		
3	202			1.2					
4	22/			1.25					
5_	216			1.10					
6	207			0.7					
7	191			0.8			1		
8	171			0.58					
126-1	216			0,93					
2	225			0.85					
3	227			0,66					
4	226			0.71					
5	219			0.59					
6	204			0.69					
ר	194			0.81					
8	191			277		<u> </u>			
				Joe					
	203.			0.896	<u> </u>				
Weather		/TJB	VAP	876	V 138	bc2			
Remarks									.

ASSUMED MOISTURE % /Z. O	METER BOX NO. $\sqrt{-11}$ (PPK)	METER FACTOR 1.0113	PROBE HEATER SETTING $130^{\circ}C$	COMMENTS ZALL	Royd # 1 - RATE 1808 Franker	ROLL B. TOOK BLOKEL	The state of the state of
PLANT Plant Yates Station Boiler No. 1	DATE 6-21-93	SAMPLING LOCATION STACK	RUN NO.	OPERATOR SEH	AMBIENT TEMPERATURE 77°F	BAROMETRIC PRESSURE 24.35 14	RIANK TIME NIMBERS T. 44 A LIC. 44 TK

Test	Leak Check ("Hg)	ж (Нg)	Tube N	Sampling	Clock	Gas Meter	Moter	Stack	DGM	Probe	1st Condensor	2nd Candensor	Pump Vacuum
Number	Pre	Post	(Lab)	(min)	Time TH	Reading	Pressure	Temp	Temp	Temp	Outlet Temp	Outlet Temp	Outlet Temp Outlet Temp
/	0.82%	25.12.4	-	0	13216	0.000	1224	128	7081	134%		206	4.0
			38A	20	1345		28"H	128F	21.0	7,5 3,781 7,17		2.8	0,0
			1/0	30	5551		2.2" 14	128F	25.0	7.h 7.KI 7.22	7.4	2.2	4.5
		_	38B	40	5071	26.485	<u>ر</u> ،						
7	0.27.	0.011	-	0	भाड	0.000	22.休	128F	23%	1384 Br	128	120	5.0
)	12.A	Q		5.007	五、"张	1295 246	747	133ºC 7ºC	705	1	4.0
			1/C	20	35	7, 8 7,89 252 3821 7,12 2056	21.18	1821	25%	132	<i>8</i> °°		50
			223	30		15021	Z./"K	7821	200	13300	2%	206	6.0
				01		20.210							
3	80.00 100.00	26.65°.	٢	0	615	0.000	J1. H.Z	7851	2%	7.85/	55	706 80	80
			ZAA	O	5251	5.400	22'K	221 128F26 13813°C	2002	135C	3.6	200	4.5
			1/1	20	1535	10,705	227/4	22 14 178 242 B32 4°C	202	Back	7.4	Jot	4,0
			20	30	1545	15.420	Z2'K	128F	27.6	133.2	46	7°C	5.0
				40	1555	20:250	有	STEM ON TUBER 27 B BLOKEN	3€£	73 B B4	DEEH	FRE	202.
- Start	2007	क्टिंग	-	0	1615	0000	247	24th 1285 762	762	1330		2.8	40
7)	364	0)	1625	6.530	2.2.张	3821	26%	133.5	29		3.5
			1/0	07	1635	10.650	7.621 11.77	1.001	ST	B32	7,9	206	3.5
			Sled	30	1645	S	7.1.拓	12K 27C	26	133,5	$\overline{}$	36	3.5
				Ş	1655	20.20)						

COMMENTS RAIN HUMID PROBE HEATER SETTING_ ASSUMED MOISTURE %_ METER BOX NO._ METER FACTOR_ TEST NO. Plant Yates Station Boiler No. 1 BLANK TUBE NUMBERS T: AMBIENT TEMPERATURE_ BAROMETRIC PRESSURE SAMPLING LOCATION OPERATOR HUN NO. PLANT DATE

1.0113

Ę	1	5	7		1						Ţ	I				_	Ħ	Ŧ	_	7-	-
Pumb Vacuu	Person	2.0	17	202	2.5		7	30	35	4.0		77	40	40	40						
2nd Condenso	Out of the Court o	α	4	4	Q.		4	1	4	ω		4	7	7	0						
1st Condensor	Outle Temo	3	3	5	Ş		9)	1	5	7		S	~	7	Λ.	•					
Probe	ا قره	13.2	133	132	134		133	133	133	133		/33	133	/33	133	•					
		1	20	7	23		26	26	27	50		29	52	52	30						
Stack	Temp T	05	129	131	/3/		129	130	130	130		128	621	871	128						
Meter	Pressure	1.1.7	2.2	2.1	17		2,3	2.1	2.1	2.1		2.2	2.2	2.2	2.2		at the second second				
Gas Meter	Reading	0.000	00h 3	10.605	15.155	095.C.	0.00	5,250	10.150	15.250	DO.240	0.000	5.350	10.200	15.150	Do 640					
Clock	Time	0650	0500	0710	6720	0730		:55	0805	0815	82.5	0840	0850	0900	0310	0850					
Sampling	(min)	0	10		30	40	0	10	2	30	40	0	5	22	30	40	ŀ				
Tube N	(Lab)	_	184	1/C	18 B		-	184	1/0	233		-	717	1/0	Z/B		F	•	77		
ck ('Ho)	Post	1636					9.823)				0.997									
Leak Check ('Hg)	Pre	id de		į			.23.8°					5000									
Test	Number						7					3	=								

ASSUMED MOISTURE %	METER BOX NO. $\sqrt{-11}$ (pp.)	METER FACTOR (. DILS	PROBE HEATER SETTING 130°C	COMMENTS				
PLANT Plant Yates Station Boiler No. 1	DATE 6-23-93	SAMPLING LOCATION STACK	RUNNO. 3	OPERATOR JEH	MPERATURE	BAROMETRIC PRESSURE 24.23	BLANK TUBE NUMBERS T: 08 4 T/C: 08 B	

	Leak Check ('Hg)		Z eqn_	Ø	Clock	Gas Meter	, vete	S C	₹ 00	Prob	ist Condensor	tat Condensor 2nd Condensor	Part Vacuum
Number	Pre-	Pos	2	E E		Heading	Fressure	Gwa	-emb	duis	Caffer Temp	dwellenno	1
	0,000	3.00t	٢	0	0655	0.000	2.3	127	23	133	5	0/	55
			ISA	<u>5</u>	S0£.0	5.105	2.2	128	24	134	\$	Ø	4.0
			1/0	20	5120	10,150	2.1	128	25	134	7	9	4.0
			153	30	2240	15.200	2.1	128	77	135	#	1	50
				1	0735	20,200							
	£000	0000	1	0	0805	0.00	2.2	128	260	133	4	6	3.0
			8	91	0815	5.050	7.7	128	26	135	Ŋ	2	2.5
			1/0	20	0825	10,050	7.7	128	26	134	γ	h	2.5
			83	36	0835	15.150	2.2	(28	77	1.32	9	6	2.5
				40	5480		2.2	128	24	(33	6	10	JEH
8000000	ogot dioit),OG 00	T	0	0160	6,000	2.2	128	26	133	9	01	2.5
	ļ		オア	10	0250		2.7	128	26	134	Ł	01	30
			1/C	22	0830	10.300	2.2	971	26	133	ኍ	6	4.0
			HB	8	0410	15,350	7.7	128	27	132	4	10	ろり
				0H	0620	20:20							
			۰	0									
			1/C						-				

METEL BOX	Condensor Pump Vacuum	1000 770 700 700 700 700 700 700 700	
2/13 2/13 144 3/23 FOL ME	Outer Temp. Outer Temp.	Newe	
PE %	Probe A A A	T T T T T T T T T T T T T T T T T T T	
ASSUMED MOISTURE % METER BOX NO. METER FACTOR PROBE HEATER SETTING COMMENTS ANDI CAL DATE 2	Power 22 Permit Property Prope	82 22	
ASSUMED MOISTUMETER BOX NO. METER FACTOR PROBE HEATER SE COMMENTS COMMENTS COMMENTS CALL DATE SCAMPLE #	12.8 12.8 12.8 12.8	977 977 977	
	Motor 2.2. 2.2. 2.2. 2.1	77.77	
	Gas Motor Reading 0.020 2.480 5.048	0.000 2.500 7.500 7.500 7.500 10.045	
	Clock Time 0.000 6.500 10.00	H871124 1134 1134 1134	
14 K 14 K TEST NO. 22-26 27-26 3A T/C:	Sempling (min) 0	02220	
St. 23	Tube N (Leb) 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	T 2 2 2 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1	
Plant Yates Station Boiler No. 1 6-23-33 OCATION STACK COCATION STACK ADIT TEST TEST THE STACK THEST C PRESSURE 21-2 C PRESSURE 21-2 E NUMBERS T: OBA T	ck ('Hg)	200 gr	
	Leak Check ('Hg) Pre 8.00 % P. P. P. P. P. P. P. P. P. P. P. P. P. P		
PLANT DATE SAMPLING RUN NO. OPERATOR AMBIENT TE BAROMETR BLANK TUB	Number	2	
	1961-X	561-1	

MODIFIED METHOD 5 FIELD DATA SHELT

PLANT NAME Plant Yates Station Boiler No. 1	:	Page of
SAMPLING LOCATION STOCK DATE 6 2043 TIME START 1240	RUN NO. TIME FINISH 1755	TEST DURATION 240 min.
PTCF 0.84 DGMCF 0.44 NOZZLE BAR PRESS 29.31 Hg	DIAMETER 13 Fe E DIA. 0 196 inches	INITIAL LEAK RATE 0.000 Ccfm/5"/6
STATIC PRESS - 0.5 " H20	OPERATOR EZ	

Point Ti	ock me	Dry gas meter reading ft3	^ P in H2O	^ H in H2O	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	Cond.
		reading ft3	in H2O	ニーロコへ								
E-1 12				in H2O	Temp. F	inlet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit
E-1 12										}		Temp. F
E-1		<u></u>	0 1-	0 00/	i 0 (30:	0 4 6		<i>i</i> -	
u		756.882	0.75	0.934	126	73	72	251	249	59	4.0	38
12	50	762:280	0.74	0.92	127	75	72	251	256	55	4.0	38
E^{-2} 13	00	767. 400	0.76	0.95	128	79	74	253	257	50	4.0	39
L i3	10	772.465	0.76	0.95	128	83	75	255	751	47	4.0	41
E-3 13	20	777.761	0.60	0.75	128	88	78	252	250	42	4.0	39
13	30	182-425	0.62	0.77	128	90	80	253	264	45	4.0	39
576P 13 1	\$ D	181.198		PORT	CHAN	7(5 (LOAK	CUGEK		9 6	45	
N-1 13	45	787 270	0.75	0.934	127	89	82	251	252	52	4.0	38'
13	55	792.550	0.74	6.92	128	91	84	253	238	46	4.0	40
N-2 140	25	797. 795	0.75	0.934	129	95	85	254	256	49	4.5	39
	15	803-140		0.934	129	97	87	253	243	50	4.5	39
N-3 14	25	808-475		0.75	129	99	89	255	241	50	4.0	41
14		813.200	0.66	0.75	129	100	91	254	241	51	4.0	4/
	45	818.148		PORT	come	FE	LONK		04	9 6		
W-1141		818-201	0-68	0.85	115	98	92	255	242	56	4.0	40
		823.330	0:68	0.85	124	100	93	254	242	53	410	43
W-2 15		828.410	0.67	0-83	128	100	93	253	2.48	50	4.0	41
152		833.575	0.67	0.83	128	101	94	254	245	49	410	40
W-3 15		838.675	0.56	0.69	129	103	95	255	264	49	4.0	41
15 4	بسسمه			507	128	102	96	254	240	5/	40	41
STOP 15 5	-	848.095	0 2 6	PORT		VGE		re cire			611/10	/
			h / C			88	88	251	254	55	4.8	36
5-/ 105			0.68	0-85	124	_	88	-				
170		853 420	0.68	0.85	128	90		254	242	45	4.0	38
5-2 171		858.580	0.74	0.92	122	94	89	251	246	50	4.0	39
		863 842	0.74	0.92	128	97	90	253	240	48	4.0	39
5-3 173			0.61	0.76	120	100	91	254	250	46	4.0	39
144			0.62	0.77	128	10/	92	255	256	47	4.0	39
END. 170	5	878.925								1 '		
	T											
Avg.	_ (7.830 S.	a823	.85	127	89.	61		140000 (2408)			
Check'd		121.788				17)						

CONSOLE # A 16 36	
FILTER #	
AMBIENT TEMP. 15	
PROBE LENGTH 6'	
LINER MATERIAL GLASS	LINES

Vetocity			engun ekster	(4) 2008	iyan Salah	. ₍₁ . 2003) 2. 2003)		(A. 1888)
% Moistu	e							
Flowrate (DS	C	FM					
lsokinetic					W.		S. O	

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MODIFIED METHOD 5 FIELD DATA SHEET

	PLANT	NAME _	Plant Yates St	ation Boile	г No. 1						Page _	of	
	SAMPL	ING LOCA	TION STA	ek.	-		RUN NO	. 2					
	DATE 6	122/93	TIME START		5		NISH	15	TEST DU	JRATION	240	m	nin fn/5" /#
	PTCF (DIMENSION	DGMCF D19		NOZZLE	DIAMET		inches	FINAL L	LEAK KA EAK RAT	E OON	130 E	cim 9 149
	BAR PR	ESS 29	34/* Hg		- -			7					
	STATIC	PRESS	. 7-50	H2O		OPERAT	OR <u>L</u>	<u> </u>				17	1000
1			I B	Λp	×.,,	I Caral	Dec ess es		l Harban	Peobe	Last	K=	والمساوية
Ì	Traverse Point	Clock Time	Dry gas meter reading tt3	in H2O	^H in H2O	Stack Temp. F	Dry gas m Inlet	Outlet	Hot box Temp.	Probe Temp	Last Impinger	Vacuum in. Hg	Cond. Exit
						·							Temp. F
(<u> </u>	0 2-1	000 7	- 7 (:	0 00	127		-	250	0.11	<i>-</i> ,	 	
ا (E-1	0755	868 .530		0.92	127	75	70	253	244	51	6.0	44
	r 7	0875	894-415	0-13	0.92	128	80	73	254	243 265	60 50	5,5 5,5	
1	<u> </u>	08725	964.330	0.14	0.92	128	86	76	254	266	41	5.5	44
	E-3		909.060			128	95	83		254	45	5.D	48
	<u> </u>	 		0.64	0.79	128	96	85	255 255	265	42	5.0	43
ı	STOP	08755	919.437	PORT	CHAN		16	LEAL			5 e 8	" Hq.	-73
	N-1	0800	919.532	0.73	0.91	127	94	86	251	248	47	00	41
			924.565	0.73	0.91	128	96	88	256	255	4Z	6.0	42
ı	がーフ	0820	930-160	0.14	0.97	128	99	83	254	265	44	6:0	43
			435.485	0.74	0.92	128	101	91	255	260	47	6.0	44
	N-3	08 40	940.840	0.64	0.79	129	102	93	254	264	46	5.5	44
		0850	945.899	064	0.79	128	102	93	254	258	47	5.5	44
		0900	950.805	PORT		VGE	70-	LEAK	<u> </u>		€ 8"		
	W-1	0905	950.895	0.68	0.85	128	98	93	254	245	53	5.5	42
		0916	956.145	0.68	0.85	128	100	94	255	261	48	5.5	43
	W-2	0915	961.300	0.67	0.83	128	102	95	253	258	50		43
1		0935	966-170	0.67	0.83	128	104	95	254	256	49	5.5	43
	W-3	0945	971.282	0.55	0.68	128	106	97	256	264	50	5.0	44
Į		0955	976.000	0.55	0.68	129	106	98	255	257	5/	50	45
	5000	1005	980.819	PORT		NGE	40,001		CHEC	K. 9	1		
		1015	980 893	0.67	0.83	128	102	98	254	260	46	5.5	43
١		10 25	987.534	0.67	0.83	128	103	98	255	253	43	5.5	44
	5-2	1035	992.670	6.75	0.93	129	106	99	256	252	44	6.0	46
ĺ		1045	998.554	0-75	0-93	128	109	100	256	253	44	7.5	45
ہے	<u>s- 3</u>	+	005.682	0-64	0.79	129	111	100	254	25/	46	5.6	45
t	END.	1105	010.763	0.64	0.79	129	110	101	253	256	47-	50	45
٥	Sigo	11.15	015-838	ļ		 	\ <u> </u>	ļ <u>.</u>			1		<u> </u>
		ļ <u>.</u>	1 0005			ror-W							
	Avg.		27.568	0.4126	- 85	1287	14	7					
	Check'd		27.049			$1D_{\perp}$							
	CONSO	LE# All	1361	- 0.825	۶۱	Velocity			636533336				
	FILTER		/ / `~ /	- 0.0		% Moisu	0.0000000000000000000000000000000000000						
		NT TEMP.	75°F	-		 - content soleto (150 tanello 	(DSCFM)						
		LENGTH_				 A 6000000000000000000000000000000000000	(%)	2007 BAD, BALL 1000					
	LINER	MATERIAL	<u>G1455</u>			***************************************							
			•										
	REMAR		E. e	n	٠ ـ •								
		7	STARTED (e 0655	COQQE	(TW F04	ZDQ IN	INMAL	HOUR I	OG TIME	100e 517	HLi	

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MODIFIED METHOD 5 FIELD DATA SHEET

												•	
PLANT	NAME	Plant Yates St	ation Boile	No. 1						Page/	_ of _ <i>1</i>		
SAMDI I	NG LOCA	TION STA	CK			RUN NO	ı	3			_		
DATE	23 93	TIME START	0645	,	TIME FI	NISH	118	TEST D	JRATION	24	<u>ი</u> _	nin fm/5"/45	
DUCT D	IMENSION	NS DGMCF 0 - 991	_ x	NOZZLE	DIAMET	ER 195	inches	INITIAL	LEAK RA	TE 6 VO	30 C	cfm 7 4	
PTCF C		9-19 Hg		NOZZEE			•	FINALL	LAK KA	E 0.00	, ,		-
STATIC	PRESS	0.5	H2O		OPERAT	or \underline{E}	<u>e</u>				.,		
											K=	1-214	_
Traverse	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m		Hot box	Probe	Last	Vacuum	Cond.	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit	
E-1	0645	030-212	0.66	0.801	126	73	70	254	255	57	3.5	47	
	0655	635-110	0-68	0826	127	80	73	255	267	5 c	3.5	45	
E-2	0705	039.955	0.70	0.849	128	85	76	254	245	47	4,0	46	l
	0715	044.935	070	0.849	128	88	78	255	250	43	4.0	45	
E-3	0725	049.995	0.59	0.716	128	93	8/	754	255	43	4.0	41	
	0735	054.455	0.59	0.716	127	95	83	255	254	43	4.0	42	
STOP	0745	059.353	PORT	CIAA	(GE		LE	K	HECK	< 0.00	2e 7"	14	
N-1	0754	059.923	0.68	0.826	126	92	86	256	250	54	4.5	47	1
	0804	065.010	0.66	0.801	128	94	88	254	760	45	4.5	45	
N-2		070.065	6.68	0.876	128	100	90	255	260	46	4.5	46	
	0824	075-170	0.68	0.826	128	102	92	254	245	46	45	45	
N-3	0834	080 282	0.58	0.704	128	104	90	255	260	46	45	46	
	08 44	085,045	0.58	6.764	128	104	95	253	248	18	4.5	48	1
	0854	089-825	PORT	CHAN		1, -,	LE		HECK	20.00		"42	1
	0900	089.9 58		0.753	127	101	96	254	248	51	5.5	50	
	0910	097.450	0.62	0.753	128	103	96	253	26/9	5 f	4.5	48	
w-2		102.190	0-62	0.753	128	103	96	25×	260	50	4.5	47	1
	0930	107.000	0.62	0.753	128	104	97	257	265	47	45	45	1
W-3	0940	114.375	0.52	0.631	128	106	92	254	257	SUE	4.0	47	
<u> </u>	0950		0.52	0.631	128	105	98	254	266	53	4.0	50	
5708	1000	123.517	PORT			103	4 541	 /	KK		@71		1
	10 19	123.605	0.67	0.813	128	98	96	254	258	56	4.0	146	1
8-1	10 28	128.925	0.62	0.753	129		46	255	267	50	1.0	44	1
S- 2	1038	133 395	0.67		129	100	98	255	260		4.0	7/6	1
2- 4	10 48		0.67	0813	129	104	48		263	51		46 2	1
C 2		138-736		0.813	130	106	· · · · · ·	256			110	44	نا
<u>s-3</u>	10 58	143.640	0.62	0:753	130	109	101	253	264	57	4.5		Ţ,
5.0	1108	149.399	0.62	0-753	130	11,1	101	254	250	50	7.2	46	f
END	1118	156-627				<u> </u>		<u> </u>		 	-	 	1
	ر م		o sent		120	400	122 -1						1
Avg.		120-415	CONTRACTOR OF THE PARTY OF THE		128	98.2	90.7						1
Check'd		125-624	118	100000000000000000000000000000000000000	T the second	Addition of the second				1			j
CONSO	LE#_A	161361			Velocity		Lagranga (17 kg 18 Tagas (18 avilland	110: 10: 10:000000000000000000000000000					
FILTER		10/00/	_		% Moist	***************							
	Y NT TEMP.	77°F	-		31,549,000,000,000,000	(DSCFM)			·				
		1 1 1			- 7 7 T T T T T T T T T T T T T T T T T			 - 1 20 20 20 20 20 20 20 20 20 20 20 20 20	4				

CONSOLE #	YCROCHY
FILTER #	% Moisture
AMBIENT TEMP. 77°F	Flowrate (DSCFM)
PROBE LENGTH	Isokinetic (%)
LINER MATERIAL GLASS	

REMARKS

MCDIFIED METHOD 5 FIELD DATA SHEET

		Plant Yates St								Page/		
AMPLI	NG LOCA	TION S TIME START NS DGMCF 0.9	tack			RUN NO	. <u>FB</u>	<u> </u>				_
DATE_	<u> </u>	TIME START	:0.is		TIME FI	VISH	012	TEST DU	IRATION		<u> </u>	in.
SACE DOCLD	MENSIO	NS DGMCF 6.5	₹\$û	NOZZI E	DIAME!	رم جـــــــر المحالية	inches	INITIAL FINAL L	EAK RAT	E 0.00	ئے۔۔۔۔۔ ^د	m e /2 '
BAR PRI	ESS	" Hg	<u></u>		<u>. ب</u>							****
STATIC	PRESS		H2O		OPERAT	OR	DJV W	AW_				
Fraverse	Clock	Dry gas meter	^P	^ Н	Stack	Dry gas m		Hot box	Probe	Last	Vacuum	Cond.
Point	Time	reading 1t3	in H2O	in H2O	Temp. F		Outlet	Temp.	Temp	Impinger		Exit
Politi	I Illine	resums no	1120	III 1120	remp.	uner	Odilet	tenth.	. Cinp	ampinger		Temp. F
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Avg.												
Check'd	_		1888 827		Talenda (n. 18.	17878,847		12.00.00				
		A Section to the Section Secti	P. 12.200 (1997)					1 (No. 1 (2004)	er i especi e ha	From secure 20.	econoci nei teeno	to control and
CONICOI	E# A	1			Velocity							
	.Е# <u>.</u>											
	#		-			ire						
		<u>80+</u>			Flowrate	(DSCFM)						
		6'			Isokinetic	(%)						
LINER N	/ATERIAL	_ Gless										
REMAR	KS											

C-104

ENTERED GEL- WHO.

SOURCE SAMPLING FIELD DATA SHEET

Page _______ of _____

Plant N	lame	Plant	Yates St	ation Bo	iler No.	1						(Table)
Sampling	Location	STACK	<u> </u>		Train _	A	ldehyde	s	Rur	1 No. <u>/</u>	-1	34.5
Date <u>oc</u>	-21-93	Time Start	1340		Time Fin:	ish <u>14</u>	08	Test Dura	tion	28	min.	6
Duct Din	nensions	x_			Diameter 13 th			Initial Lea	k Rate _c	<u></u> cfm		
_		DGMCF	00_	Nozzle D	ia. <u> </u>	147 inch	CS .	Final Lea	k Rate <table-cell></table-cell>	1.001 € 6	·/_cfm	A Pa
		<u>3/</u> " Hg									0.764	,
		.5 " H2C									0. 7864	/
Travers	Clock				4	Dry gas m	eter temp.	Hot box	Probe		Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
N-I	1346	571.567	0.59	0.46	128	79	78	257	265	74	2.0	
N-,	1356	577,780	0.59		128	83	80	256	261	59	2.0	
N-I	1404	580.760	0.59	0.46	126	85	81	261	265	51	2.6	
Stop	1408	582.274										
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Ava		10.707	0.766		127	BI	An .					
Avg.			V. (VV)		Company of							
Check'd	1/1/	10.707		<u>Langeri</u>	Life du grae.	generali ing il			1	I	l.	
CONSO	LE#	A16136Z				Velocity	_46	سي				
		NA.				% Moistu	THE STREET CONTRACTOR STREET					
		フ ロナ		-		Flowrate (
	LENGTH						(%)					
	_	- Glass				. and	▼ . ∪.₹		·····		•	
REMAR	KS		Sing	<u>le 4.</u>	Isok	instic.		H + ime	es C	<u>07</u>		



Page ____ of

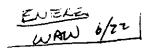
Sampling	Location_	Plant STACK			Train _								
Date OG	-22-93	Time Start	0715		Time Finish 0745 Test Duration 30						min	~ . ~ .	
Duct Din	nensions_	×_			Diameter 13 ft Initial Leak Rate 0.00						2_cfm (2) 7		
_		DGMCF 1.0	06	Nozzle D	ia. <u>0.17</u>	47_inch	ės	Final Leal	k Rate < C	7.00 IE	<u>) "</u> cfm		
Bar Press 29,34 " Hg Static Press -0.5 " H20				Operator DJV			K = 0.7753						
Trave.	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum		
	 	reading ft3	in H2O		Temp. F	inlet	Outlet	Тетр.	Temp	Impinger			
W- (0715	591.804		0.45	13)	78	77_	251	263	75	2.0		
		595, 160	0.59	0.45	/33	83	79_	267	263	5G	2.0		
9	0933	597.715	0.59	0.45	/33	85	80	257	265	56	2.6		
	0739	600.660	0.59	0.45	/33	88	82	264	259	58	2.0		
	0745	602. 890	<u> </u>						<u> </u>				
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Avg.		11.086	0 7/01	A 4-	1100	400 A	5						
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Check d				sayara nila	1000 July 15/2		1 1 10000 1000000						
CONSO	LE#	A 161362				Velocity		46,45					
	CONSOLE #					U0000000000000 N. 0002 NW	re .						
				-		Flowrate (DSCFM)_	28	975				
PROBE	AMBIENT TEMP. 70+ PROBE LENGTH 6					2000 00 00 00 00 00 00 00 00 00 00 00 00	(%)			Concurrence Coloco Coloco			
		L <u>G/q35</u>				i etalen ikkisia.					·		
REMAR	.KS	Si	gle 9+.		All To	mes C	<u>0</u> T	<u>-</u>	·		-		



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Plant N	Name	Plant	Yates St	ation Bo	iler No.	1					,	
Sampling	Location_	Stack			Train _	A	Aldehyde	3	_ Run	No. 💆	<u> </u>	
Date OC	. 23-93	Time Start	0700		Time Fin	ish <u>073</u>	30	Test Dura	ition	30	min.	7. ~ 11
Duct Din	nensions	Time Start X			Diameter	13	<u></u> ft	Initial Lea	ık Rate 🙎	2007	cfm	JJ"
PTCF _	0.84	DGMCF	006	Nozzle D	<u>7 ر. ہ</u>	<u>47</u> inch	es	Final Lea	k Rate	0.002	ctm 🙋	10 "
		19 " Hg	_			^					K = 0.	7766
		<u> 「 H20</u>									, J	
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas me	eter temp.	Hot box	Prob€	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
W-i	0700	616.602	0.56	0.43	130	79	76	262	258	65	2.0	
ļ	0705	G18.425	0.56	0.43	130	79	76	261	255	55	2.0	
	0110	620.255	0.56	0.43	131	80	77	259	258	56	2.0	
	0715	622,070	0.56	0.43	130	83	78	259	260	57	2.0	
	0720	c 23.895	0.55	0.43	131	83	78	260	257	57	2.0	
	0725	625.710	0.55	0.43	131	86	80	262	258	57	2.0	
Ston	0730	627. 531										
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Avg.		10.929	0.7461	0.43	/30.5	79	6					
Check'd		075			in Section .		a Victoria d					
		A 161362				Velocity_		45.15				
	FILTER #					% Moistur	•					
		<u> 70 +</u>				Flowrate (59. 9			
		<u> </u>				Isokinetic	(秀)					
LINER !	MATERIA	L <u>Glass</u>										
REMAR	KS		Single	04.	A	1 Times	COT					

	lame											_
Sampling	Location_	Stack			Train _	A	ldehyde	<u> </u>	_ Rur	1 No. <u> </u>	1ELD	Best. 018 018"
Date _&	-20-9	Time StartX	<u> 1325</u>		Time Fini	sh <u>/ 3</u>	269	Test Dura	tion	1.00	min.	_
Duct Din	nensions_	x	7-006	JECT	Diameter	<u> 13.2</u>	ft	Initial Lea	k Rate _	0.00	4 cfm (218
PTCF _	.84	DGMCF/.	006	Nozzle D	ia	<u> </u>	cs	Final Leal	Rate 🚄	2.00	cfm_cfm_4	218"
		" Hg	_			~~	=14				_	_
Static Pro	<u>— O</u>	-5/ H2C	<u> </u>		Operator	_52						
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas me	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
41Lor	1376	563.880									18	
560		564.932						-			70	
7												
												
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Avg.							13.24 (A).					
Check'd												
		14.51				2.880/801/2019	BOSINGER BELIEF BOOK		(10) (10) (10)			
CONSO!	나는 #	416136	<u> </u>									
AMDIEN	#	A16136 		-		% Moistur Flowrate (
DRUBE	i iemp. Iengtu	99°F				Isokinetie		wice, 200,000,000,000,000,000,000				
LINER	MATERIAL					ABUS INCHES			<u> </u>		ì	
REMAR	KS	BLAR	IK-		····					· · · · · · · · · · · · · · · · · · ·	-	



Page ____ of _______

		Plant										
Sampling	g Location_	Star	<u>ck </u>		Train _	M23 -	Dioxins/	Furans	Rur	i No. <u>√-</u>	1_	
Date og	-21-93	Time Start	1400		Time Fini	sh <u>193</u>	3	Test Dura	tion	240	min.	
		x_										
PTCF _	0.84	DGMCF _1.02	19	Nozzle D	ia. <i>3F = 0</i>	inch_	ės .	Final Lca	k Rate _C	001 81	of cim	
		3) Hg										
Static Pro	ess	3.5 H2C)		Operator		TV			R=1.	352 g	
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	Cond
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	00+
E -1	1400	678.367	0.67	0.84	122	68	G 7	254	243	56	5.0	58
	1410	683.005	0.67	0.84	122	71_	68	257	247	42	5.0	53
E.Z	1420	687.810	0.68	0.85	122	73	69	256	245	43	5.0	48
_	1430	692,705	0.67	0.84	/23	77_	72	257	256	42	50	53
F.3	1440	G97 585	0.56	0.70	/23	79	74	257	256	45	4.5	51
	1550	702.055	0.56	0.70	124	84	78	259	243	48	4.5	52
Stoo	1500	706.556		leak ck	I	@ 10"						
N-L	1505	20G. G78	0.70	088	1	80	78	256	241	58	5.0	55
	1515	711. GG5	0.67	0.84	122	83	78	253	24/	45	5.0	5/
N·2	1575	716.625	0.70	0.88	122	94	79	259	242	44	5.0	48
	1535	721.685	0.70	0.88	123	84	81	262	244	46	5.0	49
N-3	1545	726.650	0.54	0.74		90	83	260	247	47	4.5	50
- N	1555	731 290	0.59	0.74	123	89	8.2	258	248	46	4.5	50
CI.	1605	735.924	0,00			2 0.0		5"	77.	76	3/3	<u> </u>
Stop		i	0.02	100k			79	260	144	<i>a.</i>		<u></u>
W-I	1720	736.028	0.62	0.78	127	80			245	6.0	.5.0	57
	1730	741.950		0.78	126	80	78	255	250	40	5.0	50
W-2	1740	745. 415	0.62	0.78	124	73	80	257	247	42	5.0	52
	1752	751. 100	0.62	0.78	124	86	82	257	248	40	50	49
ω -3	1800	754.870	0.50	0.62	124	86	82	2G1	256	42	4.5	50
-	1810	759 145	0.51	0.63	124	86	81	7.45	252	43	4,5	50
Shop	1820	763. 481		icak			-	1				
5-1	/833			0.85	/22	81	६०	251	248	58	5.0	57
	1843	768.505	0.70	0.88	122	83	80	250	257	42	5.5	50
5-2	1853	713.555	0.71	0.88	123	\$7	82	254	246	47	5.5	52
<u> </u>	1903	778.630	0.71	0.88	/23	89	F 3	254	761	47	5.5	52
2-3	1913	783. 720	0.59	0.74	124	90	84	254	264	47	5.5	51
	1923	788. 405	0.59	0.74	124	90	84	243	251	48	5.5	52
	1933	793,092										
Avg.	<u> </u>	114.442.	0.7956	0.7946	123.3	80	63					
Check'd	1	714_72516	VTB									
		Lu	IAA			Tringione's e	si njak <u>jan</u> s	: <u>24404</u> 000000000000000000000000000000000		.::::::::::::::::::::::::::::::::::::::	· · · ·	
		4 IG I 394				Velocity_	The second of the second of the					
		NA		-								
		<u>70 +</u> 5 '						297,				
	LENGTH MATERIA					TEORINGUE	(29 <u>3</u>		a a magnificação			
CHIER	IIIA I ERIA	L C lass										
REMAR	RKS	As	Times	COT					 -		-	

Page ____ of ____

	_	Plant					 Diouina/I	? <u>.</u>	D	No 1		: <u>.</u>
	_	STAC										
_		Time Start				sh				240		
		DCMCE X				13 '						
		DGMCF/.	024	Nozzie D	12. <u>O.C.</u>	73aca	CS	rinai Lea	k Rate Z	0.001 €	Cim	
		<u>3</u>)		Operator		JV	_			1. 23	52
Travers	Clock	Dry gas meter	^ P	^н	Stack	Dry gas me	ter temp.	Hot box	Probe	Last	Vacuum	Conc
Point	Time	reading ft3	in H2O	in H2O	Temp. F	inlet	Outlet	Temp.	Temp	Impinger	in. Hg	<u>0</u> 0+
E-1	0812	809.159	0.73	0,90	127	7.	7/	248	253	65	5.0	61
<u> </u>	0822	814.180	0.73	0.90	128	76	72	251	245	4/3	5.0	49
F-2	0832	819.185	0.72	0.89	129	8.0	74	250	256	45	5.0	48
J	0842	824.240	0.72	0.89	129	82	76	252	249	41	5.0	49
E-3	0852	829.255	0.64	0.79	129	84	78	251	253	44	5.0	51
<u> </u>	09#2	834.030	0.64	0.79	/30	87	81	253	244	46	5.0	51
Stop_	0912	838.804			jeok	ck:	<0.001	@ 10	" Na			
N-I	0917	838.817	0.75	0.93	128	83	81	254	252	55	5.5	59
	0927	844.050	0.75	0.93	129	97	82	252	242	43	5.5	52
N-2	0937	849.240	0.73	0.90	129	88	82	252	248	45	5.5	51
	0947	854.465	0.73	0.90	128	90	84	257	251	46	5.5	51
N-3	0957	859.590	0.57	0.70	130	93	87	253	243	48	50	50
	1007	864 165	0.57	0.70	130	94	88	255	243	46	5.0	49
Stop	1017	868.758			Itak	ck :	(0.001	@ 10	"Hg			
W-1	1026	868.817	0.68	0.84	130	89	87	255	242	56	5.5	54
	1037	874 265	0.68	0.84	128	90	87	252	251	42	5.5	52
w-2	1047	879. 200	0.64	0,79	129	92	88	254	250	44	5.0	50
	1057	884.185	0.64	0.79	128	92	88	252	248	45	5.0	49
W-3	1107	888.940	0.54	0.67	128	93	89	252	243	47	5.0	49
	1/17	893,445	0.54	0.67	129	94	90	254	265	47	5.0	50
Stoo	1127	897.948			/eat	ck =	40,001	@ 12	" Ha			
5-1	1136	898.035	0.70	0.86	127	93	90	252	255	50	5.5	51
	1146	903140	0.70	0.86	128	94	90	252	248	46	5.5	49
<u>૬-</u> ૨	1150	908, 165	0.70	0.86	127	95	91	257	242	46	5,5	49
	1206	913 280	0.71	0.88	126	95	91	252	266	43	575	48
5-3	1216	918,405	0.57	0.70	127	98	93	255	257	45	5.0	48
	1226	923.040	0.57	0.70	127	97	93	253	263	48	5.0	50
End	1236	927.672										
Avg.	-	+/15	0.8141	0 8100	128.3	36	.9					
Check'd		118.294			1.00 St. 11. 70 St.							
Check'd CONSO FILTER AMBIEI		118.294 A161394 70+			(15.3 (778		e			(80000000000000000000000000000000000000		C1000 L-20000

Plant N	Name	Plant	Yates St	ation Bo	iler No.	1						
Sampling	Location	STACK			Train_	M23 -	Dioxins/	Furans	Run	No	3	
Date 00	-23-93	Time Start	0810		Time Fini	sh /24	19	Test Dura	tion	240	min.	
Duct Din	nensions_	x_			Diameter	13	ft	Initial Lea	k Rate <u>c</u>	.002€	دُأm <u>ح</u>	
PTCF _	0.84	DGMCF	<u>029</u>	Nozzle D	ia. <u>0. 1</u>	95 inch	es	Final Lea	k Rate <u>< (</u>	0.001@	<u>/ O</u> ctm	
		19" Hg								•		
Static Pro	=== <u>- 0</u>	. 5 * H20			Operator		<u>11</u>	_			1,24	27
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas me	eter temp.	Hot box	Probe	Last	Vacuum	Cond
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	00+
E-l	0810	960.872	0.66	0.82	127	25	74	249	262	70	5,0	68
	0820	965,650	0.66	0.82	127	76	אל	248	243	45	5.0	55~
E-2	0830	970,425	0.68	0.85	127	80	76	252	244	44	50	52
	0840	975.335	0.58	0.85	128	83	78	152	24/	46	5.0	52
E-3	0850	980.270	0.54	0.47	128	80	79	254	250	49	5,0	53
	0900	984.665	0.54	0.67	129	86	80	257	245	57	4.5	54
Stop	0910	989 083			lank		0.001		2 /0	"Hg		
N-(0916	989.246	0.70	0.87	128	82	81	253	246	59	5.0	58
	0926	994.240	0.69	0.86	/28	84	81	251	246	45	5.0	5-4
ル・ブ	0936	999.205	a.70°	0.87	128	87	82	253	247	46	5.0	52
	2946	004.200	0.70	0.87	129	8.8	83	254	257	48	5.0	53
N-3	095G	009.280	0.58	0.72	129	89	84	153	248	49	5.0	53
	100G	013,905	0.50	0.72	128	89	83	252	25 ⁻ 3	48	5.0	53
Stop	1016	018.516			leal	. ex <	0.001	c.e.		10 " H		
14-1	1032	018.555	0.62	0.77	127	26	84	250	240	G 7	5.0	61
	1042	023, 260	0.64	0.80	129	87	84	254	248	46	5.0	46
ω −2	1052	028,050	0.64	0.80	129	92	87	253	245	49	57.0	52
	1102	032.978	0.62	0.77	/30	94	8-8	254	250	49	5.0	53
Wi_3	1112	037.780	0.54	0.67	1.30	97	90	253	244	48	5.0	53.
	1/22	042.410	0.54	0.67	129	98	91	253	254	60	5.6	53
54	1132	046, 912			ì	r ck	0.001	CFM	e	" Ha		
5-1	1149	046.951	0.68	0.85	129	92	92	253	255	67	5.0	دی
	1159	052.020	0.68		1	95	93	752	242	42	6.0	51
5.2	1209	056.050	0.66	0.82	129	97	93	253	256	48	5.0	54
	12.19	062.025	0.66	0.82	(30	100	95	255	248	50	5.0	53
s-3		066,995	0.57	0.71	130	101	96	254	251	49	5.0	52
	T	071.780	0.57	0.71	129	102	96	253	253	51	5.0	51
End	ſ	076.376										
Avg.	_	115.263TB	(De	LIAW								
Check'd	13	16.00	0.3966	.78	129	813						
		-	\searrow				· · · · · · · · · · · · · · · · · · ·			· : : : : : : : : : : : : : : : : : : :	-	
		A161394		0.793		200 000000000000			000000000000000000000000000000000000000			
	# NT TEMP	80 +					DSCFM)	0000000000000000000000000000000000000	60000000000000000000		(
	LENGTH		· · · · · · · ·	COVY	recl	10.000000000000000000000000000000000000	(%)					
	MATERIAL		3	(, 0 ,		TOTAL TOTAL SANSAGE	¥77.4°.		(20 (80 (80) ماريون مو		1	
REMAR	KS			11 Tim	کی د	PT						
				.v	us C guny Es	•						C-111
			>	area	guny 2	MOL						

Plant Name Plant Yates Station Boiler No. 1

Sampling Location Stack Train M23 - Dioxins/Furans Run No. F6 Date 06-20-93 Time Start 1037 Time Finish 1037 Test Duration — min.

Duct Dimensions X Diameter 13' ft Initial Leak Rate 0.001 cfm @ 123

PTCF 0.54 DGMCF 1.029 Nozzle Dia. 0.195 inches Final Leak Rate cfm Bar Press 29.36 "Hg Static Press _____ * H2O Operator <u>ATV WAW</u> ^ P [^]H Stack Dry gas meter temp. Hot box Probe Last Travers | Clock | Dry gas meter Vacuum in H2O in H2O Temp. F Inlet Point Time reading ft3 Temp. Temp Impinger Outlet in. Hg 1037 661,294 80 79 254 251 84 Avg. Check'd CONSOLE # ______ A 16 1 3 9 4 _____ % Moisture FILTER # ____ Flowrete (DSCFM) AMBIENT TEMP. 80+ PROBE LENGTH ____ 5_' lsokinetic (%) LINER MATERIAL Glass REMARKS

1-93 Ti nsions DO 29.31 -0.5	Stace me Start X GMCF 9 " Hg	1330		Time Finis	sh <u>094</u> 13	5 (ac-23-4 ft	Secre Due	tion d	987	min	
1sions	X GMCF <u></u> , 9 * Hg			Diameter	131	ft	Initial Lea	k Rate	78/	min.	,,
.84 DO 29.31 0.5	GMCF <u>0,4</u> * Hg	194	Nozzie D	ia. O./	00 :-ak		muuai Lea				
29.31 -0.5	" Hg				ure inch	es	Final Leaf	Rate	NA	cfm cfm	
-0.5				·-·							2485
	" H2O)		Operator	0.3	· V				K = 0	
Clock D	ry gas meter		^ H		Dry gas me		Hot box	Probe	Last	Vacuum	
J	reading ft3	1		Temp. F		Outlet	Temp.	Temp	Impinger		_
		- C4	- °C	.50			 		-		
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	160.195			125	THE PERSON OF	3-0	1. 8				
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Plant N	Name	Plant	Yates St									
Sampling	Location	Stac	4		Train _	P	SD		Run N	lo/_	_	-
Date oc	·22-93	Time Start 13	30 (06	<u>~21</u> ~43)	Time Fin	ish		Test Dura	tion		min.	
Duct Din	nensions	Stace Time Start 13		`	Diameter	13	ftft	Initial Lea	k Rate _	2,00	cfm	
PTCF _	0.84	DGMCF 0.9	94	Nozzle D	ia. <u>0.1</u>	9 <i>6</i> inch	es	Final Leal	k Rate		cfm	
Bar Press	<u> 29</u>	.34" Hg										
Static Pro	css	<i>0.5</i> " H20)		Operator			_				
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas me	eter temp.	Hot box	Probe	Last	Vacuum	~ ^
Point	Time	reading ft3	in H2O		Temp. F		Outlet	Temp.	Temp	Impinger	in. Hg	Jup
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Flue-Gas Sampling Log

pousou:	Sample Kun #:
lant Location: Managed Con-	Soda-Lime Trap#: 5 400
)ate: 6-25-43	Iodated Carbon #: 💪 👡
uel Type:	Pump#: 3
ollution Control: ESD_TDB	Probe#: 1
ampling Point STA K	Filter ID: 10

	start			stop		elapsed	mean	mean
time	zero	flow	time	zero	flow	time	zero	flow
(hh:mm)	(1/min)	(1/min)	(hh:mm)	(1/min)	(1/min)	(min)	(1/min)	(1/min)
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Flue-Gas Sampling Log

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y STP) volume (1):	7,021 7 77,001
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Flue-Gas Sampling Log

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Sample Run #: Soda-Lime Trap#: Lodated Carbon #: Control: ExpTPS Probe#: 30 Point: Free: 30	0.000		1 x6	**************************************		
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Sample Run #: Soda-Lime Trap#: Lodated Carbon #: Control: ExpT			## J			
Sample Run #: Soda-Lime Trap#: Lodated Carbon #: Control: ExpT		\$*****************	*****			
Sample Run #: Soda-Lime Trap#: Lodated Carbon #: Control: ExpT		8.7	£ 28		***	
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Control: September Control: ESP-TFB		2.1	.	34-	3.0	2200
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mean		(I/min)		0.230				
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	flow	(1/min)		. 080				TOTALS:
stop	zero	(1/min)		- 200 - 420C				
	_)		5711				
	flow	(1/min)	0.500					
start	zero	(1/min)	2200					
	time	(hh:mm)	- 55%					

Integrator Volume (I):	COMMENTS
Officet Competion (1): A 15	
Oliser Collection (1): 0.10	THE CHIEF THROWN ACTED TO
Total Integrator Volume: 46.0	LEM CHECK -THOSOM DROVE - C
CO ₂ Mass Flow Correction:	
Actual (dry STP) volume (1):	2,021 7_7 7,000
% 0 ₂ : 8.0	
% CO ₂ : (D, n	Law From DIJE TO MOISTERPE
% H ₂ O: 5. O	TEAN MAINTAINED AS
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Flue-Gas Sampling Log

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Sample Run #: Halo Blank	Soda-Lime Trap#: 5405	Iodated Carbon #: 2405	Pump#:	Probe#	Filter ID:
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mean	flow (1/min)	
mean	zero (1/min)	
1	time .	H 1
	flow (1/min)	0.500
stop	zero (1/min)	-0.026
	time (hh:mm)	1120
	flow (1/min)	0.500
start	zero (1/min)	-0.07
	time (hh:mm)	11.15

Integrator Volume (1):	COMMENTS:
Offset Correction (1):	LEAK CHACK THEOX + NETER = -0.027
Total Integrator Volume: 0.000	
Actual (dry STP) volume (l):	
% 0 ₂ :	
% CO ₂ :	
% H ₂ O;	
ppm SO ₂ :	

			SOURC	CE SAM	IPLING	FIELD	DATA :	SHEET		Page	of	
Plant N	Name	Plant	Yates St	ation Bo	oiler No.	1						
					Train_		Anions		Run N	o		
Date 6	25 93	Stack Time Start b	940		Time Fin	ish/ 5	5	Test Dura	ation	134	min	1144
Duce Du	11CH210U2	x_			Diameter	ish <u> 5</u> 13 inch	ft	Initial Lea	ak Rate <u>C</u>	2·000	O ctu y	<u> </u>
PTCF _	0.84	DGMCF 100	6	Nozzie D	ia. <u>6. 195</u>	inch	ies	Final Lea	k Rate	Starr C	etm	נייי
Bar Pres Static Pro	s <u>29-4</u> ess <u>- 0-(</u>	29.33 Hg - 0 " H20			Operator	Ez				<u> </u>	1.160	<u></u>
Travers	Clock	Dry gas meter	^ P	^ H	. Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
N-3	0940	739,155	0.62	0.719	131	85	85	254	253	61	1.0	
	0950	743920	0.62	0.72	132	58	85	255	250	53	1.0	
	1000	† 	0.62	6.22	133	91	86	254	264	54	1.0	
	1018			077	133	95	88		256	56	1.0	
	1041	767 - 445	0.62			97	90		260	57	1.0	
	1055	174.002	0.62	0.72		97	91	253	258	58	1.0	
	1110		0.62	0.72	132	97	9)		255	53	1.0	
	1141	795 . 376		0.72		98	92	251	258	53	50	
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CONSOI FILTER AMBIEN PROBE	LE# // 90C NT TEMP. LENGTH	6'				% Moistur Flowrate (e DSCFM) (%)		I			
REMAR	KS										•	

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Plant N	Vame	Plant	Yates Si	tation Bo	iler No.	. 1						
Sampling	Location_	5tack Time Start			Train		Anions		Run N	o. 2.		
Date 6	26/95	Time Start	1325		Time Fin	ish (53)	0	Test Dura	ıtion .	131	min.	
Duct Din	nensions_	X			Diameter	13_	ft	Initial Lea	ık Rate D	.001 P	15 c.格	
PTCF C	184	DGMCF 1.00)6	Nozzie D	ia. 0.19!	5inch	ics	Final Leal	k Rate Z	ar oo i	ID: H	-
		" Hg									q	
Static Pro	ess <u>- 0.5</u>	H20)		Operator	EZ		_		K=	1.1586	
Travers	Clock	Dry gas meter	^ P	^н	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F		Outlet	Temp.	Temp	Impinger	1 1	
E-3	1325	881.665	6.60	0-695	133	105	102	262	257	69	1.5	
		884.320			133	106	102	260	256	61	1.5	
		888.460		0.672	133	107	103	260	256	59	1.5	
		893.515		0-672		106	102	258	252	56	1.5	1
	1409	902 - 185	0.58	0.622		106	101	258	255	59	1.5	
	1434		6.59	0 672		108	102	258	256	57	1.5	
	1445		0.58	0.672		108	102	257				
	1504	917.420	0.28			107			753 753	60	1.5	
		934.998	0-58	0.672		108	102	257			1.5	
			· · · · · · · · · · · · · · · · · · ·	0.672			102	256	254	63	1.5	
		940.110	0-58	0.672	154	108	(02	256	255	60	1.5	
	1536	942-028		<u> </u>								
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Avg.		60-363	h-Go	0192	122	r regionale de co	104.45					
Check'd			7/68/8				124.40					
			/(00.0	enten gill i Au	gagarana serige							
CONSOL	E # OCC A	161362				Velocity_						
FILTER	1651	436				% Moistur	e					
	IT TEMP.	85°F					DSCFM)	<u>Bidishdermerenenserser</u>				
	LENGTH _	6'				lsokinetic	(%)					
LINER N	ATERIAL	. GLASS.										
REMAR	KG											
WEINI WK!	n.J					*						

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Plant N	Name	Plant	Yates St	ation Bo	oiler No.	1						
Sampling	Location_	Stack			Train _		Anions 5 ft		Run No	<u> ک</u>		
Date b	27 93	_Time StartC	845		Time Fini	ish <u>105</u>	5	Test Dura	tion	30	min	11_
Duct Dir	nensions_	DGMCF O			Diameter	<u>13</u>	ft	Initial Lea	k Rate <	0.001	E effi	
PTCF_	0.84	DGMCF PC	<u> </u>	Nozzie D	ia. <u>D'19</u>	<u>5</u> inct	ics	Final Leaf	k Rate <u> </u>	্ত তথা	Celly,	199
Bar Pres	s <u>19.2</u>	* Hg										•
Static Pro	ess <u> </u>	·5 H20)		Operator	<u>ES</u>		_			K= 1.16	06
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F		Outlet	Temp.	Temp	Impinger	in. Hg	
E-3	0845	995,520	6-640	0-74	132	93	91	264	260	69	7.0	
	0850	997.990			132	94	91	269	258	55	1.0	
	6900	003.00			132	98	92	259	257	54	1.0	
<u> </u>	0910	007.555			•	101	94	259	260	56	1.0	
	0830	086,910				104	97	260	760	56	1.0	
<u> </u>	1002	032.586	0-640	0-24	133	107	100	200	261	61	1.0	
<u> </u>	1010	035.830				107	101	260	261	60	1.0	
 	10 25	043.040				109	102	260	262	60	100	
	1035	047.855	1.(((E	2.26	132	109	103		262		1.0	
	1045	051.76	0.642	6.14	137		1	 		60 57	ò	
<u> </u>	1055	052.756	0.040	0.74	1,22	110	103	260	263	21	170	<u></u>
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Check'd	<u> </u>		1,81833				1100.3	I				
CONSO	I E #	A161362				Valen	85,29949, 9,978155.	18,1642.000.000		510000000000	•	
FILTER)				1.12 (A.1. AVC MC 900000)	ne .			•		
	NT TEMP.	80 F		•			DSCFM)					
	LENGTH	- 11				200000000000000000000000000000000000000	(%)					
	MATERIA	7.14.50				- SANK KAMAN	. A Company of the Co		<u></u>		•	
REMAR	KS										_	
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Plant N Sampling	lame	Plant STACK Time Start	Yates St	ation Bo	iler No. Train Time Fini	1 sh 14 2	nions	Test Dura	Run No	. <u>Fb</u>	min.	
Bar Press	* <i>'ひ</i> り・5	STACK Time Start		Nozzle Di			ft	Initial Lea	k Rate 0	.000 (0	Actim to	1
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas me		Hot box	Probe	Last	Vacuum	
Point		i .	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
	1422	676-012										
	1400	010-319										
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CONSOI FILTER AMBIEN PROBE	LE# # NT TEMP. LENGTH	#161362 887 61 L GIASS				Flowrate (e DSCFM)			*		
REMAR	KS	*******								- 		

			SOURC	CE SAM	IPLING	FIELD	DATA S	SHEET		Page	of <u>}</u>	Table As a second of the secon
Dlant 1	Name	Plant	Vates Si	ation Bo	niter No	1						
			, 				 is/Hydro	ogen Cva	nide	Run No	. /	
Date	25 62	Time Start	3647		Time Fin	ish 0904	-	Test Due	ation	137	min	-
Duct Dir	mensions	X	<u></u>		Diameter	13	ft	Initial Le	ak Rate 0	0000	15m	
PTCF	D'84	DGMCF C) o ù	Nozzie D	ia. 0 · 19	5 incl	ies	Final Lea	ik Rate Ö	Sove	cfm7	1 by
Bar Pres	15 16-U	5 C C C C C C C C C C C C C C C C C C C			Operator	E2			_			
				, , , , , , , , , , , , , , , , , , , 	,						K=1.	<u> </u>
Travers Point	Clock Time	Dry gas meter reading ft3	^ P in H2O	^ H in H2O	Stack Temp. F	Dry gas m	Outlet	Hot box Temp.	Probe Temp	Last Impinger	Vacuum in. Hg	
W-3	0647	677.224	0.57	0.69	130	78	74	256	254	60	2.0	
	0700	683.225		0-69	130	82	76	Z 54	251	59	2.0	
	0713	689. 235	0.51	0.69	13 1	85	78	254	261	58	Z·2	
	0733	68.255	0.57	0-69	132	90	82	254	260	56	2.0	
 	0747	704.442	0.57	0.69	132	91	83	255	260	576	7.0	
	0800	710.004	0.57	0.65	132	92	85	257	260	56	2.0	
l	CS13	716-160	0-57	0.65	133	93	86	53	254	56	2.0	
	0825	721.599	0.57	0.64	132	93	87		258	55	2.0	
 _	0834	1000	0.57	0.66	けし	93	87	254	259	54	2.0 -	 1
	0841	731 . 450	0.57	0.06	133	94	38	157	 	51	2.0	
<u> </u>	0902	738 - 225		0.66	L33	94	88	256	761	50	2.0	
<u> </u>	 _	739 005	034	0.66	100	1 7	1 -0	C 10	201	 		
END.	DY DCF	127 005	 	 	-	 	 	 -	 	 	-	
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Avg.	 	61/181			Committee and a second second second	81.54		and the second second second				
Check'd	1 Scr	-		<u>'B</u>			86.318	1		1	l	
COLICO		AIC1 362	V. 7549	83		17	emerososion ingoc	:: 1:	Calabanas menus		ŝ	
	LE #	11.01.30	 -				re,					
AMDIE	NT TEMP.	70°í		-		1.0000000000000000000000000000000000000	re (DSCFM)_	10.00				
	LENGTH					- 1 1000 A.C. A.WOM	(%)	T - 600 TOOL WATER				
		L GLASS		-		100 Enicic	N 29 8	June 200 18 20			<u>&</u>	
ŘEMAR		CHANGE KS	1.160	6 340	10 mg 14	42 MUI	meë					

Page ____ of ____

Plant N	Name	Plant	Yates St	tation Bo	iler No.	1					_	
Sampling	Location_	Stock Time Start			Train _	Ammon	ia/Hydro	gen Cya	nide	Run No	. 2	
Date 116	<u> </u>	Time Start	145		Time Fini	sh <u> 3 5</u>	ft	Test Dura	tion	90	min	
Duct Din	nensions	X_		 -	Diameter	13	ft	Initial Lea	ik Rate <u>O</u>	.000 G	15 cfm	
PTCF C	7.84	DGMCF 1.00	96	Nozzle D	ia. <u>0 19</u>	5_inch	es	Final Lea	k Rate <u>O</u>	001 (E	10cfiffy	
Bar Press	s <u>29.3</u>	とし " Hg ・5 " H20								,	•	
Static Pro	ess <u>– D</u>	· <u>5 </u>)		Operator	Et				K	= 1.158	36
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
E-3	1145	840.130	0.60	0.695	134	91	90	239	252	70	4.0	· - · ·
	1150	842.895	0.60	0-695	133	91	90	249	252	58	4.0	
	1155	844.820	0.60	0 645	133	94	91	260	256	56	4.0	
	1200	847.075		0415	133	96	91	256		57	4.5	
	12.05	849.420		0.695		99	93	257	256	58	4.0	
	1215	854.290		0695		101	95	258	253	57	4.0	
	1230			0.672		104	97	264	258	54	4.0	
	1243		T -	0.672		107	99	263	26]	54	4.0	
	1255		6 58	0.672		107	101	262	257	55	410	
	1309	818.699		0:672		109	102	263	256	54	4.0	
END	1315	881.442	0 / 0	V 67 C	 ' 	101	100	-00-	928		<u></u>	
1740		047 - 772		 			 					
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		2000 Arms 100 100 100 100 100 100 100 100 100 10		a processor income				Linguage			200000000000000000000000000000000000000	***************************************
Avg.		41.312			133, 4		97.4					
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FILTER	LE DOS	(00	/ <u>^</u>			Velocity_	end business and control of the					
	TEMP.	54.E	Ψ	-		- 50,000 A4660 400 T000000000	ne DSCFM)					
	LENGTH	<u> </u>				 Mountidous dubocobos. 	DSCFM) (%)	CARRELINARY, CARLESTON				
	MATERIA!	L GLAS	5	•		430EIRTUS	V-7				i e	
			-									
REMAR	KS		·								-	

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Plant !	Name	Plant	Yutes St	ation Bo	iler No.	1					_	
Sampling	Location_	Stack Time Start U X DGMCF 1.00			Train	Ammon	ia/Hydro	gen Cya	nide	Run No	. <u>3 </u>	
Date 6	27/93	Time Start U	635		Time Fini	sh 0809		Test Dura	ition 94	 	min.	
Duct Du	mensions_	x_			Diameter	<u></u>	ft	Initial Les	ik Raic 0	. on (a)	6 6 fm	,
PTCF_	0.84	DGMCF 1.0	06	Nozzie D	ia. <u>0-194</u>	5inch	ies	Final Lea	k Rate <u>Z(</u>	20016	J. Com	7
Bar Pres	s <u>19.01</u>	" Hg								_	•	
Static Pr	ess <u>~ ()</u>	• 5 • H2C			Operator	<u>Et</u>				K:	1.160	6
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	ŀ	Outlet	Temp.	Temp	Impinger	in. Hg	
W-3	0635	951.795	0.62	0-12	133	78	15	265	257	62	4.5	
	0640	954.000	0.62	0-72	133	80	76	263	25%	5٩	4.5	
	0649	958.140	ひして	0.72	133	84	78	264	1.58	58	4.5	
	0700	963.185	0-62	0.72	13.7	88	80	264	258	60	4.5	
	0712	968 - 736	0.62	0.72	133	90	82	259	255	59	4.5	
	0721	973.022	0.62	0.72	133	92	84	257	25¥	57	4.5	
			0.62	0.72		94	86	257	252	52	4.5	
	0748					95	88	260	259		4.5	
	1080	992-000				97	90	260	258	54	4.5	
	0809	995.300				 						
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		207 X 207 2022 2022					A. 322	4.2			100 PHONE A	***************************************
Avg.		43.505			13.5	68.65	81.111	241.0	USE #	3/1/	43	
Check'd	1]		78740				85.39		1			
CONTO		161362				WW. 1729222	2006 00 50 50 50 50 50 50 50 50 50 50 50 50	31803188118811881		(3,000000000000000000000000000000000000	 \$	
FILTER		145				1.0000000000000000000000000000000000000	ne	0.00000000000000000000000000000000000				
	NT TEMP.	1221		•			DSCFM)_					
	LENGTH	6'					(%)					
	MATERIA						**** <u>*********************************</u>			· · · · · · · · · · · · · · · · · · ·	<u> </u>	
	N		·									
REMAI	RKS										_	

Page 1 of 1

Plant N	lame	Plant	Yates St	ation Bo	iler No.	1		_				
Sampling	Location_	STACK Time Start X DGMCF 1.00	11(12		Train_	Ammon	ia/Hydro	gen Cya	<u>nide</u>	Run No	. <u>FR</u>	
Date Ob	124143	Time Start	1412		Time Fini	sh <u>141</u>	<u>,</u>	Test Dura	ition	<u> </u>	-min 91	4
Duct Din	hensions .C/I	DOMOE 1:00		Namela D	Diameter :. o i C	7 inch	n	Initial Lea	k Rate _C	POST C	Chi	1
Box Dress	79.33	DGMCF 1100		NOZZIE D	ia. <u>U 1 1</u>	uici	100	Liner CCS	K Kate		- 3000	
Static Pre	- 10 · 10 · 10 · 10 · 10 · 10 · 10 · 10	7 Hg 5 " H2C)		Operator	Eŧ	124					
		Dry gas meter						Hot box	Pecho	Last	Vacuum	
Point		\$	in H2O			Inlet	Outlet	Temp.	Temp	Impinger		I
Polit			11 1120	ш, п.20	remp. 1	Inct	Outlet	remp.	City	impuiget	III. 11g	
	1412											
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Avg.												
Check'd												
CONSO	E # A1 # 94	61362				Velocity_						
FILTER	# <u>946</u>	000				100000000000000000000000000000000000000	ne					
	T TEMP.					A 2011 A 2011 A 2011 A 2011 A 2011 A 2011 A 2011 A 2011 A 2011 A 2011 A 2011 A 2011 A 2011 A 2011 A 2011 A 201	DSCFM)_					
	LENGTH	L GLASS				Isokinetic	(%)					
LINEK	MA I EKIA	- M-427										
REMAR	KS								. iii.			

STACK

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Page	١,	of	1

		STA:		ation Be	Train		 Particula	te_Dadic	muclide	. T	Run No.	1
Date / -	->41-83	Time Start /	223			sh 015					o_min.	<u></u>
		X_				JZ.					cfm €	215"
		DGMCF_O			ia. 0.2	inch	es OJ V	Final Lea	k Rate (7	.000	cfm C	1/1
		33_" Hg										
		- H2C)		Operator	JE	H	- -				
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	inict	Outlet	Temp.	Temp	Impinger	in. Hg	
815-2	1223	469.418	0.71	1-98	128	94	74	251	251	60	7.0	
		493,740		1.99	128	102	94	250	250	61	6.0	
		512.945		1.99	128	105	94	257	750	45	6.0	
4		528.50	0.71	1.91	128	108	97	750	251		6.0	
	2 2 4 4 4	562.000		1.92		113	102	252			4-0	
<u> </u>	1488	\$79.165		1.92	132	114	103	253	254		6.0	
	15/5	610.889	0.71	1.92	13/	114	104	254	753	63	6.0	
700	157	612.880		KTY			WINC	, —	154		C-H	WDZ
374		612985		1.92		104	101	252	250		5.0	
	553	632.090		192	+	106	99	-		57	5,0	
	1627	(58.250		1.92	129	100	94	450	251	37		
7 >	1904	776.56		1.92	130		2		243	68	150	
 	1934	799 40		1.92	13/	94	85	250		57	20	
 	2026		0.71	1,92	132	98	85	252	26.2	25	5.5	
47.0	2126		0,73	117 =	/30	18	88	353	2602	58	6.5	
	2219	925,610	0.72	1.57	/70	00		1.0	0-2	1/2	1.5	
stert	Ī	925,740	1 7	1.97	/30	90	86	252	353	60	6.5	
— —	4313	963.90	6,73		130	98	88	254	257	57	6.5	
 	-	1005.59				96	87	252	254		6.5	
* 5top	0/01_	1069.209	E 175	1.57	130	1.6	87	253	246	57	6.5	
* <u>Stop</u>	0133	10011-201	 	 	 -		 		 	 	 	
	 						<u> </u>	<u> </u>		 		
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		coo cel	84588	1.94	179.8		97.3	6.00.00				
Avg.		211324										

STACK

	Name		Yates St									_
		STA			Train _		Particula	te-Radio	nuclide	s R	un No.	2
Date _	<u>-25-93</u>	Time Start	0840		Time Fini	sh <u>033</u>	<u> </u>	Test Dura	tion & C	38-2010	<u>—</u> min.	
	nensions				Diameter		<u> </u>	Initial Lea	k Rate	2-010	cfm _ _	
		DGMCF	<u>88</u>	Nozzie D	ia. <u>0.2</u>	inch	es	Final Lea	k Rate	2.009	cfm@	0/4
		41 " Hg			_	. سيسيه						
Static Pro	ess <u>- 0</u>	<u>.51</u> " H20)		Operator	-3E	<u> </u>			·		
Travers	Clock	Dry gas meter	^ P	^ អ	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
5-1	soci^	771.158	.7z	1.9(130			260	251			
1	0841					OCKE	$\Delta I P$	ENA	CEA			
	0920		-73	1.23		30	#7	251	253	5z	30	1
31/164	0940			1.92	129	84	76	252	253	46	3.0	
-				1.16	129	47	80		_	4.5	30	
<u> </u>	0955		-	! 	147		00	252	250	77		
Stop	1042	831.423	,04		 		 		 			 -
start	1324	831,423	0.58	1,53	127	83	93	255	247	당)	3.0	
	1333	837 465		1.53	127	86	83	252	243	47	3.0	<u> </u>
	1405	851.925		2.006	128	96	87	254	255	52	3.0	<u> </u>
				1.17	128	101	90	251	241	54	3.0	<u> </u>
STOP		913-418		noved		time for		OW.		<u> </u>		ļ
STONE	1525	913.488	067	1.77	128	100	89	253	248	57	3.0	<u> </u>
L	1605	943.425		1.77	129	186	96	254	250	52	3.0	
	1659	983 300	0.69	1.82	129	107	98	257	255	52	3.0	
STON	1726	002.885		noveol	Moisto	٠						
	1749	002.885	0.69	1. 6 2	130	96	94	254	246	81	3.0	
2	1855	59.65	0.72	1.53	30	106	96	254	261	51	320	
	1935	86,21	0.72	1.93	130	107	97	257	245	46	3.0	
	2014	115:40	1	1.93	129	108	150	857	251	48	3.5	
sko	2107	154.175	· "		intere		cleck		@ 14ª	1 -0		ء .مدر
1 1	2112	154,300		, — — — — — — — — — — — — — — — — — — —	128	100	95	253	040		3,5	
rant	2311	199.26	0.74	10		1		Ţ — — —	246			
_					/30	104	95	355	1	50	3.5	
-	2304		0.72	1.93	1.30	102	90	256	243	<u> </u>	3,5	\vdash
<u> </u>	2359	276.53			1.30	97	70	-2522	262	رد_	3.5	
1	1018	269.746		p ma					1 1 11	11.5	3 -	\vdash
stert	0022	289.746			129	52	86	253	240	48	3.5	├
	0123	333.11		1.93		95	87	254	245		3.5	1
<u> </u>	0218	37-3.5/	0.72	193	128	96	88	255	264	20	3.5	
Avg.						JESSO HARRA			1	1		
Check'd	<u> </u>								l .	l		
001/00		1					an 1994 - Principal (1994)		200000000000000000000000000000000000000	**************	b.	
		161397				Velocity_	1000000000110-4-0000					
مرسفة دانا		# 988 75°C		-		a Million and a company of the control of	re					
FILTER	IT TELES					Liomijic (DSCFM)_	জন সভা সংক্রিক্টের				
AMBIE							200	7777 PgCLL1179875	Harry Stream	NG 48-48-38	į.	
AMBIEI PROBE	LENGTH	Le C				Isokinetie	(%)				€ -	

MODIFIED METHOD 5 FIELD DATA SHEET

Point Time reading 63 in H2O in H2O Temp. F inlet Outer Temp. Temp Impinger in Hg Extreme 10314 412.75 0.72 1.53 125 54 87 250 262 48 3			Plant Yates St	•								of <u>2</u>	
The control of the co	AMPLI OATE (NG LOCA 2-26-9 IMENSIO	TION START TIME START NS	<u>x</u>		TIME FII	RUN NO NISH ER 13)2	TEST DU	RATION LEAK RA	\TE	n	iin. fm
Point Time reading 13 in H2O in H2O Temp. F Inlet Outer Temp. Temp Impinger in Hg Exit Temp 0314 412.78 0.71 1.53 128 54 87 252 262 48 3 100 0331 425,356	TCF AR PR TATIC	ESS 2 PRESS	9.41 "Hg	H2O	NOZZLE	OPERAT	<u> 240</u> ог <i><u>ЈЕ</u></i>	inches H /Tm	FINAL L	EAK RAT	E	(:fm
TOP 0331 425,356 Avg 654,007 53702 186,7 12875 93047						Stack Temp. F	Inlet		Temp.				Cond. Exit Temp. F
Avg. — 654.007 (33762) 35LR 12855 93.047					1,53	128	\$ 4	87	252	262	48	3	
Avg 654.007 (\$37.02 364.8 128.85 93.047	<u>βρ</u>	0331	425,356										
Avg 654.007 (\$\$702 86LR 128.65 93.047													
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			654.007	133702	8618	128,95	12 . ÷.	93.047					
Contents of the content of the conte	Jheck'd						n hat §						
ONSOLE # Veboity ILTER # % Moisture	ILTER	#		.		Velocity_ % Moist	ıre .						
MBIENT TEMP. Flowrate (DSCFM) ROBE LENGTH Isokinetic (%) INER MATERIAL	ROBE	LENGTH				Isokinetic	(%)						

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STACK

	STACE				1 Rulk i		RADO	MOCKE MOCKE	FUDES	ام کر مار	
ocation_	Time Start	14.5.7	357	Time Fini	sh C)/a	14			908		_
				Diameter	sn <u> </u>						92
\$100\$ 2 <i>4</i>	DCMCE X	RA	Nozzle D	Diameter	40 inch		Final Lea	k Rate S	50.001		
		<u> </u>	NOZZIE D	.a. <u></u> _	inch	L3	rinai Cea	K 1/010	10 700 1		• •
		•		Operator	DIVE	BZ/JEH	4				
Clock	Dry gas meter	^ P	^ H	1		eter temp.	Hot box	Probe	Last	Vacuum	
Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
357	425.570	71	191	130	89	88	251	249	65	5.0	
			143	130	43				48		
			REma		75110E						
		,72	_						58	5.0	
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		. (2				, 0)	~>>	7.76	7.0		
						10.	2	24	100		
				I							
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		0.13	ł .			101	257	246	54	3.5	
				I	1	-			 		-
		0,77			101						
							Jak C		0.001		
			1.97	130	99	95	255	353	54	3,5	
147	761-24				103		257	253	52		
236	797.20	043	197	131			255	244	52		
330	837.04	6:73		132	98		254	254	53	3.5	
034	881.30	0:73	1.97	132	99	91	253	256	53	3,5	
132		0.73		/30	99	91	256	239	49	3.5	
132			- A *		visture						
					89		253	255	51	3,5	
								T			-
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	694,652	F isial	1940	/21		97.70					
		A CONTRACTOR OF THE PARTY OF TH	a reconstant for the	CONTRACTOR CONTRACTOR	a construction of	TO THE REAL PROPERTY.	 Section of the section /li>	· · · · · · · · · · · · · · · · · · ·	essanti e e e e e e e e e e e e e e e e e e e	1 96900990000000000000000000000000000000	
	Clock Time 357 417 30 34 615 615 72 72 72 72 73 715 70 70 70 70 70 70 70 70 70 70 70 70 70	29.53 "Hg -0.5i "H20 Clock Dry gas meter reading ft3 357 425.570 112 436.465 30 495.801 314 495.801 314 495.801 315 526.800 318 580.630 319 580.960 31 617.51 315 657.60 306 693.860 307 761.24 236 797.20 330 837.04 331 881.30 334 881.30 334 881.30 334 967.513 342 1012.34 440 55.04 535 95.52	29-33 "Hg -0.5i "H20 Clock Dry gas meter "P Time reading ft3 in H20 357 425.570 .71 H1Z 436.465 .72 30 495.801 .72 615 526.800 .73 28 580.630 .73 28 580.630 .73 28 580.630 .73 29 580.630 .73 29 580.630 .73 21 617-51 8.73 21 617-51 8.73 21 617-51 8.73 21 617-51 8.73 21 617-51 8.73 21 617-51 8.73 21 617-51 8.73 21 617-51 8.73 21 617-51 8.73 21 617-51 8.73 21 617-51 8.73 21 617-51 8.73 21 617-51 8.73 21 617-51 8.73 21 617-51 8.73 21 761-24 9.73 23 881-30 9.73 23 923.01 9.73 23 967.573 9.73 34 967.573 9.73 340 55.94 9.73 340 55.94 9.73	Clock Dry gas meter P P P P P P P P P P P P P P P P P P P	Clock Dry gas meter P	Clock Dry gas meter P	Clock Dry gas meter P	Clock Dry gas meter P	Clock Dry gas meter P	Clock Dry gas meter reading ft3 in H20 in H20 Temp. F Inlet Outlet Temp. Temp Impinger 1557 425.570. 74 191 130 89 88 251 247 65 412 436.465. 72 193 130 43 88 251 259 48 30 445.801 257 193 193 108 99 251 259 48 30 445.801 257 193 193 108 99 257 250 58 251 259 48 251 259 48 251 259 48 251 259 48 251 259 48 251 259 48 251 259 48 251 259 48 251 259 48 251 259 48 251 259 48 251 259 48 251 259 48 251 259 48 251 259 48 251 259 48 251 259 250 53 251 259 48 251 259 250 53 251 259 250 250 250 251 259 250 250 250 251 259 250 250 250 251 259 250 250 250 250 250 250 250 250 250 250	Clock Dry gas meter P

SOURCE SAMPLING FIELD DATA SHEET STACK Page of_ Plant Yates Station Boiler No. 1 Plant Name Bulk Particulate-Ex. Metals Run No. 1 Train Sampling Location Stack Time Finish 0725 (ahs/is) test Duration 1112 min. Date 6/24/93 Time Start 11:50 Diameter 13 ft Initial Leak Rate 0.000@ clim Duct Dimensions X DGMCF 0-994 Nozzle Dia. 0-24 inches PTCF + 84 Final Leak Rate o'vor cfm 844 Bar Press __ 29 - 33 ___ * Hg Static Press _ 70.5 Operator <u>EZ</u> K = 2.864 ^ H ^ P Dry gas meter temp. Clock Dry gas meter Stack Hot box Last Vacuum Travers Probe Point Time reading ft3 in H2O in H2O Inlet Outlet Temp Temp. F Temp. Impinger in. Hg 128 259 6.0 N-7/11:50 157.048 0.62 88 254 60 171.030 0.62 260 1.776 100 90 254 57 6.0 12.08 129 200.7220.62 1.78 52 6.0 12 47 129 106 96 254 260 130 218-635 0-62 1.78 260 56 1310 256 110 96 6.0 131 6.0 1351 249.835 0.62 121 108 257 255 63 283 944 0.62 129 6.0 116 256 1.78 በይ ZUR <u>6.5</u> 130 253 61 1515 1313.926 0.62 1.78 123 117 245 1575 321.817 STOP 130 112 246 57 60 1532 321.820 062 111 254 6.0 362.785 0.62 95 250 56 1625 756 100 6.0 1908 279 94 THE 60 1836 49 2129 2/3 1.78 51 93 2128 242 580,24 0,62 178 515 1216 7.5 2307 0.62 178 127 83 84 251 279 1.78 7.0 98 83 0007 658.05 0.62 128 256 175 94 0.62 84 254 249 *ጉነ*־ 0102 99 235 0.62 1.75 56 75 0.62 257 247 7.5 96 830,01 0,62 7.5 אמשמי

97 91 260 56 +xx sent 10529 1891.598 129 252 7.5 1.78 0.62 8,0 103 256 250 49 0629 937.854 0.62 1.78 129 92 8.0 256 48 0717 969.526 0.62 1.78 128 104 0725 K16-252 97.565 818-991 178740 1.78 129.00 Avg. Check'd Velocity % Moisture # 908 FILTER #

101

89

PROBE LENGTH 6'
LINER MATERIAL GLASS

AMBIENT TEMP.

0453

0524

868.46

1891.465

% Moisture
Flowrate (DSCFM)
Isokinetic (%)

256

*** seawed ing. cetch, leak their through pleasure 0.000@14"

REMARKS * ROMONE MONSING FROM THANKING

0.62

Que xt " " " " leak chech through imp: 0:00 2 @ 15" ailica get imp, replaced due to blow out of bettom. liquid level in 3ed imp

C-139

STACK

Sampling	Location_	S77	KK		Train _	Bulk	<u>Particula</u>	ite-Ex. M	<u> Ietals</u>	_ Run !	۷o. <u>ک</u>	
Date 6		Time Start 12	46		Time Fini	sh <u>033</u>		Test Dura	tion	<u> </u>		
Duct Din	nensions	x_			Diameter		<u> </u>) cor (C		
PTCF D	811	DGMCF 0-4		Nozzle Di	ia. <u>0-24</u>	inch	es	Final Lea	k Rate <u>C</u>	10010	<u>/4</u> ^cfm .	z.'
	19.41	" Hg 1.				社				.,	2-	70
Static Pro	:ss <u>~ 0.2</u>	120) 		Operator					<u> </u>	=2-8/2	$\not=$
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
E-I	1246	214.097	0.64	1.75	124	81	8	225	259	74	3.0	
	1365	225.225	0.64	1.75	124	89	82	252	248	50	3.0	
	13 22	237.899	0.64	1.75	124	94	85	254	250	52	3.0	
	1400	264,982	6-64	1.75	124	49	89	254	750	53	3.0	
	1430	285.726	0.64	1.75	124	101	92	250	262	52	3·0	
STOP	1528	326 - 305		Remon	WOTST	use F	con -	MAIN.				
5724	1531	326.890	0.64	1.75	124	100	91	251	260	53	3.0	
	1612	355-845	0.64	1.75	124	[0]	92	25¢	250	53	3.0	
	1G58	389,995	0.64	1.75	124	101	92	253	244	49	3,0	
Stop	1729	411.792		Stoppe	d to	Remo	e Mo	tstore				
Start	ט־זרן	411.792	0.64	1.75	126	87	88	348	252	73	2.0	
1	1902	464.37	864	1,7	126	96	87	254	253	46	20	
	1536	488135	0.64	1,75	127	95	87	25.3	242	42	2.0	
	2016	5110.39	0.64	1.75	627	96	87	253	248	41	ن. يـ	
stop	2114	556.829	ramou.	ed mo	isture		& check	00010		Hrough	g. Reas a	ريد
Skut	2118	556.935	I	1.75	125	86	83	Sa	255	53	2.0	·
	22/2	595,23	0.64	1.74	126	91	82	253	259	47	200	
	2305	632,71	0.64	1,75	127	52	84	253	253	46	2.0	
(Jund)	000+	760.90										
	0001	670.90	064	1.35	22	92.	84	257	252	48	2.0	
	0030	69125	064	1.75	127	89	88	252	257	47	2.0	
	0125	729.41	0164	1.75	126	86	79	253	256	70	2.0	
	0219	767,02	064	1.75	126	88	75	253	256	ルブ	2.0	
	0312	803:01)			124	87	79	253			20	
500	0731	815.698				_						

Avg.		600.91	8000	1.75	125.4		89.05					
Check'd					Marie (Saulie)							
		16136 A10	• 4 - • •			Wasser No. 100	i naudenii ee il	a - 22 222 september	1150 occope#f# fff	100000000000000000000000000000000000000	,	
FILTER		# 981	1394			Velocity_	•	e e e e e e e e e e e e e e e e e e e	<u>ाराज्यका मृत्</u> विक्रिक्तिकाराज्यक			
	″ ≀T TEMP.	P- 4 - /					DSCFM)				4	
	LENGTH						(%)					
	MATERIA						<u> </u>		* 8/307 (N TS		•	

STACK

Samplin	g Location	Stac	<u></u>		Train	_ Bulk	Particula	te-Radio	muclide	<u>s−</u> ' F	tun No.	3
Date 6	26 93	Time Start	1442		Time Fini	ish ac.	c //)	Test Dur	ation	ያ ያ ፖ	min	
		DGMCF 1.07						Initial Lea	k Rate <	6.000	2 /6m 11	<i>†</i>
PTCF (- 84	DGMCF 1.07	9	Nozzle D	ia. <u>0.7</u>	finct	ies	Final Lea	k Rate	0 001	€_ clm	1-0
Bar Pres	is 24-31	Hg				=2	1 11-					
Static Pr	ess	' 5 _ " H2C) 		Operator	EZ.	7 ME				K=2.	69
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
W-3	1442	943-115	6.58	1.560	125	85	84	254	253	65	4.0	
			0.58	1.560	126	95	87	252	256	49	4.0	
\$ W	1537	979 676	ZE	KOVE.	EXCE	5 MO	STORE	FRON	impi	TICTER	ر ک	
* ANT		929.676	0.58	1-540		91	86	257	256	55	3.5	
	1617	005.940	0.58	1.50	128	96	89	25/	254	50	3.5	
	1650	027.760	0.58	1.56	126	97	89	250	254	46	3.5	_
	1729	54.350	0.58	1.6	126	99	90	253	25-3	44	3.5	1
56p	1743	63 453		/	Pomor co	/_/	Moistur	e	ļ			<u> </u>
Start	1750	63.953	0.58	1.5	126	90	8-9	253	249	67	3.5	<u> </u>
<u> </u>	1823		0.58	1.6	128	100	91	255	239	47	3.5	<u> </u>
	1916	126.52	055	116	125	94	87	252	241	49	3,5	↓_
	2005		0.58		125	91	83	323	256	45	3.5	
Stop	2055	194,406		Remo	vel	moiste		ech ch	rck	0,003	@13"	↓
scut	3103	184.615	0.58	1.6	125	83	80	253	253	55	3.5	
	2146	334.01	0158	1.6	12/4	91	83	252	239	1	3.7	↓_
	2235		0.18	1.6	126	92	84	527	244	49	3.5	
	2329		0.5E	1.6	127	93	85		253	46	3,5	├
	0032		0.58	116	128	92	84	253	248		3.5	┼—
	6/3/	374.90		_	125	90	83		256	44	3,5	┼—
2/27	2232	416.035			nout	1	Leak		0.000	T		┼─
Stut	0241	416.215			126					55		╀
	0341	458.11	0.58	1.6	126	88	80	251	253	48	7.5	┼─
	0439	497.84	0.55		126	90	81	254	257	42	3.5	+
 	0533	535,24	0.58	1.6	126	89	82	252	541	43	3,5	+-
	0916	561.891				-	 	-		 -	-	+
												上
		//19 -2-2-2	20.797	1682	151 2		OnE02	Daggi, medici				
Avg. Check'd	 -	618.386	- 1913 <i>11</i>	1.37 3			90,583			7		
Check 0	<u> </u>	<i>t</i>	3-1000000000000000000000000000000000000	(त्राक्त्रावक्षः (त्रिः) स्त्रा		The second of the second	IR (JAC Design					2 20000
CONSO	LE#	2161394				Velocity_						
FILTER		F 92.4		-		% Moistu	ne					
	NT TEMP.	89°F					DSCFM)_					
PROBE	LENGTH .	- Glass				Isokinetic	(%)		- 48 M		Ž	

MOCIFIED METHOD & FIELD DATA SHEET

PLANT	NAME	Plant Yates St	ation Boiler	No. 1		 -				Page	_ of	_
SAMPL	ING LOCAT		TACK			RUN NO				14	+ _ OV	•
DATE (25-43	TIME START	X 114		DIAMET	NISH	₹	TEST DU	RATION LEAK RA	TE 40	. <u>O</u> .	iin. fm <i>(</i> 2/2
PTCF		DGMCF O	994	NOZZLE	DIA. D.	195	inches	FINAL L	EAK RAT	E 0.8		im 2 (2
STATIC	PRESS	-0.51	H2O		OPERAT	OR	SEH					
Traverse	Clock	Dry gas meter	^ P	^ H	ŧ	Dry gas me		Hot box	Probe	Last	Vacuum	Cond.
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit Temp. F
1					<u> </u>							
E-1	1147	481.490	-60	.70	128	80	79			68	1-0	
<u>- z</u>	1159	987,420	-61	.72	128	84	80			52	1.5	
=3	1211	943.200	.55	4ء.	128	89	83			55	1.5	
STOP	1223	770.70		-	170	00	6.1			7-7		
2-1	1233	193.73	-100	.30	128	86	84			67	1.5	-
	1247	1007.300	38	-72 -68	128	97	97			54	1-0	
5600	1311	1015 654	1 i=	4 10 1 1	OK	ر د	(0			<u>٦٠٦ ا</u>	1-0	
7-1	1318	1015710	-60	.71	17%	92	90			62	1.0	
-7	1330	1071.400	-61	72	125	47	92		-	56	~ ~	
-3	1342	1027 Z65	,55	-66	126	98	92			59	1.0	
200	1354	1032.900	LE	4x C	HECY							
3-	/358	1032-920	.56	.67	126	96	93	_		61	1.0	
-2	1410	1038510	.58	-70	125	100	94			56	1.0	
_3	1422	1044.300	-59	H	126	102	95			58	1.0	
5700	1434	1050,179				•						<u> </u>
	<u> </u>											
						-						
ļ					ļ					<u> </u>		<u> </u>
}		 			 					<u> </u>		}
	<u> </u>				 -				<u> </u>			 -
	<u> </u>						<u> </u>					
 		 			 							 -
-		 		<u></u>	 							
	 	 			 				 			
												<u> </u>
Avg.		68 563	7(6581	0.694	136.8	90	54					
Check'd	1											
		111 121 1			17. 24.155.151051.014.		218/28/1141/511 ·	. 1803808800	·			
CONSO	LE#	4161361	_		Velocity_	re <u>/</u> 4	<i>.</i>					
AMBIF	NT TEMP		-			(DSCFM)						
PROBE	LENGTH	6'				(%)	200					
	_	DIDEX			er a new market				•			
		' /										
REMAR			ـــ ، سر	_								
	AL	LTIMES	-OT					_				

MODIFIED METHOD 5 FIELD DATA SHEET

PLANT	NAME _	Plant Yates St	ation Boiler	No. 1						Page	_ of	_
SAMPLI	NG LOCA	TION 5	ACX			RUN NO	. •	2		. 41.4	,	
DATE	7-76-93	TIME START	X	<u> </u>	TIME FIN		443	TEST DU	RATION	144 TE (2)	<u> </u>	in.
PTCF	-84	DGMCF _99	<u>u^</u>	NOZZLE	DIA.	E.135	inches	FINAL L	EAK RAT	TE 0. C	52	im on
BAR PR	ESS <u>24</u>	DGMCF _99			OPERAT		JE	_				9
STATIC	PRESS	<u>-0.51</u>	H2O		OPERAT	∪k <u> </u>	-16-1					
Traverse	Clock	Dry gas meter	^ P	, H.		Dry gas me		Hot box	Probe Temp	Last	Vacuum	Cond.
Point	Time	reading ಗಿರ	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	remb	Impinger	in. Hg	Exit Temp. F
とし	1041	087.000	-61	.71	130	78	79			62	1-0	
7	105 5	6A2 475	ليرا	.74	130	83	81			59	10	
-3	1105	088 5%	156	.65	130	88	82	_		1-0	10	
460	1117	103 797	1	EAK	V 0						7.0	
1-1	1140	103.826	.62	.37	130	87	85			65	1.0	
-2	1152	109-805	64	74	130	91	86			30	1-0	
_3	1206	11/2 550	.57	66	130	45	88			54	10	-
5/00	1718	171 230	1 2	= Av	2						1-12	
	1300	171 800	5/	-65	130	44	91			43	1.0	
<u> </u>	13/Z	177 151	44	20	130	96	92			40	10	
- 5	1376	132 525	-57	101	120	10Z	95			(1)	10	
-5	1221	132 677) <u>, , , , , , , , , , , , , , , , , , ,</u>	4 ic 1 -	OK	702	7.			<i>EO</i> 1	7.0	
300	1036	122 016		721	130	96	95			15	10	
5-1	114-51	1/1/2 000	10	· 5		78	96			(2)	50	
	1/27	143.000	<i>-161</i>		130		97			95	5.0	
-2	1433	149.250	-D#	167	130	102	T.			ردی	5-0	
500	1773	154-063							 -			
									<u> </u>			
 									<u> </u>			<u> </u>
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ļ										<u> </u>		
<u></u>		<u> </u>				ļ	1				ļ	<u> </u>
Avg.			888. NO.		100	Approximate						
Check'd	_	64,971	748861	1892	1300		95.70					
CONSO	LE#_ <u>A(</u>	[a[3[a]			Velocity		0.64	CPS-1/18/18/88				
FILTER	" - -				900.0000000000000000000000000000000000		40		:			
AMBIE	NT TEMP	78°F	-		Flowrate	(DSCFM)			C	0		
		61				(%)		91	-,,,	•		
		DYDEX			- បាលកាត់កាត់កា				•			

MODIFIED METROD 5 FIELD DATA SHEET

			Plant Yates St		No. 1	<u></u>	оМб -				Page		2.4
SA	MPLI	NG LOCAT	TION START	TACK		TIME ED	RUN NO	-5	3 TEST DU	ID A TION	14	1/2 -	
					<u></u>	DIAMET	ER	13.0	INITIAL	LEAK RA	TE O.	20 7 0	fm 🕜
PT	CF	84 79	DGMCFHg	4	NOZZLE	ھے۔ نے	2455H	inches	FINAL L	EAK RAT	E_0.0	08	efm 🖷
ST	ATIC	PRESS	-0.51			OPERAT	OR	JEN	/				
Ta:	verse	Clock	Dry gas meter	^ P	×н	Stack	Dry gas m	eter temp	Hot box	Probe	Lasi	Vacuum	Cond
	Point	Time	reading 13	in H2O	in H2O	Temp. F	Iniet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit
							-	i					Temp.
E	-1	0800	154.230	.66	.75	130	73	7Z			68	10	
	-2	0817	160.180	-68	.77	130	77	73			65	1.0	1
	<u>-3</u>	0824	166-145	:60	168	130	<u> 8</u> Z	76			65	1-0	
		0838	172.622		HLV	OK							
<u> </u>	1-1	0901	172-655	<u>-65</u>	.74	130	84	82			68	1-0	_
<u> </u>	-2	ळ्य	178.530	-63	.74	130	91	85			5/	1.0	
<u> </u>	-3	0925	184-450	.58	.67	130	96	88			54	40	
	~ / 1	0937	190.040		ar_	OK	<i>(</i> 22	00			, 1		
	_	1011_	190.066		71	130	92	89			68	1.0	
-	<u>-</u> 콘	10Z3	195660	r(2 0	,69	/30	48	90 92			53	1.0	-
F	* +	1035	201380	<u> </u>	.60	130	18	14			22	1.0	
	© D	1047	26.670	, 7	750	190	94	92			68)	1 -1	
42		1114	206.700 212-680	167	.72		96	73			50	1-0	
	<u>-2</u>		218.500		.67	130 Bo	100	94			54 54	1.0	_
_	-3			.30	.01	20	100	7-1			37	1-0	
3	(P)	1130	23.70										
-	 †												
						-							
													•
	Avg.		69.589	78684	.7117_	130,0		875					
Ch	ieck'd	_											
		1				112000000000000000000000000000000000000	8************	018-8938330 (1888)**	3 44622300087				
CO	NSOL	.E# <u></u>	161361			-10 1000 000 000 000 000 00							
TIL AM	LIEK ABIFN	"	78°F	-									
PR	OBE I	LENGTH	6'			Flowrate Isokinetic	(%)						
LIN	NER N	ATERIAL	PYREF			The state of the s	er Kore e Francis						
			′ /										

Plant	Plant Yates	Station Boiler N	lo. 1	_	Comments				
		5 STACK				 			
un No	/					T ME.	C. X.		
ate 6	121/93				Operator	Junt 1	2JV		
Sorbing Reas	gents:	(CO2)	(02)_	(CO)	1				
Replicate Number	Original Volume Reading	(CO2) Reading 2 (ml)	(CO2) Volume (2-1) (ml)	(O2) Reading 3 (mi)	(O2) Volume (3-2) (ml)	(CO) Reading 4 (ml)	(CO) Volume (4-3) (ml)		
/	0.0	10.1	18-8	8.7	·				
2	0.0	10.2	19.0	8.8					
	_								
				<u> </u>					
Averaged Re	sults:			% O2 % N2					
Ory Molecul	ar Weight, M	W (dry) =							
		+0.32_ CO2) (%		0.28 CO + % N2)					
	=	+	+		Y-(096	ESP I		
			Rur	#Train	OFSaz	<u> </u>	ESP Out		
				nponent <u>b</u>			St		
					_ 0	1900 Sm	plr DJV		
				on site		_			
				*		al Wt	C-1		



	-		ORSAT I	DATA SHE	ET		
		tation Boiler N			Comments		
Location	STACK						
Run No	<u> ユ</u>						
Date	6-22-9	73			Operator	JEH	<u> </u>
Sorbing Reag	gents:	(CO2)	(02)_	(CO)			
Danka	O-i-i1	(CO2)	(CO2)	(02)	(00)	(CO)	(60)
Replicate	Original	(CO2)	(CO2)	(O2)	(O2)	(CO)	(CO) Volume
Number	Volume Reading	Reading 2 (ml)	Volume (2-1)	Reading 3	Volume	Reading 4 (ml)	(4-3)
	Veaning	(1111)	(2-1) (ml)	(101)	(3-2) (ml)	(1111)	(ml)
1	0.0	10.8	10.8	19.4	8.6		(1425)
	 			 			
<u> </u>	0-0	10.7	10.7	19-3	8.6		
	<u> </u>						
	<u> </u>						
					<u></u>		<u> </u>
	ļ						
	ļ						
	<u> </u>			1	<u> </u>	<u> </u>	
				% O2	6 /		
Averaged Re	sults:	% CO2i	<u>0,8</u>	% O2	8.6		
		% CO		% N2	80.6		
De Malacul	ar Weight, M	N (d=v) =				· -	
Dry Molecul	ar merkur, m.	•• (dry) —					
	=0.44	+0.32_	+0	0.28			
		02) (%0					
	=	_+	_+		Y-2	52	
			Run	#2 Train	Orste	er.c	ESP O
			Com	ponent be	cia .	7	6
				/ ^ -	73 Time	Smp	Ir DTV
				on Site	Analysis Co		
				Wt			

C-146



Plant	_Plant Yates S	Station Boiler N	Comments				
Location	stack_						····
Date <u>6/</u>	22/93			·····	Operator	TMP	
				(CO			
Sorbing Rea	gents:	(CO2)	(02)_	(CO))		
Replicate	Original	(CO2)	(CO2)	(O2)	(O2)	(CO)	(CO)
Number	Volume	Reading 2	Volume	Reading 3	Volume	Reading 4	Volume
	Reading	(ml)	(2-1)	(ml)	(3-2)	(ml)	(4-3)
			(ml)	,	(ml)		(ml)
/	0.0	10.2	10.2	18.6	8.4		
2	0.0	10.2	10.2	18.7	8.5		
						Ţ.	
				1			
							
				-			
						<u> </u>	
		<u> </u>					
	/	L				<u></u>	
					5		
Averaged Re	esults:	% CO2	10.2	% O2	<u> </u>	<u>) </u>	
					013	2	
		% CO		% N2_	B1.3)	
Dev Molecu	lar Weight, M	(W (dry) =					
Diy Molwa	iai weight, w	· · · (613) —					
	=0.44	+0.32	+(0.28			
	(%0	CO2) (%	02) (%	CO + % N2)			
	=	_+	+		Y-2	57	
			Run	# <u>3</u> Train	orsut		ESP Inlet ESP Outlet
			Con	nponent <u>b</u>	&		Stack
				6.22-9	_	Smr	olr DJV
				on site			
				- W		75 05	C-14

Plant	_Plant Yates !	Station Boiler N	Comments				
Location	LAB -	AUDIT S	AMPLE				
Run No. 🗾	4UDIT_						
Date <u>6/2</u>	23/93				Operator	TMP	_
·	·	/					
Sorbing Rea	gents:	(CO2)	(O2)_	(CC	D)		
D. Harri	T Odata	(000)	(600)	(00)	(00)	(30)	(60)
Replicate	Original	(CO2)	(CO2)	(O2)	(O2)	(CO)	(CO) Volume
Number	Volume	Reading 2	Volume	Reading 3	Volume	Reading 4	
	Reading	(ml)	(2-1)	(ml)	(3-2)	(ml)	(4-3)
	0,0		(ml)	0.	(ml)	1	(ml)
<u>/</u>	 	0.0	0.0	9.0	9.0	 	
2	0.0	0.0	0.0	9.0	9.0		·····
					<u> </u>		
			<u> </u>				
· · · · · · · · · · · · · · · · · · ·							
				 	<u> </u>	 	<u> </u>
				 		 	
Averaged R	esults:			% O2_			
		% CO		% N2_			
Dry Molecu	lar Weight, M	(W (dry) =					
	=0.44	+0.32	+	0.28			
			02) (%				
	= <u></u>	+	_+.		Y-19	7	LAB
			Run #	BTrain_	orsat		ESP Out
				_			St
				onent Cy			
			Date_	<u>6-23-93</u>	Time IL	150 Smpir	TMY_
			Lab _	on site A	Analysis <u>C</u>	20 0 C	
			Tare '	W+	Time!	W/+	

C-148

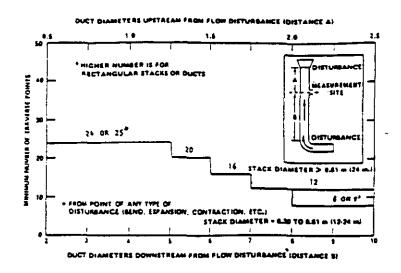
		Station Boiler N	Comments				
	•						<u></u>
		25-90			Operator	TMP	
		<u> </u>			Operator		
Sorbing Rea	gents:	(CO2)	(O2)_	(CC))		
Replicate Number	Original Volume Reading	(CO2) Reading 2 (ml)	(CO2) Volume (2-1) (ml)	(O2) Reading 3 (ml)	(O2) Volume (3-2) (ml)	(CO) Reading 4 (ml)	(CO) Volume (4-3) (ml)
1	0.0	11.0	11.0	18.8	7.8		
2	0.0	10.8	10.8	18.6	7.8		
		<u> </u>			<u> </u>	1	
Averaged Re	esults:			% O2_ % N2_	7,8		
Dry Molecu	lar Weight, M	(W (dry) =					
	=0.44	+0.32	+0	0.28			
	(%€	CO2) (%(02) (%(CO + % N2)	Y-319		
		_+	— ⁺ Run <u>∦·</u>	Train	orsat		ESP Inlet ESP Outlet
			Compon	ent bag			Stack
			Date 6	- 25-93	_Time_14(021
			Lab <u>ən</u>	<u>site</u>	Analysi	(0, 0;	<u></u>
			Tare W	Γ(g)	Final	Wt(g)	

Plant	Plant Yates S	Station Boiler N	io. 1		Comments		
	_						
Run No.	onase 2	run 2					
Pate	6/26/9:	run 2_3			Operator	TMP	
	•	~	_				
Replicate Number	Original Volume Reading	(CO2) Reading 2 (ml)	(CO2) Volume (2-1)	(O2) Reading 3 (ml)	(O2) Volume (3-2)	(CO) Reading 4 (ml)	(CO) Volume (4-3)
/	0.0	11.4	(ml)	18.8	(ml)		(四)
	0.0	11.4	11.4	18.8	7.4		
	<u> </u>	<u> </u>		<u> </u>			
Averaged Re	esults:		11.4	% O2 % N2	7.4		
ry Molecu	lar Weight, M	-					
	=0.44	±0.32	4.1	0.28			
		CO2) (%C					
	=	+	+		Y	-385	
			R	un # <u>2-2</u> Tra	in 085	AT	ESP ESP O
			C	omponent	CRSAT		
			D	ate 6 26]	93 Time	1400 Sm	
						nalysis 012	
			T	are WT(g)		Final Wt(g)_	

Plant	lant Plant Yates Station Boiler No. 1					Comments				
Location	STACK	 				· · · · · · · · · · · · · · · · · · ·				
Run No	1-3 6/27/	33			Omerator	TMP				
	0/21/	<u>/2</u>			Operator	<u> </u>				
Sorbing Rea	gents:	(CO2)			D)					
Replicate	Original	(CO2)	(CO2)	(O2)	(O2)	(CO)	(CO)			
Number	Volume	Reading 2	Volume	Reading 3	Volume	Reading 4	Volume			
	Reading	(ml)	(2-1)	(ml)	(3-2)	(ml)	(4-3)			
		ļ.———	(ml)		(mi)	 	(ml)			
/	0.0	11.6	11.6	19.0	74					
2	0.0	11.6	11.6	19.0	7.4					
						<u> </u>				
			1	\	 					
_										
Averaged R	esults:		11.6	% O2	7.4					
		ж со	<u> </u>							
Dry Molecu	lar Weight, M	(W (dry) =								
	=0.44	+0.32	+-1	0.28						
		(%02)			 -					
	=	+	+		Y	'-453				
	<u></u>	' 	Ru	ın # <u>2-3</u> Tra	in <i>o A</i>	LSAT	ESP Ini ESP Outle			
			Co	omponent	ORE A	· —	State			
						/300 Sm	plr DJV			
				bon Si			,			
				re WT(g)			100			
				- · · · · · · · · · · · · · · · · · · ·		T-1119T M.f(8)	C-151			

TRAVERSE FIELD DATA SHEET

Plant Name	Plant Yates Station Boiler No	1 Stack Diameter 13
Sampling Lo	cationStack_	Sample Port Diameter 4"
Date	06 - 18 - 93	Sample Port Depth 6"
Operator	OJV, JEH	Distance Upstream
		Distance downstream



raverse Point Number				Nun	aber Tro		Points	On A D	ATTRO NO	<u> </u>		
	2	4	- 6	<u>i</u> •	10	1 12	14	16	18	20	22	24
	<u> </u>			ì	İ							
	14.6	6.7	4.4	3.2	2.6	21	1.8	1.6	1.4	1.3	1.1	1,1
2	85.4	25.C	14.6	10.5	1 8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
<u> </u>		75.0	29.6	19.4	14.6	11.8	9.9	1.5	7.5	6.7	4.0	5.1
4		93.3	70.4	32.3	22.4	17.7	14.6	12.5	10.9	9.7	1 8.7	7.1
5	i		85.4	67.7	34.2	25.0	20.1	16.5	14.6	12.8	11.8	10.8
5	ì		95.6	1 80.6	65.6	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7	1		l	49.5	77.4	64.4	36.6	28.3	23.0	20.4	18.0	16.1
8	-			96.8	85.4	75.0	63.4	37.5	29.8	25.0	21.8	10.4
9	1				91.8	823	73.1	62.5	38.2	30.5	26.2	23.0
10	Ī		i		97.4	88.2	79.9	71.7	61.4	38.8	31.6	27.
*1	1	1				93.3	85.4	78.0	70.4	61.2	30.5	32.
'2	1			:	1	97.9	95.1	83.1	76.4	45.4	40.7	35.0
:3				ı	i		€.3	87.5	81.2	75.0	64.5	60.
14				:	1	}	95.2	91.5	85.4	70.6	73.8	67.
5	1				i .	į		95.1	88.1	83.6	78.2	72.1
.6	1			ī	1		:	94.4	92.5	47.1	142.0	77.0
• ?	1		1			:	,	1	95.6	90.3	85.4	80.
18	-		!			ı	1	1	94.6	93.3	144.4	83.
· g	,			:		j	Ī	j	!	96.1	1 91.3	84
20		:	,		i			<u> </u>		96.7	94,0	89.
21	1		1	l		ì	:			i	96.5	62
22	;	:						!	i	1	94.9	94.
73							1	<u>. </u>		1	1	96.
24	· · ·			1						,		50.

	Fraverse Points
No.	Distance From Wall
1.1	16,86+6"
2	6,86 + 6" 12,8 + 6" 46.2 + 6"
3	46.2 + 6"
4	
5	
6	
7	
8	
9	
10	į į
11	
12	
13	
14	
15	
16	1
17	
18	
19	
20	1
21	i
22	1
23	
24	

VELOCITY PROFILE FIELD DATA

	ne Location				Samole	Ident	Preli	miso eu	Elaw
ate <u>ec</u>	·18-93 (MMDDYY)	Time St	art <i>15</i>	<u>00(</u> НН	MM) Time	e Finish	150	(HHMI
New Die	ensions			•		4 or Dis	meter	/3	
TCF		0.84		_	% H,O _	 	-		
ar Press		29.3		" Hg	% CO _		_ % N	· 2 ———	
tatic Pre	ss	-0.5		_ ″ H₂O	% CO ₂ .	≈ 9.0	_ %⊦	l ₂	
perator	nitials	0.T.V, J	EH	— " Hg " H ₂ O	% O ₂ _	₹ 7.0	% C	H ₄	
<u>,</u>	s	itack Temp. *	F	Velo	city Pressure	• * H ₂ O		Other ()
Pt.	#1	#2	Ave.	#1	#2	Ave.	#1	#2	Ave.
E · I	122			0.70					
E-2	122	ļ		069				<u> </u>	
E-3	121			0.61		<u> </u>			<u> </u>
N-1	121			0.66		<u> </u>		 	-∤
N-2	122			0.71					
<u>v-3</u>	121			0.59		ļ		<u> </u>	
W-1	122	<u> </u>		0.68	<u> </u>	<u> </u>			
N-5	122	<u> </u>	 	0.64		<u> </u>			 -
w-3_	122		<u> </u>	0.49		 			- -
5-1	12.1			0.64					
<u>5-2</u>	122	 	 	0.67		 		 	
<u> 5-3</u>	121		 	0.58			<u> </u>		 -
		 				-	<u> </u>		
				<u> </u>		 	ļ	 	
		 	 	 		 -		+	+
	<u> </u>	 	<u> </u>	 		 	 	 	+
	 	 	-	 	_	 	 		
eather									
emarks	Po	int 1 e	11 the	way	in.				····

VOST FIELD DATA SHEET

PLANT Plant Yates Station Boiler No. 1	ASSUMED MOISTURE %	7.5
DATE 06-21-93	METER BOX NO.	A167043
SAMPLING LOCATION ESPINIET	METER FACTOR	0.9910
RUN NO. 1 TEST NO. 1	PROBE HEATER SETTING	7° a85
OPERATOR RJい	COMMENTS SAMP	Sample o a O.S.L. DER M.A
AMBIENT TEMPERATURE 80°F		201 Samoles
BAROMETRIC PRESSURE 29.51		
BLANK TUBE NUMBERS T: 145.28 P T/C: 145.28 6		

F		T.			_						_		_	i		-			
Pump Vacuu	Outlet Temp. Outlet Temp.	2 0	S C	Š	8		3.0	3.0	30	3.0		0. p	0.7	ە د ه	4.0				
2nd Condensor	Outlet Temp.	59	59	35	28		PS.	S B	65	Sa		25	3	\$2.	53				
1st Condensor	Outlet Temp.	\$\$	53	25	٤5		\$5	54	5.5	Sb		\$\$	SS	55	Se				
Probe	Temp	052	242	952	952		652	192	264	592		592	397	192	± \$2				
DGM	Temp	44	34	8	28		28	88	83	SS		85	88	8s	81				
Stack	Temp	306	309	307	510		310	318	520	3.9		300	301	Sos	308				
Meter	Pressure	1.4	1.5	* '+	1.4		ナー	→ ' l	1.4	1.4		1.5	75	7.0	1.4				
Gas Meter	Reading	03,000	11.85	16.90	52,13	21.235	28 000	33,12	54,89	43.14	48.150	50.000	54.84	24.42	12:50	70.115			
Clock	Time	1400	1410	0241	1430	077	1455	5051	5151	5251	1535	1550	1600	0/91	1620	1630			
Sampling	(min)	0	٥	٥2	50	STOP	0	0,	02	50	STOP	0	07	82	30	STEP	0		
Tube N	(Lab)	1	HSULON	1/0	145408		1	145434	1/C	145436		⊥	15548	1/C	HSFLE		T	 1/C	
ik ("Hg)	Post					"વાજ0					D. 20 (7"					0 वाड "			
Leak Check ("Hg)	Pre	"F1 @ 0					51000					0,0 lg"							
Test	Number	(STDA, R				>	SIGO DELLA				-	300 DA 12 0,00 18"				7			

VOST FIELD DATA SHEET

PLANT Plant Yates Station Boiler No. 1	ASSUMED MOISTURE %
DATE 06-22-93	METER BOX NO.
SAMPLING LOCATION ESPIALET	METER FACTOR
RUN NO. 2 TEST NO. 1	PROBE HEATER SETTING
OPERATOR ZJW)	COMMENTS
AMBIENT TEMPERATURE 80 0 F	4
BAROMETRIC PRESSURE 29 ↔	
BLANK TUBE NUMBERS T: 14519 A T/C: 14519 B	

@ O.S.L PER MIN

Samples

20 5

750°F

A 164043 4.0

0.9910

Test	Leak Check ("Hg)	k ("Hg)	Tube N	Sampling	Clock	Gas Meter	Meter	Stack	DGM	Probe	1st Condensor	1st Candensor 2nd Condensor	Pump Vacanum
Number	Pre	Post	(Lab)	(min)	Time	Reading	Pressure	Temp	Temp	Temp	Outlet Terno	Outlet Terms	Pressue
1 STPALE	02011"		⊢	0	2440	71.000	7	166	13	75.1	-		
			145104	ા	7510	15.93	ナー	592	* *	258	9	2) a
			1/0	02	7080	80.84	+ ~	7.40	76	759	3 6	2.3	2) =
			14SloB	30	2180	86.07	ナー	742	8	852	ŝ	- N) c
۲.		"ऽ। ७०		Trop	7780	91.045)			2
240 Pail	ZuoPaie Dalle		L	0	0910	92.000	-	2+2	8t	777	۶,5	a V	C.V
			145,34	0	0260	46.96	y .	282	79	260	00	200	5.5
				92	0930	10 0 .80	<u>ئ</u> -	276	80	260	45	58	c's
			145136	30	0460	106.89	1.4	243	83	292	54	- &	5.0
ر ۔		,जा ७०		500	0950	112.030							
300 AIA 02	"SI GO		<u> </u>	0	1001	115.000	э —	295	ळॅ	797	58	63	o, z
,			4215H	g	1011	41.811	1.4	205	96	292	53	-2	5.0
			1/2	20	1201	123.14	1.4	300	85	72	\$\$	59	5.0
			म्हाम	33	1031	12.8.21	1.4	301	98	292	£5	15	0.2
}		0.00		300	1041	133.050							
			F	0									
										† -			
			1/0										

VOST FIELD DATA SHEET

ASSUMED MOISTURE % + 0	METER BOX NO. // 16 70 43	METER FACTOR 0.9970	PROBE HEATER SETTING ZS0°F	COMMENTS SAMPLED & D.S L PER MIN	201 Samples	-
lo. 1		ESP INLET	TEST NO. 1	RIM	75°E	65.62
Plant Yates Station Boiler No.					AMBIENT TEMPERATURE	BAROMETRIC PRESSURE

Test	Leak Check ("Hg)	k ('Ha)	Tube N	Sampling	Clock	Gas Meter	Meter	Stack	DGW	Probe	1st Condensor	2nd Condensor	1st Condensor 2nd Condensor Fump Vacuum
Number	e d	Post	(Lab)	(min)	Time	Reading	Pressure	Temp	Temp	Temp	Outlet Temp.	Outlet Temp.	-dwer
STOBIO	ISTORIA DO IK"		-	0	24 40	156.000	1.5	297	Tree.	292	9	6/	50
			4Spi	01	7510	161.07	1.5	500	241 48 241 48	192	99	9	5.0
			T/C	92	7080	166.12	7.1	+62	48	263	/9	29	5.0
			USD 10	30	2180	140.88	-	309	80	266	51	99	5.0
۲.		1001c"		Jals	2280	176.040							
2 NON Z	"Si Ci Ci		F	0	0840	177.000	ት ነ	305	83	952	60	19	5.0
			450KA	01	0880	80'28	ナー	311	Ö	797	51	49	53
			1/C			86.48	١. ب	307	8%	£ \$2	29	20	5.0
			\$25.5±	\	0160	75.061	1.4	314	87	052	29	19	۷,۵
-;		"SI @0		dais	0250	193.075							
200 0. 0	10.00	3333	┝	0	74 60	193 500	ナー	315	88	197	દ્વ	57	d'o
	2		K45374	9	2700	th.202	<u>خ</u> ر	415	88	24.5	<u>-</u>	29	۵,۵
			2/1	}		86, 101	4.1	975	96	152	60	79	۲,0
			14532	1	2001	46.212	+1	\$18	ō	153	09	79	ďρ
)ର ଜ୍ୟ		STOP	7101	211.58		3					
CONTRACTOR CONTRACTOR		000000000000000000000000000000000000000	►	0									
												:	
			1/C										

(ENTEREC)

	FLANT	NAME	Plant Yates St	ation Boiler	r No. 1						Page	of	_ .	
	SAMDII	NG LQCAT	TION ES	Pinlet	4		RUN NO	. Sor	ni wake	5% C	Lanic	S Age	kl.	
	DATE	10/21/97	TIME START		33	TIME FI	NISH/	875	TEST DU	JRATION	- 240) ~ {	fin.	
	DUCT I	THENEIGN	10 8.5	X 5	5.7 NO.771 E	DIAMET			INITIAL	LEAK RA	TE <u>0.0</u> ,	2015°c	fm 446	
	PTCF BAR PR	FSS 2	DGMCF O	1-07	NOZZLE	DIA. <u>().</u>	35 0	inches	FINAL L	EAR RA	عبو ع	15011	****)	
	STATIC	PRESS	-6.4	H2O		OPERAT	OR	سال						
		SHO	1.422											
	Traverse	Clock	Dry gas meter	^ p	^ Н	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	Cond.	i
	Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit	1
		12551				217	٠					4	Temp. F	KFZ
	El-1		07/1/75	0 04	1	283	, 73	77		235	1	29	39	
		1259	075475		1.03	48 3		72			5/			11.47
	2	HZ 1300		0.09	P	298	74	23		237	48	397	39	11.2
N	5	1305	80.9	0.06	0.68	297	16	27		240	47	4	39	
2.54	- 4	1310	83.1	0.03	0.34	254	75	76		245	49	4	39	<u> </u>
`	5	13/5	84.6	0 05	0.56	293	75	76		250	52	4	40	
	0	/320	86,2	0.00	0.34	299	80	רר	_	247	51	4	40	l
	5top	1325	88,020	5	od lea	Kched		6"/4						Á
							X=76					-2-	1/2	ح نا
	F3-1	1336	XX88.065	0,02_	0.22	295	80	78		230	60	2	40	/t.3 [·]
		1341	89.7	0.02	0,22	308	80	78		236	.59	2,	40	4
	3	1346	910	004	045	307	80	78		232	5%	4	40	4
2.46	- [1351	92.8	0.08	0.91	308	81	79		240	52	4	41	
•	5	1356	95,3	0,10	1.15	307	83	80	_	248	49	4	41	•
	7	131401	78.0	0,10	1,15	306	85	81	-	257	50	4	42	1
	5/00	1406	101.046	Goo	pel lea	K Che	cka	6"1	16					•
	,						x= 80							ĺ
	E4-1	1415	101.119	0.02	0.23	250	85	82		245	60	2	42	•
	2	1420	102.7	0.04	0.45	308	85	82		2-(3	57	2	4/3	1
J	3	1425	104.3	0.06	0.68	308	85	83	_	257	55	2	43	
5.924	4	1430	106.3	010	1.11	310,	85	82		250	52	5	42	11.12
יכ	5	14/35	107.4	0 18	2.0	308	88	85	!	243	53	7	43	1
	ط	1440	1/3.8	837	2.4	309	90	48	-	244	55	8	44	i
	5/00	1445	117,043		1 /	check		14			77	-		1
		7773	171,0-13	13000	1004 6	MEC !	¥=83	1						
	Ela	14-0	112.03	0.02	0,23	318	45	84		370	62	3	14	10.8
	_ <u>Z</u>	1958	117.278	3003				841	_	230		 	4	1
	3	10/50	118.8	206		323	86		-	235	60	5	45	ł
	5	145 608	120.4	2100	0.65	,	85	84	-1			 3	 7 2	1
	\ <u>\</u>	1573			me	* 1	bitch	Sh	LET	JW		 	 	1
	367	1518	er al issue l'estat d'	iles ibee	tiletii.	000	1, 7, 25	ušik už veed	Nosas nā.					•
	AVE.					299		(88) 33 345						1
	Check'd		rungr sagga stallt	I makan k	j 5 ja misal bear	<u>Englishmil</u>	1-2-1-2002			5-436		1	1	3
	CONTO	. 				1 0000 00 W 10 00 		. gygnn (1921-1938) . gygnn (1921-1938)	Should Harrin Aurost G. 1961 Abril 800 800	į.				
	CONSO	# <u>Inst</u>	Ic	_		79,40,65,45,170,303		200000000000000000000000000000000000000	4.60.000	<u>.</u>				
	AMRIEN	〃 <u> </u>	an of	_		 188 USANOTA 20 	ire (DSCPM)	5.5 1100		-				
	PRORE	I FNGTH	&£+			and the fallence of the control of the	(%)	Of Grand and Control for the Con-	a a ration before decident	ë B				
	LINER	MATERIA!	90°F 8ft guarte	5/45		-SURINGE	(1.77) (1.21)	<u></u>	2000 - 1765 <u>2</u>	ğ.				
			7	J'-"										

REMARKS

PLANT	NAME	Plant Yates St	ation Boilei	r No. I						Page		
SAMPLI	NG ZOÇA		ilet	NOZZLE		RUN NO	. <u>Seriu</u>	sichle	Onza	nic Ph	use (Run
DATE _	0/2019	TIME START			TIME FI	MSH		TEST D	JRAPION	==-	n	ın.
DUCT D	MENSION	۱ <u>۶</u>	_		DIAMET	ER		INITIAL	LEAK RA	\TE	c	fm
PICF		DGMCF		NOZZLE	DIA		inches	FINAL L	EAK KA	E		cím
STATIC	PRESS	DGMCF Hg	H2O		OPERAT							
J171110												
Traverse	Clock	Dry gas meter	Ϋ́P	'nН	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	Cond
Point	Time	reading fl3	in H2O	iл H 2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit
	i	ļ	ļ	ļ	,				(Temp.
						7-						- /
F6-1	1458	117,278	0.02	0.23	3/8	85	84		230	6Z	3	4/4
2	1503	1184	0.03	0.73	323	16	84		235	60		4/4
3	1508	1204	0.06	0.65	320_	85	84		241	58	5	4:
4	1513		0.1	1.1	320	82	84		258	5%	6	41
_5	1518	125.4	0.16	1.7	2321	88	84		244	57	7	48
6	1523	129,5	0.2	2.2	330	90	86		240	59	7	50
5/20	1528	132.626				C 01						
						2-86			1			
W2-(1541	132.753	0.02	0.7	278	87	86		230	-51	3	44
2	1546	134,1	0.04		300	% 7	85		255	570	4	4
3	1551	135.6	0.05	0.56	243	87	85	_	240	53	٠.	4/3
ار.	1556	137.7			302	88	86	=	245	54	-3 -	4/2
			0.03			87	86	 = 	247		5	 /- -
	1601	139,5	0.06	6.67	300				 	54		42
	1606	142,0	0.17	1.5	305	51	47	 	246	57	8	177
Stop	1611	145.331	 -	 	<u> </u>	x=87	 -	l	 			 -
	1618	145.552	0.02	6.7-	298	90	89		230	59	3	44
W4-1 2		40	 		299	90	88		254		5	70
- 4-	1623	11815	004				 		1	5		45
7	1628	148.5	0.07	0,78	298	90	88		253	54	5	73
7 7	/633	150.5	0,12	1,3	}	91	88		255	52	7	
	1637	154,2	0.15	1.7	286	53	87	<u> </u>	254	52	5	4/3
(6	1643	157,7	0.16	1.4	282	95	90	l 	232	52	5	46
5/07	1648	160,865						ļ <u>.</u>				
		-				Y=90					<u> </u>	<u> </u>
			ļ		ļ							
			500000000000000000000000000000000000000				6.6		4 8000000000000000000000000000000000000			
Avg.					303	88	17					
Check'd									1			
CONSOI	F#				Velenie				ë ë			
					12 1 1000 1000 1000			1 39 0 9 10 10 10 10 10 10 10 10 10 10 10 10 10				
AMBIFN	T TEMP		-						Ž K			
PRORF	LENGTH				Isokimetir	15						
						- 3.75 January	<u> </u>		<u>.</u>			
LINER N	MATERIAL											

FLANT	NAME	Plant Yates St	ation Boiler	No. 1		·····	.a			Page	_ of	- ,
SAMPLI	NG FOCK	TION /A/LE TIME START NS DGMCF Hg	7			RUN NO	<u> جو ک</u>	oluth	00	nc Pha	use 1 K	uu (
DATE I	6/2//9.	TIME START			DIAMET	ER		TEST DU	JKA TIUN LEAK RA	TE		ius. fm
PTCF		DGMCF	_ ``	NOZZLE	DIA.		inches	FINAL L	EAK RAT	Έ		cím
BAR PRI STATIC	PRESS	Нд	H2O		OPERAT	OR						
Traverse	Clock	Dry gas meter	^ P	^H	Stack	Dry gas m	ter temp.	Hot box	Probe	Last	Vacuum	Cond.
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Injet	Outlet	Тетр.	Temp	Impinger	in. Hg	Exit Temp. F
Wbi	1658	161.014	0,01	0,11	265	90	89		225	61	2	46
2	1703	162.0	0.02	0.22		90	90	_	253	61	4	47
3	1708			0, 22	280	90	89	_	242	60	4	48
4	1713	16500	0,03		241	90	89	_	225	60	4	57
5	1718	-	0.05		271	5 l	85	_	238	60	5-	5/
4	1723	168.3		0.57	273	91	90		249	60	5	52
5/24	1728	170.421										
W4-1	1745	171.000	0.06	0.69	273	89	89		227	64	5-	56
2	1750	1730	0 03	,	2.227		87	_	237	40	4	52
3	1255	12412	0.02	0.23	279	90	89		26	58	4	47
4	1800	1761		0,23		90	89		253	58	c/	46
3	1805	177.4	0.02			90	89	_	244		4	45
5	1810	-	2.04		282	91	90		244	56	5	45
5:00	1815	180,685	<u> </u>	- 1 (-		, -			27.7			
				-						1		
		103.779 V	0	23965	4		67.44 V					
Avg.		103/17) DY	0:11	212.	- 65≥	354					
Check'd	-								1	I		1
CONSO					Velocity_					41-	U057	co//4
			_ - -		% Moiso	000000000000000000000000000000000000000				E8-	Alde	hyde
					Flowrate	(DSCFM)				F7-	Alde PSD C	allert
					Isokinetic	(%)					, -, -	,
LINER N	MATERIAI	L									به ، ک	_

PLANT	NAME	Plant Yates St	ation Boiler	r No. 1						Page_/	_ of <u>_3</u>	1
			PINLET	_		RUN NO	2	<	1/26.68	c Pha		
DATE /	ING LOCA	TIME START	0774		TIME FIL	NISH 13	41					
DUCT I	IMENSION	vs 8'6"	X	ベ・デフ'	DIAMET	ER N	<u></u>	INITIAL.	LEAK RA	TE	2106	fm/5 /
PTCF BAR PR	6.84 ESS <u>2</u> 9	DGMCF O	1999	NOZZLE	DIA. <u>Ø,</u>	<u> </u>	inches	FINAL L	EAK KA	E	2186	cim /2
STATIC	PRESS	الم. الم	H2O		OPERAT	<u>کہ</u> OR	20m					
Traverse	Clock	Dry gas meter	~ Р	^н	Stack	Dry gas me	eter temp.	Hot box	Probe	Last	Vacuum	Cond.
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit
İ			!					ı				Temp. I
W8-1	729	187,155	0.07	0.77	270	72	7/		233	56	3	57
2	734	187.3	0.06	0.66	202	73	72	_	253	54	حار	53
3	739	191.3	0.03	0.33	274	72	72		251	57	4	56
1	724	193.0	0.02	0.22		75	73		2:17	56	3	53
5	7 49	194.30	0 03	0.33	271		73					35
	754		0,04	0.44	269	76			750	57 57	5	
6		195.9			269	77	74		220	3/	6	54
Siop	754	197.450	Good	/ Rinal	kull (·	}	 -
					2797	WM TO	<u> </u>		224			le.
6b-1	825	198.107	(0,0)	0,34	23-1	רד	75		279	58	2	18
2	830	199.9	001	0.45	232	רכ	75		255	_53	3	1
3	835	201.6	0.06	0.68	279	78	76		248	51	4	40
4	840	207,8	0.07	0.79	280	81	77	_	243	49	4	46
5	845	206,3	OH	0.68	275	82	78		243	49	4	47
6	850	208.6	0,10	1.1		85	80			49	5	47
544	855	211.382	Good	Final 1	eat de	ck						
		_	Groos	Zuit	int le	ctole						
w4-7	930	211,568	0.03	0.34	276	80	50	_	222	53	3	46
2	935	2B.3	005	6,53	29300	81	80		252	55	3	47
3	940	215,3	0,07	ררים	294	82	80	-	245	53	5	45
3	945	20.7	0,12	1.3	251	83	80		250	54	5	48
5	950	220,7	0,15	1,7	293	85	81	-	244	51	6	1/8
1-	955	224.3	0.17			88	82		253	53	7	50
5/10	1000	227,878	0.17 Cost	look 1	Fock							
779	1	22,,-1	2700			·						
	 		 	 	 	-						
ļ			 	 	 						 	<u> </u>
<u> </u>	 		 	 					 			
		 	 	 	 	 			 -	 	-	
	 		 		 	 	<u> </u>		-	-	 	
Avg.						s de die fine						
Check'd		British San Taylor S. S. Capper	1	<u> </u>	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	and the second	and standard and	■ 1 (20) (20) (20) (20) (20)		Becommending		4 (2000 2000 TOO)
Check'd		1 101 -			Velocity							
	LE# Al	<u>61365</u>										
	LE# <u>#1</u>	61365	_		 - Curvious de code de code de code de code 							
	LE# <u>#</u> #_ nt TEMP.	61365 800 F	- 1 t		% Moiste	ire (DSCFM)			•			
	LE# <u>A</u> I .# NT TEMP. LENGTH_	61363 800 th 900 th	<u>-</u> rt 		% Moiste Flowrate	ire						

		Plant Yates St	_	r No. 1	<u> </u>		_	. (i) A		Page 2	= ° 3	,
	ING LOCA	mon_7~	0+			RUN NO	0. <u>50mico</u> l	atole C	Reules	phase	, i pac	
DATE	DIMENSION	TIME START	_x		TIME FIL	VISH —		TEST DU	TRATION	TE	n	nin. Im
PTCF	JIMICHSIOI	VS DGMCF* Hg	_^	NOZZLE	DIA.		inches	FINAL L	EAK RAT	E		cím
			' H2O				_					
STATIC	PRESS		H2O		OPERAT	OK	Jum					
Traverse	Clock	Dry gas meter	^ P	^ H	Stack	Deces	neter temp.	Hot box	Probe	Last	Vacuum	Cond.
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit
		_			-			·				Temp. F
		00000			-6.5				- (5			
42-1	1003	227,968		0.33	292	87	84	_	247	60	3	50
1		229.7	0.04	0,44		88	84	_	247	60	3	57
	1013	231.6	0.05	0.55	302	47	84		250	54	4	47
Ч	1018	237.6	0.09	0,99	303	88	84		252	52	5	47
		236.4	0.12	1.3	319	50	85		253	50	6	46
6		239.6	0.16	1.8	319	91	86		245	50	7	76
34p	1033	243.148		T		شر دا						ļ
	1		500	d In	hal 1	eate	hech					
	- 2mm		ļ.,	ļ			ļ					
F212	1049	243.311	0.04	0,44	325	87	86		229	57	4	45
27	1054	245.6	0.05	0.55	328	87	86		249	58	5	44
3 4	1059	247,5	0,08	0,87	330	87	86		248	55	5	
45	1104	250,2	0,12	1,3	337	89	86		254	52	フ	44
56	1109	253.2	0.18	٥, ر	341	91	87		257	52	8	4/3
Stor	1114	257.3	0,21	2,2	336	93	88			ل ا	0	45
5 foe	1119	261.159	Good	France	/rat	chek	<u> </u>					
												<u></u>
E5-1	1126	261.347	0.02	0.21	3/3	91	85		228	61	3	5>
2	1136	262,8	0.03	0.32	924	91	89		256	60	4	49
3	1126	244,3	0.67	0.75	323	92	85		250	58		49
4	41.11	266.7	0,/3		327	93	90		250	53	5/	-10
5	1146	269.8	0.19		330	91	90		250	55	(0	49
6	1651	273,8	0,20		324	96	91		242		11	50
1	1156	277.405	I	 								
		71.303										
				1								
						 						
	 		 				1		 			<u> </u>
Avg.	 				Nganga	igher wu	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Principal (900400	(Chr. 100 (C)		
Check'd				60,800 d. 10	7000		1 0/8					
Circle d	<u>.</u>	r. w. data and a state of	1 11 11 11 11 11 11 11 11 11 11 11 11 1	I			<u> </u>	1	I	uma i gyenski).		
CONSO	LE#				Velocity	147 Colle						
FILTER					% Moisu	ire .						
					Flowrate	(DSCFM	j y (1), 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,		5			
					isok in e tic	(%)						
		<i></i>						· ·				
REMAR	RKS											

SAMPLII	NG LOCAT	MON_LIA	let	NOZZLE		RUN NO	. <u>Sem</u>	iwati	le the	se (Ku	りて	
DATE _		TIME START			TIME FIR	MISH		TEST DU	JRATION	<u> </u>	m	in.
DUCT D	IMENSION	IS	_ X	NO77LE	DIAMET	EK	inahaa	INITIAL	LEAK KA	TE	c	tm :tm
PICF	22:	Ho		NUZZLE	DIA		uncnes	FINAL L	EAN RAI	E		ım
STATIC	PRESS	TIME START IS DGMCF Hg	H2O		OPERAT	or S	SW ~					
								<u> </u>				
Traverse	Clock	Dry gas meter	^ p	^ н	Stack	Dry gas m	eler temp.	Hot box	Probe	Last	Vacuum	Con
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit
l l								·	·		اِ	Temp.
		10 5 / Do 5										
W3-1	1227	278.979				88	88	223	223	64	3	32
2	1232	280.4	6.02	0.21	313	<u> 77</u>	87		239	64	<u>a</u>	<u> 56</u>
3	1237	281,7	0.65	0.54	34	87	87		250	60	5	<u>5)</u>
4	1242	283,8	0.07	0.75		90	88		250	58	6	4
5	1247	286.3	0.10	1.1	316	91	88	_	235	56	7	46
6	1252	289.0	0.14	1.5	315	93	89		243	56	9	4
5100	1257	29236	600	1 Fin	1 lead	chec	K	Good	17:47	.		
U1-1	1314	Z92.700	0.00	0.96	311	91	84		225	57	7	4
2	13.16	_	008	0.46	312	91	87		242	57	フ	49
3_	1321	298.01	0.04	0.43	3//	Ÿ/	89	_	248	57	5	50
4	1326	299, Y	0.04	0.43	309	91	89		2-19	61	5	5
3	1331	301.7	0.04	0.47	305	51	89	-	252	62	5	79
6	1336	30 3,5	0.04	0,43	3/15		89	_	2-17	64	5-	5
56	1341	305,411	Fi	1/10	Eche		0.01	(Q I				
		07 100							79			
 †		- 240	0.4	Leck	aher	2 20	un					
			8 - W C	1041	<u> </u>							
										<u> </u>		
				<u>'</u>					-	 		
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			Jop			ســـــــــــــــــــــــــــــــــــــ		<u> </u>				
Avg.		115,043	0.24513	0.85125	303.52	* 5*	74					
Check'd		1/TB		1/18								
1		115,043 V 18		0.95125 V18	303.52	8	74					
CONSCI	E #				17292 02							
					34 TO 100	ire			4 5 5			
					A 300 300 300 300 40		odelen i oden di i o		•			
					400000000000000000000000000000000000000			10.00				
		·			INDENDERIN	170			į.			
EHIER N	''Y I EKIYL	·										
REMARI	V C											

FILTER AMBIEN PROBE	NT TEMP. LENGTH		<u> </u>		Velocity % Moiste Flowrate Isokinetic	(DSCPM) (%)						
Avg. Check'd	-	પદાવા										
											_	
Stor	४५७	360,062										
5	837	755,4	0.17	1,9 2.4	311	93	84	-	250	71	7	49 57
4	432	348.5	0,12	1.32	313	88	83	_	248	70	6	20
3	827	346.1	0.06	0.66	304	85	81	-	249	69	د/	51
2	822	44.3	0.05	0,55	305	84	80		258	69	3.5	54
E5-1	817	342.769	0.03	0,33	300	84	80		226	69	3	58
Stop	0810	342.495										
6	0405	337. 2	0.16	1.75	292	86	79		257	69	7	50
5	0400	376.0	0.11	1.2	296	83	70		255	68	5-	49
-4	0755	333.4	0.0%	0.57	297	42	77		252	68	4.5	51
-3	0750	331.4	6,05	0.55	297	80	76		247	7 0	40	55
-2	0745	329.9	0.03	0.22	298	79	75		241	65	3.0	58
51 <u>00</u> E3 -1	0740	328,35	Beach		Check	78	~+4		240	62	2,0	56
	0732 0737	328.105	0.00	0.65	287	78	73		244	<i>5</i> 2	4.0	42
5^	0727	323,8	0.06	0.63	292	76	72		242	423		44
	0722	321.8	0.05	0.54	293	75	2/_	-	258	53	3_	44
3	0717	319.5	0.07	0.76	293	74	70		250	52	4	4/3
2	0712	317.0	0.08	0,87	290	71	69	-	256	57	4	42
E1-1	0707	34.121	0.1	1.1	290	69	68		230	51	3,5	40
Traverse Point	Clock Time	Dry gas meter reading ft3	P in H2O	^ H in H2O	Stack Temp. F	Dry gas m Inlet	Outlet	Hot box Temp.	Probe Temp	Last Impinger	Vacuum in. Hg	Cond. Exit Temp. F
STATIC	PRESS	-6.0	H2O		OPERAT		Jwm		.			
PTCF	0.84 FSS 7.	DGMCF Hg	799	NOZZLE	DIA. 👝	358	inches	FINAL L	EAK RAT	E_O	0146	eim 1147
DUCT C	MENSION	TIME START	<u>X</u>		TIME FIN	ER	250	INITIAL	JRATION LEAK RA	TE	2006	min.
SAMPLI	NG LOGA	TION IN			TO AC CO	RUN NO		Phase		.n3 ,	21 a	•
			ation Boiler	<u> </u>			\sim	Δì	, A		_ of <u>3</u>	_

PLANT	NAME	Plant Yates St	ation Boiler							Page 2	_ of <u>_3</u>	-
DATE		TION IN			TIME FI	RUN NO	. <u>Sen</u>	TEST DI	Mase T TRATION LEAK RA	-Run	<u> </u>	in.
DUCT I	MENSION	VSTHg	_ x	NOZZLE	DIAMET	ER	inghas	INITIAL	LEAK RA	TE	с	lm - (
D + D D D	ESS	"Hg		NOZZLE	DIA		niches	rinal L	LAK KA I	<u> </u>		:lm
STATIC	PRESS		' H2O		OPERAT	<u>ت _</u> OR	eu~					
Traverse	Clock	Dry gas meter	^P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Lası	Vacuum	Cond.
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit
										j	-	Temp. F
<u></u>	11	74- 17-	0.02	2 22	-	-	87		> - -			
E) !	851	360.172-			316	91	87		227	458	543	54
	\$52	361.8	0.03	0.33	320	92	88		257	<u>5</u>	3	52
3	4901	363.7	0.05	0.53	326	92	88		247	56	٠, ٧	53
4	906	365.8	0.09	1.0	327	92	हुन	_	252	53	5	57
5	911	368 5	0.15	1.7	332	94	89	-	24/254	52	7	48
7	9/6	372.1	0.21	2, 3	330	56	91		246	52	9.5	50
	921	376.091	Grac		- Clar	KM	u!					
> 			Guo	11118	Ch		2670					
W-2-1	946	376.420		0.33	218	90	89	_	219	65	3	57
<i>W-J-1</i> 2					-							
		77×.2	0.03	0.33	300	51	85	<u> </u>	258	60	3.5	52
	958	379.9	0.04	0.44	304	91	89	-	250	59	7	53
7	1001	381.8	0.07	0.78	307	51	37		248	58	5	_53_
5	1006	384.2	8112	1.3	297	93	90		248	_52_	7	54
6	1011	387.4	0.15	1.7_	307	96	91		250	57	8	55
5/20	1016	390.767	Goz	of Fire	· Tloa		ich					
						<u> </u>						
W4-1	1022	390,980	002	0.22	290	94	92		216	67	3	59
>	1027	392,5	0.02	0.22	298		93		242	64	3	53-
<u> </u>						95		 	-			
	1032	3 73.8	0.05	0.73		55	93		245	58	5-	53
¥	<i>[037</i>	396.0	0.1	Le (307	96_	93		242	52/		49
		398.8				97	93		244	<u>52</u>	8	49
6	1047	402,0	0.14	1.6	299	99	94		245	52	8.5	49
Stop	1052	405.540	Gare	1 6'~	1 120	k Che	ck					
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Avg.		44.426										
Check'd												
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FILTER					- 35 (6000) (6000)	All the second second second second		CONTRACTOR AND ADDRESS OF THE PARTY OF THE P				
AMBIEN	NT TEMP.				Flowrate	(DSCFM)						
					Isokinetic	(%)						
LINER	MATERIAL	<i>,</i>										
DEMAD	vc											•

DI ANIT	MAME	Diant Vates St	etion Boile	- No. 1						Page 3	of 1	?
		Plant Yates St	0 + - S	eniula	6/0		Pho	so / 1	Qual	7	_ 01	-
SAMPL DATE	ING LOCA	TION	ي اع		LINIT LI	NISH		1556 129	IKALIUN		rr	nin.
DUCT	IMENSIO	TIME START NS DGMCF Hg	_ x		DIAMET	ER		INITIAL	LEAK RA	TE	c	fm .
PICF BAR PR	ESS	DGMCF Hg		NOZZLE				FINAL L	EAK KA	TE		cina
STATIC	PRESS		' H2O		OPERAT	OR _ <i></i>	wm					
Traverse	Clock	Dry gas meter	^ P	H			eter temp.	Hot box	Probe	Last	Vacuum	Cond.
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	Exit Temp. F
			-	}						ļ '		reup. r
U6 (1111	405.659	0.01	0.11	249	94	93		215	69	3	56
2	1116	406.8	1	0,22	302	93	93	-	234	65	3	53
3	1121	408.2	0.03	0.34	299	94	93		247	62	4	53
4	1126	4094	0.03	0.34	289	94	93	~	248	60	4	53
5	1130	411.6	0.04	0.45	291	95	94	_	248	60	5-	54
6	1136			0.78	281	97	95		218	60	ی	53
2/00	1141	416,100			(l	
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458 1	1220	416.178	0.04	0.45	289	91	90	~	226	63	4	55
Z		4187		0.34	290	91	71		244	61	4	53
3	1230	420,4			281	92	91		247	62	4	574
4	1235	421.8	6.01	0,11	7	93	91		745	65	2.5	57
5	- 1	423.0		0.44	293	94	9/	_	247	65	4	52
6	1245	424.7		0.33	291	95	73	_	245	62	4	54
Ston	1250	426,397					1				,	
121212	1		leak c	hock	0.0	140	1104	·				
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Avg.	 		78/	2100	300.5		/TR					
Check'd		(Head)	Ind. Ch.	F AST A ST	ودري د ا	1	V ID	rtu Synd iik	A Section (Section)	.		<u></u>
CONSO	LE#				Velocity) }			
					% Moisu	110		4.77.58.88	8 5 6			
					Flowrate	(DSCFM) jakanjarija		.			
					lsokineti	: (%)	gi Sirki		n Ž			
	_											
REMAR	UKS .											

AMDIT	NG LOCA	TION ESP	INIP	T		RUN NO	. <i>E</i>	, RI-	x /	Sea. : 1.3.	_ of	
AMPLI ATE (120/43	TIME START	11300	<u> </u>	TIME FI	NISH	· <u></u>	TEST DI	RATION		<u>''</u> "	in.
UCT D	MENSIO	NS 8,5	_ X <i>4</i>	3 ? NO321 E	DIAMET	ER	:	INITIAL	LEAK RA	TE	c	fm
AR PRI	ESS 7	Hg "Hg		NUZZLE	DIA	-	niches	FINAL L	EAR RAI	L		1111
TATIC	PRESS	TION ESP TIME START NS 8,5 DGMCF 156 Hg	H2O		OPERAT	OR _J	<u>س</u>					
									<u> </u>			
raverse Point	Clock Time	Dry gas meter reading ft3	^ P in H2O	^ H in H2O	Stack Temp. F	Dry gas m	eter temp. Outlet	Hotbox Temp.	Probe Temp	Last Impinger	Vacuum in. Hg	Cond. Exit
ronn	111120	1020113		un 1320	Tunp. 1	unc t	Odnet	remp.				Temp. F
		061.325										
		064.965										
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Avg.	_					2000 V						
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CONSOL	LE# A	61393	_									
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Page ____ of ___

Plant l	Name	Plant	Yates St	tation Bo	iler No.	1							
Samplin	g Location	INLET	•		Train		— Aldehyde	×	Rui	ı No.	<i> </i> .		•
Dato	-7/.93	Time Start	3//	· · · · · · · · ·	Time Fin	ish / 3 4	15	Test Dur	ation 3	<u>ح</u> ج	min.		1
Duct Di	mensions	8/1/x	451		Diameter		ft	Initial Le	ak Rate 🕖	00801	5 40		
PTCF _	.84	DGMCF /	009	Nozzle D	ia. <u> 2 ;</u>	75 incl	hes	Final Lea	k Rate 0	1007 a	elm		
Bar Pres	ss <u> </u>	?_5/_ " Hg								10	4		
Static Pr	ress	Plant INLET Time Start X DGMCF S Hg Hg H20)		Operator	MLO	7	_					
Travers	Clock	Dry gas meter	^ P	^H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum		1.
Point	Time	reading ft3	in H2O	in H2O	Temp. F		Outlet	_	Temp	Impinger	1	3.86	'
N/A	1214	58273X											
777	12/5	50//13	1/	41	3/4	77	77	11/4	75-1	17	4.0	e (i)	
	VZ 2 0	COX 94	1/	47	3/4	10	17/	/ ////	0115	13	40	7.87	
	1225	100 (1)	1/		5/	10	46	 	200	00	20	3,8,0	
	1226	CO 2 2	10	.38	3/5	13	70	 	7-	64	110	3.71	· C
	1230	9/1/4	0/()	138	3/0	BZ	137		4.5/	63	4,0	3.74	_
	17111	50201	<i>a/Q</i>		3/4	84	21		20	67	3,5	3.76	
ļ	1215	572.81	-//0	.38	3/4	09	_		4	Ce/	410	3.76	
	Y 24)	594.5 <i>[5</i>	.70	, 35	2/7	85	2/	<u> </u>	677	0/	4.0	3.16	
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	<u> </u>	17 701						 	ļ.——				
	<u> </u>	12.281					ļ		<u> </u>	ļ			ŀ
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			VSP						1				
Avg.	_	12.29(0.323	A 10	315	21	19		252				
Check'd		7	1	1			1/7	100000000000000000000000000000000000000					
S	<u> </u>	Control of the second s				183 64 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6				•	6 6556		8
CONSO	LE #	80°F				Velocity_	100 gan as kin 2000 fi 160 Paris sa 1600 sa						
FILTER	* Na			-			re						
AMBIE	NT TEMP.	_00°F_					(DSCFM)_						
PROBE	LENGTH		<u>.</u>			Isokinetic	(%)				* *		
LINER	MATERIAI	glass											
		J											
REMAR	CKS										_		

Page ____ of ____

Plant !	Name	Plant	Yates St	ation Bo	iler No.	1				_	_	
Samplin	z Location	ESP INL	et .		Train	A	Aldehyde	s	Rur	1 No. 🚄	- _	
Date 6	<i>-Z2-</i> 93	Time Start X	0735	·	Time Fini	ish 080		Test Dura	ition	30	 min.	
Duct Di	nensions_	8'6" X_	45	<u>57</u> '	Diameter	-21	<u>5</u> n	Initial Lea	ık Rate 🛭	0.008	Acim 5	W .
PTCF _	84	DGMCF _(, _/, _/, _/, _/, _/, _/, _/, _/, _/, _/	09	Nozzle D	ia	inch	es	Final Lea	k Rate <u>C</u>	006	cfm	
										at 1	o //	
Static Pr	ess <u> </u>	<i>_4</i>)		Operator	MKO					Part	€-9
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point		reading ft3			Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	K:3.
4/10	1776	1003,780						NIA				
<i>PV /#</i> _	0746		111	.53	300	78	16	N / 1	2.66	67	4,0	
	- 740	604.12	1/2	1,6	3//	1207	75	 	7/0	55	4.0	
	077	1006,10	13	4/01	3//	25	2/		700			
<u> </u>	0/50	608 17		4 /		-0	76	 	470	76	400	· · ·
 	0.7>2	6/0.60	13	.49	3//	78.	76	 -	652	57	4.0	
<u></u>	0860	617 30	1/5	.49	3//	78	76	 	713	158	4.0	
ļ	0300	614375	0//	.41	3/1	79	76		249	78	40	
								<u> </u>				
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Avg.		10.395	0.352	n 102	311	76:						
Check'd		7	11	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1	anca T						
CONSO FILTER AMBIEI PROBE	LE# A # NT TEMP. LENGTH	16/402 - 74 - 10' - 9/015				Velocity_ % Moistur Flowrate (Isokinetic	ne DSCFM)_			ටය් වියද වියද වියද වියද වියද වියද වියද වියද		
REMAR	eks			·		· · · · · · · · · · · · · · · · · · ·					-	

Page ____ of ___

Plant N	Name	Plant	Yates St	ation Bo	iler No.	1			_	1		
Sampling	Location	Time Start	(017)		Train _	<i>P</i>	ldehyde	<u>s</u>	_ Rur	1 No. <u>3</u>		
Date '2'	-2343	Time Start	112	- ,	Time Fini	ish <u>// 75</u>	6	Test Dura	tion	50	min.	1/
Duct Din	nensions_	<u> </u>	100 01	<u>57</u> ′	Diameter		ft	Initial Lea	ak Rate <u>/</u>	1009	Conferm 2	-
PTCF _	184	DGMCF	7 ~	Nozzle D	ia. <u>" </u>	inch	cs	Final Lea	k Rate <u>U</u>	,00/0	ofm cfm	
Bar Press	s <u>27.3</u>	7 Hg			0	ML				/ (5 '	
Static Pro	-88 <u>- (</u> -	<i></i> " H2C	,		Operator	<u>"40</u>						
Travers	Clock	Dry gas meter	^ P	^н	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	6
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	K-38
11/0	1720	627,675	Ø					11/#				
7//	0125	624.42	//	41	3//	76	15	 -<i>1</i> /// 	262	62	315	
	0730	626.16	. / ()	30	310	76	75		156	55	25	
	0735	12201	# / · ·	38	3/6	76	75		150	2	2.5	
	200	1000	1/0	30	317	177	76	 	7/0	30	7 5	
	0745	19116	00	38	318	83	79		261	17	7 -	
	075	1720	10	138	3/3		(4)	 	1.6/	63	3.5	
	0750	0>/10	9/0	120	7/7	24	80	<u> </u>	1005	60	7	
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Avg.		10.275	0.3132	0.37	314	1777						
Check'd		A DAN										
CONSOI FILTER AMBIEN PROBE	LE#_A # NT TEMP. LENGTH_ MATERIAL	16/402 72°F 10'		•		% Moistan Flowrate (E DSCFM)_					
REMAR		,		·	· · ·		<u> </u>		· · · · · · · · · · · · · · · · · · ·		-	

Plant Name Plant Yates Station Boiler No. 1 Sampling Location FSP INLET Train Aldehydes Run No. FB

Date 6/21/93 Time Start 1306 Time Finish Test Duration min.

Duct Dimensions X Diameter ft Initial Leak Rate cfm PTCF DGMCF Nozzle Dia. inches Final Leak Rate cfm Bar Press 24.58 "Hg Static Press ___ -6. \(\sqrt{} \) " H2O Operator __ Twm Travers | Clock | Dry gas meter | ^ P ^ H Stack Dry gas meter temp. Hot box Probe Last Vacuum Point Time reading ft3 in H2O in H2O Temp. F Inlet Outlet Temp. Temp Impinger in Hg 319,212 1306 319.440 Avg. Check'd Velocity CONSOLE # ____ % Mousture____ FILTER # _____ Flowrate (DSCFM) AMBIENT TEMP. PROBE LENGTH _____ Isokinetic (%)____ LINER MATERIAL REMARKS

REMARKS

Sampling	Location	Plant			Train	F	PSD	_	Run N	io		*
Date (/	Time Start	i555,		Time Fin	inh 1741		Tast Daw	tion i	loc -	min.	2
Duct Dim	ensione	X / X	465	7 07/	Diameter		ft	Initial Lea	ak Rate 🛭	.00E	<u>((</u>	
PTCF _	84_	DGMCF 96	80	Nozzle D	ia. 🏒 🕏	inch	cs	Final Lea	k Rate	.	cfm	
		<u></u>			. 7	.15 n16.	$\overline{}$				Part	67
Static Pre	ss	* H2C)		Operator	MK				/	17	E - 1
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	K= 30
N/A	ICET	10002	7									
~//	(201)	11/2 1/3	167	.27	3/5	90	79	11/1	262	-61	3,0	
_	1605	99 32	407	7-1	3/1	2	77	77.1			2.0	
	16.10	613 29	.07	77	3/3	(C)	10		2 - /	57	310	
	<u>610</u>	(1411	61	11	219	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ 	79		27/4	50	300	
 	122	11/16	. 17	100	2/2	\$/	80		15-1	58	2.5	1
	11-1	4610	101	11/	211	92	80	 	200	1 0		-
	675	61157	e () /	27	3/6		20	 	2/1	60	2.9	
	630	67.04	101	127	13/8	82	25		<u> </u>	57	3,0	
	1635	670.62	6-1	17	3/8	58	00	ļ	255	5/	3.0	
	1640	621.8	.07	21	320	87	83	ļ <u>.</u>	257	57	3.0	
	1645	623.33	01	127	322	88	84		255	58	3.0	
/	650	624.15	107	.27	321	80	84		234	58	3.0	
	1655	626.25	101	,21	3/9	89	85		248	59	310	
	700	627,75	10%	,21	220	89	86		Z50	59	3.1	
7	705	629 14	.07	.71	3/9	89	86		241	6/	310	
	716	63057	.07	127	310	90	86		145	9	3.0	
	17, 6	13724	07	17	219	90	26		709	60	3/	
	1700	633,75	10-1		219	90	26		251	61	3.5	
1	125	634,93	.07	127	219	98	86		251	62	33	1
	1750	2	,07	27	20	91	97		251	11	3.0	
		03651			3/8	4	(i) -		750			
	1777	638.00	101	,27	39	7/	0-7	 		0/	3-0	
	140	639,650	207	27	321)	7/	9/	 	75/	6 <u>Z</u>	150/	
					<u> </u>	<u>'</u>	<u> </u>				 	ļ
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					1				ļ			
Avg.		30.730	,265		318	84.8						
Check'd		V		3.5 (****	1							
	ſ.	11 0		hanga da da da da gara								
CONSOL	.E# <u>-</u>	16/397 ble #131	7			Velocity_						
FILTER	This	ble # 131	4	,		% Moistu	P	10. <u>F</u>			S Š	
AMBIEN	T TEMP.	_77				Flowrate (DSCFM)_	246	,52/		¥ 8	
PROBE I	ENGTH	10'				Isokinetic	(%)	104			Í	
LINER N	(ATERIA)	L G/AS5										

Single point sample collection From port ES E7 Jum

Page ___ of ____

	Vame	Plant	Yates Su	ation Bo	<u>oiler No.</u>	1						
Sampling	Location	INLE-	<u> </u>		Train	F	SD		Run N	io. <u>2</u>		
Date 6	-22-93	Time Start	925		Time Fini	sh	15	Test Dura		40		
Duct Dir.	Densions	8.6" X	57 '		Diameter			Initial Lea	ak Rate_c	0.068	of circle	11
rfef Z	400	Time Start	980	Nozzle D	ia. <u>,27</u>	5_inch	CS .	Final Lea	k Rate	NA	cîm	
Bar Pres	s <u>29.</u>	4 <u>0 </u> " Hg										40
Static Pr	ess6	. 4 " H20)		Operator	MEO					E.	- \$ 8
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	<i>j.</i>
Point	Time	reading ft3	in H2O	in H2O	Temp. F		Outlet	Temp.	Temp	Impinger	in. Hg	K=39
1116	0025	652.063		=								
VIII	016	100000		2/	219	82	80	1./4	1 < 3	102	35	
	0745	658.90	.08	<u> </u>	3/7	02	CD .	10//	01/2	05	2.7	
 -	1205	064,40	108	<u>-\$/</u>	3/9/	90	00	 	1242	<u>کیک</u>	2.5	
	1075	670,33	100	<u> </u>	37/	27	80_		253	63	3,5	
	1045	676 de 0	100	.3/_	320	26	23	 	242	60	3.5	
	1605	68784	108	-3/	22/	70	25	<u> </u>	246	60	3.2	
	1/25	68823	06	13/	3/1	96	P.6	<u> </u>	941	61	3.>	<u> </u>
	145	695525	OR	31	321	9/	38		250	62	3.5	L
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						\	<u> </u>		<u> </u>			
Avg.		43.462	0.2812		320	85						
Check'd					V							
		0 11	7					Microscope Control		001000000000000000000000000000000000000		
CONSO	LE #	76°F	<u>/</u>			Velocity_						
FILTER	#					- 5 90000 0000 0000 0000 0000 0000 0000			10000000000000000000000000000000000000	996 060000000000 00000 000		
AMBIE	NT TEMP.	76 4				~v.0000010000000000000000000000000000000	894 896 NG NG 1178		0000000000000000000000	######################################		
PROBE	LENGTH					Isokinctic	(%)					
LINER I	MATERIA	10								•		
	_	•										
REMAR	KZS											

C-176 Single point sample collection From port E-8

Page ____ of ____

Plant N	Name	Piant	Yates St	ation Bo	iler No <u>.</u>	1							
Sampling	Location	3Time Start X			Train	F	PSD		Run N	io. 3			
Date 6	-23-9	3Time Start 6	935		Time Fini	sh // 3	30	Test Dura	ıtion	115	min.		
Duct Din	nensions	$\frac{2}{x}$	455	7' 03"	Diameter		ft	Initial Lea	ak Rate _	0,016	cim a	115	
PTCF	.84	DGMCF _ 7	88.O	Nozzie Di	ia27	<u>'</u> inch	es	Final Len	k Rate		cfm	, -	
Bar Pres	s 29	,36 " Hg											
Static Pro	ess — C	6 H20)		Operator	med							
Travers	Clock		,	^ H	Stack	Dry gas m	eter temp	Hot box	Probe	Last	Vacuum		
Point	Time	reading ft3	in H2O	F I	Temp. F		Outlet	Temp.					
k)	Tune	TOZOBIG ILD	B1 1120		Temp. 1	milet	- Cunct	remp.	Temp	mpuiger	11g		_
NIX	0935	702-172										KZ	2
	0955	708.40	108	13/	3/1	90	87	NA	295	68	3.0		
	1015	7/4.5/	6.98	.3/	3/7	93	39	1	256	57	3/2		1
	1035	7-20,7/	009	_3/	317	94	20		250	57	3.0		
	1055	72693	.09	3/	3/9	99	94		249	60	3,0		
	1100.	733,22	00	31	38	99	95		241	61	3,0		
	1170	739.50	09	3/	3/5	99	95		24%	61	30		
112	45	2612 875	18	21	319	100	95	†	7 45		3.0		'
1/2.2		C. Classic	00	-4	/-/	7.07	77	†	(-1)	6/	1		i
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Avg.		40.653	0195	al	319	94							1
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Check'd	<u> </u>			₽ 1555 \$ 158 \$ 15	Mikratik (1995)	rawatiik y 10 10	grane (pari), 1 %.	1	1		1	•	1
CONSO	LE#	416139	ラフ			Velocity							
CII TED	4					1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		0000000000000000000000000					
AMBIEN	NT TEMP	78		•			DSCFM)						
PROBE	LENGTH	10'				- 1-1-10-100000000000000000000000000000	(%)			STINDEROCKIDATION CONTRACT			
LINER	MATERIA	10' L 644	> 55			resident More.	vasta <u>ili.i i</u>				-		
													
REMAR	RKS												

Page 1 of 2

		lame				iler No.	1					101	2
	Sampling	Location_	ESPI	Wet		Train _	Partic	culate / M	letals	_ Rui	n No. 🖊	[f/ks	26
	Date 6/	25/93	Time Start	0800		Time Fini							
	Duct Din	nensions	3 'C" X	45 5	التحا	Diameter		ft	Initial Lea	k Rate 🗸	2,017	cim €	(2),8/1
	PTCF _	0.84	DGMCF	00	NOZZLE	DIA. <u>D.</u>	357 i	nches	Final Leal	k Rate	0,014	cfm 🕢	24 1/1
			53 Hg O										
	Static Pre	:ss <u>5</u>	* H20)		Operator	Swi	<u> </u>	-				
	Travers	Clock	Dry gas meter	, b	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
	Point	Time	reading ft3	in H2O	in H2O		Inlet	Outlet	Temp.	Temp	Impinger		
	W8-1	0800	46,205	0.06	611	277	74	73	237	226	49	7	
	2	805	4486	0.04	0.66		77	72	70 7	24%	43		
1037	7	810	450,5	0.03	0.33	284	74	73	_	247	43	4.5	
ر آن			\$ 42.0				77	73		246	45	3	
	5	815	4530	0.02	0.22		75	73		227	48	3	
	6	820	454,6	0.06	0.66						46		
		825					76	73		252	160	 -	
	500	830	456,576			check	-		 		./6	4	
	461	836	456 677				7)	75		225	49	4	
1	2	841	458.6	0.03		275	75_	76		253	50		
200	3	846	461.2	0.04			_75	77		246		5	
2.508	4	45 P		0.07	0.77	284	82	75	مد	232,	47	7.5	
	 -	856	464.5	0,06			84	79		2:44	48	2	
	6	701	4 66 6	6,09	0.58		86	81		249	48	9	
	5/00	906	469.185			chec						 	
	-	922-	469.800	0.03	0.33	250	83_	82		22/	54	5	
ارخا	<u> </u>	927	471.6	0,04	0.44		83	81		235	53	5	
ر مر ^و طا		932	473.4	0.07	0.77	306	83	82_		244	49	7.5	
()	4	937	4760	0.01	1.1	292	85	82	<u> </u>	248	49	11	
		942	478.7	0.15	43-	292	88	83		243	49	18]
	6	947	482.2	0.15	1.7	285	90	84	<u> </u>	242	83	19	
	SEE	952	485.871	<u> </u>									
	WZ-1		486,100	i .	0,37	291	83	82		272	54	5	
a	ک	1025	488.3		0.44		83	72		256	52	5	
ر م	3	1030	439.8		0.53		84	83		2-13	50	6	
3	4	1835	492.0		0.88		86	84	_	247	49	9	
	َد	1040	494,2	0,14		299	88	89		2/6	48	17	
	6	1045	497.6	2.41	1.55	3∞	90	85		243	57	77	
	5700	1050	501,030										
	Avg.		111.213	7403	7/25	301		84					
	Check'd		111.				286 à 1718 S						
	<u> </u>											***************************************	
	CONSO	LE#	61363 52				Velocity_					1	
							S Moistui	e francisco e como					
							144 a 2019/9844, 2046/066	DSCFM)_	987975050607000000000000	000000000000000000000000000000000000000			
		_					lsokinetic	(%)				<i>;</i> 2	
	LINER N	MATERIAL											
	051440	ve	Good (of tat is	lonk	- choc	ik						
	REMAR	<i>v</i> 2	- Ciuc	, · · · · ·	, ται	-76,						-	

Page _2_of _2

	icocation_	Plant Lalet Time Start			Train _	Partic	ulate / N	1etals_	Rur	1 No/		45C
		Time Start			Time Fini	sh		Test Dura	ition		min.	
Duct Din	nensions	x_			Diameter		<u></u> ft	Initial Lea	ak Rate _		cfm	
		DGMCF		NOZZLE	DIA.)	nches	Final Lea	k Rate		cfm	
Bar Press	·	Нд	_		_							
Static Pre	:S\$	H2C)		Operator	_JW	Mr.	_	<u> </u>			
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas me	ter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
E2-1	1058	501.500	0.03	0.33	316,	88	86		<i>2</i> 23	മ	5	 -
2		503.2	004	0.44	324	87	86	-	253	53	6	
3	1108	505.0		0.66	327	88	85	_	250	53	8	
	///3	50 7.3	40/	n (. 1	332	88	86	_	24		13	
25 5	1118	5/0.2	0.15	1.6	336	9/	87	_	2-17	53	22	
- 6	1123		0.18		336	93	88	-	247	52	22	,
Stap	1128	516.925	Le	K Clec	× 0,0	0/10	231/16	- Che	nred	Silie	u Ge	INP
	•			·	1	ilica A				170		
E5-1	1211	5-18,040		_		82	82	-	223	1 "	5	-
	1216		0.04		_	82	82		249	54	6.5	
	1221	521.6			315	83	82	_	248	52	9.0	
4 4			0.11	1,2	315	85	83	-	245	51	14.0	
	1231	527.0	0.16	1,75	316	48	84	_	253	53	22	
1	1236	530,4	0.22		315	90	83-	_	2-16		22	
Stoe	1241	534,089	Good				4					
E3-1		534,268				87	85	_	236	62	5	
7	121300			0.22	305	86	85	_	224	58	~	
7	1305	C323	0.04	0.4	3//	86	85		241	51	7	
7	1310	5,37,2	0.07				85	_	253	49	10	
5	/315	541.6	0.1.		3//	89	86	_	243	48	15	
6	/320	544.4	8:16		308	92	87	_	249	49	22	
Stop	/325	547.172	Jein	Jene						'		
1	1335	548.300	0.09	1.0	306	90	87		209	49	17	
2	1340	-		0.76	307	90	87		243	49	12	
3	1345	553.2	0.05	054	307	90	87	_	242		9	
7	/350	533, 3	0,03	0.33	305	90	88		252		っ	
5	/355	557.0	0.03	0.33	304	91	88)	253	57	7	
6	4731400		0.04	0.44	284	91	88	_	246	53	9	
	1705	SWEY										
AVE					20. 10. 10.11	tuderki kar istori	58.08 (2.52.39)		a Charles and a	2 - 1000 100 100 100 100 100 100 100 100	800000000000000000000000000000000000000	

REMARKS

Could not pul the proper rate through the Silica gel impinger.
The impinger mass was determined and then the silica gel C-179
Impinier was re-charged with fresh silica gel.

Page ____of _____

	Plant N	lame	Plant	Yates St	ation Bo	iler No.	1					10	, –
	Sampling	Location_	Inlet			Train _	Partie	culate / N	fetals	Rur	1 No. 2	_//n	25e C
	Date 6	126/93	Time Start(<u> </u>		Time Fini	<i>رون </i> sh	//	Test Dura	لخت tion	<u> 40</u>	min.	
	Duct Din	nensions	X_			Diameter		ft	Initial Lea	k Rate _	<u>0:00</u>	6 cſm €	23"
			DGMCF O	<u> 199</u>	NOZZLE	DIA. 💋	<u>, 358</u> i	nches	Final Leal	k Rate	0.01	z cím 🥃	52414
	Bar Press	29	56 Hg										•
	Static Pro	:ss <u> </u>	2. ≤8 " H20)		Operator	_JWI	Λ	_		DHO	=/.	822
	Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temn	Hot box	Probe	Last	Vacuum	والتسابط
	Point	Time	reading ft3	in H2O		1		Outlet	Temp.	Temp	Impinger		Ector
	<u> </u>												
	E1-/	935	579.944	0.1	1.1	289	72	72	-	222		10	10.8
18	2	940	582.9	008		294	73	72		262	45	8	
239	3_			0.05	0.55	253	75	72		244	49	4	
1	4	950	587.5	0.03	0.33	295	76	73	_	246	<i>5</i> 3	_5_	
	5	9 53~	387.2	0.03	0.33	296	לל	74		257	54	5	105
	6_	1000	570.9	0.03	0.33	287	78	75	~	244	53	5	
	Stor	1005	392,536	Boo	d leak	cleak	@ Z3"	K					
	E3-1	1011	572.798	0.03	0.33	290	78	76	_	219	54	5	
بر. آب	2	1016	574.7	0.02	0.22	305	75	76	_	244	52	4	
بري	3		546.0	0.05		306	80	7)	_	257	48	6	
۲.	4		1981	0.08			82	78	_	2-17	46	9	
	5	1026	600.4	0.11	1.2	304	84	75	_	257	47	125	
		1031					87	80	_		47		
	6		603.9	0,15		300		 		243	_//	18	-
	Stop	1041	607.235	(700	leak	Check	024"/4	7					
	<u> </u>		(2) (2)		2.23	300		-0			-7	4	
إير	F24	1113	607,821		0.33	298	6 2	80	_	212	32	5	
ام مارئ	2	1/18	609.6		0.22	307	82	81	-	227	52/	4	<u> </u>
ί-		1/23	611.0		0,77	3/2	83	81	_	257	52	8	
	4	1128	613.57	0,14	1.5	3/3	87	83	~	24/2	44	18	
		1133	6/6/7	0.14	1.6	3/3	85	83	_	247	53	19	
			615.5	0.19	1.7	310	90	83	_	243	33	22	<u> </u>
	500	1143	623582	,	6000	LEAK	102	3" Hc					
	7-												
				<u> </u>				<u> </u>		ļ			
													† · · · ·
	Avg.	_ {a	110.002	12490	7700	ചരാ		87					
	Check'd			T test									
		L	I was a second s	pa gerintrovitto (g)	** Transfer Selection (Control of Control of	grupu os estelli siliki	E 10 00 1000 00 00 00	· The second section of the second se	F-000-000-000-000-000-000-000-000-000-0				•
	CONSO	LE# /	61363				Velocity						
	FILTER	# 125	0				74000000000000000000000000000000000000	ne					
					•		- N-96.80 (00080 000 N-60 N	DSCFM)_	000000000000000000000000000000000000000				
							11998803000000000000	(%)	Carlo de la companya de la companya de la companya de la companya de la companya de la companya de la companya				
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	REMAR	KS										_	
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Page ______3

26/47 ensions	Plant Tn(c) Time Start X DGMCF "Hg "H20 Dry gas meter reading ft3 23.800 b25.9 632.6 639.164 639.164	1 P in H20 10.03 10.04 10.07 10.14 10.14 10.12	^ H in H20 D. 33 D. 44 D. 37 L. 1 6 1.5 6 1.5	Time Fini Diameter DIA. Operator Stack Temp. F 321 323 328 338 338 340 350 350 350 350 350 350 350	Dry gas miniet 86 90 90 91	eter temp. Outlet 85 86 87	Test Dura	ak Rate k Rate	Last Impinger SS SS SS SS SS SS SS SS SS SS SS SS SS	mincfmcfm	
Clock Time 53 1153 1158 1703 1708 1713 1718	X_DGMCF*Hg*H20 Dry gas meter reading ft3 \$\inc 23.8\infty \$\inc 25.9\$ \$\inc 25.9\$ \$\inc 25.9\$ \$\inc 32.6\$ \$\inc 35.9\$ \$\inc 39.164\$	0.03 0.04 0.07 0.14 0.12 60	1.1 1.1 1.5 1.5 1.5 1.5	Operator Stack Temp. F 321 323 328 332 335 Kdcc	Dry gas m Inlet 86 98 90 91 93	eter temp. Outlet 85 86 87	Hot box Temp.	Probe Temp Z48 Z50 Z51 Z47	Last Impinger SS SS SS SS SS SS SS SS SS SS SS SS SS	Vacuum in. Hg 6.0 6.0 9.0 12.0 20.0	
Clock Time 5-1148 1153 1158 1703 1708 1713 1718 1718	DGMCF * Hg * H20 Dry gas meter reading ft3 \$23.800 \$25.9 \$29.9 \$32.6 \$32.6 \$39.164	0.03 0.04 0.07 0.14 0.12 6.03	^ H in H20 0.33 0.44 0.37	Operator Stack Temp. F 321 323 328 332 335 Kdcc	Dry gas miniet 86 98 90 91	eter temp. Outlet 85 86 87	Hot box Temp.	Probe Temp 248 250 251 244	Last Impinger SS SS SS SS SS SS SS SS SS SS SS SS SS	Vacuum in. Hg 6.0 6.0 7.0 7.0 70.0	
Clock Time 1153 1158 1703 1708 1713 1718	Hg "H20" Dry gas meter reading ft3 123.800 125.9 130.6 130.6 130.6 130.6 130.6 130.6 130.6 130.6 130.6 130.6	0.03 0.04 0.07 0.14 0.14 0.12	1.1 0.33 0.44 0.37 1.1 81.5 81.5	Operator Stack Temp. F 321 323 328 332 335 Kolce	Dry gas m Inlet 86 98 90 91 93	eter temp. Outlet 85 86 86 87	Hot box Temp.	Probe Temp Z48 Z50 Z51 Z41 Z44	Last Impinger SS SS SS SS SS SS SS SS SS SS SS SS SS	Vacuum in. Hg 6.0 6.0 6.0 7.0 7.0	
Clock Time Clock Time L153 L153 L158 L703 L708 L703 L708 L713 L713 L714	"H20 Dry gas meter reading ft3 L23.800 b25.9 L37.6 829.9 637.6 639.164	1 P in H20 10.03 10.04 10.07 10.14 10.12 10.03	1 H in H20 0.33 0.44 0.37 1.1 1.5 1.5 1.5 1.6 0.33	Stack Temp. F 321 321 323 328 332 335 Kolce	Dry gas me Inlet BL BB GO GO GO GO GO GO GO GO GO	Outlet 85 86 86 87	Temp.	748 750 751 749 744	Impinger SS SS SS SS SS SS SS SS SS SS SS SS SS	in. Hg 6.0 6.0 6.0 7.0 7.0 70.0	
Clock Time 5-1148 1153 1158 1703 1708 1713 1718	Dry gas meter reading ft3 i 23.800 b 25.9 b 37.6 b 32.6 b 35.9 b 39.164	1 P in H20 10.03 10.04 10.07 10.14 10.12 10.03	1 H in H20 0.33 0.44 0.37 1.1 1.5 1.5 1.5 1.6 0.33	Stack Temp. F 321 321 323 328 332 335 Kolce	Dry gas me Inlet 86 98 90 91 93	Outlet 85 86 86 87	Temp.	748 750 751 749 744	Impinger SS SS SS SS SS SS SS SS SS SS SS SS SS	in. Hg 6.0 6.0 6.0 7.0 7.0 70.0	
Time 53 1148 1153 1158 1703 1708 1713 1713 1718 1734 1734	reading A3 123.800 125.9 129.6 129.9 132.6 132.6 139.164 1639.840	0.03 0.04 0.07 0.14 0.12 60	in H20 D. 33 D. 44 D. 31 L. 1 S. 1.5 S. 1.5 L. 1 L. 1 L. 1 L. 1 L. 1 L. 1 L. 1 L. 1	321 321 323 328 332 332 4444	10 10 10 10 10 10 10 10 10 10 10 10 10 1	Outlet 85 86 86 87 81	Temp.	748 750 751 749 744	Impinger SS SS SS SS SS SS SS SS SS SS SS SS SS	in. Hg 6.0 6.0 6.0 7.0 7.0 70.0	
1153 1158 1203 1203 1203 1213 1218 1334 1341	639.840	0.03 0.04 0.07 0.14 0.12 60	0.33 0.44 0.37 41.5 81.5 	321 321 323 328 332 335 Kolc	86 90 90 90 90 90 90	85 86 87 81	-	248 250 251 249 247	22 22 23 24 23	6.0 6.0 9.0 12.0 20.0	
1153 1158 1703 1708 1713 1718 1718 1734 174 174	639.840	0.04 0.07 0.14 0.12 Go	0.44 0.77 1.1 81.5 81.5 	321 323 328 332 335 Kalic	क्षेत्र च क के अव च क के अव	85 86 87 81	-	250 251 249 247	22 24 25 28	6.0 9.0 12.0 20.0	
1153 1158 1703 1708 1713 1718 1718 1734 174 174	639.840	0.04 0.07 0.14 0.12 Go	0.44 0.77 1.1 81.5 81.5 	321 323 328 332 335 Kalic	क्षेत्र च क के अव च क के अव	85 86 87 81	-	250 251 249 247	22 24 25 28	6.0 9.0 12.0 20.0	
158 1203 1208 1213 1218 134 134 134	639.840	0.14 0.12 Go	0.77 1.1 81.5 81.5 w/ea	323 328 332 335 Kolic	90	86 87 81	-	251 249 247	55 54 53	9.0 12.0 20.0	
1703 1708 1713 1718 1718 1734 174 174	629.9 632.6 635.9 639.164	0.14 0.12 Go	1.1 81.5 81.5 	328 332 335 Kalic	91	86 87 81	~	249	53 53	12.0 20.0	
1208 1213 1218 1334 1341 1346	632.6 635.9 639.164 639.840	0.14 0.12 Go	81.5 81.5 /ea	332 335 Kduc	94	87 81	~	217	\$3	Z0.0	
1213 1218 1334 1341 1346	639.164 639.840	0.12 Go	451.5 /ea	335 Kalic	94	87					
133/ 134/ 134/6	639.164 639.840	G.03	o.33	Kohec	ke 2	3"45		013	33	660	
133/ 1341 1346	639.840	0.03	0.33		~ e ~	2 7					
1341 1346				274			1				
13Ý1 1346				274					-		
1346	643.3	0.04			84	83	-	232	60	6	
	L43.3				94	83		246	49	7	
ノフィサート		0.04		,	85	84	-	241		7	
/357		0.08	0.88	295	87	84		253		12	
1352	647.7		1.3	296	88	84	_	249	47	18	
1401	651.0					85	_	244	<i>5</i> 7	22	
1406	654.580	6	200 4	BYV	@ Z4'	He					
	_										
4/22	654.791	0.03	0,33	288	80	85		217	63	6	
			_								
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	1173						 	1	r		
								UTS	20	10	
1702	D+0.100	6	DOD L	CAKV	20 /5	77-	 	 		 	
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					Isokinetie	(%)	2,000,000				
ATERIAL											
	40/ 406 422 427 432 437 442 447) 1482 TEMP.	1401 651.0 406 654.580 1427 656.6 1432 656.6 1432 656.6 1437 661.0 1442 661.0 1447 661.3 1452 670.100	1401 651.0 0.15 406 654.580 6 422 654.79 0.03 427 656.6 0.05 432 658.6 0.06 437 661.0 0.11 442 641.1 0.15 447 667.3 0.11 452 670.100 6	1401 657.0 0.15 1.5 406 654.580 6000 W 422 654.79 0.03 0.3) 427 656.6 0.05 0.55 432 658.6 0.06 0.06 437 661.0 0.11 1.2 447 667.3 0.11 1.2 4482 678.6 0.06 6000 W	401 657.0 0.15 1.5 295 406 654.580 6000 LAKK 422 654.79 0.03 0.33 288 427 656.6 0.05 0.05 298 432 658.6 0.06 0.00 296 437 661.0 0.11 1.2 300 447 667.3 0.11 1.2 7.80 4452 670.100 600 LAKK 4482 670.100 600 LAKK 4482 670.100 600 LAKK 4482 670.100 600 LAKK 4482 670.100 600 LAKK 4482 670.100 600 LAKK 4482 670.100 600 LAKK 4482 670.100 600 LAKK 4482 670.100 600 LAKK 4482 670	140/ 65/.0 0.15 1.5 295 9/ 406 654.580 6000 (28.6.4.2.2.2.2.6.5.4.7.9) 0.03 0.33 288 87 4/27 656.6 0.05 0.05 298 87 4/32 65.6 0.06 0.66 296 88 4/37 661.0 0.11 1.2 300 9/ 4/47 661.3 0.11 1.2 280 95 4/47 661.3 0.11 1.2 280 95 4/47 661.3 0.10 6000 (28.6.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2	140/ 657.0 0.15 1.5 295 9/ 85 406 654.580 6000 LEVEL D 26 46 2/22 654.79/ 0.03 0.33 288 87 85 4/27 656.6 0.05 0.55 298 87 85 4/32 658.6 0.06 0.06 296 88 85 4/37 661.0 0.1/ 1.2 300 9/ 86 4/42 6(H// 0.15 1.65 293 93 87) 4/47 661.3 0.11 1.2 280 95 91 4/52 670.100 6000 1 5000 25 46 6000 1 5000 25 46 Noisture Flowrate (DSCFM) Incorrect Control I	1401 657.0 0.05 1.5 295 91 85 - 406 654.580 6000 LERKY D 21.445 1422 654.79 0.03 0.33 288 80 85 - 1420 656.6 0.05 0.55 298 80 85 - 1432 658.6 0.06 0.06 296 88 85 - 1437 661.0 0.11 1.2 300 91 86 - 1442 641.1 0.15 1.65 293 93 80 - 1449 667.3 0.11 1.2 280 95 91 - 1452 676.100 6000 LERKY D 25 "H5 TEMP. Flowrite (DSCFM) Isokinetic (%)	Yelocity St. Yelocity Yel	Yelocity Yelocity	Yeloeity South S

Page 3 of 3

Plant N	iame	Plant	Yates St	ation Bo	oiler No.	1					/ 01	.2
Sampling	Location	Plant Inde	Y_{-}		Train	Partic	 :ulate / N	Aetals	Rui	n No. Z	-/ Pho	isc
Date 1	126 45	Time Start			Time Fini	ish		Test Dura	ation		min.	
		x									cfm	
PTCF _		DGMCF		NOZZLE	DIA		nches	Final Lea	k Rate		cfm	
Bar Press	·	" Hg										
Static Pre	:\$5	* H2C)		Operator	<u> </u>	<u></u>	_				
Travers	Clock	Dry gas meter	^ P	^ н	Stack	Dry gas m	eter temp	Hot box	Probe	Last	Vacuum	-
Point		, · ·	in H2O		Temp. F		Outlet	Temp	1	Impinger		
					 ,	 _		1 cmp.	<u> </u>			
Wol	1457	640.485	0.03	0.30	285	93	85		217	56	6	11
2	141502	672.1	0.03	0.33			89		238	52	_ フ	L
3	1507	673 8	0.03	0.33	298	92	87		243	52	7_	
4	1512	675.3	0.04	0.44	299	53	90		244	5%	8	
_ 5	1517	677.3	0.06	0.66	295	95	91		253	54	10	
6					283		93		257		H	
	1527					@ 22"						
2.2	150	0 60.000		1000	-		3	 			<u> </u>	
181	KUI	682.477	0.03	A 22	175	92	91		2/2	/3	7	
									2/7	62		 -
			0.05			92	91	-	239	526	5_	
3	1551	686.2				93	9,	ļ	257	57	6	 -
	1556	64),65				93	92	<u> </u>	235	58		<u> </u>
5	1601	689.4			281	74	52		245	35	6	
6	1606	691.0		0.33	282	94	92	<u> </u>	242	60	2_	
Stop	1611	692 478			<u> </u>							
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			Jor			<u> </u>						
Avg.		107.55	0,246									
Check'd												
FILTER AMBIEN	#IT TEMP.					% Moistur	DSCFM)_					
		·					**************************************	<u> </u>	<u></u>		į	
REMAR							· · <u>_</u> · · · · · · · · · · · · · · · · · · ·		·····		_	

Plant N	Name	Plant	Yates St	ation Bo	iler No.	1				_	10	1 1
Sampling	[cocation_	INLET			Train _	Partic	culate / M	1etals_	Ru	n No. 🤇	SIM	25e2
		Time Start	848		Time Fini	sh 140	25	Test Dura	ition	240	Zmin.	12414
Duct Dir	nensions	<u>8'6" x</u>			Diameter		<u> </u>	Initial Le	ik Rate _	0.017	cfm <i>&</i>	124 45
		DGMCF_O	.997	NOZZLE	DIA. <u>O</u>	,35Y	inches	Final Lea	k Rate	0.010	c(m &	23174
Bar Pres	s <u> </u>	. 7 Hg			•	JUM						
Static Pro	ess	2.5 5.7 H20)		Operator	300						
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	Fresh
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	buch
W8-1	848	72.943	0.04	0,44	281	75	74		226	54	6	11.0
2	T	714.8	0.05	0.35	28/	75	74		235	50	6	
2 3	858	716.7	0.04	0.44	278	7)	75		220	49	3	
4	903	7/8.6	0.02	0.22	276	78	76		242	50	4	
5	908	720.0	0.02	0.22	279	79	76	-	215	うおが	. 4	
6	7/3	721.3	0,05	0,55	276	80	77	-	242	52	6	
Stop	918	723,56	C	and le	at che	ck Q 2	2"14					
LX-1	939	723.840	0.02	0.22	284	80	77,	_	225	55	4	
2	944	725.5	007	0.33	286	80	78	_	23 Z	53	5	
3	949	727.0	0.05	0.55	288	81	78	_	236	52	6	
4	954	728.3	0.04	0.44	287	82	79	-	232	52	3	
5	959	730.9		רר,ט	278	93	80	_	245	48	7	
	1004	733.6	0.08	0.90	284	85	80		250	48	5	
sto		735.654		Herec	beck a		7	LOOKO		22.14		
-						 						
4-1	1015	735,999	0.02	0.22	275	83	81	_	205	57	4	
0 2	,	737.5	0.04	0.46	2.89	84	82	-	240	54	6	
3	1025	737.4	0.08	0.50	253	85	82	-	24	50	9	
4	10 30	742.5	0.11	1.25	295	87	83	-	248	45	14	
5			0.14	1.6	291	88	83	_	240	4	19	
6	1040	748.9	0.16	1.8	292		84	-	244		21.5	
Stop	1045	752,419			Check	@ 25"	1/01	}				
				- 7. 3.3			3					
 _												
							 	<u> </u>				
								 	l			
wg.		111.690	72524	7205	303		90					
'heck'd												
		144747								· Common of the common	500000000000000000000000000000000000000	***************************************
		1/6/363				Velocity						
	#916,	/ thimble	· 			% Moistur	300cccommontoccc					
	T TEMP!	<u>80</u>				-2000 000 000 000 000 000 000 000 000 00	DSCFM()_					
	LENGTH	8FH				Isokinetic	(5)					
NEKA	MATERIAL	<u>- 9kiss</u>										

MARKS Good Leak check of pitot tube fline (all Phase 2 pitots & lines were leak checked where applicable.)

AT FAID OF RUAL - Thimble became dis lodged from 1. - 12.

Page Z of 3

	Location_	Plant Lu	10-4		Train	Partic	culate / N	letals	Rui	n No. 3	Pha	se Z	
		Time Start			Time Fini	sh		Test Dura	tion		min.		
		x									cfm		
		DGMCF								-			
ar Press		* Hg											
tatic Pre	:33	* H2C	*		Operator	্রী ১	<u> </u>	_					
ravers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	cter temp.	Hot box	Probe	Last	Vacuum	K]
Point	Time	reading ft3	in H2O		Temp. F		Outlet	Temp.	Temp	Impinger		factor	
	1.16	752.612	4 02	6 7 3	785		84		204		4		ł
	1049				298	87			221	60	5-		
	1054	757.1	0.03	0.33		80	84	-		33		 	Ì
	1059	7537,7		0.44	307	88	85	 	243	53	6	11.00	
	1104	757,7		0.99	299	89_	86		257	49	11	11.06	
	1109	760.2			302	51,	87		241	47	19		Į.
	Billia		0.13		Je/_	94	88			58			,
5/2/	1117	767,291	<u> </u>	od ot	22 "	y leak	chek	1600	dinin.	al leak	CHICK	251	7 .
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2-4	1148	768 450	0.03	0.33	317	89	87		216	65	6	41.12	1/0. ¥
2	1153	770.2	0.04	0,44	322	89	87	_	240	22_	7		}
3	1158	772.0	0.06	0.66	328	90	87	_	242	52	8		1
4	403	774.3	0.09	1.0	330	91	88	~	244	57	12		
	1208	777.0	6.18	1.6	333	93	89	-	242	54	22	}]
	1213	780.6	0.19	1.6	336	95	90	-	249	57	22]
	1218	783.812				k 02	sell 1	0.01	V A3/	1:1			1
-1-4-							77			7			1
3-1	1225	784.027	0.02	0.22	316	92	90	-	222	67	5		1
	/230			0,45		92	89	_	247	60	7		1
		787.4	0.07		321	92	90			57	11	1	1
	1240	790.0		1.25			91		250		18	 	1
	1245	392.5		1.55			92	 	251		21	 	1
- 2	1250	796.6		1.4	322		92	 	245		22	 	ł
4			0-16			7.5	100	 	013	1.02	المالية المالية	 	ł
799	1255	799.342		 			}	}	 	}	 	 	ł
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		11.690	0.254	<u> </u>				.					1
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						Velocity_	8499499000000000000000						j
EK	#					10001000010001000100	P	2 9025007005000000000000 00					
IEN.	i iemp.					- 1700 (800) (800) (800-100)	DSCFM	######################################	96469999999999999				
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Plant N	Vame	Plant	Yates St	ation Bo	iler No.	1				-	100	-
Sampling	Location_	Inle	<u>+</u>		Train_	Partic	culate / N	letals	Ru	n No. <u>ع</u>	1 Pha	5e 6
Jane	14/171	I RUE SOUTH			fillie trut	ə <i>11</i>		I CSL Duia	mou		mın.	
Duct Din	nensions	x_			Diameter		ft	Initial Les	ak Rate _		cfm	
		DGMCF	·	NOZZLE	DIA		nches	Final Lea	k Rate		ctm	
		" Hg			•	5 1.						
itatic Pro	ESS	H20	<i>-</i>		Operator	<u>، لمال</u>	<u> </u>					
ravers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	lnlet	Outlet	Temp.	Temp	Impinger	in. Hg	
F3-1	1259	799.545	002	0.22	307	94	92		206	66	4	
ح ت		801.1	0,03	0.33	315	74	92		226	65	7	
3	1309	8027		0.33	318	95	92		247	65	 -	
4		804.8		034		96	83		24	55	10	
	·			1.3.11	316		94				0	
	1319	807.7		1,3	314	99			245	54	20	
6		8 10.5				99	54		242	52	22	
Stop	1329	813,735	(70	po wa	- Char	K62	2"/43	<u></u>	 			
E (/		6	5	A 33	2.5	62	6.1			CE	/3	
	/3.75	814.000		0.77	309	97	94		205		/3	
		816.5	0.09		314	7	94		239		12	
<u>)</u>	1345	819.4	0.04		3/2	97	93		241	54	11	
	/338	821.5	0.03	033	310	98	94		260	52	7	
		823.3	0.04		309	57	74	_	252	57-	10	
6	H6605-	825.2	0.05	0.33	303	9)	44	~	257	57	11	
top	1105	877778							-	\		
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Avg.												
Theck'd												
	<u> </u>				ي سيستن خدين بنا	Velocity						1 5000040000000
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MBIEN	T TEMP			•			DSCFM)					
							(%)					
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Plant N	iame	Plant Inle- Time Start X DGMCF	Yates St	ation Bo	iler No.	1				6) 0/	(m)
Sampling	Location_	Inter	<u> </u>		Train _	Partic	<u>:uiate / N</u>	<u> 1etals</u>	Rui	n No. 🎵	resed (
Date 2	4 Jun 9	Time Start	1206		Time Fin	ish		Test Dura	tion		min.*	
Duct Din	nensions_	x_			Diameter		ft	Initial Lea	k Rate	0.01	2_cfm €	1514
PTCF _		DGMCF		NOZZLE	DIA.	1358 i	nches	Final Leal	k Rate _		cfm	_
Bar Press	3	" Hg										
Static Pre		H2C)		Operator	JW	~					
Travers		Dry gas meter	^P		1	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	
	DO.	426, 95						 		 		
	211						<u> </u>	 -				
	120	426.845	<u> </u>		 	<u> </u>		ļ			_	
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Flue-Gas Sampling Log

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Sponson Plant Intes Station Boiler Sar	lant Location: ESP in Let Soc)ate: 06.25-45 100			

	start			stop		elapsed	mean	mean
time (hh:mm)	zero (1/min)	flow (1/min)	time (hh:mm)	zero (1/min)	flow (1/min)	time (min)	zero (1/min)	flow (1/min)
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Offset Correction (1):		STARTS
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CO ₂ Mass F	CO2 Mass Flow Correction:	
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% H ₂ O:	۲.۵	
ppm SO ₂ :	1500 To 2000	

START: LEAK V @ METER -> -0.012 STOP: KEAK V @ METER -> -0.005 HEAT SHEATHED PROBG TEMP 105 °C TO 115 °C

Flue-Gas Sampling Log

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YATES STATION BOILER				tion Control: RP Pro	int
YATES STATION BOILER		6-26-15		ution Control; Esp Pro	int
YATES STATION BOILER		6-26-15		lution Control: BBP	int
YATES STATION BOILER		6-26-15		ollution Control: RP Pro	int
Sponsor: YATES STATION Couler 1 Sa				ollution Control; Esp Pro	int

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mean	flow	(1/min)						
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	flow	(1/min)	2420					TOTALS:
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	time	(hh:mm)	215124					
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start	zero	(1/min)	- 0.003					
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Integrator Vo	lume (1):	100.00	COMMENTS:
Offset Correct	tion (1):		STATE! FOX / O METER -0 001
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CO ₂ Mass Flo	ow Correction:		
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% 0 ₂ :	8.0		10 21 12 01
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% H ₂ O:	7,0		
ppm SO ₂ :	1500 70 7000	00	

STRATELENKY OF METER TO.OOK STRATELENKY OF METER TO.OOK	HEAT SHEATHED PROSE TEMP 105 0c TO 115 0c		
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Flue-Gas Sampling Log

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Sponson: Yares STATION Polle (# 1 Sal	Plant Location: ESP 1 NGT Soc		Fuel Type: Coac Pun	d s 3 ij	Sampling Point: W. I

	start			stop		elapsed	mean	mean
time	zero	flow	time	zero	flow	time	zero	flow
(hh:mm)	(1/min)	(1/min)	(hh:mm)	(l/min)	(1/min)	(min)	(1/min)	(l/min)
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ne: tion: ne (1):	Integrator Volume (I): 100.0	COMME
ss Flow Correction: dry STP) volume (1): 8,0 10.0	Offset Correction (1):	STARTLEY
dry STP) volume (1): 8.0 10.0 7.0	Total Integrator Volume:	STOP L
dry STP)	CO ₂ Mass Flow Correction:	•
	Actual (dry STP) volume (1):	H
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	ppm SO ₂ : 1500 10 2000	

Flue-Gas Sampling Log

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Sample	Soda-Lime Trap#:	Iodated Carbon #:	Pump	Probe	Filter
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time (hh:mm)	zero (1/min)	flow (1/min)	time (hh:mm)	zero (1/min)	flow (1/min)	time (min)	zero (1/min)	flow (1/min)
0021	-0.011	0.50	0121	. 0.01	ł I			
					TOTALS.			

Integrator Volume (I):	olume (I): O	COMMENT
Offset Correction (I):	ction (I):	
Total Integra	Total Integrator Volume:	
CO ₂ Mass Flc	CO ₂ Mass Flow Correction:	
Actual (dry S	Actual (dry STP) volume (1):	
% 0 ₂ :	8.0	
% CO ₂ :	0.01	
% H ₂ O:	7.0	
ppm SO ₂ :	0002 ~ 0051	

COMMENTS:
LERK / @ MITER > -0.011
HEAT SHEATHED DROBE TEMP
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Page ____ of ____

Plant N	Name	∨ Plant	Yates S	tation Be	oiler No.	1				1		
Sampling	Location_	culot			Train_		Anions		Run N	o.		
Date 6	-7 <i>C</i> ~9-	不ime Start /	225		Time Fin	ish / 404	5	Test Dur	ation A		/ min.	
Duct Dir	nensions_	864 X	45		Diameter		ft	Initial Le	ak Rate _	2.00	reen .	0.010
PTCF _	81	8 64 X DGMCF 1	002	Nozzle D	ia. <u>- 3</u>	15_inch	ies	Final Lea	k Rate	2.00	400	0.01@
Bar Pres	s <u>79,5</u>	, <u>5</u> " Hg			_	///	_		Dad L	w-3	,	_
Static Pr	ess <u>– 5</u>	.55* H20	0		Operator	MR	<u> </u>	_ /		W-3		
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas m	eter temp	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	F/3
If	1715	385,887	7					1				
	1245	397,46	11/	1.49	290	79	78		25	(1	3.0	
	1305	410.73	10	136	190	BA	8/		1/3	57	3.0	
	1325	423.28	10	136	1911	87	0,	1-1-	160	65	3.5	
	12/10	435.90	09	1.11	790	43	27	+-+	150	52	22	1
l	160	41071	2 //	1,36	700	43	27	+	200	-7-	5.0	
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CONSO	LE# A	76140	24			Velocity_	Grander	25988888				
FILTER	, 12	29					e e					
AMBIEN	NT TEMP	78		-		Flowrate (DSCFM				;	
PROBE	LENGTH	18				Isokinetie	Fig. 9 1 N. Nov. Of J. 50501.77	200000000000000000000000000000000000000	documentament and a second and a second and a second and a second and a second and a second and a second and a		<u> </u>	
LINER	MATERIAI	5/45		•				<u></u>	<u></u>	o. 64.066137313188888	:	
REMAR	KS											

ESP INLET Plant Name Plant Yates Station Boiler No. 1 ANIFAS Sampling Location Molet Train Bulk-Particulate Radiomedides Run No. 1/
Date 6-2693 Time Start 1/08 Time Finish 12/2 Test Duration 65 min. 2 Duct Dimensions 8 6 X 95 57 Diameter ft Initial Leak Rate 0.00 4 con 10" PTCF 84 DGMCF 1,003 Nozzle Dia. 1375 inches Final Leak Rate 0,009 cfm Bar Press 29:50 "Hg at 84 Operator Mko Static Press 58 " H2O Probe Clock Dry gas meter Stack Dry gas meter temp. Hot box Impinger in Hg Point Time reading ft3 in H2O in H2O Temp. F Inlet Outlet Temp. Temp 44.245 0.3201 1.405 281.5 88.0 CONSOLE # 4/6/40/ THIMBLE # # 1232 Velocity % Moisture AMBIENT TEMP. 74 Flowrate (DSCFM) Isokinetie (%) PROBE LENGTH ___/ O LINER MATERIAL 5/45 REMARKS

C-192

Page ____ of ____

Plant N	Name	Plant	Yates St	ation Bo	iler No.	1				_		
Sampling	Location_	Time Start	27		Train _	Ą	nions		Run No	<u>. 3</u>		
Date 6	-27-9	Fine Start	3715		Time Fini	ish <u>08</u>	37	Test Dura	ition	321	min.	1 . 11
Duct Dir	nensions	86" ×	45'		Diameter		ft	Initial Lea	ık Rate 🏒	1.009	cfm 🔗	1/2
PTCF_	. 84	DGMCF / O	03	Nuzzle D	ia. <u>~37</u>	5inch	es	Final Lea	k Rate	1006	cfm	,
Bar Pres	s <u>29.5</u>	Hg			•	11/-		1		سے ہ	arg c	/
Static Pr	ess	H20) 					_ /'0	(7- 6	7		,
Travers	*	Dry gas meter		^ Н	7	Dry gas me		Hot box	t :	Last	Vacuum	F-19
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	K=12
1/1	0715	655.883										
	0735	666.72	.08	1.02	310	72	71		256	58	20	
	0755	67817	.08	1.02	308	73	7/		768	53	2,5	
[0815	68930	08	1537	310	83	76		761	56	2,5	
	0835	701.025	.07	1.59	3//	84	76		258	56	25	
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Avg.	 -	45,140	12765	7875	310		76					
Check'd	<u> </u>											
CONSO	LE#	A16140	/			Velocity						
FILTER						30.334000 0000	E10.000 (
AMBIE	NT TEMP.	<u> </u>		-		100000000000000000000000000000000000000	Milanconormous		00000000000000000000	000000000000000000000000000000000000000		
PROBE	LENGTH	10'				1,469,696,696,696,666,66			<u> Contabbookaanaanaanaanaanaanaanaanaanaanaanaanaan</u>	MANAGER AND AND AND AND AND AND AND AND AND AND	**	
LINER	MATERIA	10' L <u>5/45</u> ,	5							·		
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REMAR	RKS											

Page _____ of ____

Bar Press Static Press Cloc Point Time	Plant Ationy /NLeT PTime Start X DGMCF "Hg "H20 Ock Dry gas meter reading ft3	O P in H2O	Nozzle D	Operator	inch	es	Initial Lead Final Lead Hot box Temp.	Rate	Last Impinger	cfm Vacuum	
Sar Press Static Press Cloc Point Time	" Hg " H20 ock Dry gas meter me reading ft3	^ P in H2O	^н	Operator Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Travers Cloc	" H20 ock Dry gas meter me reading ft3	^ P in H2O	^н	Stack	Dry gas m	eter temp.	1				
Point Time	ock Dry gas meter me reading ft3	^ P in H2O	^н	Stack	Dry gas m	eter temp.	1				
Point Time	me reading ft3	in H2O					1				
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Plant N	Name	Plan	t Yates S	tation Bo	oiler No.	. 1							
Sampling	g Location_	SFTE	SP IN	<u>slet</u>	Train _	Ammor	iia/Hydro	ogen Cya	nide	Run No	· <u> </u>	**	
Date 6	-25-9	Time Start	<u>1456 </u>		Time Fin	ish /651	2	Test Dur	ation	70_	nin,	11	
Duct Dir	mensions/	<i>5 6''</i> x	<u> 45</u>		Diameter		ft	Initial Le	ak Rate _	0010	O Coffee	1.	
PTCF	. 84	DGMCF	003	Nozzle D	ia. <u>. 3</u>	7 <u>5</u> inct	nes	Final Lea	k Rate <u>(</u>	0,009	1 ciml 2	9	
Bar Pres	s Z 9-	55" Hg				1			1 6				
Static Pro	css	<u>5.8 </u>	20		Operator	M	<u>-()</u>		Part	W	-3		
Travers	Clock	Dry gas met	er ^P	^ н				Hot box	Probe	Last	Vacuum		l
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Sampling Location	Plant I	Name	Plant	Yates S	tation Be	oiler No.	. 1						
Travers	Sampling	Location	INLET			Train	Ammor	nia/Hydro	ogen Cya	ınide	Run No	. Q	
Travers	Date 6	71.93	Time Start	6930	·	Time Fin	ish <u>103</u>	5	Test Dur	ation1	\$ 65	min.	_
Travers	Duct Dir	nensions	86 x	451		Diameter	<u> </u>		Initial Le	ak Rate _	0,009	cfm a	x10/
Travers	PTCF_	<u>84</u>	DGMCF /	003	Nozzle D	ia. <u>23</u> 2	7 <u>5</u> incl	nes	Final Lea	k Rate	2.006	cim_	011
Travers	Bar Pres Static Pr	s <u>29.5</u> css <u>-5</u>	<u>(</u> "Hg " # H20	0		Operator	M	20		PE	4 u	1-4	0''
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Vec. — 4/622 /3122 /5/283 80 Console / A (6/40) Filter / Washing Majority		1030	546.65	10		195	90	77		158	54	45	
Vec						195	88			154	54	4.5	
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CONSOLE # A 16/40/ CONSOLE # A 16/40/ FILTER # — SMOISTURE AMBIENT TEMP. 70 FROBE LENGTH 10 LINER MATERIAL 9/477	 			 	 	-	 	 	 	 		-	
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Plant I	Name	Plant	Yates St	ation Bo	Trois	Ammon	<i>()</i>	つ '	nido.	Dun No	. 2	
Sampung Date 4	g Location_ /~///	Time Start /	(421)		Time Fini	sh 15 2	im/Hydru	Test Duca	tion /-		nin.	-
Duct Di	mensions S	5/61/ X	45		Diameter		ft	Initial Lea	ak Rate	2.00	<u> </u>	110
PTCF_	.84	DGMCF	003	Nozzie D	ia. <u>. 3 7</u>	inch	es	Final Lea	k Rate 💋	,006	cfm	11
Bar Pres	18 <u>29</u>	Plant /N LOT Time Start / G'/ X DGMCF Hg H20				MLX		Pa	At U	1-1	412	- / -
									4	, - /		_
Travers	Clock	1 -		^ H		Dry gas m		Ī	Probe	Last	Vacuum]]
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	13,5
Nft	1410	595310				76 /	2 4					
	1440	6/0/3	1//	1,40	18/	96	93		266	08	5.0	igspace
<u></u>	1500	676.95	09	1.21	707	75	72	 	7.00	23	5.5	
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Avg.	 -	41.654	13077	1.34	284		94					
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CONSO	LE #	A1614	0/			Velocity_					\$	
FILTER	· *					% Moistui	re					
AMBIE	NT TEMP.	70					DSCFM)_					
PROBE	LENGTH	78	35			lsokinetic	(%)				Ĕ	
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Page ____ of ____

Plant N	lame	Plant	Yates St	ation Bo	iler No.	1						
Sampling	Location_	INLET			Train _	Ammon	ia/Hydro	gen Cya	nide	Run No	. <u> 4 </u>	
Date _	-219	Time Start	1920	<u>-</u>	Time Fin	ish <u>104</u>	<u> </u>	Test Dura	ation	80	min. 🚈	
Duct Din	nensions_	81/ 1/ X_	450		Diameter		ft	Initial Le	ak Rate _	B. 10	a start	12/
PTCF	, E ⁴ _	DGMCF /10	<u> </u>	Nozzie D	ia. <u>37</u>	inch	C\$	Final Lea	k Rate 💋	1004	cfm_/	F811
Bar Press	29.5	<u>∠⊘</u> " Hg			•	111	_		ر م	Del	+	
Static Pro	<u> </u>	######################################)		Operator	N/ K-1.	<u>/</u>	_ (1	
Travers		Dry gas meter		^ H		Dry gas m		Hot box		Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	$\overline{}$	Outlet	Temp.	Temp	Impinger	in. Hg	K=/2
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D. Fris	597()		100	1 00	7.4	Q 7	01		2/00			
	1940	7/3-02	109	1.07	7/7	83	81 82		200		50	
		725.17		(1/5	315	85	73-		7.57	2,5	3.0	
_	102/	736,62				2/	2	 	13	60	5.0	
	1040	140,000	.08	1.62-	5/6	86	87.		157	61	50	
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A		W 25C										
Avg.		44.835	14 11	40850	315		83					
Check'd					J. Stranger	1	l .		ı			
CONSO	.E#	A16140				Velocity_				***		
FILTER						% Moistu					}	
AMRIEN	"	4/6/401 -76 10		•			DSCFM)					
PRORE	LENGTH	10	 ·			100000000000000000000000000000000000000	(%) (%)					
LINER	MATERIAL	9/455					NAV <u>A</u>				•	
	well U											
REMAR	KS					,		·			_	

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Cama-1: *		Plant	7	ation Bo	Train	Ammon	— is/Hydra	gen Cun	nide	Run No	Kinal	もしゃ
Date (a	-///C-3	Plant In/e- Time Start	1257		Time Fini	th /-/2	<u>الارتارة:</u> 2	Test Dues	tion	Kuii 110	· Min	7
PTCF		DGMCF_		Nozzle D	ia.	inch	 cs	Final Leal	Rate		cfm	
		* Hg										
		H20			Operator	JW	1					
		11.7							5 .		,, T	
Travers		Dry gas meter		^ H	Temp. F	Dry gas me		Hot box	Probe	Last Impinger	Vacuum	
Point	Time	reading ft3	IN H2O	In H2O	remp. r	Iniet	Outlet	Temp.	Temp	imparger	in. Hg	
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Avg.												

ESP INLET Page of Plant Yates Station Boiler No. 1 Plant Name Sampling Location vilot __ Train Bulk Particulate-Radionuclides Run No. / Date 6-15-93 Time Start 0745

Duct Dimensions 8 6 X 45

Diameter ft Initial Leak Rate 0.009 of PTCF 84 DGMCF 1.009 Nozzle Dia. 375 inches

Final Leak Rate 0.006 Diameter ft Initial Leak Rate 0.009 of my 2// Bar Press 29/65 _ " Hg Operator MKC Static Press ___ + /_ 4 H2O ^ H Stack Dry gas meter temp. Clock Dry gas meter Travers Hot box Probe Last Vacuum | reading fl3 in H2O in H2O Temp. F Inlet Temp Impinger in Hg Point Time Outlet Temp. 608 300 18 3.0 310

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SOURCE SAMPLING FIELD DATA SHEET ESP INLET Page ____ of ____ Plant Yates Station Boiler No. 1 Plant Name __ Sampling Location

Sampling Location

Date 6-269 Time Start

1546 Time Finish 1700

Test Duration

Duct Dimensions

Diameter

Diameter

PTCF 84 DGMCF 1009 Nozzle Dia. -375 inches

Final Leak Rate 0.000 cfm Bar Press 29.56 "Hg Operator M/CO Part E-7 E-7 Port Static Press _" H2O Clock Dry gas meter P Travers [^]H Stack Dry was meter temp. Hot box Vacuum Last Probe in H2O | in H2O | Temp. F | Inlet Point Time reading ft3 Outlet Temp. Temp Impinger in. Hg C T PF

				388 88						
Avg. Check'd	(/(45.950	2905	1.1	317		97			9 800
CONSOLI THIMBLI AMBIEN' PROBE L LINER M	E# TTEMP. ENGTH_	<u> </u>	52	-		% Moistu Flowrate	re (DSCFM)_			
REMARK	S		<u>-, , , , -, -, -, , , , , , , , , , , ,</u>				<u></u>	<u> </u>	 	C-2

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	- Plant	rates Si	ation Bo	Her No.	Rulle 1	 Doctionlo	to Dadia	muelida	e D	lun No	2
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(-1-)	1 tine Start/	45		Diameter	sii <u>/ U -/(</u>		Test Dura	illiUli	10 17 18		011
nsionsc	DCMCE // 2	72	Alemba D	Diameter		n	Final Lea	k Pate		Jem /	£-1, 1
70	DUMCP <u>7.77</u> ∴ ″ • □ =	<u> </u>	MOZZIE DI	7 37	inch	cs ^ .	Littat Cea	K Kale —	0,00	/_cinec	1 20
ر) ^{در ب} ر	ng			0,57	ME			0	ر لا،		
<u> </u>								110	Λ' (-·	<u> </u>	
Clock	Dry gas meter	^ P	ј ^н ∣	Stack	Dry gas inc	eter temp.	Hot box	Probe	Last	Vacuum	12-
Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	<u> </u>
11-1	149696										
	7/000		1 50	7,7	31	20	The state of the s	7/	75	25	
742	100,77	100	00	24/			72-7	450	2	71/2	
$\frac{Z}{2}$	-3-1	0 /	27	7 / 4.				C-/	2/	20	
1-11		1	1. 1	3/3/	75	70		255	260	75-	
240	77.779	-07	87	3/6	78	75		2-/2	57	4.0	
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	45 094	2737	955	314	A Section Control of the Control of	શ્ક					
	Signature (1)			W15	124115-0-51	- Aug	2.33	2 - 1050000000000000000000000000000000000	Language proposed finds	- A 1744 CONTRACTOR (CONTRACTOR)	**********************************
	Clock	Clock Dry gas meter reading ft3 (720 148.685) 200 750,859 200 770,790 240 772,790	Clock Dry gas meter reading ft3 in H2O (120 148.68 - 08 140 760.5 08 121 783.4 08 140 79279 07	Clock Dry gas meter reading ft3 in H2O in H2	Clock Dry gas meter P	Clock Dry gas meter reading ft3 in H2O in H2O Temp. F Inlet 120	Clock Dry gas meter reading ft3 in H2O in H2O Temp. F Inlet Outlet 148.695	Clock Dry gas meter P	Clock Trime reading ft3 in H2O in H2O in H2O Temp. F Inlet Outlet Temp. Temp. 1	Clock Dry gas meter P	Time reading #3 in H20 in H20 Temp. F Inlet Outlet Temp. Temp Impinger in. Hg 120 148 695 149 760 55, 68 167 37 47 89 56 57 756 65 3.5 221 78344 88 132 315, 92 37 55 56 35 240 79379 07 89 374 97 73 277 57 9.0

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Plant N	Name	Plant	Yates St	ation Bo	iler No.	. 1			_	_	,	
Sampling	Location_	Time Start	0/-		Train	Bulk	Particula	ate-Ex. M	letals_	_ Run !	۷o. <u>/</u>	_
Date	6-6-9	Fime Start	445		Time Fin	ish _/04		Test Dura	ition	2001	min.	A 1
Duct Din	nensions_0	DOMCE A	73	Marria D	Diameter :- Z	75 inch	I	Final Lea	ik Kale <u>/</u>	2001	cim	/12//
PICF_6	296	5 * Hg	70.7					Linai Dem	K Nate	rw y		1011
Static Pro	ess	# H2C)		Operator	MX	0	_			6-	4
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas in	eter temp.	Hot box	Probe	Last	Vacuum	12
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	12.5
NA	094	711.42	;									
,,,		725 85	./3	1.15	294	86	84	17	252	59	3.0	
	1025	741.00	12		295	86	44		25/	49	كرج	
	1145	754.84	113	1,75	798	26	8		257	50	4.0	
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Ava	-	H3 420		سے وہدا ہے	201		85	1 / (Mary 1994)	2000			
Avg.			113606	14.75	276		02					
Check'd	·											
CONSO	LE #	78 10/c/a 2/16				Velocity_						
FILTER	#	Thu	oble)	-		% Moistu	re				2	
AMBIEN	NT TEMP.	178				Flowrate	DSCFM)_					
PROBE	LENGTH	10 c/a	55			Isokinetic	(%)		An Tab		\$ ~	
LINER!	MATERIA	L <u>4/195</u>										
REMAR	.KS			 -		····					_	

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Plant N	vame	/ Plant	Yates St	ation Bo	Train	Rulk	—– Portioulo	ta Ev N	fatale	D	10 T	
Sampling	Location_	Carly S	345		Time Fini	eh CTA	Carricus	Test Dues	ietais_	i¥nııı	۷٥. <u> </u>	_
Date <u>(@</u>	neneione	Y // X	45		Diameter	ره الم	7	Initial Lea	uon kRate (1.01	mm.	
PTCF 4	84	Time Start DGMCF J	103	Nozzle D	a 37.	inch	es	Final Lea	k Rate	0.007	cfm	
Bar Pres	27	56 " Hg						-				
Static Pro	ess <u> </u>	,56 " Hg " H20)		Operator	_ []	<u> </u>					
Travers	Clock	Dry gas meter	^ P	^ н	Stack	Dry gas me	ter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Teinp. F		Outlet	Temp.	Temp	Impinger	in. Hg	KEL
E-7	1345	827565	0.08	1.1	322	87	86		225	56	4.0	
	1400			0.97	323	92	88		238	57	4.0	
	1415	B39.15	0.07	0.92	323	96	OP		241	58	40	
	1430	847.04	0.87	0.92	323	96	90	-	245	60	4.0	
	1445	855.00	0.02	0.92	323	100	94	-	247	60	4.0	
	1500	8L3.00	0.07	0.92	373	101	95		238	62	4.0	
STOP	1505	865,845								ļ 		
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Avg.		43,280	0.2676	0.9583	322.8	92	20					
Check'd			51850 (Free	187. A-803.		in the second						
CONSO FILTER AMBIEN PROBE LINER	LE #	A 1614 78 10'	o/ nbie	-		% Moistur Flowrate (DSCFM)				•	
REMAR	ks										_	

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	Name		Yates S	tation Bo	iler No.	1 - ::	 .		_		1	
Sampling	Location_	inle F			Train _	Bulk	Particula	te-Ex. N	letals	_ Run!	۷o. <u> ح</u>	_
Date 6	- 27.5	Time Start 1 G 6 X DGMCF / C	<u> </u>		Time Fin	ish	2	Test Dura	tion	70	min.	+101
Duct Dir	nensions_	<u> </u>	43		Diameter	7	A	Initial Lea	ik Rate _	2.009	cfm *	
PTCF _	24	DGMCF // C	03	Nozzle D	ia.	inel	ies	Final Lea	k Rate _	000	clm c	410
Bar Pres	s <u> </u>	(16) " Hg			0.37	m/c				F-	<	
Static Pro		. <u>/</u> . Н2С		· · · · · · · · · · · · · · · · · · ·								
Travers	Clock	Dry gas meter	^ P	^ H	Stack	Dry gas in	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Temp	Impinger	in. Hg	12.8
MA	13/1/2	79343						- /				
1	12 2 11	80603	19	115	211	94	92		110	66	75	
	17 111	2018	1	115	210	an	42		167	22	4/1	
	7-19-7	0105	107	11.7	710	78	7.7	 	47/	7/	TIV	
	145!	8 3/15/	0/1	1.78	7//	76	9-7		263	7	4.7	
	1410	837.60		1.18	318	97	93		(60)	58	7	
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Avg.		44.144	Peno.	3016	316	Jack Com	94	L va sous				
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Check'd	<u> </u>		1 28	10.8			I	* service and a service as	1	1	4.0000000000000000000000000000000000000	
CONSO	18 # 4/	16144				Valinaite	gritaria ganta na a	1,0525549993			ţ.	
COMPO	# 100		nble			e training		n de la companya de la companya de la companya de la companya de la companya de la companya de la companya de La companya de la companya de la companya de la companya de la companya de la companya de la companya de la co			6 0 0	
ALADIES	NT TEMP.		nuie)	-		A MIOISU	Decret			entro s entro especial.	•	
		· - /				Clowlate (DSCFM)_		ogu stá 1689) Zi nagy			
	LENGTH	70	= .			Isokinetie	(%)		7 - 1		Ê	
LINER	MATERIA	- 5/A5ª			1 1	1/2 -	-41	/		1	1.1	A.
	_	Sillon	(50	MR	19 W	K	47/	4117		of "	mu	y re
REMAR	KS -	9/150		7.	<i>a 1</i>	/ /-		· · ·			_	U
			7124	n W	0/	01/2						C-205
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ESP INLET Page ___ of __ Plant Name Plant Yates Station Boiler No. 1 Sampling Location with Train Size Fract. Particulate Run No. Date 6-25-93 Time Start 8800 Time Finish 1020 Test Duration 160 min.

Duct Dimensions 6 X 45 Diameter ft Initial Leak Rate 6,009 cfm4444

PTCF 05 DGMCF 9886 Nozzle Dia. 375 inches Final Leak Rate cfm Bar Press 29.55 " Hg Static Press -6,4 H2O Operator MKC ^ H Stack Dry gas meter temp. Hot box Probe ^ P Travers Clock Dry gas meter Last Vacuum Temp Impinger in Hg 4=3.9 in H2O Temp. F Inlet in H2O Point Time reading ft3 Outlet Temp. N/A 0800 341.86 2.0 360.87 201 \$1000 379.80 41.161 [2826.31 288 81 Avg. Check'd CONSOLE # A16/40/ Velocity FILTER # #/308 % Moisture Flowrate (DSCFM) AMBIENT TEMP. Isokinetic (%)___ PROBE LENGTH LINER MATERIAL REMARKS

C-206

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Plant !	Name	Plant	Yates St	ation Be	oiler No.	1				_		
Sampling	g Location_	Time Start X DGMCF 1.00	S 2/3/		Train _	Size Fra	act. Part	iculate	Run	No. 2	_	
Date 6	<u> 2643</u>	Time Start	3071		Time Fin	ish)	Test Dura	ation	20	min.	, //
Duct Di	mensions	8' (11 X _	451		Diameter		ftft	Initial Le	ik Rate _	0.017	cfm_o(T10
PTCF _	. 84	DGMCF /- O	07	Nozzie D	1a. <u></u>	inct	ies	Final Lea	k Rate	NA_	cfm	
Bar Pres Static Pr	18 <u>79</u> 1938 <u></u>	<u>. 5 (</u> " Hg 5 - 分 _ " H20)		Operator	MKO)	·	10	ont c	-8	
Travers	Clock	Dry gas meter	^ P	ΛH	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading 63	-in H2O	in H2O	Temp. F		Outlet	Temp.	Temp	Impinger	in. Hg	K= 38
MA	1915	769.69						NA				
y //	0935	777.03	.//	.42	3//	81	79		248	62	3.0	
	0955	783.87	10	.38	3/1	82	80		246	61	3.0	
	18/5	790,78	10	.38	3//	86	84		244	60	3,0	
	1045	798 24	2/2		3/0	85	87		242	6/	3,0	
- 1	1105	805.16	0/2	.46	3//	88	134		201	60	3.7	
	1145	\$1370	10	38	3/1	89	86		1.52	59	3,5	
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Avg.	<u> </u>	43, 9150	0.3287	0.913	310 8	₽3.						
Check'd	ı			10 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)								
		161402	mm-)_			% Moistu	re .					
AMBIE	NT TEMP.	76										
	LENGTH					lsokinetic	(%)					
LINER	MATERIA	1 glass										
REMAR	RKS										_	

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Plant N	Vame	Plant			oiler No.						•	
Sampling	Location_	met			Train _	Size Fra	ict. Parti	<u>culate</u>	Run I	No. 3	.	
Date 6	-27-73	Time Start	7740		Time Fini	ish <u>048</u>	55	Test Dura	tion	35	min.	1
Duct Dir	nensions_2	Time Start	45		Diameter	1200	ft	Initial Lea	ik Rate _	0,01	Leim a	410
PTCF_	<u> 24</u>	DGMCF <u>7. 8</u>	784	Nozzie D	1a. <u> </u>	inch	es	rinai Lea	K Kate	<u>va</u>	ctm	
Static Pr	ess <u> </u>	7 " Hg " H20)		Operator	PVI	J	_				
Travers	Clock	Dry gas meter	^ P	^н	Stack	Dry gas m	eter temp.	Hot box	Probe	Last	Vacuum	
Point	Time	reading ft3	in H2O	in H2O	Temp. F	Inlet	Outlet	Temp.	Тетр	Impinger	in. Hg	10:3
<i>E</i> -8	0740	938.170	0.08	0.31	310	74	73		240	63	2.3	
	0755			0.34		78	75		238	62	20	
	0810		0.08	0.31		81	78		237		20	
	0825	952.28	209	0.34		82	79	_	238		7.0	
	0840	· · · · · · · · · · · · · · · · · · ·	0.08	D. 31	314	84	80	_	247		2,0	
	0855	962.12	0.08	0.31	3:4	86	82	-	249	63	2.0	
		966.85	0.08	1	314	87	84	_	246	64	20	
	0925	971.45	0.08	0.31	315	87	84	_	241	65	z, 0	
	0940	975.93	0.08	0.31	314	89	87	_	Z43	62	2.0	
STOP	0955	980.847										
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Avg.		42 677		.32.00	313		82					
Check'd	r			60010-00		100 (10)						
	 	4	<u> </u>						• 3 3 4 2 3 4 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	go toota na sa sa sa sa sa sa		
		H6140Z				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						
FILTER		(47)	mm)	-		0.0000000000000000000000000000000000000	<u> </u>			•		
		17				100 100/00000 1 1/1 /	DSCFM)_		Photograph and a second second			
	LENGTH	10'				Isokinetie	(%)	~ # # # # # # # # # # # # # # # # # # #			<u> </u>	
LINEK !	ma i ekiai	<u> </u>										
REMAR	ıks						·		·		_	

Plant	_Plant Yates St	ation Boiler N	o. I	-	Comments _	<u> </u>					
_ocation	ESP IN										
Run No	/		·								
					Operator	JWM					
Sorbing Rea	gents:	(CO2)	(O2)	(CO)						
Replicate	Original	(CO2)	(CO2)	(O2)	(O2)	(co)	(CO)				
Number	Volume	Reading 2	Volume	Reading 3	Volume	Reading 4	Volume				
	Reading	(ml)	(2-1)	(ml)	(3-2)	(ml)	(4-3)				
			(ml)	,	(ml)		(ml)				
/	0.0	0.8	18.0	17.2)			(/				
		BAD B	Sag /	emp/E							
				// -							
Averaged Re	wasults:	% CO2	SUME (Oz = 8 % 02_	. 5	Nz = 81 					
Dry Molecu	lar Weight, M\	<i>W</i> (dry) =			Ą						
	-0.44	+0.32	±0	28							
											
	=	_+	•		Y-(097 L	ESP I				
			Run	#Train	0120	<u> </u>	ESP Ou				
				nponent <u>bo</u>							
				e 6-21-9	7 Time	1930 Sm	plr TWM				
			Lab	on site	_Analysis _	(02 Oz					
			Tar	e Wt. 12a	Fir	nal Wt. Na	 C-209				
							C-209				

	1/2 - 10	3				Thomas	1+00
Date	6/22/9	<u> </u>			Operator	Thm /	Trap
Sorbing Rea	gents:	(CO2)	(O2)_	(CC))		
		T				1 1	
Replicate	Original	(CO2)	(CO2)	(O2)	(O2)	(CO)	(CO)
Number	Volume	Reading 2	Volume	Reading 3	Volume	Reading 4	Volume
	Reading	(ml)	(2-1)	(ml)	(3-2)	(ml)	(4-3)
		ļ	(ml)	<u> </u>	(ml)		(ml)
<u> </u>	0.0	10.2	10.2	18.0	7.8	ļ	
2	0.0	10.0	10,0	18.6	8.6		
3	0,0	10.0	10.0	1816	816		
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	-		 	 			*****
	 	 		 	 		
Averaged Re	esuits:	% CO2/	0.2	% O2_	8.6		
Averaged Re	esuits:	% CO2/	0,2	% O2_ % N2_	8.6 Bl.2		
-	esults: lar Weight, M		0,2	% O2 % N2	8.6 Bl.2		
-	lar Weight, M				8.6 Bl.2		
-	lar Weight, M	W (dry) =+0.32_).28	8.6 Bl.2		
-	e0.44	W (dry) =+0.32_	+(O2) (%().28	8.6 81.2 Y-25		
Averaged Re	e0.44	W (dry) =+0.32_ CO2) (%0	+(%)).28	Y-25	5 1	ESP O
-	e0.44	W (dry) =+0.32_ CO2) (%0	——————————————————————————————————————	0.28 CO + % N2) Z Train_	Y-25 Of Sat	5 1	ESP O
-	e0.44	W (dry) =+0.32_ CO2) (%0	+(O2) (%) + _ Run i	0.28	Y-25 Of Sa	51 E	
-	e0.44	W (dry) =+0.32_ CO2) (%0	Pate	0.28 CO + % N2) Z Train_	Y-25 Of Sa 3 Time_	51 Smpl:	ESP O

Plant	_Plant Yates S	Station Boiler N	∛o. 1	<u></u>	Comments _		
Location_E	SP Inlet	L					
Run No 3							
Date 6/2	23/45				Operator	TMP	
		/	/				
Sorbing Rea	gents:	(CO2)	(O2)_	(CC))		
D - 1: - 4-	0-1-1-1	(000)	(CO2)	(00)	(02)	(60)	(CO)
Replicate Number	Original Volume	(CO2)	(CO2) Volume	(O2)	(O2)	(CO) Reading 4	(CO) Volume
Number	1	Reading 2 (ml)	(2-1)	Reading 3	Volume	1 - 1	(4-3)
	Reading	(1111)	(ml)	(ml)	(3-2) (ml)	(ml)	(mi)
/	0.0	10.8		19.0	8.Z		(1111)
	0.0		10.8	19.4	8.5		•
2		10.9	10.9				
3	0.0	10.8	10.8	19.0	8.2		
	 				 		
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					<u> </u>	<u> </u>	
Averaged Re	esults:	% CO2	10.8	% O2_ % N2_	8.3 80.9		
Dry Molecu	lar Weight, M	W (dry) =					
	=0.44	+0.32	+	0.28			
				CO + % N2)			
	_	1	+		v	256	
		+	T		1	-256	ESP 1
			R	tun # <u>3</u> Tr	ain OSS	<u>t</u>	ESP Ou
				Component D			٥
			_		-935 Tin	2. 90	mplr JWM
				Date 6-23.			
				Lab on Si			
			7	Tare Wt	F	inal Wt	C-211

Plant	Plant Yates S	Station Boiler N	lo. 1	_	Comments _		
Location	Ly In	Ruart					
Run No.	Metals	Rusin	2-1		_		
Date $6/2$	25/93				Operator	TMP	
Sorbing Read	pents:	(CO2)	(02)	(CO))		
2010128 21006		(000)			,		
							·
Replicate	Original	(CO2)	(CO2)	(O2)	(O2)	(CO)	(CO)
Number	Volume	Reading 2	Volume	Reading 3	Volume	Reading 4	Volum
	Reading	(ml)	(2-1)	(ml)	(3-2)	(ml)	(4-3)
	<u> </u>	 	(ml)	<u> </u>	(ml)	<u> </u>	(ml)
/	0.0	10,2	10.2	19.0	8.8	<u> </u>	
2	0.0	10.0	10,0	19.0	9.0	<u> </u>	
	<u> </u>						
	<u> </u>	T					
Averaged Re	esults:	% CO2	10,1	% O2	9.9		
		% CO		% N2			
		 ···					
Dry Molecul	lar Weight, M	W (dry) =					
	=0.44	+0.32_		0.28 CO + % N2)	<u> </u>		
	(%)	CO2) (%6	(J2) 19h	::7* 76 N/.I			
	=	_ +	_ +		Y-33	7	
			Run #	Train) (SCI)	t	ESP C
				onent has	- DL	^^=	
			Date &	×24.	_	all Two	
			/-			30 Smplr	J WM
_				on site		- -	
2			i are V	/T(g)	Fina	ıl Wt(g)	

CO2 CO2 CO2 CO2 CO2 CO2 CO2	Operator	(CO) Reading 4 (ml)	
Run No.	(O2) Volume (3-2)	(CO) Reading 4	(CO)
CO2 CO2	(O2) Volume (3-2)	(CO) Reading 4	(CO)
Number Volume Reading 2 (ml) Volume (2-1) (ml) Reading 3 (ml) 1 0.0 11.8 18.8 7.0	(O2) Volume (3-2)	Reading 4	
Number Volume Reading 2 Volume Reading 3 Reading (ml) (2-1) (ml) I 0.0 11.8 18.8 7.0	Volume (3-2)	Reading 4	
Number Volume Reading 2 (ml) Volume (2-1) (ml) Reading 3 (ml) 1 0.0 11.8 18.8 7.0	Volume (3-2)	Reading 4	
Number Volume Reading 2 (ml) Volume (2-1) (ml) Reading 3 (ml) 1 0.0 11.8 18.8 7.0	Volume (3-2)	Reading 4	
Reading (ml) (2-1) (ml) (ml) 1 0.0 11.8 18.8 7.0	(3-2)	1 - i	AOIRTIDE
1 0.0 11.8 18.8 7.0		(1111)	(4-3)
1 0.0 11.8 18.8 7.0	(m)	1	
	 - -	 	<u>(ml)</u>
2 0.0 //.8 / 6.0 7.0	1		
	-	+	
		 	 -
	 		
	<u> </u>		
Averaged Results: % CO2 / 1 · 8			
Dry Molecular Weight, MW (dry) =			
=0.44 +0.32 +0.28	· · · · · · · · · · · · · · · · · · ·		
(%CO2) (%O2) (%CO + % N2)			
=++	Y	7-454	
Run #2-3Tra	in ORSA	H	E.
Component			
Date 6/27/9		1/40- 5-	mair T
Lab On Si			
Tare WI(g)			1/2

TRAVERSE FIELD DATA SHEET

Plant Name Plant Yates Station Boiler Nol

Operator RVW/DJV/JWM

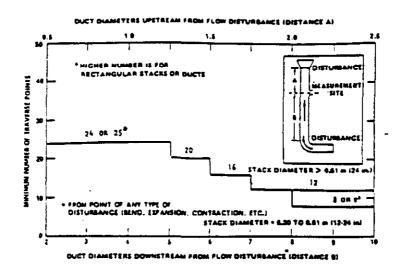
Stack Diameter 8'L" x 45'

Sample Port Diameter 4"

Sample Port Depth /4"

Distance Upstream

Distance downstream



raverse Point Number				Nurr	iber Tra	IVO/B0	Powney	On A D	1277410 1	,		
	2	4	6		10	12	14	16	18	20	22	24
•	14.5	6.7	4.4	3.2	2.6	2,1	1.4	1.6	1.4	1.3	1.1	1.1
2	85.4	25.0	14.0	10.5	1 4.2	6.7	5.7	4.9	4.4	3.9	3.5	3.7
•	i	75.0	29.6	19.4	14,6	11.8	9.8	8.5	7.5	6.7	6.0	5.4
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	8.7	1.7	7.5
S	j		85.4	67.7	34.2	25.0	20.1	16.9	14.8	12.9	11.6	10.4
6)		95.6	80.6	65.8	35.6	26.5	72.0	18.5	16.5	14,6	13.2
7	1	1	,	89.5	77.4	64.4	36.6	25.3	23.6	20.4	18.0	16.
8	1		1	96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
0	1	1	;		91.8	82.3	73.1	62.5	30.2	30.6	26.2	23.1
10			1	-	97.4	84.2	78.9	71.7	61.6	34.1	31.5	27.
11		!)	Ī	Ī	93.3	1 85.4	78.0	70.4	61.2	39.3	32
12	Ī		,	1		97.9	90.1	83.1	78.4	69.4	80.7	39.
13)	1	1		94.3	47.5	81.2	75.0	64.5	60.
14	:		Ī	!	1		94.2	81,5	85.4	79.6	73.8	67.
15	1	:	ī	,				95.1	89.1	83.5	78.2	72
15				1	Ī			94.4	82.5	87.1	82.0	77.
:7				1	:	;		1	95.6	90.3	15.4	80.
15	1		:	:		i		1	98.6	93.3	84.4	1 83.
19	ī		<u> </u>				1	i i			1 01.3	•
20	1	_	1				1	: 		84.7	94.6	1 85.
21	<u> </u>	<u>:</u>	1	i .			-	!	· !		96.5	
722						i			;		94.5	_
ත	<u> </u>			-	:	1	1				1	94.
24	- 	,		<u> </u>	-	-	-	·			:	1 86.

	Traverse Points										
No.	Distance From Wall										
	PORT DEPTH INCUME										
1	22,5 39.5 56.5										
2 7	139.5										
3	56.5										
4	1 + 2.5										
5	90.5										
5	107.5										
7											
8	1										
9											
. 10											
11											
12											
13											
14											
15											
16											
17											
18	<u> </u>										
19											
20	1										
21											
22	<u> </u>										
23											
24	<u> </u>										

			VELO	CITY PROI	FILE FIELD	DATA			
Plant Nat	no In	let Pr	elimi	nary v	relain	, trav	erse (75 M	W Packock is
Sampling	Location	Inle	1		Sample	ldent.			
_ /	116/63								
Duct Dim	ensions	8, <i>5</i>	,,,,,,	4.	<u> </u>	ft or Dia	meter		P(HHMM)ft.
PTOF	0.84			`	% H O 3	E 7.0			
Bar Press		19.58		— " Ha	% CO		- %ot	N_	
Static Pre	SS,	-6.5		" H_O	% CO.	9.0	- - %-⊦	'2 ——— I.	
Operator	nitials	A 0	5V. Jω:	<u>м</u>	% O	7.4	%	2 ———— H	
					2			· · ·	
1 all fe	e vay i.			, 					
		tack Temp. *F		 	city Pressure			Other ()
Pt.	#1	#2	Ave	#1	112	Ave.	#1	#2	Ave.
		284			0.06			 	
2	205	283		7	0.06			 	
3	285	287			a035	<u> </u>	- -	 	
4	284	285			0.02			 	
- 5	283	283		0025				 	
	269	269	_	0.00					
E2-1		282		0.02				 	
2	282	283		T	0,015				
3	284	284		Y'	0,02				
4	282	282			002				
5	274	275		0.04					
	7	263		0,04					
F3-1			-	0.02					
	295			0.02,					
3				0.04					
<u> </u>	256			0.08	}	<u> </u>			
5	294	<u> </u>		0.09					1
6	270	<u> </u>		0.13			<u> </u>		
Weather	4	ve VAP	<u> 0.25</u>	າ					
		Stock Tomp	- 283	°F					
Remarks	-	Vel	: <i>17.1</i>	2 fps					
		ACEM	: 292	904					

mas

DSCFM

Plant Nam	10 <u> </u>	-			· · · · · · · · · · · · · · · · · · ·							
Sampling	Location .				Sample	Ident						
Date		(MMDDYY)	Time Sta	art	(HH	I <mark>MM</mark>) Tim	e Finish	 -	(HHMM)			
Duct Dime	ensions .		د	·		_ft. or Di	ameter _		ft.			
PTCF				_	% H,O _	<u>.</u> .	-					
Bar Press.				" Hg	% CO _		_ % N					
Static Pres	is			" H ₂ O	" H ₂ O % CO ₂ % H ₂							
Operator Is	nitials			_	% O₂ ¯ _		%0	H ₄				
		Stack Temp. *1		Veld	city Pressur	• " H ₂ O	T	Other ()			
Pt.	#1	#2	Ave.	#1	#2	Ave.	#1	#2	Ave.			
F-1-1	290		6706°	0.02								
2	293	000	A. 05	0.05								
3	298			0.06								
4	299			0.14								
5	259			0.16								
6	290			0.19								
F5-1	250			0,03								
٢	292			0.03								
3	295			000								
4	299			0.12								
5	300			0.15								
6	296			0.20								
E6-1	295			0.03								
2	296			0,04								
3,	302			0.07								
7	305			0,14	J.,	<u></u>	<u> </u>					
3	367			0.17			<u> </u>					
6	308			0.18								
Weather						_						
Remarks		***************************************										

Sampling	Location _				Sample	Ident	<u> </u>	<u>-</u>	
Date(MMDDYY) Time St					urt(HHMM) Time Finish				
				¥		ft or Di	ameter		+
PTCF				(% H ₂ O _			 -	
Bar Press.	·			" Hg	«cό		_ % N	, ——	
Static Pres	15. <u> </u>	ito 6	,4	" H ₂ O "	% CO,		% н	· ———	
Operator I	nitials			`	% O, ¯ _		% Ci		
				,	-			•	
	St	ack Temp. *	F	Velo	ity Pressuri	* H ₂ O	<u></u>	Other (1
Pt.	#1	#2	Ave.	#1	#2	Ave.	#1	#2	Ave.
E7-1	309			0.03					
2	309			0.04					
3	311			0.09					
4	311			0.12					
5	3,4,			0.19					
	314			0.20					
E4-1	304			0.07					
	305		ļ	0.1					
	307		<u> </u>	0.08		 _		ļ <u>.</u>	
9	308,		ļ	0.11		ļ	<u> </u>	<u> </u>	<u> </u>
5	314		 	0.14					
	315		 	0.22			 		
	274			0.06					
	275		 	0.07		 	 		 -
	282		 	207					
	277			0.06			 		
	262			0.13			 		
<i>U</i> 2			<u> </u>	(Je ,)			1	L	

acress.

W1-1

	Sampling Location				- Sample	i ident			
Duct Dimensionsx			tart	irt(HHMM) Time Finish(H					
			x		_ft. or Dia	ameter		f	
TCF					% H ₂ O _		-		
ar Press.				" Hg	% CO _		_ % N.	, ——	
tatic Pres	ss			" H ₂ O	% CO,		% н	· ·	
perator I	nitials		<u></u>	_	% O ₂ _		% CI	' 4 —	
	Sta	ack Temp. *	F	Velo	city Pressure	* H ₂ O		Other ()
Pt.	#1	#2	Ave.	m,	#2	Ave.	#1	#2	Ave.
WZ-/	273	····		0.04					
2_	277			0.03					
3.	277			0.05					
4	279			0,07			·		
5	286			0.16					
6	276			0.15					
N3-1	278			0,02					
2	202			0.04					
3,	284			0,06					
4	284			0.13				Ĺ	
5	28/			0,17		"			
6	279			0,19					
14-1	284			0.03					
	270		<u> </u>	0.05		<u> </u>			
3,	282,			0.08					
	284			0.13	<u> </u>	<u></u>	<u> </u>		
5	280			0.0					
6	272			0.13					
eather/		 						··-	

	10					_			
Sampling	Location _				Sample	Ident			
Date	(N	MDDYY)	Time S	tart	(HHMM)				
									ft.
PTCF				_	% H ₂ O _		_		
Bar Press.				" Hg	% co _		_ % N		_
PTCF				″ н,о	% CO,		% н	- وا	
Operator I	nitials		<u>.</u>		% O ₂ _		%0	H ₄ ——	
	St	ack Temp. *	F	Vei	ocity Pressure	. H³O		Other ()
Pt.	#1	#2	Ave.	#1	12	Ave.	#1	#2	Ave.
45-/	275			0.04					
2	275			0.06	<u> </u>				
3	274		<u></u>	0,10					
4	277		ļ.,	0.11			<u> </u>	<u> </u>	
5	273			0.13	<u> </u>	<u></u>			
6.				0.15					
W6-1	246			0.03					
	206			0,03					
	272			0.05		<u></u>			
4	271			0.00					
5	265			0,0%					
6	261			0,16					
W7-1	260			0,02					
こ	263			0.02					
3,	263			0.02	1				
4	258		<u> </u>	0.02	<u> </u>			<u> </u>	
5	260			0.34	<u> </u>				
9	243	<u></u>		0.04					
Weather	<u></u>								•
Remarks									

Plant Name					Sample Ident.					
Date	(N	(YYDDMN	Time St	art	(Hi	HMM) Tin	ne Finish		(HHMM)	
									ft.	
PTCF	0.8	વ		_	% H ₂ O .	æ 7.0				
Bar Press.	7,	7.58		_ " Hg	% CO _		_ % N	, ——		
Static Pres	is	G.4		_ " H ₂ O	% CO2		% н,	· ·		
Operator I	nitials	JWW		-	% O ₂ .	7.4	% Ci	H ₄		
	St	ack Temp. *F	f	Ve	locity Pressu	re " H ₂ O		Other ()	
Pt.	#1	#2	Ave.	#1 /	#2	Ave.	#1	#2	Ave.	
W8-1	254			0.04,				1	T	

282.9

0.7556

APPENDIX D: QUALITY ASSURANCE/QUALITY CONTROL

Appendix D presents a summary of analytical results for QC samples, estimates of measurement precision and accuracy based on analysis of QC samples, and potential limitations in the use of the data.

Overall, QA/QC data associated with this program indicate that measurement data are acceptable and defensible. The QA/QC data indicate that the quality control mechanisms were effective in ensuring measurement data reliability within the expected limits of sampling and analytical error.

Quality control data provide information for identifying and defining qualitative limitations associated with measurement data. The following key types of QC procedures provide the primary basis for quantitatively evaluating data quality:

- Field and laboratory blank samples;
- Duplicate field samples;
- Matrix and surrogate spiked samples;
- Laboratory control samples; and
- Performance evaluation (audit) samples.

Additional details of the project QA/QC program are documented in the DOE Quality Assurance Project Plan.

Sample Collection

Several factors are evaluated to determine acceptable sample collection. Key components of the sampling equipment including the Pitot tubes, thermocouples, orifice meters, dry gas meters, and sampling nozzles were calibrated in the Radian Source Sampling Laboratory before use in the field. These calibrations were also checked after the equipment was returned to the laboratory after the field activities. The presampling calibrations were reviewed by the Radian QA Coordinator as part of the on-site Technical Systems audit.

These calibrations as well as the post sampling calibrations are on file at Radian Corporation. Standard EPA methods or other acceptable sampling methods were used to collect the organic, metal, and anion samples. The sampling runs were well documented, and all gas samples were collected at rates of between 90 and 110% of the isokinetic rates. Sufficient data were collected to ensure acceptable data completeness and comparability of the measurements.

Gas samples were collected from the ESP inlet, ESP outlet, and stack as integrated samples for most analyses over a specified time period. Solid samples of coal, limestone, bottom ash, ESP fly ash, and FGD slurry were collected at hourly intervals over each of the test runs. These individual grabs were combined to provide a single composite sample of each stream for each of the three test runs. Liquid streams were also collected as hourly grabs which were combined to provide a single composite for analysis for each test run. Liquid streams include the ash pond, gypsum recycle water, ash sluice filtrates, FGD slurry filtrate, limestone slurry filtrate, and the inlet and outlet to the condenser. All sampling was conducted while the plant was operating at 85 to 100% of full load and should be representative of typical operation for Plant Yates.

Analytical Quality Control Results

Generally, the type of quality control information obtained pertains to measurement precision, accuracy (which includes precision and bias), and blank effects that are determined using various types of replicate, spiked and blank samples. The specific characteristics evaluated depend on the type of quality control checks performed. For example, blanks may be prepared at different stages in the sampling and analysis process to isolate the source of the blank effect. Similarly, replicate samples may be generated at different stages to isolate and measure sources of variability. The QA/QC measures used as part of this program data evaluation protocol and the characteristic information obtained are summarized in Table D-1. The absence of any of these types of quality control checks from the data for a particular analytical technique does not necessarily reflect poorly on the quality of the data but does limit the ability to estimate the magnitude of the measurement error and hence, prevents placing an estimate of confidence in the results.

As shown in Table D-1, different QC checks provide different types of information, particularly pertaining to the sources of inaccuracy, imprecision, and blank effects. As part of this program, measurement precision and accuracy are typically being estimated from QC indicators that cover as much of the total sampling and analytical process as feasible. Precision and accuracy measurements are based primarily on the actual sample matrix. The precision and accuracy estimates obtained experimentally during the test program are compared to the data quality objectives (DQOs) established for the program as listed in the project QAPP.

These DQOs were not intended to be used as validation criteria but as empirical estimates of the precision and accuracy that would be expected from existing reference measurement methods and that would be considered acceptable. The precision and accuracy objectives are not necessarily derived from analyses of the same types of samples being investigated.

Table D-1
Types of Quality Control Samples

QC Activity	Characteristic Measured
Precision	
Replicate samples collected over time under the same conditions	Total variability, including process or temporal, sampling, and analytical, but not bias.
Duplicate field samples collected simultaneously	Sampling plus analytical variability at the actual sample concentrations.
Duplicate Analyses of a Single Sample	Analytical variability at the actual sample concentrations.
Matrix- or Media-Spiked Duplicates	Sampling plus analytical variability at an established concentration.
Laboratory Control Sample Duplicates	Analytical variability in the absence of sample matrix effects.
Surrogate-Spiked Sample Sets	Analytical variability in the sample matrix but at an established concentration.
Accuracy (Including Bias and Precision)	
Matrix-Spiked Samples	Analyte recovery in the sample matrix, indicating possible matrix interferences and other effects. In a single sample indicates both random error (imprecision) and systematic error (bias).
Media-Spiked Samples	Same as matrix-spiked samples. Used where a matrix-spiked sample is not feasible, such as the stack sampling methods.
Surrogate-Spiked Samples	Analyte recovery in the sample matrix, to the extent that the surrogate compounds are chemically similar to the compounds of interest. Primarily used as indicator of analytical efficacy.
Laboratory Control Samples (LCS)	Analyte recovery in the absence of actual sample matrix effects. Used as an indicator of analytical control.

Table D-1 (Continued)

QC Activity	Characteristic Measured
Standard Reference Material	Analyte recovery in a matrix similar to the actual samples.
Blank Effects	
Field Blank	Total sampling plus analytical blank effect, including sampling equipment and reagents, sample transport and storage, and analytical reagents and equipment.
Trip Blank	Blank effects arising from sample trans- port and storage. Typically only used for volatile organic compound analyses.
Method Blank	Blank effects inherent in analytical method, including reagents and equipment.
Reagent Blank	Blank effects from reagents used.

Although analytical precision and accuracy are relatively easy to quantify and control, sampling precision and accuracy are unique to each sample matrix. Data that do not meet these objectives are not necessarily unacceptable. Rather, the intent is to document the precision and accuracy obtained, and the objectives serve as benchmarks for comparison. The effects of not meeting the objectives should be considered in light of the intended use of the data.

Table D-2 presents the types of quality control data reported for the program and a summary of precision and accuracy estimates. Almost all of the quality control results met the project objectives.

The following potential problems were identified by the quality control data.

- Chloromethane, methylene chloride, and tetrachloroethene were found in one or more of the field blanks analyzed for VOST. In many cases, the same concentrations were also found in the field samples.
- A standard limestone sample (NIST 1C) was submitted blind as a performance audit sample. Aluminum, silicon, and sodium recoveries in this sample were below 50%, and the recovery of potassium was greater than 200 percent. This may indicate a similar low bias for these elements in the limestone process streams.
- Selenium showed no spike recovery in the impinger solutions analyzed by GFAAS.
 However, selenium recoveries in the audit samples submitted by RTI showed recoveries of 104 and 113 percent.

A discussion of the overall measurement precision, accuracy and blank effects is presented below for each measurement type.

Precision is a measure of the reproducibility of measurements under a given set of conditions. It is expressed in terms of the distribution, or scatter, of the data, calculated as the standard deviation or coefficient of variation (CV, standard deviation divided by the mean). For duplicates, precision is expressed as the relative percent difference (RPD).

Accuracy is a measure of the degree of conformity of a value generated by a specific procedure to be assumed or accepted true value, and includes both precision and bias. Bias is the persistent positive or negative deviation of the method average value from the assumed or accepted true value.

The efficiency of the analytical procedure for a given sample matrix is quantified by the analysis of spiked samples containing target or indicator analytes or other quality assurance measures, as necessary. However, all spikes, unless made to the flowing stream ahead of the sampling, produce only estimates of the recovery of the analyte through all of the measurement steps occurring after the addition of the spike. A good spike recovery tells little about the true value of the sample before spiking.

Table D-2 Summary of Precision and Accuracy Estimates

		Ob	jectives	Measured	
Measurement Parameter	How Measured	Precision (% RPD)	Accuracy (% Recovery)	Precision (% RPD)	Accuracy (% Recovery)
Semivolatile Organics in Gas Solid Phase -	Precision- Matrix-Spiked Duplicates				
SW8270	Accuracy - Matrix Spikes				
Acenaphthene	-	54	47-145	4.1	86
4-Chloro-3-methylphenol		69	22-147	5.0	84
2-Chlorophenol		62	23-134	3.0	82
1.4-Dichlorobenzene		58	20-124	3.2	80
2,4-Dinitrotoluene		55	39-139	3.2	78
n-Nitrosodipropylamine		130	0.1-230	6.3	60
4-Nitrophenol		78	0.1-132	7.0	89
Pentachlorophenol		84	14-176	9.0	45
Phenol		43	5-112	3.4	58
Pyrene		36	52-115	4.1	86
1,2,4-Trichlorobenzene		55	44-142	4.0	90
Semivolatile Organics in Fly Ash -	Precision- Matrix-Spiked Duplicates				
SW8270	Accuracy - Matrix Spikes				
Acenaphthene		54	47-145	1.3	82
4-Chioro-3-methylphenol		69	22-147	5.6	84
2-Chlorophenol		62	23-134	1.8	84
1,4-Dichlorobenzene		58	20-124	2.5	81
2,4-Dinitrotoluene		55	39-139	2.7	76
n-Nitrosodipropylamine		130	0.1-230	7.8	60
4-Nitrophenol		78	0.1-132	37	49
Pentachiorophenoi		84	14-176	5.3	64
Phenol		43	5-112	2.7	76
Pyrene		36	52-115	17.7	48Q
1,2,4-Trichlorobenzene		55	44-142	1.2	89
Semivolatile Organics in FGD Solids - SW8270	Precision- Matrix-Spiked Duplicates Accuracy - Matrix Spikes				
Acenaphthene	Accuracy - Maurix Spikes	54	47-145	7.3	82
4-Chloro-3-methylphenol		69	22-147	7.3 9.3	76
		= -	23-134		
2-Chlorophenol		62		7.1	84
1,4-Dichlorobenzene		58	20-124	8.7	80
2,4-Dinitrotoluene		55	39-139	4.0	74
n-Nitrosodipropylamine		130	0.1-230	14	52
4-Nitrophenol		78	0.1-132	14	92
Pentachlorophenol		84	14-176	4.1	74
Phenol		43	5-112	5.5	73
Pyrene		36	52-115	4.4	90
1,2,4-Trichlorobenzene		55	44-142	9.8	92
Semivolatile Organics in Aqueous Streams - SW8270	Precision- Matrix-Spiked Duplicates Accuracy - Matrix Spikes				
Acenaphthene		54	47-145	11	79
4-Chioro-3-methylphenoi		69	22-147	10	83
2-Chlorophenol		62	23-134	10	80
1,4-Dichlorobenzene		58	20-124	6.8	72
2,4-Dinitrotoluene		55	39-139	7.4	82
n-Nitrosodipropylamine		130	0.1-230	12	75
4-Nitrophenol		78	0.1-132	8.6	47
Pentachlorophenol		84	14-176	11	72
Phenol		43	5-112	12	40
Pyrene		36	52-115	7.6	78
1,2,4-Trichlorobenzene		55	44-142	9.7	82
				- • •	~ ~

Table D-2 (Continued)

		Ob	jectives	Measured	
Measurement Parameter	How Measured	Precision (% RPD)	Accuracy (% Recovery)	Precision (% RPD)	Accuracy (% Recovery)
Dioxins and Furans in Stack Gas Solid	Precision: NA				
Phase	Accuracy: Internal Standard Recovery				
¹³ C ₁₂ -2,3,7,8-TCDF		50	40-120		60
¹³ C ₁₂ -2,3,7,8-TCDD		50	40-120		61
¹³ C ₁₂ -1,2,3,7,8-PeCDF		50	40-120		56
¹³ C ₁₂ -1,2,3,7,8-PeCDD		50	40-120		63
¹³ C ₁₂ -1,2,3,6,7,8-HxCDF		50	40-120		69
¹³ C ₁₂ -1,2,3,6,7,8-HxCDD		50	40-120		69
¹³ C ₁₂ -1,2,3,4,6,7,8-H _P CDF		50	40-120		57
¹³ C ₁₂ -1,2,3,4,6,7,8-HpCDD		50	40-120		64
¹³ C ₁₂ -1,2,3,4,6,7,8,9-OCDD		50	40-120		50
PCDD/PCDF	Precision - NA				
	Accuracy - Internal Standard Recovery,				
	average for all samples analyzed.				
¹³ C ₁₂ 2,3,7,8-TCDF			40-120		57.2
"C ₁₂ -2,3,7,8-TCDD			40-120		54.7
¹⁵ C ₁₂ -1,2,3,7,8-PeCDF			40-120		55.7
¹³ C ₁₂ -1,2,3,7,8-PeCDD			40-120		63.3
¹³ C ₁₂ -1,2,3,6,7,8-HxCDF			40-120		69.2
¹⁵ C ₁₂ -1,2,3,6,7,8-HxCDD			40-120		69.0
¹³ C ₁₂ -1,2,3,4,6,7,8-HpCDF			40-120		57.1
¹³ C ₁₂ -1,2,3,4,6,7,8-HpCDD			40-120		63.6
¹³ C ₁₂ -1,2,3,4,6,7,8,9-OCDD			40-120		50.0
PCDD/PCDF in Stack Gas	Precision - NA				
	Accuracy - Surrogate Spike Recovery,				
	average for all samples analyzed.				
³⁷ Cl ₄ -2,3,7,8-TCDD			70-130		118.4
¹³ C ₁₂ -2,3,4,7,8-PeCDF			70-130		113.2
¹³ C ₁₂ -1,2,3,4,7,8-HxCDF			70-130		120.8
¹³ C ₁₂ -1,2,3,4,7,8-HxCDD			70-130		141.6
¹³ C ₁₂ -1,2,3,4,7,8,9-HpCDF			70-130		104.7
¹³ C ₁₂ -1,2,3,7,8,9-HxCDF			70-130		75.4
¹³ C ₁₂ -2,3,4,6,7,8-HxCDF			70-130		84.3
Volatile Organics in Vapor Phase -	Precision - NA				
SW8240	Accuracy - Surrogate Spike Recovery				
1,2-Dichloroethane-d4		50	70-130		114
Toluene-d8		50	70-130		101
4-Bromofluorobenzene		50	70-130		108
Aldehydes in Vapor Phase	Precision - Duplicate Analyses Accuracy - Matrix Spiked Samples				
Acetaldehyde		50	50-150	10	94
Formaldehyde		50	50-150	36	90
Aldehydes in Aqueous Streams	Precision - Duplicate Analyses				
-	Accuracy - Matrix Spiked Samples				
Acetaldehyde		50	50-150	14	101
Formaldehyde		50	50-150	18	94

Appendix D: Quality Assurance/Quality Control

Table D-2 (Continued)

		Objectives		Measured	
Measurement Parameter	How Measured	Precision (% RPD)	Accuracy (% Recovery)	Precision (% RPD)	Accuracy (% Recovery)
Metals in Gas Solid Phase - ICP-AES	Precision - Matrix-spiked pairs				
	Accuracy - Matrix-spiked Sample				
Aluminum		20	75-125	62Q	62Q
Antimony		20	75-125	20	84
Barium		20	75-125	30Q	75
Beryllium		20	75-125	<1	89
Chromium		20	75-125	2.9	88
Cobalt		20	75-125	1	91
Copper		20	75-125	<1	93
Manganese		20	75-125	2.2	91
Molybdenum		20	75-125	3.7	94
Nickel		20	75-125	5	89
Vanadium		20	75-125	2.2	94
Metals in Gas Solid Phase - ICP-AES	Precision - NA				
	Accuracy - Standard reference material				
	(NIST 1633a Fly Ash)				
Aluminum	,	20	75-125		94
Antimony		20	75-125		NC
Barium		20	75-125		82
Beryllium		20	75-125		147Q
Calcium		20	75-125		99
Chromium		20	75-125 75-125		96
Cobait		20	75-125 75-125		88
Copper		20	75-125 75-125		95
Iron		20	75-125 75-125		
		20	75-125 75-125		93
Magnesium					95
Manganese		20	75-125		94
Potassium		20	75-125		109
Nickel		20	75-125		94
Silicon		20	75-125		98
Sodium		20	75-125		96
Strontium		20	75-125		92
Titanium		20	75-125		97
Vanadium		20	75-125		95
Zine		20	75-125		97
Metals in Gas Vapor Phase - ICP-AES	Precision - Matrix-spiked Duplicates				
	Accuracy - Matrix-spiked Sample				
Aluminum		20	75-125	<1	104
Antimony		20	75-125	4	101
Barium		20	75-125	0	106
Beryllium		20	75-125	0	108
Boron		20	75-125	2.9	104
Chromium		20	75-125	0	105
Cobalt		20	75-125	Ŏ	102
Copper		20	75-125	0	105
Manganese		20	75-125 75-125	<1	103
Molybdenum		20	75-125 75-125	2.0	100
Nickel		20	75-125 75-125		100
Vanadium		20		0	
A SINGINII)		20	75-125	U	107

Table D-2 (Continued)

		Objectives		Measured	
Measurement Parameter	How Measured	Precision (% RPD)	Accuracy (% Recovery)	Precision (% RPD)	Accuracy (% Recovery)
Metals in Gas Vapor Phase - ICP-AES	Precision - NA		· · · · · · · · · · · · · · · · · · ·		
(HNO ₃ /H ₂ O ₂ Impinger Solution)	Accuracy - Standard reference material (EPA ICP-19)				
Antimony	(======================================	20	75-125		93
Beryllium		20	75-125		101
Calcium		20	75-125		109
Chromium		20	75-125		99
Cobalt		20	75-125		100
Copper		20	75-125		119
Iron		20	75-125		93
Manganese		20	75-125		97
Molybdenum		20	75-125		108
Nickel		20	75-125		102
Vanadium		20	75-125		103
	B 11 Nr.	20	75 .25		105
Metals in Coal - INAAS	Precision - NA Accuracy - Standard Reference Material				
	(NIST 1632b coal)				
Antimony		20	80-120		94
Barium		20	80-120		99
Beryllium		20	80-120		109
Boron		20	80-120		99
Chromium		20	80-120		99
Cobalt		20	80-120		NC
Copper		20	80-120		99
Manganese		20	80-120		103
Molybdenum		20	80-120		102
Nickel		20	80-120		99
Vanadium		20	80-120		97
Metals in Limestone - ICP-AES	Precision - NA				
	Accuracy- Standard reference material (NIST Limestone Ic)				
Aluminum		20	75-125		14Q
Calcium		20	75-125		101
Iron		20	75-125		700
Magnesium		20	75-125		69Q
Manganese		20	75-125		74Q
Potassium		20	75-125		2240
Silicon		20	75-125		1.5Q
Sodium		20	75-125		47Q
Strontium		20	75-125		97
Metals in FGD Solids - ICP-AES	Precision - Matrix-spiked Duplicates				
A Brownian to	Accuracy - Matrix-spiked Samples	20	75 105	0 7	0.4
Aluminum		20	75-125 75-126	8.7	94
Antimony		20	75-125	4.7	83
Barium		20	75-125	6.0	84
Beryllium		20	75-125	4.6	81
Boron		20	75-125	28Q	91
Chromium Cabak		20	75-125	5.7	82
Cobalt	•	20	75-125	5.6	78 27
Copper		20	75-125	5.1	87
Manganese Malubdanum		20	75-125	15	79 70
Molybdenum Niebol		20	75-125 26-126	5.1	79 70
Nickel Vandings		20	75-125	5.0	79
Vanadium		20	75-125	5.6	84

Table D-2 (Continued)

		Ob	jectives	Me	easured	
Measurement Parameter	How Measured	Precision (% RPD)	Accuracy (% Recovery)	Precision (% RPD)	Accuracy (% Recovery)	
Metals in ESP Fly Ash - ICP-AES	Precision - Matrix-spiked Duplicates Accuracy - Matrix-spiked Samples				<u> </u>	
Aluminum		20	75-125	16	78	
Antimony		20	75-125	8.4	91	
Barium		20	75-125	10.2	85	
Beryllium		20	75-125	1.8	92	
Chromium		20	75-125	1.7	94	
Cobalt		20	75-125	1.8	93	
Copper		20	75-125	2.4	95	
Manganese		20	75-125	2.5	92	
Molybdenum		20	75-125	4.5	84	
Nickel		20	75-125	5.2	96	
Vanadium		20	75-125 75-125	2.8	94	
Metals in Aqueous Process Streams -	Precision - Matrix-spiked Duplicates					
ICP-AES	Accuracy - Matrix-spiked Samples					
Aluminum		20	75-125	4.4	96	
Antimony		20	75-125	16	87	
Barium		20	75-125	7.6	99	
Beryllium		20	75-125	4.4	92	
Boron		20	75-125	1.0	96	
Chromium		20	75-125	4.9	92	
Cobalt		20	75-125	4.6	89	
Copper		20	75-125	4.0	96	
Manganese		20	75-125	4.5	92	
Molybdenum		20	75-125	4.8	89	
Nickel		20	75-125	7.3	90	
Vanadium		20	75-125	3.6	95	
Metals in Aqueous Process Streams -	Precision - NA Accuracy - Performance Audit Samples					
	(2 concentrations)					
Antimony	(2 ************************************	20	75-125		127Q/82	
Beryllium		20	75-125		99/93	
Calcium		20	75-125		169Q	
Chromium		20	75-125		94/97	
Cobait		20				
		20 20	75-125		100/87	
Соррег			75-125		96/110	
ron		20	75-125		103/139Q	
Magnesium		20	75-125		131Q	
Manganese		20	75-125		96/95	
Molybdenum		20	75-125		98/114	
Nickel		20	75-125		104/111	
l'itanium		20	75-125		98	
Vanadium		20	75-125		96/104	
Zinc		20	75-125		99	
Metals in Gas Vapor Phase - GFAAS and CVAAS	Precision - Matrix spiked Duplicates Accuracy - Matrix Spiked Samples					
Arsenic	sand standards manual messelesans	20	75-125	4.0	100	
Cadmium		20	75-125	<1	114	
Lead		20	75-125	45Q	84	
Mercury		20	75-125	1.3	98	
Selenium		20	75-125	940	0	
Metals in Gas Solid Phase - CVAAS	Precision - Matrix spiked Duplicates Accuracy - Matrix Spiked Samples	20	25	,,,	Ū	
Mercury		20	75-125	1.0	128Q	
Metals in Gas Vapor Phase - CVAAS	Precision - NA					
and a second	Accuracy - Performance Audit Samples					
Mercury (KMnO ₄ Impinger Solution)		20	75-125		33Q	

Table D-2 (Continued)

		Objectives		Measured	
Measurement Parameter	How Measured	Precision (% RPD)	Accuracy (% Recovery)	Precision (% RPD)	Accuracy (% Recovery)
Metals in Process Solid Streams - GFAAS	Precision - Matrix spiked Duplicates				· · · · · · · · · · · · · · · · · · ·
and CVAAS	Accuracy - Matrix Spiked Samples				
Arsenic		20	75-125	< 1	104
Cadmium		20	75-125	8.8	110
Lead		20	75-125	1.2	86
Mercury		20	75-125	2.6	107
Selenium		20	75-125	25.3Q	103
Metals in Solid Phase - GFAAS and	Precision - NA				
CVAAS	Accuracy - Standard reference material				
A:-	(NIST 1633a Fly Ash)	20	75-125		NA
Arsenic Cadmium		20	75-125 75-125		NA NA
		20			
Lead			75-125		NA
Mercury		20	75-125		119
Selenium		20	75-125		NA
Metals in Aqueous Process Streams -	Precision - Matrix Spiked Duplicates				
GFAAS and CVAAS	Accuracy - Matrix Spiked Samples				
Arsenic		20	75-125	4.2	99
Cadmium		20	75-125	2.2	108
Lead		20	75-125	12	76
Mercury		20	75-125	24.6Q	35Q
Selenium		20	75-125	41.2Q	76.4
Metals in Aqueous Process Streams -	Precision - NA				
GFAAS and CVAAS	Accuracy - Performance Audit Samples (2 concentrations)				
Arsenic	(2 COLCOLLISTICAL)	20	75-125		94/100
Cadmium		20	75-125		93/100
Lead		20	75-125		99/96
Selenium		20	75-125		96/50
	maratita a NEA	20	15-125		70/30
Metals in Gas Vapor - ICP/MS	Precision - NA				
(HNO ₃ /H ₂ O ₂ Impinger Solution)	Accuracy - Performance Audit Samples	27.4	***		90
Antimony		NA	NA		89
Arsenic		NA	NA		109
Beryllium		NA	NA		98
Cadmium		NA	NA		97 27
Chromium		NA	NA		9 7
Cobalt		NA	NA		88
Copper		NA	NA		83
Lead		NA	NA		87
Manganese		NA	NA		97
Molybdenum		NA	NA		94
Nickel		NA	NA		90
Selenium		NA	NA		106
Vanadium		NA	NA		93

Appendix D: Quality Assurance/Quality Control

Table D-2 (Continued)

		Ob	jectives	Me	easured
Measurement Parameter	How Measured	Precision (% RPD)	Accuracy (% Recovery)	Precision (% RPD)	Accuracy (% Recovery)
Extractable Metals - ICP/MS	Precision - Duplicate Analysis				
Nitric acid digestate)	Accuracy - Matrix-Spiked Samples				
Antimony		20	NA	40Q	NA
Arsenic		20	75-125	434Q	118
Berium		20	75-125	5.8	94
Beryllium		20	75-125	11	108
Cadmium		20	75-125	0	94
Chromium		20	75-125	9.4	98
Cobalt		20	75-125	7.7	100
Copper		20	75-125	19	100
Lead		20	75-125	1.6	83
Manganese		20	75-125	9.6	108
Mercury		20	75-125	NC	852Q
Molybdenum		20	NA	12	NA.
Nickel		20	75-125	13	103
Selenium		20	75-125	43Q	1380
Vanadium		20	75-125 75-125	3.6	109
		20	73-123	3.0	109
Extractable Metals - ICP/MS	Precision - Duplicate analysis				
(Gastric fluid leachate)	Accuracy - Matrix-spiked samples				
Antimony		20	NA	6.5	NA
Arsenic		20	75-125	NC	0Q
Barium		20	75-125	1.5	85
Beryllium		20	75-125	12	79
Cadmium		20	75-125	27Q	107
Chromium		20	75-125	4.2	88
Cobalt		20	75-125	3.4	92
Copper		20	75-125	14	92
Lead		20	75-125	3.2	97
Manganese		20	75-125	3.2	710
Mercury		20	75-125	610	124
Molybdenum		20	NA.	10	NA.
Nickel		20	75-125	3.7	81
Selenium		20	75-125	NC	84
Vanadium		20	75-125	NC	
Vanagium		20	73-123	NC	0Q
Metals in Gas Solid Phase - GDMS	Precision - NA				
	Accuracy - Standard Reference Material				
Aluminum	(NIST 1633a Fly Ash)				
Antimony		NA	NA		180Q
Berium		NA	NA		NC
Beryllium		NA	NA		357Q
Calcium		NA	NA		NC
Chromium		NA	NA		70Q
Cobalt		NA	NA		140Q
Copper		NA	NA		NC
Iron		NA	NA		203Q
Magnesium		NA	NA		-
•					79
Manganese		NA NA	NA NA		120
Potassium		NA	NA		58Q
Nickel		NA	NA		119
Silicon		NA	NA		115
Sodium		NA	NA		111
Strontium		NA	NA	,	39Q
Titanium		NA	NA		320Q
Vanadium		NA	NA		131Q
Zinc		NA	NA		141Q
		NA	NA		129Q

Table D-2 (Continued)

		Ob	jectives	Measured		
Measurement Parameter	How Measured	Precision (% RPD)	Accuracy (% Recovery)	Precision (% RPD)	Accuracy (% Recovery)	
Anions in Aqueous Process Streams -	Precision - NA					
	Accuracy - Performance Audit Samples					
Chloride		20	80-120		0Q	
Fluoride		20	80-120		39Q	
Sulfate		20	75-125		350Q	
Anions in Gas Vapor Phase -	Precision - Matrix spiked Duplicates					
·	Accuracy - Matrix Spiked Samples					
Chloride	• •	20	80-120	9.7	100	
Fluoride		20	80-120	1.9	107	
Anions in Process Solid Streams	Precision - Matrix spiked Duplicates					
	Accuracy - Matrix Spiked Samples					
Chloride		20	80-120	<1	95	
Fluoride		20	80-120	3.5	70	
Anions in Aqueous Process Streams	Precision - Matrix spiked Duplicates					
Wittens III Wincons Liocess 24 exists	Accuracy - Matrix Spiked Samples					
Chloride	Accoracy - Madrix Spized Samples	20	80-120	3.6	111	
Fluoride		20	80-120	1.6	101	
Sulfate		20	75-125	1.5	97	
	Province Matrix miles d Provinces					
Ammonia in Gas Vapor Phase by 350.2	Precision - Matrix spiked Duplicates Accuracy - Performance Audit Standard					
Ammonia	Accuracy - Performance Audit Standard	20	80-120	390	63Q	
		20	80-120	23Q	03Q	
Ammonia in Aqueous Streams by 350.1	Precision - Matrix spiked Duplicates					
_	Accuracy - Performance Audit Standard					
Ammonia		20	80-120	60Q	88	
Cyanide in Gas Vapor Phase by 335.2	Precision - Matrix spiked Duplicates					
	Accuracy - Performance Audit Standard					
Cyanide		20	75-125	16	50	
Cyanide in Aqueous Streams by 335.2	Precision - Matrix spiked Duplicates					
•	Accuracy - Performance Audit Standard					
Cyanide	-	20	75-125	13	80	
Phosphate in Aqueous Streams by 365.2	Precision - Matrix spiked Duplicates					
	Accuracy - Performance Audit Standard					
Phosphate		20	75-125	6.1	97	

NA = Not applicable.

NC = Not calculated.

Q = Outside project QC objectives.

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. The representativeness criterion is based on making certain that the sampling locations are properly selected and that a sufficient number of samples are collected.

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Sampling data should be comparable with other measurement data for similar samples under similar conditions. This goal is achieved using standard techniques to collect and analyze representative samples and by reporting results in appropriate units. Data sets can be compared with confidence when the precision and accuracy is known.

Completeness is an expression of the number of valid measurements obtained compared with the number planned for a given study. The goal is to generate a sufficient amount of valid data.

Semivolatile Organics

Precision. The precision of the semivolatile organic analyses was estimated using matrix spiked duplicate pairs. The precision was met for all of the gas-phase solid samples, the gas vapor-phase samples, the solid stream samples, and aqueous-phase sample streams. The precision estimates are summarized for each stream in Table D-2.

Accuracy. The accuracy of the semivolatile analyses was estimated using matrix spiked duplicate samples. All of the spiked compounds analyzed in the gas solid-phase samples and the aqueous process streams were within the accuracy objectives. Matrix spikes into the solid process streams were all within the recovery objects for all analytes in the FGD solid stream and all the except pyrene in the ESP ash solids. Recovery for pyrene was 51% and 56% (project objective--52-115%) for the ESP ash sample and 48% and 37% for the ESP ash field duplicate.

Blank Effects. Acetophenone and benzoic acid were found in one or more of the field blanks associated with the gas-phase solids analyses. The concentrations of these compounds in the blanks, however, were not significant in comparison to the concentrations found in the samples. Several phthalates were also found in the field blanks. The concentrations found in the samples were about the same level as found in the blanks and are therefore considered an artifact of the sampling and handling process.

Volatile Organics

Precision. Precision for volatile organic analysis of the aqueous process streams was estimated using matrix spiked duplicate samples. The 50% precision objectives were met for each of the volatile analytes used for the matrix spikes.

Accuracy. Accuracy for the volatile organic analyses in the aqueous process streams was estimated using matrix spiked samples and accuracy for the gas vapor-phase streams was estimated using surrogates spiked into each sample prior to analysis. The accuracy objectives for recoveries ranging from 0.1% to 234% were met for all analytes of interest (actual recoveries ranged from 70-136%) for the aqueous streams. Accuracy objectives for surrogate recoveries of 70 to 130% for the gas-phase streams were met for all samples except for toluene-d8 in one stack sample. Accuracy based on the analysis of two laboratory method spikes met the recovery objectives for all analytes of interest except for one acetone, chloromethane, chloroethane, and methylene chloride spike.

Blank Effects. Chloromethane, methylene chloride, and tetrachloroethene were found in one or more of the field gas vapor-phase blank samples. In most cases these compounds were found in the investigative field samples at about the same level as in the field blank or at lower concentrations. The sampling, handling, and transport from the field may have contributed this observed contamination. Chloromethane and methylene chloride were also found in one laboratory blank.

Aldehydes

Precision. Precision for the aldehyde analyses was estimated using duplicate sample analyses. The precision objectives of 50% were met for both formaldehyde and acetaldehyde in the gas vapor-phase samples and the aqueous process stream sample analyses.

Accuracy. Accuracy for the aldehydes was estimated using matrix spiked samples. The project accuracy objectives of recoveries of 50-150% were met for the gas vapor-phase and aqueous stream sample spikes for both formaldehyde and acetaldehyde.

Blank Effects. Formaldehyde and acetaldehyde were found in concentrations (3.8-8.2 μ g, formaldehyde; 2.7-8.6 μ g, acetaldehyde) above the reporting limits in the field blanks to the gas vapor-phase sampling train. Low levels (within 3 times the detection limit) of these analytes were also found in two of the four laboratory (method) blanks but were not found in the trip blanks.

Metals

Precision. The precision of metals analyses by ICP-AES, GFAAS, and CVAAS was estimated for samples using matrix-spiked duplicate samples. The precision objectives (RPD <20%) were met for all target analytes analyzed by ICP-AES except aluminum and barium in the gas solid-phase spiked samples and boron in the process solid-spiked samples. The precision objectives for the GFAAS analyses were met except for lead in the gas vapor-phase matrix-spiked samples, selenium in the process solid matrix-spiked samples, and mercury and selenium in the aqueous process stream matrix spikes. In most of these cases, the concentrations of the analytes of interest were within 10 times the detection limit where the precision would not be expected as good or the spiked amount was low (<4 times) the amount found in the original sample.

Accuracy. The accuracy of metals analyses was estimated for the gas solid-phase samples using standard reference material (NIST 1633a fly ash) submitted blind to the laboratory as a performance audit sample. All of the metals analyzed by ICP-AES were within the 75-125% accuracy objectives except for beryllium (147%) which was recovered above the objectives. The fly ash (NIST 1633a) reference standard was also submitted for GDMS analysis. The results for this analysis are shown in Table D-2. Accuracy objectives were not assigned to the GDMS analyses since this technique has not been validated or widely used for these types of samples at the present time. However, the recoveries have been compared to the accuracy objectives for ICP-AES and flagged with a Q when outside the QC objectives.

The accuracy of the metals analyses was estimated for coal samples using a standard reference coal sample (NIST 1632b) submitted blind to the laboratory. All of the metals analyzed by INAA in the reference sample were within the 75-125% accuracy objective.

The accuracy of the metals analyses was estimated for the limestone samples using a standard reference limestone (NIST Limestone 1C) submitted blind to the laboratory. The results show that the recoveries for most of the metals were outside the 75-125% accuracy objectives. Aluminum, silicon, and sodium recoveries were 50%, and the recovery for potassium was greater than 200 percent. The recoveries of these analytes may show a similar bias in the limestone process streams.

The accuracy of the metals analyses for the gas vapor-phase samples and the aqueous process streams were estimated using performance audit samples prepared from EPA reference standards. The gas-phase audit sample was prepared in the solutions used for the impingers (multi-metals train) and the two aqueous-phase samples were prepared in HPLC grade water. The results show that the recoveries of all the metals analyzed by ICP-AES and GFAAS were within the 75-125% accuracy objectives except Sb (127%), Ca (169%), Fe (139%), and Mg (131%) by ICP-AES and Se (50%) and Hg (33%) by GFAAS. The concentrations of these elements in the samples were at or near the detection limit and are not expected to be as accurate as concentrations at higher levels (at least 10 times the detection limit). The gas-phase audit sample prepared in the HNO₃/H₂O₂ impinger solution was also analyzed by ICP/MS. The results for this analysis showed recoveries ranging from 83 to 109%, all within the accuracy objectives for ICP-AES (accuracy objectives were not assigned for ICP/MS).

Matrix-spiked samples were also used to determine the accuracy of the metals analyses in the gas, process solids, and aqueous process matrices. Recoveries for the target analytes were within the 75-125% accuracy objectives except for selenium (0% recovery) in the gas vaporphase matrix mercury (35% recovery) in the aqueous process stream matrix.

Blank Effects. Aluminum, iron, manganese, and nickel were found at concentrations above the reporting limits in the field blanks to the gas vapor-phase sampling train. These elements were also found to a lesser extent in the impinger reagent blank solutions. Field blank filters combined with probe/nozzle rinses were also analyzed to determine the contribution of the filter media to the gas solid-phase components. Background or blank correction was

performed for the gas-phase samples using the results of the analysis of the impinger reagent blanks and the blank filter media.

Anions

Precision. Precision for the anions analyses was estimated for the gas vapor-phase samples, process solid streams, and aqueous process streams by the analysis of matrix spiked samples. The precision objectives of 20% were met for chloride, fluoride, and sulfate except for chloride and sulfate in one matrix spike pair from the stack with RPDs of 22% and 24%, respectively.

Accuracy. Accuracy for the anions analyses was estimated using matrix spiked duplicate samples. The accuracy objectives of 80-120% recovery were met for all analytes and all sample matrices except for the fluoride spikes into the ESP ash solid samples with recoveries of 56% and 60 percent. A performance audit sample was submitted for analysis of the target anions in an aqueous matrix. The recoveries for this sample were outside the accuracy objectives for all three analytes. This sample was prepared with each analyte concentration at the MDL; therefore, no corrective action was initiated.

Cyanide, Ammonia, and Phosphate

Precision. Precision for the cyanide, ammonia, and phosphate analyses was estimated using matrix spiked duplicate sample analyses. The precision objectives of 20% were met for each of the analytes for both the gas vapor-phase and aqueous process streams except for ammonia spikes into the JBR process liquids. The spike concentration was too low in comparison to the level found in the native process sample.

Accuracy. Accuracy for ammonia, cyanide and phosphate was estimated using both matrix spiked duplicate samples and "double blind" performance audit samples. The accuracy objectives (cyanide, 75-125%; ammonia, 80-120%; phosphate, 75-125%) were met for all matrix spiked samples except for the ammonia spikes into the JBR process liquids with recoveries at 60 and 273 percent. Recoveries for the performance audit samples met the accuracy objectives for all analytes with recoveries of 88% for ammonia, 80% for cyanide, and 97% for phosphate. Recoveries for performance audit samples spiked into the gas vapor-phase impinger solutions were not as good as the aqueous spiked audit samples. The recovery for ammonia in the impinger solutions was 63% and the recovery for cyanide was 50 percent. The aqueous spikes and impinger spikes were performed using the same spiking solutions and were spiked at the same concentration levels.

Performance Evaluation Audit Samples

Performance audit samples are samples of known composition which provide a point-in-time assessment of analytical performance. Audit samples were prepared for this study by spiking known concentrations of target analytes from EPA Quality Control Check material, vendor-certified standard material, or standards obtained from NIST (formerly NBS). Audit samples are similar to QCCS except that they are submitted "double blind" to the analytical laboratory. That is, the laboratory does not know the identity or composition of the audit samples.

Audit samples were prepared at concentration levels simulating the expected range of the analytes in the field samples when possible. Organic audit samples were not prepared because the laboratories performing organic analyses have consistently shown acceptable performance on surrogate recoveries and internal quality control samples. Results for these samples are shown in Table D-2.

Quality Assurance Audits

The purpose of a quality assurance audit is to provide an objective, independent assessment of a sampling or measurement effort. It ensures that the sampling procedures, data generating, data gathering, and measurement activities produce reliable and useful results. Sometimes inadequacies are identified in the sampling/measurement system and/or the quality control program. In such cases, audits provide the mechanism for implementing corrective action.

A technical systems audit (TSA) is an on-site, qualitative review of the various aspects of a total sampling and/or analytical system. It is an assessment of overall effectiveness and represents a subjective evaluation of a set of interactive systems with respect to strengths, deficiencies, and potential areas of concern. The audit consists of observations and documentation of all aspects of the measurement effort. Checklists that delineate the critical aspects of each methodology are used by the Radian auditor during the audit to document all observations. In addition to evaluating sampling and analytical procedures and techniques, the systems audit emphasizes review of all recordkeeping and data handling systems including:

- Calibration documentation for analytical instrumentation and sampling apparatus;
- Documentation of quality control data (control charts, etc.);
- Completeness of data forms and notebooks;
- Data review and validation procedures;
- Sample logging procedures;
- Chain-of-custody procedures;

- Documentation of maintenance; and
- Review of malfunction reporting procedures.

A technical systems audit of the Radian sampling and on-site analytical efforts was conducted on June 23 - 25, 1993 at Plant Yates by Barbara Hayes, a member of Radian's Quality Assurance Section. No critical or major concerns were observed during the audit; therefore, no Recommendations for Corrective Action (RCAs) were made. The sampling team was led by Dave Virbick and the analytical team was led by David Maxwell. The sampling team appeared well versed in the sampling methodology and requirements of the program. The equipment and instrumentation were generally in good working condition. All sampling and measurement procedures conformed to those described in the site Management Plan. Sampling information and any problems encountered were recorded onto preformatted data sheets or into bound laboratory notebooks. Duplicate samples were collected for the solid and aqueous streams at a rate of ten percent or one duplicate set per sample type (bottom ash, fly ash, etc.).

Sample collection procedures used by the sampling team followed those outlined in the site test plan. A detailed sampling schedule was used by the team to guide the collection of the samples for each analytical species at each sampling point.

No problems were identified with the sample custody procedures or documentation. A detailed master logbook was prepared prior to the field effort for all samples to be collected during each sampling period. This log was updated as the various samples were collected with the actual dates and times of sample collection. Samples were labelled with preformatted sample labels and stored at ambient temperature or cooled as required by the analytical species. Chain-of-custody forms were filled out and the samples were prepared for shipment to the laboratories for analysis.

Calibration of all on-site equipment was checked and found to be up-to-date. The analytical balance and top loading balance in the on-site laboratory trailer had been calibrated and certified within the past year. In addition, certified weights were available for daily balance checkout. All dry gas meters, consoles, Pitot tubes, and nozzles had been calibrated in the Radian Source Sampling Laboratory prior to being transported to the field location. Documentation for each of the observed instruments and equipment in use could be found in the records maintained by the sampling crew chief in the on-site laboratory. Sufficient replacement units were on hand to allow for breakage or equipment malfunction.

Recordkeeping practices by the project team were observed to be sound. Entries were made onto preformatted data sheets in ink, without erasures, signed and the time noted as each sample was collected.

Coal Round Robin

An interlaboratory study consisting of a coal round robin analysis was conducted by CONSOL, Inc. The objective of this round robin study was to estimate the analytical

variability one can expect on trace element analyses when comparing results from the same laboratory or results from two or more laboratories. The results of CONSOL's study is contained in the document entitled "Interlaboratory Variability and Accuracy of Coal Analyses in the U.S. Department of Energy Utility Air Toxics Assessment Program," which follows this section. The results from Radian's laboratory are designated as "Lab III" in the above referenced document. Radian's objectives in assessing this data are (1) to compare Radian's round robin results with the overall results of the study, and (2) based on this assessment, determine if a change in any of the analytical methods for Phase II should be made.

The analytical accuracy for each laboratory involved in the round robin study was measured by a comparative analysis of a standard reference material (SRM) coal sample (NIST 1632b). Each laboratory's analytical results for the standard reference material were compared to the certified or informational (non-certified) values. The round robin criteria for accurate results was 90-110% recovery of the SRM's certified value. (This is more stringent than the 80-120% recovery objective established for the program at Plant Yates). The following discussion addresses the performance of Radian's subcontracted coal laboratories with respect to the accuracy and precision assessments conducted by CONSOL on the NIST SRM.

Discussion of Results

The results of Radian's analysis of the SRM and the SRM-certified values are shown in Table D-3. Accuracy and precision objectives for the SRM coal in the round robin study were met by Radian for all ultimate and proximate parameters (% ash, C, H, N, S, and HHV) with the exception of one sulfur analysis which was reported outside the objective range for accuracy and precision. The methods used for ultimate, proximate, and HHV analyses are current ASTM protocols and are consistent with the methods used by most of the other laboratories. No change in the analytical approach for Phase II of this project is warranted.

Major ash minerals were primarily determined by instrumental neutron activation analysis (INAA). Silicon dioxide (SiO₂) and sulfur trioxide (SO₃) were not reported for the Plant Yates or the round robin study. The accuracy and precision objectives were met for all major ash minerals reported except calcium, magnesium and potassium. For future work, other ASTM methods (ASTM D-4326 or alternate) should be used to improve analytical bias and precision for these elements. This is especially important where these major elements are considered key factors in assessing mass flow rates in material balance closures.

Radian analyzed most of the trace elements in coal by INAA. Other methods of analysis using different preparation techniques were performed for As, B, Be, Cd, F, Hg, Pb, and Se. Of the target trace elements, 82% were detected. Cadmium, copper, and nickel were not detected. The results for copper and nickel are surprising, since this same SRM (1632b) was used as an internal audit sample during the Plant Yates study, and recovery by the same method (INAA) was 99% for both elements. Cadmium was determined by ICP-AES and this technique does not have the sensitivity to detect cadmium at the levels present in the SRM. Analysis of cadmium by graphite furnace-AA will be specified in Phase II of this project.

The accuracy objectives of the round robin study were met for 50% of the detected trace elements. Elements meeting accuracy objectives were barium, chromium, cobalt, and vanadium. Certified values for boron, beryllium, fluorine, and mercury are not available for this SRM, so no accuracy measurements were performed for these elements in the round robin report. However, the results for these noncertified elements appear consistent with those from the other laboratories. Elements that did not meet the 90-110% recovery range were arsenic, cobalt (1 result), manganese, molybdenum, lead, antimony, and selenium. (Antimony, manganese and molybdenum SRM recovery values obtained during the Plant Yates study were well within the 90-110% objective of the round robin study. See Table D-2.)

One of the requirements of the round robin study was to report analytical results for the target analytes that were determined by the same methods used to report plant coal sample results. For the Yates project (and the coal round robin study), Radian performed multiple techniques for some elements (i.e., INAA vs. GFAA or ICP-AES) to provide comparative results, especially where questionable results by any one technique had been previously encountered. Performance evaluation (PE) audit samples (SRMs) were submitted for analysis by each method and the accuracy and precision were assessed before selecting the best qualified data for reporting and for use in material balance calculations.

Comments

One of the conclusions evident from the round robin study is that there is a high degree of variability and repeatability between methods, laboratories, and duplicate results for trace elements. Evidence of the variability in trace element analyses can be shown, for example, with neutron activation analysis where unacceptable results were reported for the analysis of the NIST SRM in the round robin study, but the same technique produced 90-110% recovery for the same elements in the NIST 1632b standard reference coal submitted as an audit sample during this project. This suggests that the performance of some techniques, like INAA, may vary substantially between repeated analysis and analytical batches. Neutron activation appears to be a cost effective analytical technique; however, as with all analytical techniques, the results must be evaluated on a case-by-case basis.

Although the round robin analysis is useful for indicating problematic methods and poor quality control, the project-specific quality control activities should be used for assessing the accuracy and precision of the coal analyses performed at each site.

Table D-3
Radian Lab analysis of Standard Reference Coal, 1632b

Parameter	Certified Value	Analytical Method	Average % Recovery	Run 1	Run 2
Ulitmate/Proxim	nate (% Dry Basis)				
Ash	6.80	D 3174	99.6	6.78	6.77
Carbon	78.11	D 5373	99.4	77.74	77.52
Hydrogen	5.07	D 5373	101.2	5.14	5.12
Nitrogen	1.56	D 5373	97.1	1.54	1.49
Sulfur	1.89	D 4239	140.7	1.93	3.394
Chlorine	0.126	D 4208	84.5	0.107	0.106
BTU/lb	13,890	D 2015	99.2	13,767	13,797
Major Ash Min	erals				
SiO ₂	44.03				·
Al ₂ O ₃	23.75	INAA	98.5	24.37	22.43
TiO ₂	1.11	INAA	92.8	0.97	1.09
Fe ₂ O ₃	15.96	INAA	91.7	14.24	15.04
CaO	4.2	INAA	53.5	2.3	2.19
MgO	0.93	INAA	80.1	0.77	0.72*
Na ₂ O	1.02	INAA	85.3	0.87	0.87
K ₂ O	1.33	INAA	74.1	1.07ª	0.9*
P_2O_5		ICP-AES	-	0.36	0.39
SO ₃					

Table D-3 (Continued)

Parameter	Certified Value	Analytical Method	Average % Recovery	Run 1	Run 2
Trace Elements				-	
As	3.72	GF/AA	53.8	2 ^b	2⁵
В	~-	ICP-AES		61	60
Ва	67.5	INAA	106.6	71.2	72.7
Ве	~	ICP-AES	<u></u>	0.6	0.6
Cd	0.0573	ICP-AES		< 0.2	< 0.2
Cr	114	INAA	96.4	11	10.2
Co	2.29	INAA	89.5	2.09	2.01°
Cu	6.28	INAA		<35.3	<35.7
F		D 3761		40	40
Hg		DGA/CVAA		0.05	0.05
Mn	12.4	INAA	86.3	10.8°	10.6°
Mo	0.94	ĪNAA	191.7	1.55 ^b	1.9 ^b
Ni	6.1	INAA	145.1	< 8.8	< 8.9
Pb	3.67	ICP-AES	81.7	3°	3°
Sb	0.24 ^d	INAA	81.3	0.196°	0.194°
Se	1.29	GF/AA	77.5	1°	1°
v	14 ^d	INAA	101.1	14.2	14.1

^{*} Results exceed ASTM reproducibility limits.

^b Results exceed certified values by more than 25 percent.

[°] Results exceed certified values by more than 10 percent.

d Informational value (not certified).

Interlaboratory Variability and Accuracy of Coal Analyses in the U.S. Department of Energy Utility Air Toxics Assessment Program

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INTRODUCTION

The 1990 Clean Air Act Amendments (CAAA) empower the Environmental Protection Agency to set emission standards for a variety of potentially hazardous air pollutants from combustion sources. In order to define emissions from coal combustion sources, the U.S. Department of Energy (DOE) is coordinating an air toxics assessment program to characterize stack emissions from coal-fired utility boilers of volatile and semi-volatile organics, metals and anions specified in Title III of the Clean Air Act Amendments of 1990. The information from the DOE study will enable the Environmental Protection Agency to properly classify coal-fired utility boilers with regard to the CAAA and evaluate the potential risk to human health posed by these types of emission sources.

The first phase of DOE study consisted of sampling eight power plants. These plants represented a diverse range of boiler configurations, emission controls, and coal feeds. Part of the sampling protocol at each of the sites was to collect representative samples of the feed coal to the boiler. By analyzing the feed coal as well as all gas, solid, and water effluent streams, a material balance around each site could be established. A material balance closure near 100% would indicate that sampling and analyses of all streams was handled properly, and reliable emission estimates could be calculated.

Five laboratories participated in analyzing samples that were collected at the eight test sites. As part of the DOE program, CONSOL R&D conducted a coal analysis round robin among these laboratories. The primary purpose of this study was to estimate the analytical variability one can expect on trace element analyses when comparing results from the same laboratory or results from two or more laboratories.

Trace elements in coal generally are defined as those elements that occur at concentrations of 100 parts per million (ppm) or less. Seventeen trace elements were included in this study. Thirteen of these elements are listed in the 1990 CAAA as hazardous air pollutants. Earlier studies have shown the interlaboratory variability of trace element analyses can be quite large. This analytical variability should be considered when determining the potential emissions from coal combustion sources.

The variability of other commonly measured coal quality parameters also was evaluated.

COAL SAMPLES

The coal samples used in the round robin study were supplied to CONSOL R&D by the prime contractor at each of the eight test sites. These were the same coals that were being fed to the boilers during the testing period at each site. The coals were geologically diverse and ranged from lignite to bituminous in rank. Once received, all sample reduction and preparation was according to ASTM D 2013 "Standard Method of Preparing Coal Samples for Analyses". A spinning riffle was used to divide the gross sample prepared from each coal into homogenous splits. This is the preferred method in the coal industry to divide a sample of coal into several samples having the same composition and is widely used in commercially sponsored coal analyses round robin programs.

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ROUND ROBIN DESIGN

Each participating laboratory was provided duplicate samples of each of the eight coals, along with a sample of a National Institute for Standard and Technology (NIST) certified reference coal. The samples were randomized and were identified only by code letters. Each laboratory was requested to analyze the samples in duplicate using the same procedures used to analyze the samples from the DOE Air Toxics Assessment programs. By using this round robin design, intralaboratory repeatability and interlaboratory reproducibility, as well as individual laboratory precision, could be established. The suite of analyses included in this study is shown below:

Proximate-Ultimate	Major Ash Elements	Trace I	Elements
Moisture	SiO ₂	As	Hg
Ash	${\rm Al}_2 {f ilde{O}}_3$	В	Mn
Carbon	TiŌ2	Ba	Mo
Hydrogen	Fe $_2$ Ō $_3$	Ве	Ni
Nitrogen	CaŌ ਁ	Cd	Рb
Sulfur	MgO	Cr	Sb
Chlorine	Na ₂ O	Co	Se
Heating Value (Btu/lb)	K₂Õ	Cu	V
•		F	
	P ₂ O ₅ SO ₃		

The average interlaboratory results for this suite of analyses for all eight samples are shown in Table 1. Individual laboratory results for all samples are presented in Appendix A. Samples identified as A&J and B&K are Illinois basin bituminous coals. Samples C&L, F&O, and H&Q are mid-sulfur bituminous coals. Sample D&M is a subbituminous coal from the Powder River basin. Sample G&P is also a subbituminous coal. Sample E&N is ranked as a lignite.

ANALYTICAL TECHNIQUES

The analytical techniques used by the participating laboratories to complete the suite of analysis in this study are shown in Table 2. No one parameter was measured by all laboratories by the same analytical technique. All of the labs used ASTM standard methods for the Proximate and Ultimate analyses. However, numerous techniques were used for the major ash and trace element analyses. The techniques included graphite furnace atomic absorption (GF/AA), inductively coupled plasma emission spectroscopy (ICP/ES), inductively coupled plasma mass spectroscopy (ICP/MS), instrumental neutron activation analyses (INAA), ion chromatography (IC), cold vapor atomic fluorescence (CV/AF), and X-ray fluorescence (XRF). Mercury was measured by gold amalgam cold vapor atomic absorption (GA/CVAA), double gold amalgam cold vapor atomic absorption (DGA/CVAA), and cold vapor atomic fluorescence (CV/AF). The techniques of AA, GF/AA, ICP/ES, ICP/MS, IC, and CVAA require that the analysis sample first be put into solution before being introduced into the instrument. INAA, XRF, GA/CVAA, and DGA/CVAA analyses can be performed on the whole coal or an ash sample of the coal.

ACCURACY

The accuracy of analyses performed by each laboratory was evaluated using the NIST Standard Reference Coal 1632b. This Pittsburgh seam coal is the most characterized standard reference material available from NIST. Certified or informational values are listed for all of the parameters included in this study except for boron, barium, fluorine, phosphorus, and mercury. For trace elements, all definitive results ("<" values ignored) that fell within 10% of the certified or informational value arbitrarily were considered accurate values. Values outside this range were considered to be inaccurate. ASTM interlaboratory reproducibility limits were the criteria for accuracy on all other analyses. Table 3 shows the results reported by the each laboratory for NIST SRM 1632b. Using the previously described criteria for accuracy, the percentage of accurate results (accurate results/total definitive results) was calculated. Parameters without a certified or informational value were not included.

The table below shows the percentage of accurate results reported by each lab for the suite of trace elements, the percentage of accurate results for all analyses, and the percentage of trace element results that were reported as definitive. Although lab IV showed the highest percentage of accurate results (75%), that figure is based on only the 80% of definitive results reported by that laboratory.

As shown in the table below, the percentage of accurate trace element analyses ranged from 38% to 75%. Non-definitive results reported for antimony, cadmium, copper, fluorine, molybdenum, nickel, and selenium. Only one laboratory reported definitive results for the entire suite of trace elements. The most troublesome elements, with respect to accuracy, were arsenic, cadmium, molybdenum, antimony, and selenium. Only one lab reported accurate results for cadmium, molybdenum or antimony.

The Proximate and Ultimate analyses reported by labs II, III, IV, and V were all within ASTM reproducibility limits except for a single sulfur analysis. Lab I reported results that exceeded ASTM reproducibility limits for hydrogen, nitrogen, sulfur chlorine and heating value. Two labs reported all major ash elements within ASTM limits. Lab I exceeded limits for silicon, iron, calcium, magnesium, and potassium. Lab III exceeded limits for calcium, magnesium, and potassium. Lab IV performed only a limited number of major ash element analyses, but reported results for aluminum and potassium that were outside established ASTM reproducibility limits.

% ACCURATE RESULTS ON NIST 1632b

Lab	Definitive Trace Element Results	Trace Elements	All Analyses
I	88	38	43
II	100	73	88
Ш	82	50	63
IV	80	75	80
V	100	48	78

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REPRODUCIBILITY

The percent relative standard deviation (PRSD) of the analytical results was chosen to represent interlaboratory reproducibility in this study. Table 4 shows the average PRSD for all labs, on all samples, for the entire suite of analyses. Reproducibility for trace elements ranged from 11.0 PRSD for vanadium to 60.7 PRSD for molybdenum. The average PRSD for all of the trace elements (all coals, all labs) was 27.9%. In most cases the PRSDs for cadmium, copper and antimony are based on results from only three laboratories. These elements were either below detection limits at laboratories II and III or were not determined.

Excluding Lab I's results, Proximate and Ultimate analyses were generally within ASTM limits. Aside from the determination of percent ash this particular laboratory reported only a single sulfur analyses on the standard reference material that was within established ASTM limits. Chlorine, although not generally considered a trace element in coal, is listed in the 1990 CAAA as a hazardous air pollutant. It showed an average PRSD for all labs of 37.2 %. Three of the coals sampled in the study are ranked subbituminous or lignites. Chlorine on these samples (D&M, E&N, G&P) was reported as below detection limits (0.01 and 0.02%) by two laboratories and not determined by another laboratory. Therefore, the PRSD for these three samples was calculated with data from only two labs. The reproducibility estimates for chlorine may have been larger if more labs had reported data.

Major ash elements were determined with an average PRSD of 21.7%. This is only slightly better than the average PRSD of 27.9% for trace elements. Phosphorous, calcium, and magnesium had PRSDs greater than 35%. Including only labs II and V, the overall average PRSD for the major ash elements drops to 7%. These were the only labs that did not exceed ASTM limits on the certified reference material. Labs I and III showed a consistent low bias for calcium and magnesium on most samples as well as on the certified reference material. Lab I showed poor intralaboratory repeatability for most major ash elements.

Figure 1 shows the interlaboratory reproducibility as PRSD for the suite of trace elements on all samples. The overall average PRSDs for V, F, Be, Mn, B, Hg, Cu, Sb, and Cr, and Ba are between 9.6 and 22.9%. PRSDs for Ba, Co, Ni, and Se were somewhat poorer, averaging nearly 30%. Ni, As, Cd, Pb and Mo showed the most variability with PRSDs from 36.2 to 60.7%.

Figure 2 shows the average interlaboratory reproducibility for the suite of trace elements, as well as the range of PRSDs, for each element on each sample. Although the average PRSD for many elements is reasonably good (~20%), on any given sample the range of reported values can be quite large. The average minimum PRSD for interlaboratory trace element analyses was 13.6%. The average maximum was 48.1%. Ba, Cd, Cu, Hg, Mo, Ni, Pb and Sb all had a PRSD range over 30%. The range of reported values for Mo, Ni, and Cd on some samples was 52%, 76%, and 110% respectively. This shows that outliers are to be expected when comparing trace element analyses between laboratories.

REPEATABILITY

Figure 3 shows the average intralaboratory repeatability for each trace element for all coals. Intralaboratory repeatability was calculated as the average percent difference in a given

laboratory's results on the eight paired samples. The data show that the overall laboratory repeatability on trace elements ranged from a low of 7.8% for chromium to a high of 32.5% for cadmium. The average repeatability for all trace elements was 14.6%. Overall intralaboratory repeatability for all elements by all labs was less than 10% on half of the analyses, less than 20% on 68%, and less than 30% on 75% of all trace element results. In general, elements with lower between-lab reproducibility also had lower same-lab repeatability. Similarly, elements like cadmium, that showed reproducibilities with a high PRSD, had higher average repeatabilities, with the exception of molybdenum. This element had a relatively low repeatability (16.8%), but showed the highest reproducibility (60.7%). This may suggest bias in the various methods used for its determination. Data showing the complete list of individual laboratory repeatability for all samples is presented in Appendix B.

VARIABILITY vs COAL RANK

Figure 4 shows the variability in interlaboratory trace element analyses as PRSD plotted as a function of the as-determined heating value for the eight coals. The as-determined heating value of a coal is one way to roughly establish coal rank. The data clearly show that trace element analytical variability is a function of coal rank, increasing as the coal rank decreases. This is not unusual; many ASTM coal standards have precision statements that are rank-dependant. In the case of the eight coals studied here, as the heating value of the coal (Btu/lb) decreases, the analytical variability of trace elements increases. Sample pairs A&J, C&L, H&Q, F&O, and B&K are bituminous coals. Samples G&P and D&M are subbituminous and samples E&N are classified as lignites. A regression analyses of the data is shown in Figure 5 and has an r² value of 0.95. Average trace element intralaboratory repeatability showed a similar trend. The overall trace element repeatability for the bituminous coals was slightly better (14.8%) than that for the subbituminous and lignite samples (20.2%).

MERCURY

Of the potential hazardous air pollutants mentioned in the CAAA, mercury is receiving the most attention regarding possible emissions from coal combustion sources. As mentioned earlier, four of the five laboratories in this study used some form of gold amalgamation followed by cold vapor atomic absorption for mercury analyses, the other used cold vapor atomic fluorescence. The table below summarizes intralaboratory repeatability and interlaboratory reproducibility for mercury analyses. Repeatability is shown as the percent difference in a laboratory's results on the eight paired samples, and reproducibility is shown as PRSDs.

REPEATABILITY AND REPRODUCIBILITY OF MERCURY RESULTS

	<u>L&A</u>	<u>B&K</u>	C&L	D&M	E&N	F&O	G&P	H&O	Avg.
Repeatability, as % difference	11.3	46.3	19.1	19.1	25.8	11.7	8.6	21.2	17.6
Reproducibility, as PRSD	10.4	40.6	24.8	16.7	16.9	20.4	9.1	26.1	20.6

A recent, more extensive round robin on mercury analyses³ estimated interlaboratory reproducibility and intralaboratory repeatability at 25 and 50%, respectively. That particular round robin

involved three coal samples and 12 laboratories. Although the majority of laboratories in that study also used cold vapor atomic absorption for mercury analyses, some data were provided by labs using neutron activation and cold vapor atomic fluorescence.

SUMMARY AND CONCLUSIONS

Based on the analyses of the certified reference coal, even the best laboratory in this study reported trace element levels to within 10% of their certified value only about 80% of the time. On average, only 57% of the reported data from all labs met this 10% level of accuracy.

The techniques used in many laboratories for trace element analyses produced a significant number of non-definitive ("<") results. If certain detection limits are required, analytical techniques must be specified.

Although the overall interlaboratory trace element reproducibility is 28%, it may be very poor, approaching 60% for some elements.

Interlaboratory reproducibility for trace element analyses is dependent on coal rank. As coal rank decreases, analytical variability increases.

The variability of coal trace element analyses makes accurate estimates of emissions from combustion sources difficult, especially if the estimates are based solely on feed coal analyses.

RECOMMENDATIONS FOR CONDUCTING FUTURE COAL ANALYSES ROUND ROBIN PROGRAM

- 1. Follow ASTM standard method E 691. This standard lists specific guidelines for conducting an interlaboratory coal analysis round robin program. The standard also specifies software for the statistical interpretation of results. Both the method and the software are available from ASTM for a nominal fee. One of the guidelines violated in this round robin was the number of participating laboratories. E 691 states that a minimum of six laboratories is necessary to generate ASTM precision statements. For that reason we were unable to use the software from this standard that would have generated ASTM limits for repeatability and reproducibility.
- 2. Laboratories that are candidates for the round robin should be evaluated. Based on the data reported on the standard reference coal in this study, it is obvious that Lab I was not proficient with coal analyses. Laboratories that are candidates for round robins should be audited by someone familiar with the guidelines set forth in ASTM D 4182, "Evaluation of Laboratories Using ASTM Procedures in the Sampling and Analysis of Coal and Coke". These labs also should be able to demonstrate their ability to conform with ASTM D 4621, "Accountability and Quality Control in the Coal Analysis Laboratory". A lab not in compliance with either of the standards should not be included in the study. As a minimum, candidate labs should be able to demonstrate proficiency by analyzing a certified reference material within specified precision limits prior to conducting the actual round robin.
- 3. Specify the minimum detection limits that are required for each element. Based on the large number of non-definitive results reported for several of the trace elements it is apparent that

most laboratories are not using techniques that can accurately assess the levels of some of the trace elements found in coal. Using half the detection limit, which is the common practice for treating this type of result, would lead to a considerable overestimation of some trace element levels. Examples of this overestimation based on half the detection limit are found in Table 3. For instance, Lab III reported an average detection limit for Cu as 35.5 ppm. Using one half of this value, or 17.8 ppm, would overstate the certified value for Cu on this sample by nearly three fold.

REFERENCES

- 1. Lengyel, John Jr. and Obermiller, Edward L. "Interlaboratory Variability and Accuracy In Trace Element Analyses of Coal". Proceedings, Fourth Annual Pittsburgh Coal Conference, Pittsburgh, PA, 1987, pp. 148-159.
- 2. "ASTM Volume 05.05 Gaseous Fuels; Coal and Coke", American Society for Testing and Materials, Philadelphia, PA, 1993.
- 3. Lengyel, John Jr., Devito, M. S., and Bilonick, R. A. "Interlaboratory and Intralaboratory Variability in The Analyses of Mercury In Coal". Paper to be presented at the Air Waste Management Association Annual Meeting, Cincinnati, OH, 6/19-24/94.

Table 1. Average of Interlaboratory Results for All Samples.

	A&J IL BASIN	B&K IL BASIN	C&L <u>BIT.</u>	D&M PRB	E&N ND LIG.	F&O BIT.	G&P SUB. BIT.	H&Q BIT.
Trace Elements			pı	pm Dry Coa	ai			
As	2.39	2.74	9.43	1.24	7.64	26.0	1.70	3.45
8	227	212	72. 3	83.4	126	70.7	76.5	169
Ba	47.3	48.9	31.1	370	568	76.1	312	48.6
₿e	1.33	1.61	1.33	0.42	0.72	2.37	1.29	1.41
Cd	0.580	1.013	0.112	0.058	0.079	0.085	0.560	0.508
Cr	28.3	34.7	16.3	4.40	8.05	20.0	9.61	21.4
Co	3.87	3.57	5.50	0.86	2.10	6.95	4,14	4.42
Cu	10.7	11.3	8.47	9.52	9.28	21.2	14.5	13.1
F	97.1	112	58.0	44.3	56.9	81.3	80.3	79.5
Hg	0.101	0.109	0.126	0.084	0.145	0.260	080.0	0.085
Mn	41.3	34.3	18.4	145	123	26.5	76.6	29.0
Mo	8.34	7.91	1.87	7.93	3.98	4,54	2,11	5.80
Ni	17.6	18.5	14.1	5.09	7.26	28.2	6.84	18.3
Pb	9,12	13.1	6.00	5.22	3.31	13.6	8.86	8.47
Sb	0.49	0.79	0.64	0.47	0.75	2.10	1.74	0.62
Se	2.94	3.16	1.92	0.84	0.80	2.56	1.18	2.21
V	36.6	46.3	31.0	9.36	16.8	34.0	26.1	38.5
Proximate & Ultimate			%	6 Dry Basis				
Ash	11.99	12.54	11.56	11.7	16.71	13.35	20.57	10.59
Carbon	69.58	69.80	72.08	67.6	58.80	70. 26	61.27	71.03
Hydrogen	4.87	4.78	4.96	4.80	4.53	4.86	4.78	5.14
Nitrogen	1.33	1.33	1.39	1.01	0.89	1.37	1.05	1.42
Sulfur	3.42	3.53	3.26	1.15	1.12	3,01	0.65	2.89
Chlorine	0.064	0.074	0.085	0.03	0.040	0.140	0.039	0.115
Heating Valu	12214	12189	12888	11350	9601	12452	10636	12587
Major Ash Elements			%	Dry Ash				
SiO ₅	44.58	49.7	44.98	42.12	39.48	45.67	59.26	51.55
Al ₂ Õ ₃	16.78	18.6	21.41	16.48	10.58	22.54	20.62	21.74
TiO ₂	0.89	0.99	0.99	0.88	0.47	1.22	1.00	1.03
Fe ₂ O ₃	15.95	15.1	24.75	6.07	6.14	21.33	4.45	16.39
CaO	4.11	2.69	1.04	7.79	10.54	1.50	3.29	2.46
MgO	0.77	0.82	0.60	2.55	2.97	0.73	0.93	0.79
Na ₂ O ₃	0.91	0.75	0.43	0.29	0.84	0.30	0.23	0.84
ĸ,ŏ ´	1.95	2.20	1.84	0.51	1.35	2.17	1.26	2.50
P ₂ O,	0.29	0.36	0.16	0.37	0.17	0.58	0.04	0.26
so,	4.57	2.61	1.39	11.41	15.08	1.71	3.68	2.56

Table 2. Analytical Methods Used on DOE Air Toxics Assessment Coal Samples.

Parameter	Lab I	Lab II	Lab III	Lab IV	Lab V
Moisture	D3173	D 5142	D 3173	D 3173	D 3173
Ash	D3174	D 5142	D 3174	D 3174	D 3174
Carbon	D3178	D 5373	D 5373	D 3178	D 5373
Hydrogen	D3178	D 5373	D 5373	D 3178	D 5373
Nitrogen	D3179	D 5373	D 5373	D 3179	D 5373
Sulfur	D3177	D 4239	D 4239	D 4239	D 4239
Chlorine	D4208	LECO	D 4208	***IC	D 4208
Stu/lb	D2015	D 1989	D 2015	D 2015	D 2015
Major Ash Elements					
SiO ₂	ICP/ES	ICP/ES	ND	D 4326 XRF	ICP/ES
Al ₂ Õ ₃		И	INAA	•	•
TiO ₂	il	ú	•	•	ů.
Fe₂Ō₃	N		•	ND	H
CaO	H	ij	•	ND	W
MgO	•	₹	•	ND	•
NaO	H	a	•	D 4326 XRF	u
K ₂ O ₃	n	n	¥	19	•
P2O3	a	II.	ICP/ES	ND	•
so₃°	u	N	ND	ND	u
Trace Elements					
As	GF/AA	ICP/MS	GF/AA	GF/AA	CV/AF
8	ICP/ES	п	ICP/ES	ICP/ES	ICP/ES
8a	•	ICP/ES	INAA	•	
8e	•	ICP/MS	ICP/ES	•	•
Cd	AA	4	•		GF/AA
Cr	ICP/ES	a a	INAA	4	ICP/ES
Co	н	u	*		•
Cu		II	*	H	9
Cu	ü	п	•	u	4
F	D3761	*!C	D 3761	***IC	•
Hg	CVAA	DGA/CVAA	DGA/CVAA	GA/CVAA	CV/AF
Mn	ICP/ES	ICP/MS	INAA	ICP/ES	ICP/ES
Mo	н	11	•	H	•
Ni	II .	II .	*	14	•
Pb	AA	.i	ICP/ES	GF/AA	GF/AA
Sb	GF/AA		INAA	11	CV/AF
Se	GF/AA	**#ICP/MS	GF/AA	4	
V	ICP/ES	ICP/MS	INAA	ICP/ES	ICP/ES
-				· ·	,

^{*}IC Hydropyrolysis with IC Finish

^{***}IC-Soluble Species Only

AA CVAA CV/AF DGA/CVAA GF/AA	Atomic Absorption Cold Vapor Atomic Absorption Cold Vapor Atomic Fluorescence Double Gold Amalgam Cold Vapor Atomic Absorption Graphite Furnace Atomic Absorption	ICP/ES ICP/MS INAA ND XRF	inductively Coupled Plasma Emission Spectroscopy Inductively Coupled Plasma Mass Spectroscopy Instrumental Neutron Activation Analyses Not Determined X-ray Fluorescence
IC	ion Chromatography	AHF	X-ray riuorescence

^{**#}ICP/MS Hydropyrolysis with ICP/MS Finish

Table 3. Individual Laboratory Analyses of National Institute of Standard and Technology, Standard Reference Coal 1632b.

	CERTIFIED	3	181	3	17811	**	# 8	7	2	148	>
PAHAMETER	VALUE	Aun 1	1 Run 2	Run 1	Run 2	Run 1	Run 1 Run 2	Run 1 Run	Run 2	Run 1	Run 2
					g.	Parts Per Million, Dry Coal	in, Dry Coal				
A S	3.72	3.04	3.54	3.71	3.67	Cal E	OH S	N# Ş	9 Y	4 5	C
E C	67.5	201	40 60 60	8	90	71.2	72.7	3 2	3 2	67.2	67.6
99		0.93	0.82	0.58	0.59	9.0	0.0	0.5	0.0	0.693	0.668
දී දී	0.0573	22	3	91 9	0.000	<0.2	<0.2	<0.2	<0.2	0.020	₽;
5 6	•	122) -	5 6	= 8	20.5	3 10	=	7	;
3 3	6.28		21 K	9 4	2 K	20.0	0.2 7.8 7.8	N: C	NI 4	2.16 8.16	7
u.		×100	400 400	63.0	35.0	Ç	4	₽	문	;;;	# #
HQ.		0.17	0.15	0.009	0.005	0.05	0.05	0.05	0.07	0.057	0.062
- F	12.4	111	T:	5.1	12	10.0	10.0	12	13	10.9	11.1
OM.	6.0	601 601	2.63	0.85	0.0	1.55	9	۲ <u>٠</u>	×3	Q	Q
Ē	50	- Col.	7.30	5.65	6.23	8.8	9.9 \	•	Ľ	22	œ
2 5	3.67	44.0	3.44	3.61	6. 6 6. 6	ر د ا		ਚ !	₹ '	S)	-
3 6	•	9.0°	5 0.5 0 35	0.22	0.23	6.1	9	⊽ ·	⊽ 9	2	Q
5 >	14	102	0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		12.7	4	4	-: ₹	S 5	1.23	0 751 14 a
	•		# 24 1) i	•	•	<u>:</u>	!	2	2	0.
Single-underlined re Double-underlined re * Informational Value ND=Not Determined	Single – underlined results exceed certified values by more than 10% Double – underlined results exceed certified values by more than 25% * Informational Value ND=Not Determined	more than 10 y more than 29	* *								
						wt %, Dry Coal	/ Coal				
Ash	6.80	6.92	6.91	6.91	6.91	6.78	6.77	6.78	6.79	6.76	6.83
Carbon	78.11	76.43	76.97	77.93	78.39	77.74	77.52	76.89	76.72	77.62	77.2
Hydrogen	5.07	6.70	0.14	5.03	4.99	5.14	5.12	40.4	4	5.06	5.01
Nitrogen	1.56	0.47	0	1.54	1.0	1.54	1.40	1.5	1.56	1.46	1.41
Suffer	1.89	2:27	- 8	- 80	1.92	1.93	3.39	8	1.95	29.	10.1
Chlorine	0.126	0.030	0.040	0.112	0.109	0.107	0.106	Q	2	0.12	0.12
Btu/lb	13690	12796	13022	13809	13809	13767	13797	13760	13763	13774	13778
Underlined results exceed ASIM repr	ceed ASTM reproducibility limits										
						w %, Dry Ash	y Ash				
SiO,	44.03	50.15	47.08	45.27	45.41	2	Q	44 02	Q	4 4	438
Alo,	23.75	25.7	23.70	24.09	25.06	24.37	22.43	15.51	2	24.3	242
	1.11	1.37	1.25	Ξ	1.11	0.97	1.09	0.04	Ş	-	9.0
Fe ₂ O,	15.96	88 11	16.75	16.88	17.03	14.24	15.04	Q	Q	16.4	5
Cao	4.2	1,72	1.72	2	4.63	6	2 19	9	Q	4.2	4.2
00.5	60.0 60.0	7 C		.03	8	0.77	0.72	2	2 :	0.02	76.0
, z	20.7	2 T.	00.	40.	CO.1	78.0	0.87	101	2	-	-
χ. α Ο . α	1.33		1.24	e :	1.37	70.1	ol (S)	2	E	L.
֖֓֞֞֞֞֞֞֞֞֞֞֞֞֞֞֞֓֓֞֞֞֓֓֓֞֞֓֓֓֞֓֓֓֓֓֞֓֓֞		0.20	0.24) i	91.0	0.36	0.30	2	Ž	0.23	0.23
os Os		2	2	*	51.4	2	2	S	2	*	<u>4</u>
Underlined results exceed ASTM repr	ceed ASTM reproducibility limits										

Table 4. Percent Relative Standard Deviation for All Samples.

Trace Elements	A&J	BR	CAL	D&M	E&N	F80	G&P	H.60		Average PRSD	Maximum PRSD	Minimum
Ą	24.3	37.7	36.2	40.4	43.7	38.5	39.3	29.3		36.2	43.7	24.3
6 0 ;	14.6	14.7	16.0	33.8	35.0	18.3	16.7	21.6		21.3	35.0	14.6
Ba	37.7	21.5	20.6	53.4	34.7	26.8	45.0	14.4		31.7	53.4	4 4
В	4.1.4	15.9	15.7	17.9	17.0	11.8	8.40	21.7		15.0	17.9	4.0
Ç	35.1	58.4	32.0	62,9	38.6	39.0	142	57.9		58.3	142	32.0
ŏ	9.91	4.34	19.0	19.2	13.0	20.9	14.1	14.3		14.3	20.9	4.34
ပိ	29.0	21.4	30.6	43.1	45.5	27.8	25.4	40.3		32.9	45.5	21.4
no -	17.7	17.7	19.8	22.1	29.7	12.5	49.2	14.8		22.9	49.2	12.5
u.;	16.0	4.9	7.75	14.4	7.7	15.4	16.8	9.83		12.9	16.8	7.7
H _G	10.4	40.6	24.8	16.7	16.9	20.4	9.05	26.1		20.6	40.6	9.05
W.	24.4	14.0	10.1	19.1	17.1	1.3	20.1	13.0		16.1	24.4	10.1
No.	51.6	53.6	46.9	55.1	98.0	46.3	26	47.5		60.7	87	46.3
Z	15.5	13.0	15.4	89.8	49.9	38.2	17.5	25.0		33.1	89.8	13.9
2 :	34.8	29.8	43.8	27.2	63.6	33.7	22.6	38.5		36.8	63.6	22.6
ag.	5.86	35.2	7.59	4.08	36.9	9.11	44.0	25.0		21.4	44.0	5.86
Se	20.5	37.6	25.6	28.2	33.9	24.0	33.8	26.1		28.7	37.6	20.5
>	11.5	Q)	13.7	9.31	8.73	13.9	6.07	15.3		11.0	13.9	6.07
AVG.	21.8	25.9	22.7	32.8	34.1	24.1	35.7	25.9		27.9	49.1	16.1
Proximate & Ultimate												
Ash	1.48	990	0.58	1.68	990	990	990	0.72		1 14		
Carhon	9.0	271	CRC	1 07	9 15	20.6	1 87	2 7 B		8		
Hydroden	70.5	4	4 66	0.44	23.0	2.4	7.65	2.1		9 0		
de CoriN	. v	2 6	3 5		, C ,	3.0	60.4			2 4		
Stiffer	5. S	4 45	2.5	3.5		0.45	20.4	4 75		9 -		
Chlorina	23.1	3.15	2. A.	4 5	0 KG	2.15 30.5	2 e c	. u		37.0		
Heating Value, Btu/Ib	4.89	3.44	.58	6.79	6 .35	3.55	4.39	3.53		4.32		
										!		
									AVG.	10.4		
Major Ash Flements												
SiO,	17.71	3.38	1.93	3.27	3.18	3.09	3.25	10.7		5.81		
,	17.08	4.60	4. Si	26.0	34.9	4.72	4.1	7.23		13.8		
TiÓ,	8.77	25.7	5.58	15.6	5.67	32.0	16.3	30.0		17.5		
0,91	7.74	36.8	5.71	15.2	16.1	3.43	7.40	10.8		12.9		
CaO	50.7	38.5	27.2	62.2	63.9	21.5	37.9	30.6		41.6		
OBW.	43.7	45.4	30.7	60.2	66.2	28.8	47.5	38.1		44.7		
Najo	9.35	4 .1	13.7	12.2	7.84	26.0	26.3	9.64		14.9		
o.	13.1	7.38	7.80	18.3	23.2	9.94	9.38	12.2		12.4		
o d	34.9	30.2	37.2	38.7	39.3	33.5	37.8	31.0		35.3		
so,	36.6	32.4	17.8	28.1	3.37	8.01	4 8 8	12.8		18.0		
									AVG	21.7		

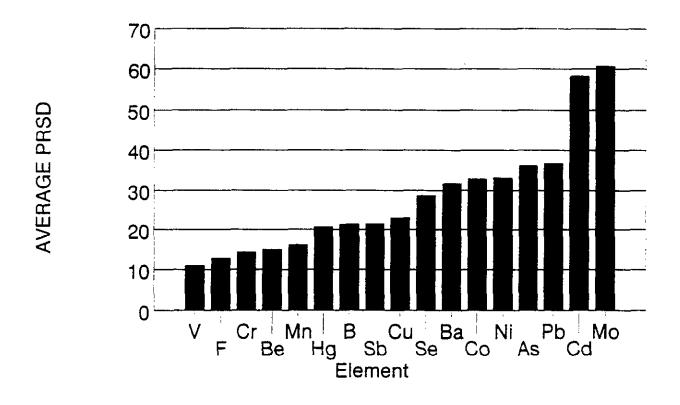


Figure 1. Average Variability for All Coals.

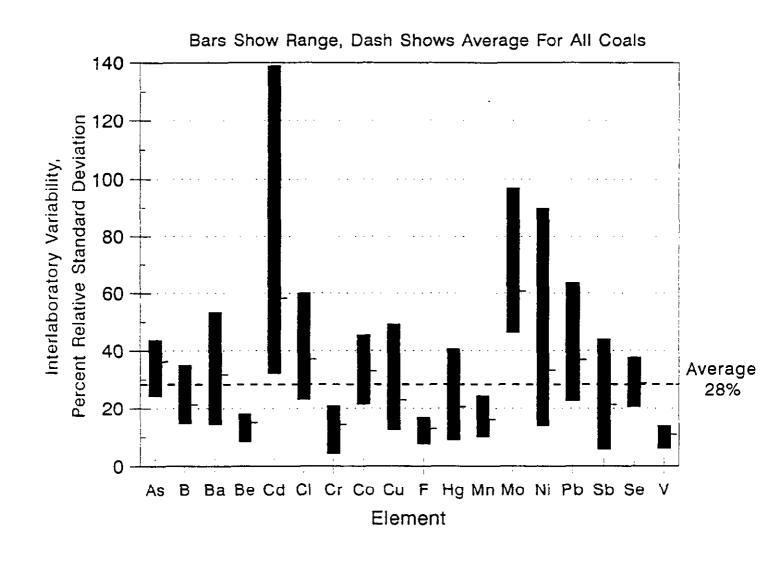


Figure 2. Interlaboratory Variability by Element

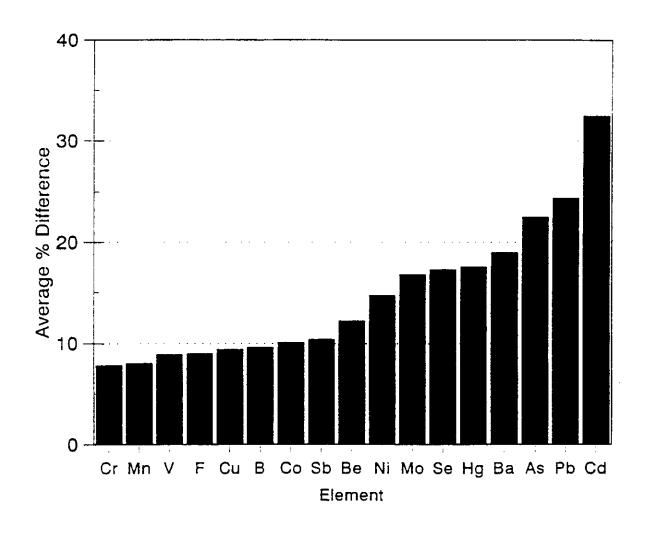


Figure 3. Average Interlaboratory Repeatability.

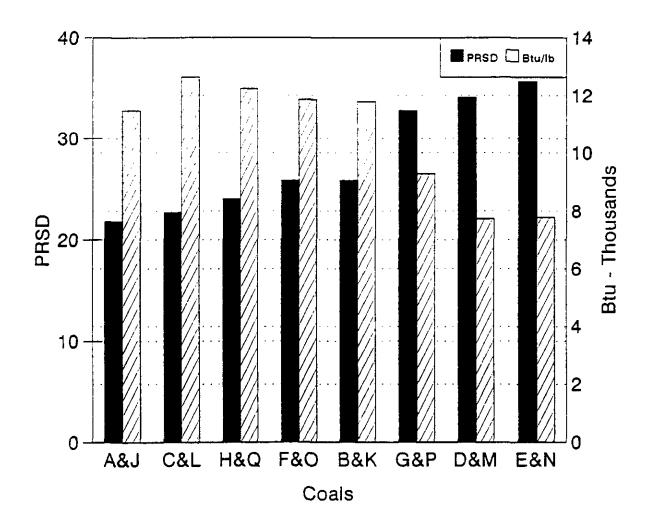


Figure 4. Comparison of Interlaboratory Variability vs. Heating Value.

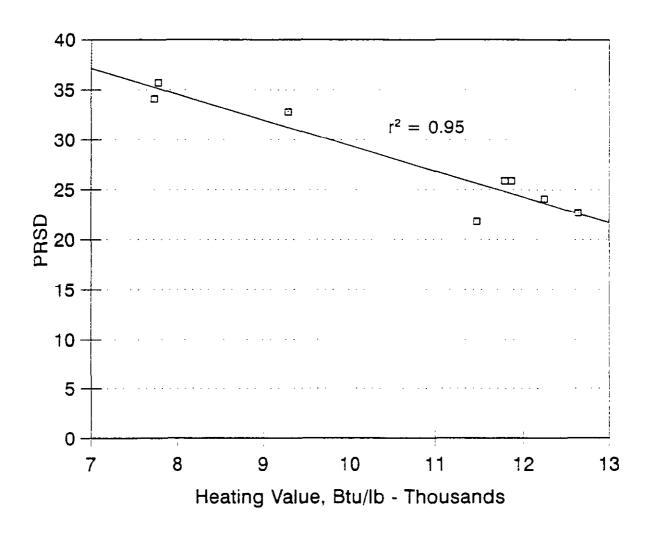


Figure 5. Correlation of Variability vs. Heating Value.

APPENDIX A

INDIVIDUAL LABORATORY ANALYSIS OF ROUND ROBIN SAMPLES

INDIVIDUAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE A

PPM DRY WHOLE COAL BASIS

TRACE	ם	LAB I		LABII	2	LAB III	Ξ.	LAB IV	7	> 84
ELEMENTS	BUN 1	RUN 2	BUN 1	BUN 2	HUN 1	RUN 2	RUN 1	RUN 2	RUN 1	RUN 2
As	2.36	3,01		3.46	8	2	2	X	26	6
6 0	236.33	290.64		182.77	250	230	230	230	276	217
Ва	29	32.29		63.3	76.7	72	58	55	49.4	49.8
Be	1.29	161		1,09	1.3	6.1	v.	6.1	1.49	1.35
PO	0.5	0.55	0.57	0.59	<0.3	<0.3	4.0>	<0.4	0.373	0.545
ٙڹٙ	25.78	30.14		24.44	25.2	28	35	34	24.6	25.5
ပ္ပ	4.73	5,81		3,35	3.28	3.44	ß	រប	2.71	3.79
Cu	8.7	10.76		8.54	<37.3	<38.3	12	12	13.2	13.1
<u>u.</u> :	<100	× 100		107,67	\$	100	S	2	72	19
Hg	<0.1	<0.1		0.095	0.09	60.0	0.1	0.1	0.123	0 109
Æ	36.52	39,83		51.8	29.3	31.2	53	52	42.8	41.7
Wo	11.82	8.61		6.78	15.1	14.6	9	9>	6.5	ic.
Z	17.19	19,38		15.28	12.8	14	23	21	181	17.6
Pb	4.08	6,89		10.71	80	80	13	4	6.7	6
Sb	8.0>	<0.8		0.53	0.466	0.512	₹	Ī	2	S
.	3.01	3,55		3.61	0	8	6	2	6.1	2.9
>	35.45	40.9		28.9	34.3	35.8	45	4	40.1	38.1
					9 7 2 2	NDV BACIO				
PROXIMATE & ULTIMATE	AATE				2					
ASH	12.16	12.18	12.08	12.13	12.18	12.26	11.83	11.75	11.86	11 05
CARBON	68.33	68.88	70.09	70.22	70.32	70.15	69.2	69.25	69 2	69 14
HYDROGEN	4.97	5,88	4.83	4.79	4.89	4.92	4.67	4.6	4.76	4.7.4
NITROGEN	1.25	1.26	1.37	1.41	1.48	1.4	1.35	1.31	1.25	1.28
SULFUR	3.44	3.6	3.44	3.48	3.46	3.42	3.41	3.4	3.43	3.4
CHLORINE	90.0	0.05	0.077	0.064	0.075	0.072	2	2	0.1	0.00
Stu/ID	12460	11297	12478	12462	12425	12477	12453	12455	12427	12402
					% 0₽0	K DRY ASH				
MAJOR ASH ELEMENTS										
SiO ₁	39.75	49.24	48.71	48.87	2	S	47.03		45.9	46.8
Al ₂ O ₃	13.18	15,36	18.5	18.84	16.37	17.74	18.21	S	17.9	17.8
102	0.6	0.97	0.95	0.95	0.72	0.7	0.89		0.9	0.8
Fe ₁ O ₃	13.89	16.43	17.27	17.35	15.21	15.17	2		17	17.3
O S	2.47	2.23	6.48	6.43	2.36	2.21	2		5.5	5.9
08 **	0.4	0.35	1.05	1.06	0.59	0.72	2		- -	-
) Sec. 2 2 2	0.77	96'0	0.95	0.95	0.78	0.78	0.97		0.99	0.97
	1.92	2:24	2.18	2.18	1.68	1.85	2.01	문	2.1	2
J. (3	0.26	S	0.25	0.22	0.2	0.24	2	2	0.24	0.26
ર્જુ	Ş	₹	8.83	3.29	<u>Q</u>	2	2	S	6.18	5.97

INDIVIDUAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE B

PPM DRY WHOLE COAL BASIS

FI FMFNTS							<u></u>		4	>
	HUN 1	RUN 2	HUN 1	RUN 2	RUN 1	RUN 2	BUN 1	HUN 2	BUN 1	RUN 2
As	2.7		3,26	3.18	-	8	S	Q	53	*
æ	260.01	LW	193.41	189.71	260	270	190	200	227	ğ
Ba :	37.44		47.8	49.3	64.3	73.7	47	46	46.5	46.5
. 	1.87	1.86	1.37	1.44	1,5	. 5.	1.4	£.	. .	<u>+</u>
5	0.92		26.0	-	<0,3	<0.3	4.0>	<0.4	0.573	0.94
్	36.4		32.57	35.14	35.2	34.5	38	37	31.1	32.1
ខ (5.62		3.43	3.58	3.57	3.53	0	6	2.77	3.0
7 0	11.44		9.61	9.79	<41.8	<42.4	5	9	13.2	13
<u> </u>	×100		124.37	125.42	110	120	9	2	88	Ö
Hg	<0.1		0.131	0.115	0.11	0.11	0.12	0.11	0.105	0.10
Z .	32.24		40.6	39.9	59.9	28.1	38	37	35	34.
MO ::	7.28		7.2	7.36	<13.6	<13.8	ស	၈	4.9	9
Z	19.76		16.94	17.49	22.9	21.8	21	21	17.3	6
Pb g:	7.49		14.95	14.77	15	6	15	15	10.2	တ
Sp	<0.8		0.69	0.69	0.707	0.566	₹	⊽	2.56	Z
%	3.33		4.71	4.78	6	4	-	Q	3.2	2
>	49.92		38.79	39.29	44.7	49.1	47	47	49.5	49.8
PROXIMATE & UL'TIMATE	(ATE				% DRY BASIS	ASIS				
ASH	12.68	12.54	12.69	12.72	12.56	12.53	12.45	12.55	12.43	12.4
CARBON	68.33	67.79	70.23	70.07	70.12	69.95	68.86	68.82	68.84	68.7
HYDROGEN	5.1	5.29	4.82	4.84	4.83	4.81	4.51	4.56	4.68	4
NITROGEN	1.26	1.23	1.33	1.44	1.42	4.	1.35	1,3	1.33	5.
SULFUR	3.63	3.63	3.43	3.49	3.46	3.47	3.48	3.47	3.51	3.4
CHLORINE	0.05	0.05	0.084	0.077	0.079	0.078	Q	2	0.1	0.1
Btu/Ib	11900	11480	12398	12402	12376	12367	12390	12378	12350	12321
MAJOR ASH EI FMENTS	SIX				& DRY ASH	ASH				
SiO ₂		49.47	51.04	51.01	Q	2	50.45	2	49.2	0.0
Al ₂ O ₃	18.59	18.69	19.41	19,46	18.28	19.4	19.05	2	6	6
TO ₂	1.01	-	سب	0.99	0.86	0.78	96.0	Q	8.0	Ö
Fe ₁ O	16.42	16.5	17.97	17.83	16.7	16.42	욷	9	17.1	10
CAO	1.84	1.62	3.94	3.85	1.84	1.97	Q	S	3.6	ဗ်
Ç ₀	0.3	0.36	1.09	- -	0.77	0.77	S	용	- -	-
Na,O,	0.7	0.71	0.79	0.79	0.78	7.0	0.73	2	0.86	0.8
0,0	2.37	2.19	2.39	2.38	2.25	2.22	2.26	2	2.2	2.2
7.0 	6.0 6.4	0.0 E. (0.26	0.27	0.51	0.51	9	2	0.43	ö
3	Ē	2	70 +	40	2	2	2	•		

INDIVIDUAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE C

THACE	4	AB	_	LABII	5	IAB III	IA	≥	¥	/ AB /
ELEMENTS	RUN 1	RUN 2	HUN 1	RUN 2	HUN 1	RUN 2	BUN 1	RUN 2	RUN 1	RUN 2
As	3.06	5.82	13.61	13.04	G	7	Q		12.1	13.4
© :	91.69	86.72	66.46	63.46	90	8	73	76	79.1	- 10 - 40
Ba	28.52	27.55	32.2	34.9	34.6	45.2	35	35	35.2	34.3
8	1.63	1.63	1.13	1.17	1.3	1.2	1.2	1.2	1.53	15.
<u>.</u>	0.08	0.08	0.1	0.11	<0.3	<0.3	<0.4	<0.4	0.079	0.237
్	21.39	20.4	16.77	15.9	17.2	18.2	19	20	6	12.4
ပိ	9.37	8.67	4.51	4.46	4.92	5.13	ιΩ	7	4.03	4.6
Cu	9.88	8.06	6.98	6.95	<38	<39.3	\$	60	10.9	11.2
u. ;	<100	×100	63.96	63.22	9	9	2	2	58	53
Hg	<0.1	0.16	0.147	0.143	0.1	0.11	0.14	0.14	0.135	0.145
E .	18.34	18.36	15.7	16.4	19	18.5	22	23	61	961
\S	3.77	3.06	1.62	1,65	1.71	2.87	9>	9>	2	2260
Z	16.3	16.32	12.44	12.06	10.4	10.7	15	5	14.2	13.8
Pb	3.77	0.65	6.44	6.52	S	7	7	60	4	5.7
Sp	8.0>	<0.8	99.0	0.7	0.603	0.654	. ₹	\	2	Z
Se	1.94	1.53	2.47	2.57	-	8	8	_	0.837	-
>	37.69	37.75	24.63	25.27	9006	29.9	33	33	33	33.2
										!
PROXIMATE & ULTIMATE	MATE				X DRY BASIS	BASIS				
ASH	11.59	11.62	11.52	11.53	11.64	11.6	11.57	11.51	1161	11 59
CARBON	71.69	71.12	72.79	72.63	72.98	72.72	71.64	71.72	71 99	71.86
HYDROGEN	5.76	5.01	4.85	4.86	4.99	4.98	4.6	4.0	4 85	4.86
NITROGEN	4.	1.38	1.44	1.39	1.42	1.42	1.45	1.45	1.43	36.1
SULFUR	3.44	3.55	3.15	3.16	3.28	3.27	3,13	3,18	3.37	3.16
CHLORINE	0.05	0.05	0.092	0.089	0.098	0.104	9	Q	0.11	0.11
Btu/lb	11987	12644	12957	12971	12972	12932	12989	12953	12906	12906
					% DA	& DRY ASH				
MAJOR ASH ELEMENTS						•				
SiO ₂	47.09	45.15	45.02	45.57	S	2	44.73		44.5	44.3
Al ₂ O ₃	23.24	21.56	21.31	21.63	19.36	18.78	21.74		21.4	21.5
1102	1.08	1.04	96.0	0.98	=	1.09	0.99	_	6'0	6.0
Fe ₂ O	25.13	25.11	25.63	26.06	23.41	24.61	2		25.2	25.4
CaO	0.64	0.64	1.22	1.29	1.17	1.04	2		7	1.1
Og X :	0.35	0.33	0.71	0.69	0.72	0.63	2		0.73	0.71
Na ₂ O ₃	0.54	0.37	0.4	0.42	0.38	0.41	0.42	_	0.44	0.46
o,	2.12	2.01	1.93	1.89	1.77	<u>1.</u>	1.85	_	1.7	6
P ₂ O ₅	0.13	0.12	0.0	90.0B	0.21	0.23	2		0.15	0.23
so.		2	1.44	1.51	9	2	2	Q	1.04	1.05

INDIVIDUAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE D

PPM DRY WHOLE COAL BASIS

TRACE	٥	- AB	-	IABI	H H H	=	N AB I	2	1	× 04 1
ELEMENTS	RUN 1	RUN 2	HUN 1	RUN 2	RUN 1	RUN 2	RUN 1	RUN 2	RUN 1	RUN 2
As	1.25	1.87	1.93	1.89	⊽	V	-	S	0.45	0.63
82	117.71	104.86	40.44	39.86	100	110	06	06	102	76
Ba	187.83	137.31	432.1	424.4	269	640	170	150	450	536
Be	0.53	0.47	0.45	0.41	0.4	0.4	0.3	0.3	0.421	0.408
P (<0.06	>0.06	20.0	0.0	<0.3	<0.3	<0.4	<0.4	0.049	2
٠٥	6.01	4.62	6.17	4.64	4.79	3.97	4	4	3.03	3.54
ပိ	<2.0	<2.0	1.19	1.17	0.757	0.663	⊽	⊽	Q	0.77
Š	11.65	8.74	7.5	7.07	<45	<43.9	80	80	14	12.1
<u>u</u> ;	×100	<100	48.59	48.12	20	<u>2</u>	2	2	39	35
5H	<0.1	<0.1	0.086	960'0	0.08	0.08	0.1	0.1	0.102	0.091
M a	137.74	121.08	188.4	186.3	96	9.66	160	150	148	151
Mo	9.01	6.99	6.55	6:38	11.1	10.8	7	4	4.84	5.37
Ž	5.01	3.74	4.15	3.34	16	15.2	8	Ψ-	080	208
Pb	5.13	5.12	5.44	5.45	60	7	S	· w	3.8	600
Sb	<0.8	<0.8	0.48	0.48	0,451	0.429	\ \ \	√ √	S	Ş
Se.	<0.6	76.0	6.0	0.92	⊽	⊽	·	S	Ş	Ē
>	11.65	10.86	8.54	7.99	9.73	8.3	6	6	9.5	을 유
PROXIMATE & UL'IIMATE	AATE				% DRY BASIS	ASIS				
ASH	12	11.67	11.86	11.93	11.51	11.51	11.7	11 79	11 48	ν •
CARBON	62.27	62.9	68.55	68.65	68.41	68.21	67.27	67.36	67.38	67.43
HYDROGEN	7.42	1.95	4.68	4.71	4.63	4.61	45.5	4 52		24.70
NITROGEN	0.98	0.94	0.93	0.85	1.08	<u>-</u>	1 02	101	. t	5 -
SULFUR	0.93	0.91	0.96	0.96	0.95	4.82	0.91	0.92	76.0	4
CHLORINE	0.04	0.04	<0.02	<0.02	<0.01	60.1	Q	2	0.03	0.04
Btu/lb	11342	9083	11735	11717	11693	11601	11751	11759	11634	11663
					% DRY ASH	YSH.				
MAJOR ASH ELEMENTS	NTS					;				
SiO ₂	42.49	36.97	44.35	44.06	Q	욷	41.94	2	41.7	41.8
Ajo,	20.6	8.89	19.24	19.09	18.48	18.26	18.88	2	18.2	18.1
TiO ₂	0.92	0.86	98.0	0.85	0.8	0.67	0.85	Q	0.8	90
Fe ₂ O ₃	5.22	4.74	6.9	7.12	6.97	6.1	2	2	6.3	6
CBO	2.92	2.55	13.24	13.12	4.2	4.01	2	2	11.7	11.5
MgO	_	1.01	4.13	4.09	1.22	1.21	Q	2	4	60
Na ₂ O,	0.31	0.25	0.32	0.32	0.27	0.26	0.3	2	0.25	0.24
o,	0.72	0.67	0.52	0.51	0.4	9.0	0.5	2	0.47	0.48
o,	0.33	0.29	e.0	0.3	0.56	0.56	윤	2	0.26	0.24
SO S	Q N	2	11.31	11.21	Q	2	2	2	13.02	13.54

INDIVIDUAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE E

TRACE	۵	LAB	_	LAB II	_	I AB III	IAR	2	-	7 04
ELEMENTS	HUN 1	RUN 2	RUN 1	RUN 2	RUN 1	HUN 2	RUN 1	RUN 2	RUN 1	HUN 2
As	9.0>	8.63	11.53	11.69	4		7	60	84	66
a	153.79	139.65	45.15	45.15	150		130	140	151	138
Ba	192.23	266.6	628.9	669.8	795		400	380	714	2
Be	0.82	0.71	0.72	0.73	0.7		0.6	0.7	0.639	0.732
Ç.	0.12	<0.06	0.1	0.1	<0.3		<0.4	<0.4	0.052	0.092
j,	8.59	7.87	7.88	9.85	9.6		\$0	æ	6.4	9
ပိ	3.33	2.79	2.66	2,54	1.91		-	Q	2.02	Q
Ca	9.36	8.89	6.97	7.1	<48.2		7	7	6.1	=
Щ. ;	<100	<100	55.8	60,87	9		9	2	54	57
Hg	<0.1	40. 1	0.159	0.144	0.17		0.18	0.18	0.113	0.136
W.	108.93	99.02	149.2	151.2	93.9		140	140	124	122
OM:	3.59	3,3	2.77	2.75	7.51		9>	9>	2	7.20
Ž	8.07	5.71	6.97	7.62	18.1		9	6	3.7	4.92
a .	1.92	9.0>	3.04	2,63	4		4	4	4	1.8
Sp	<0.8	<0.8	0.77	0.72	0.679		7	7	Z	23
80	9.0>	<0.6	0.88	0,98			-	_	2	0 746
>	17.94	16.5	14.34	14.32	16.4	15.5	17	6	16.2	16.2
PROXIMATE & ULTIMATE	MATE				X DRY BASIS	BASIS				
ASH	17.69	16.32	16.15	16.19	16.23	16.29	17.45	17.5	16.83	16.67
CARBON	55.85	54.93	59,58	59.55	59.05	59.17	58.91	58.61	59.38	59.33
HYDROGEN	7.41	7.38	4.21	4.15	4.24	4.31	3.92	3.9	3.91	3.87
NITROGEN	0.09	0.88	0.99	16.0	1.02	1.02	0.79	0.82	1.05	102
SULFUR	1.15	1.09	1.13	1,13	1.15	1.14	1.13	1.12	111	1 12
CHLORINE	0.03	0.03	<0.02	<0.02	<0.01	<0.01	2	2	0.05	0.05
Btu/lb	9252	8208	9842	9841	9920	9914	9777	9823	6866	9917
					% DR)	X DRY ASH				
MAJOR ASH ELEMENTS										
SO.	37.26	36.67	39.92	40.18	2	2	39.61		38.5	38.7
Al ₁ O ₃	3.01	3.53	12.68	12.69	12.35	11.98	12.38		11.6	11.7
1102	0.45	0.44	0.45	0,46	0.55	0.43	0.49		0.5	0.4
Felo	4.35	4.67	6.93	7	6.43	6.17	2		6.7	6.6
CaC	2.23	3.16	17.34	17,53	5.32	5.04	S		16.2	16.3
OŠ M	0.94	1.15	4.96	4.97	1.19	1.05	2		4.8	4.
Na ₂ O ₃	0.67	0.72	0.89	0.89	0.8	0.78	0.87		0.84	0.84
Ŏ,	4.	0.12	1.39	1.39	1.99	2.1	1.25	S	£.1	1.3
o, d	0.13	0.13	0.13	0.14	0.22	0.21	S	2	0.13	0.11
Ś	2	2	14.99	15.21	S	2	2	9	15.42	16.02
										! ! !

INDIVIDIJAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE F

NIS	THACE	-	- 04	-	= 0			•		•	:
MATERILEMENTS MATERILEMENTS MATERIAL	CIEACATE	•	- 20			_	,		≥	ž	>
MATERILEMENT 1482 50.44 36.51 35.07 17 17 24 ND 26.7 267 27.57 27.4 27.1 27.5 26.5 27.5 27.5 267 27.57 27.4 27.1 27.5 27.5 27.5 27.5 267 27.57 27.4 27.5 27.5 27.5 27.5 27.5 27.57 27.54 27.5 27.5 27.5 27.5 27.5 27.5 27.54 27.54 27.5 27.5 27.5 27.5 27.5 27.54 27.5 27.5 27.5 27.5 27.5 27.5 27.54 27.5 27.5 27.5 27.5 27.5 27.5 27.54 27.5 27.5 27.5 27.5 27.5 27.5 27.54 27.5 27.5 27.5 27.5 27.5 27.5 27.54 27.5 27.5 27.5 27.5 27.5 27.5 27.55 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5	CLEMENIO	NO	HON 2	Z Z	- 1	NO.		NON 1	HUN 2	HUN I	
MATE & ULTIMATE 1982 196.74 64.7 64.4 198 65.6 65.6 64.9 65.8 64.9 65.8 64.9 65.8 64.9 65.8 64.9 65.8 65.8 64.9 65.8 65.8 64.9 65.8 65.8 65.8 64.9 65.8 65	As	4.82	50.43	35.51	35.07	17	17	24	S	28.7	28.1
SS.39 SS.51 B6.4 96.1 93 65.6 83 69 59 59 69 69 69 69 69	æ	89.23	96.74	64.7	63.46	73	26	69	65	649	53.4
1.00 1.00	ቘ	55.38	53.51	86.4	98.1	66	85.6	83	89) (1)	67.3
Color Colo	æ	2.67	2.78	2.14	2.18	<u>0</u>	N	2.3	2.4	2.75	2.44
22.56 22.64 25.55 26.97 19.7 21.7 20 21 11.	ਣ	0.07	0.09	0.1	0.12	<0.3	<0.3	<0.4	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	0 093	2
Name	ō	22.56	22.64	25,35	28.97	19.7	21.7	50	22	=	144
NATION ACTION Color Colo	රි	9.74	11.32	5.9	5.88	6.23	9	60	7	4.56	3.59
Color Colo	J.	21.54	21.61	17,35	17.07	<37.8	<37.4	20	2	22.2	58
11	L .	<100	<100	90.46	92,55	90	100	욷	2	63	65
25.64 15.73 26.6 26.6 27 232 30 31 25.5 26.67 29.84 21.98 22.39 26.8 26.8 25 25 26 26 12 26.67 29.84 21.98 22.39 26.8 26.8 26 25 26 12 27.8 <	E.	0.21	0.27	0.238	0.251	0.24	0.26	0.25	0.25	0.338	0.323
7.38 6.48 4.25 4.46 3.65 3.8 <6 6 6 192 2.6.67 2.944 2.198 2.239 26.6 2.55 25 25 25 25 25 25 25 25 25 25 25 25 2	Ę	25.64	15.73	26.6	26.6	27	23.2	30	31	25.5	26.6
MATE & ULTIMATE 2964 21.96 22.39 26.8 28.2 25.5 1.13 2.26 3.27 3.29 2.25 1.13 2.26 3.27 3.29 2.2 2.2 3 ND 1.5 1.23 1.13 2.26 3.27 3.29 2.2 3 ND 1.5 1.53 1.13 2.26 3.27 3.29 3.6 3.6 3.5 3.6 3.5 3.6 3.5 3.6 3.5 3.6 3.5 3.6 3.5 3.6 3.5 3.6 3.5 3.6 3.5 3.6 3.5 3.6 3.5 3.6 3.5 3.6 3.5 3.6 3.6 3.5 3.6 3.5 3.6 3.5 3.6 3.5 3.6 3.6 3.5 3.6 3	°E :	7.38	6.48	4.25	4.46	3.65	3.8	9>	9>	1.92	15.
728 40.6 15.67 15.66 15 15 16 17 12.3 1.95 1.95 2.88 2.2 2.25 1.97 2.1 2 2 2 ND 1.5 1.5 1.95 3.2 3.6	Z	26.67	29.84	21.98	22.39	26.8	28.2	52	28	23.5	23.8
195 288 2.2 2.25 1.97 2.1 2 2 NUD 1.5 1.13 2.26 3.27 3.29 2.3 36.3 35 ND 1.5 1.14 42.19 28.06 27.96 33.6 36.3 35 ND 1.5 1.15 2.86 2.87 2.87 3.88 3.8 3.8 3.8 1.15 13.42 13.42 13.44 13.4 13.21 13.27 13.39 13.42 13.42 13.45 13.44 13.4 13.21 13.27 13.39 13.4 13.4 13.4 13.4 13.4 13.2 13.27 13.39 13.5 13.6 4.77 4.94 4.86 4.63 4.58 4.77 13.6 2.95 2.95 3.1 3 2.96 2.99 3.16 14.6 2.95 2.95 3.1 3 2.96 2.99 3.16 14.7 1.207 1.267 1.2649 1.2649 1.2665 1.2669 1.2652 14.8 1.207 1.207 1.207 1.207 1.207 1.207 14.8 1.207 1.207 1.207 1.209 1.207 1.209 1.207 14.8 2.31 2.462 2.319 2.337 22.36 2.357 ND 22.1 14.8 1.12 1.23 1.06 1.07 1.3 1.12 1.12 ND ND 0.24 14.8 1.10 1.17 1.28 1.39 0.85 ND 0.24 14.8 1.20 0.33 0.34 0.35 0.35 0.36 ND 0.24 15.8 2.31 2.32 2.319 2.32 2.319 0.35 0.35 ND 0.24 15.8 2.32 2.33 0.33 0.35 0.35 0.36 ND 0.24 1.10 2.21 2.32 2.33 0.33 0.35 0.35 ND 0.24 1.10 2.21 2.32 2.33 0.33 0.35 0.35 0.36 ND 0.24 1.10 2.21 2.32 2.33 0.33 0.35 0.36 ND 0.24 1.10 0.24 0.25 0.24 0.36 0.89 ND 0.24 1.10 0.24 0.25 0.24 0.36 0.89 ND 0.55 1.11 1.12 1.13 1.14 0.15 0.36 ND 0.24 1.12 2.13 0.33 0.46 0.48 0.89 0.89 ND 0.55 1.13 2.14 2.15 2.15 0.25 0.36 ND 0.55 1.14 0.17 0.18 0.19 0.86 0.89 0.89 ND 0.55 1.15 0.15 0.15 0.15 0.15 0.36 ND 0.24 1.15 0.15 0.15 0.15 0.15 0.36 ND 0.24 1.15 0.15 0.15 0.15 0.15 0.36 ND 0.24 1.15 0.15 0.15 0.15 0.15 0.36 ND 0.24 1.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 1.15 0.15 0.15 0.15 0.15 0	a	7.28	9'0>	15.67	15.66	5	15	16	4	12.3	11.5
1.13 2.26 3.27 3.29 2.5 3.5 3.5 3.5 3.5 MATE & ULTIMATE 13.42 13.42 13.45 13.44 13.4 13.21 13.27 13.39 OGEN	ą,	1.95	2.88	2.2	2.25	1.97	2.1	N	N	2	Z
MATE & ULTIMATE ON 66.75 66.24 71.23 13.45 13.44 13.4 13.21 13.27 13.39 OGEN 5.3 5.26 4.76 4.71 71.34 71.38 70.41 70.23 69.98 OGEN 5.3 5.26 4.76 4.71 71.34 71.38 70.41 70.23 69.99 OGEN 1.39 1.35 1.43 1.43 1.45 1.39 1.35 1.28 OGEN 5.3 5.26 4.76 4.71 71.34 71.38 70.41 70.23 69.99 OGEN 6.75 0.05 0.14 0.119 0.12 ND ND 0.12 HINE 0.6 0.05 0.14 0.119 0.12 ND ND 0.12 IL207 10953 12674 12648 12645 12609 12665 12669 12653 A. DRY ASH ELEMENTS A. S. B. B. B. B. B. B. B. B. B. B. B. B. B.	స్తి	1.13	2.26	3.27	3.29	8	8	က	Q Z	5	2.2
MATE & ULTIMATE 13.42 13.42 13.42 13.42 13.42 13.43 13.44 13.41 13.42 13.42 13.42 13.45 13.44 13.44 13.41 13.27 13.39 OGEN 5.3 5.28 4.76 4.77 4.94 4.88 4.63 4.59 6.938 OGEN 1.39 1.35 1.43 1.43 1.45 1.34 1.45 1.39 1.32 1.32 1.33 0.04 0.05 0.05 0.05 0.05 0.05 0.05 0.05	>	40	42.19	28.06	27.98	33.6	36.3	35	36	35.5	38.2
ON 66.75 66.24 71.23 71.11 71.34 13.21 13.27 13.39 ON 66.75 66.24 71.23 71.11 71.34 71.38 70.41 70.23 69.96 OGEN 5.3 5.28 4.76 4.77 4.94 4.88 4.63 4.59 70.41 70.23 69.96 OGEN 1.39 1.35 1.43 1.45 1.39 1.39 1.35 1.28 71.11 71.34 71.34 70.41 70.23 69.96 70.41 70.60 0.05 70.14 70.14 70.12 ND ND ND 70.12 ND ND 70.12 ND ND 70.12 ND ND 70.12 ND ND 70.12 ND ND 70.12 ND ND 70.12 ND ND 70.12 ND ND 70.12 ND ND 70.14 70.14 70.14 70.14 1.36 ND ND 70.14 1.14 1.14 1.14 1.15 ND ND 70.14 1.14 1.14 1.14 1.14 1.14 1.14 1.14	PROXIMATE & UL	TIMATE				% DRY I	BASIS				
ON 66.75 66.24 71.23 71.11 71.34 71.38 70.41 70.23 69.98 OGEN 5.3 5.28 4.76 4.77 4.94 4.88 4.63 4.58 4.77 OGEN 1.39 1.35 1.43 1.45 1.39 1.39 1.28 4.77 OGEN 1.39 1.35 1.43 1.45 1.39 1.39 1.28 4.77 OH 0.05 0.155 0.14 0.119 0.122 ND ND 0.12 RINE 0.6 0.05 0.155 0.14 0.119 0.122 ND ND 0.12 RASH ELEMENTS *** PARK 1.2648 1.2648 1.2645 1.2609 1.2665 1.2669 1.2623 ASH ELEMENTS 1.12 47.16 46.04 ND ND 44.91 ND 46.11 ASH ELEMENTS 1.12 4.50 1.05 2.34 2.39 2.39 1.32	ASH	13.42	13.42	13.42	13.45	13.44	13.4	13.21	13.27	13.39	13.37
OGEN 5.3 5.28 4.76 4.77 4.94 4.88 4.63 4.59 4.77 OGEN 1.39 1.35 1.43 1.45 1.39 1.39 1.36 4.78 4.77 OGEN 1.39 1.35 1.43 1.45 1.39 1.39 1.36 4.77 OF 0.05 0.155 0.14 0.119 0.122 ND ND ND 0.12 ND 12207 10953 12674 12646 12645 12669 12665 1269 3.16 ASH ELEMENTS 12207 10953 12674 12646 12645 12669 12665 12669 12663 12623 ASH ELEMENTS 45.04 ND ND 44.91 ND 46.12 ND 46.04 ND 44.91 ND 46.12 ASH ELEMENTS 1.12 1.23 1.06 1.07 1.3 1.12 ND ND A6.1 ASH ELEMENTS	CARBON	66.75	66.24	71.23	71.11	71,34	71.38	70.41	70.23	89.98	60 04
GGEN 1.39 1.35 1.43 1.45 1.39 1.39 1.35 1.48 1.45 1.39 1.39 1.35 1.28 PRINE 3.1 2.96 2.95 3.1 3 2.96 2.99 3.16 PRINE 0.6 0.05 0.155 0.14 0.119 0.122 ND ND ND 0.12 12207 10953 12674 12646 12645 12609 12665 12669 2.99 3.16 45.86 49.3 47.16 46.04 ND ND 44.91 ND 46.1 23.1 24.62 23.19 23.37 22.98 23.97 22.55 ND 46.1 23.1 24.62 23.19 23.37 22.98 23.97 22.55 ND 17.4 1.12 1.23 1.06 1.07 1.34 1.36 ND ND ND 1.4 1.18 1.07 1.34	HYDROGEN	5.3	5.28	4.76	4.77	4.94	4.88	4.63	4.58	4.77	4 75
HANNE 0.6 0.05 0.155 0.14 0.119 0.122 ND ND 0.12 ND ND ND ND ND ND ND ND ND ND ND ND ND	NITROGEN	1.39	1.35	1.43	1.43	1.45	1.39	1.39	1,35	1.28	1.32
HINE 0.6 0.05 0.155 0.14 0.119 0.122 ND ND 0.12 12207 10953 12674 12648 12645 12609 12665 12688 12623 ***CHAYASH** ***CHYASH** ***CH	SULFUR	3.1	2.96	2.9	2.95	3.1	6	2.96	2.99	3.16	3.13
RASH ELEMENTS 45.86 49.3 47.18 46.04 ND ND ND 44.91 ND 46.1 23.1 23.1 24.62 23.19 23.37 22.98 23.97 22.98 23.97 22.15 ND ND 22.1 1.12 1.23 1.06 1.07 1.85 1.91 1.44 1.36 ND ND ND ND 21.4 1.18 1.07 1.85 1.91 1.44 1.36 ND ND ND ND ND 0.24 1.18 0.22 2.32 2.32 2.32 2.33 0.87 0.87 0.87 0.87 0.87 0.87 0.89 ND ND ND ND 0.24 0.25 0.36 ND ND 0.24 0.25 0.37 0.38 ND ND ND 0.45 0.45 0.45 0.45 0.45 0.45 0.45 0.45 0.45 0.45 0.45 0.47 0.48 0.48 ND ND ND ND ND 1.53	CHLORINE	9.0	0.05	0.155	0.14	0.119	0.122	2	S	0.12	0.13
** DRY ASH ASH ELEMENTS ** DRY ASH 45.86 49.3 47.18 46.04 ND 44.91 ND 46.1 23.1 24.62 23.19 23.37 22.98 23.97 22.55 ND 22.1 1.12 1.23 1.06 1.07 1.3 1.12 1.12 ND 22.1 20.76 23.02 21.68 22.01 20.9 19.67 ND ND 21.4 1.18 1.07 1.85 1.91 1.44 1.36 ND ND 21.4 0.43 0.33 0.87 0.87 0.86 ND ND 0.86 0.22 0.21 0.3 0.3 0.25 0.25 0.38 ND 0.24 2.39 2.22 2.3 2.32 1.92 2.11 2.05 ND 0.25 0.47 0.53 0.48 0.46 0.89 0.89 ND ND 0.45 ND 1.78 1.83 ND ND ND 0.45	Btu/Ib	12207	10953	12674	12648	12645	12609	12665	12688	12623	12583
HASH ELEMENTS 45.86 49.3 47.18 46.04 ND ND 44.91 ND 46.11 23.1 24.62 23.19 23.37 22.98 23.97 22.55 ND 22.1 20.76 20.76 20.76 20.70 20.70 1.3 1.12 1.12 1.12 1.12 1.12 1.12 1.12 1.13 1.14 1.14 1.14 1.14 1.14 1.15 ND 1.17 1.18 1.19						★ DRY	ASH				
45.86 49.3 47.18 46.04 ND ND 44.91 ND 46.1 23.1 24.62 23.19 23.37 22.98 23.97 22.55 ND 22.1 1.12 1.23 1.06 1.07 1.3 1.12 1.12 ND 1 1.18 1.07 1.85 1.91 1.44 1.36 ND ND 21.4 0.43 0.33 0.87 0.87 0.86 ND ND 1.7 20.39 2.22 2.3 2.32 1.92 2.11 2.05 ND 0.24 2.39 2.22 2.3 2.32 1.92 2.11 2.05 ND 0.24 ND ND ND 0.45 ND ND ND 1.78 ND ND ND 1.53	MAJOH ASH ELEI										
23.1 24.62 23.19 23.37 22.98 23.97 22.55 ND 22.1 1.12 1.23 1.06 1.07 1.3 1.12 1.12 ND 1 20.76 23.02 21.68 22.01 20.9 19.67 ND ND 21.4 1.18 1.07 1.85 1.91 1.44 1.36 ND ND 21.4 0.43 0.33 0.87 0.87 0.86 ND ND 1.7 2.39 2.22 2.3 2.32 1.92 2.11 2.05 ND 2.2 0.47 0.53 0.48 0.46 0.89 0.89 ND ND 0.45 ND ND 1.79 1.53	S.C.	45.86		47.18	46.04	2	2	44.91	2	46.1	45.3
1.12 1.23 1.06 1.07 1.3 1.12 ND 1 20.76 23.02 21.68 22.01 20.9 19.67 ND ND 21.4 1.18 1.07 1.85 1.91 1.44 1.36 ND ND 21.4 0.43 0.33 0.87 0.87 0.86 ND ND 0.86 0.22 0.21 0.3 0.3 0.25 0.25 0.38 ND 0.24 2.39 2.22 2.3 2.32 1.92 2.11 2.05 ND 2.2 0.47 0.53 0.48 0.46 0.89 0.89 ND ND 1.53	Al ₂ O ₃	23.1		23.19	23.37	22.98	23.97	22.55	2	22.1	22.2
20.76 23.02 21.68 22.01 20.9 19.67 ND ND 21.4 1.18 1.07 1.85 1.91 1.44 1.36 ND ND 1.7 0.43 0.33 0.87 0.87 0.73 0.86 ND ND 0.86 1 0.22 0.21 0.3 0.3 0.25 0.25 ND 0.24 2.39 2.22 2.3 2.32 1.92 2.11 2.05 ND 2.2 0.47 0.53 0.48 0.46 0.89 0.89 ND ND 0.45 ND ND 1.53	⊡	1.12		1.06	1.07	.	1.12	1.12	S	-	-
1.18 1.07 1.85 1.91 1.44 1.36 ND ND 1.7 0.43 0.33 0.87 0.87 0.73 0.86 ND ND 0.86 0.22 0.21 0.3 0.3 0.25 0.25 0.38 ND 0.24 2.39 2.22 2.3 2.32 1.92 2.11 2.05 ND 2.2 0.47 0.53 0.48 0.46 0.89 0.89 ND ND 0.45 ND ND 1.78 1.83 ND ND ND ND 1.53	Fe ₂ O ₃	20.76		21.68	22.01	20.9	19.67	2	2	21.4	2
0.43 0.33 0.87 0.73 0.86 ND ND 0.86 0.22 0.21 0.3 0.35 0.25 0.38 ND 0.24 2.39 2.22 2.3 2.32 1.92 2.11 2.05 ND 2.2 0.47 0.53 0.48 0.46 0.89 ND ND ND 1.53	Q U	1.18		1.85	1.91	1.44	1.36	2	2	1.7	1.8
O ₃ 0.25 0.21 0.3 0.3 0.25 0.25 0.36 ND 0.24 2.39 2.22 2.3 2.32 1.92 2.11 2.05 ND 2.2 0.47 0.53 0.48 0.46 0.89 0.89 ND ND 0.45 ND ND 1.78 1.83 ND ND ND ND 1.53	Og¥	0.43		0.87	0.87	0.73	0.86	Q	2	0.86	0.86
2.39 2.22 2.3 2.32 1.92 2.11 2.05 ND 2.2 0.47 0.53 0.48 0.46 0.89 0.89 ND ND 0.45 ND ND 1.78 1.83 ND ND ND ND 1.53	Na ₂ O	0.22		0.3	0.3	0.25	0.25	0.38	S	0.24	0.26
, 0.47 0.53 0.48 0.46 0.89 0.89 ND ND 0.45 ND ND 1.78 1.83 ND ND ND 1.53	, K	2.39		2.3	2.32	1.92	2.11	2.05	2	2.2	2.2
N ON ON ON ON 1.83 ND ON ON 1.53	o, j	0.47		0.48	0.46	0.89	0.89	2	2	0.45	0.46
	နှ	2		1.78	1.83	욷	2	Q	2	1.53	1.49

INDIVIDUAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE G

TRACE		(AB		LAB II		LAB III	[AB	≥	Š	LAB V
ELEMENIS	HON I	AUN 2	NO.	RUN 2	FUN 1	HUN 2	NON T	HUN 2	HUN 1	RUN 2
As	1.53	1.65	2.53	2.57	-	-	8	2	0.75	1.21
@ :	95,36	74.61	87.94	6.06	96	84	82	65	60.7	47.4
8	95.36	88.87	404.6	417.4	402	461	250	520	365	389
	1.53	1.21	1.33	4.	1.2	1.2	-	1.3	1.47	1.39
P O	>0.06	>0.06	,0.01	<0.01	<0.4	<0.4	9'0>	<0.6	0.036	0.34
٠ ت	10.96	8.56	12.89	10.44	10.2	0	6	유	7	7.5
ပ ိ	5,59	4.83	3.96	4.07	4.24	4.38	4	4	2.34	2.38
ָם נו	52.61	10.53	10.44	10.47	<40.5	<42.9	10	10	14.1	14.7
ш.;	<100	×100	92.65	91.53	06	06	<u>Q</u>	2	73	78
Hg	×0.1	<0.1	0.097	0.093	0.08	0.08	0.07	0.07	0.078	0.071
	54.81	50.47	99.5	100.7	73.9	82.7	77	62	76.3	75.5
E 0	2.52	~	1.75	1.73	6.65	5.92	9	9>	0.429	0.795
Z	7,45	6.69	8.4	7.74	<15.2	<16.1	9	4	6.4	6.4
Pb	6.25	5.05	10.02	10.06	12	12	0	=	6.1	7.5
Sb.	1.97	0.99	1.72	1.72	1.38	1.63	-	~-	4.43	3.22
œ,	<0.6	<0.6	1.62	1.64	-	-	8	운	1.07	1.77
>	29.6	24.14	24.82	25.52	52	26.8	27	23	27	27.9
PROXIMATE & ULTIMATE	ATE				% DRY BASIS	BASIS				
ASH	20.52	20.6	20.54	20.66	20.6	20,63	20.64	20.61	20.71	20.86
CARBON	58.09	58.61	62.29	62.02	61.81	61.95	61.25	61.29	6135	61 13
HYDROGEN	5.82	5.38	9,4	4.62	4.71	4.76	4.51	4.5	4.35	4.56
NITROGEN	1.01	1.02	0.89	1.03	1.1	1.06	1.04	1.04	109	1.09
SULFUR	9.0	0.53	0.71	0.73	0.71	0.69	0.69	0.67	0.72	69 0
CHLORINE	0.08	0.05	<0.02	<0.02	<0.01	<0.01	Ž	2	0.0	0.04
Btu/Ib	69/6	9471	10855	10858	10848	10848	10848	10857	10804	10797
					X DRY ASH	ASH				
MAJOR ASH ELEMENTS						•				
SiO ₁	62.96	50.22	61.22	61.62	S	2	59.37	60.34		59.6
Alo,	18.16	16.1	22.76	22.61	20.51	•••	21.59	21.81	21.1	20.7
	0.98	0.81	0.96	0.93	1.35		1.19	0.94		0.0
Fe ₂ O ₃	4.35	3.5	4.63	4.68	4.48		Q	2		4.6
CaO	2.24	2.01	4.68	4.68	1.52		운	2		4.2
0 63	0.23	0.33	1.33	1.32	0.73		2	Q		<u>.</u>
Na _z O _z	0.12	0.11	0.25	0.27	0.2		0.31	0.19		0.29
Ž,	1.16	4.09	<u>-</u>	1.39	1.15	1.27	1.23	1.28		1.3
o d	0.04	0.03	0.03	0.03	0.05		2	Q		0.1
so,	Z		3.53	3.54	2		2	2		3.7

INDIVIDUAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE H

				•		ב כסקו מ	S S S S S S S S S S S S S S S S S S S			
IHACE	_	AB I	لـ	LABII	¥	IAR III	TY	I AB IV	-	3
ELEMENTS	HUN 1	HUN 2	HUN 1	RUN 2	RUN 1	RUN 2	RUN 1	RUN 2	RUN 1	1 RUN 2
As .	9.0>	3.63	4.63	4.51	ო	en	ď	Ş	č	
נ מב	203.01	181.49	142.76	134,99	160	170	160	<u>.</u> چ څ		4. 4. 5. 6.
S (97.4	33.09	51.1	20	54.5	6.64		4	101 48.8	142
9 F.	1.71	1.49	1.23	1.26		7.	1.3	-	, , ,	97
<u>ت</u> د	0.46	0.4	0.56	0.63	<0.2	<0.2	<0.	¥0>	2000	1000
ט כֿ	22.44	21.35	19.58	19.69	23.1	20.1	22	200	18.5	0.107
<u>د</u> د د	6.41	7.79	3.59	3.62	4.08	3.71	ស	4	2.0.c	5 6
3,	13.89	11.74	10.99	11.19	<34.0	<32.2	- 5	· <u>c</u>	45.4	75.7
. :	<100	<100	92.92	93.09	8	90	2.84	! S	<u> </u>	
Ď.	<0.1	0.15	0.098	0.098	0.05	0.05	0.05	2 0	- G	- 600
	26.71	23.49	31.7	31.7	21.2	22.3	3	3.5	2,75	0.080
O <u>X</u> :	5.98	6.73	5.05	5.1	11.5	11.4	7	5 °	5.7	7.07
Z	20.3	18.15	15.19	15.32	13.6	13.4	r <u>α</u>	4 0	7	40.0
Pb	5.45	<0.6	10.6	10 73	0		2 ;	; مُ	7.01	16.3
Sb	<0.8	<0.8	0.62		מ מ	7	= 1		7.6	9 .9
S _e	130	17.	600	5 6	0.000	0.417	▽	⊽	2	2
; >	D 0		80.5	3.01	N	8	8	운	7.5	6.
•	9.0	/o./o	31.43	31.58	36.1	36.5	39	38	40.4	39.6
PROXIMATE & ULTIMATE	E E				% DRY BASIS	SASIS				
ASH	10.47	10.68	10.67	10 71	10 57	40	7	9		,
CAHBON	67.37	67.64	72 52	72.47	200	2 6	10.51	10.48	10.59	10.69
HYDROGEN	4	68.8	7.77	4.7	80'7'	72.7	71.27	71.23	71.23	71.19
NITROGEN	•	5 4	7) . T	4. j		5.01	4.7	4.73	4.81	4.79
SHEIB	87:- C	54. 0	₽ . (1.54	1.46	1.5	1.43	1.43	1.43	1.35
	3.00	7.07	20. 20.	2.84	2.87	2.86	2.86	2.89	2.86	2.82
Bride	90:0	90.0	0.122	0.124	0.135	0.148	Q	2	0.14	0.14
	12911	0/911	12858	12828	12815	12809	12776	12767	12734	12706
STATATION ACH CHEMINTS	ģ				% DRY	ASH				
SiO	2	7.7	1							
	5,00	44.00	20.7	50.64	2	2	48.97	2	49.7	40 6
7.0°	23.13	18.88	22.1	22.14	21.61	20.21	21.32	2	21.4	5
5.	1.16	0.98	1.09	1.09	-	1.02	1.08	S	0	2
rez.	16.05	14.01	16.52	16.59	15.37	13.41	2	S	. .) ()
	1.71	1.54	3.3	3.39	1.89	1.68	S	S	0	- 6
0 6	0.39	0.38	1.06	1.07	0.85	0.85	2	Ž	יי י	6 .7
Na ₂ O ₃	0.85	69.0	0.91	0.93	0.79	0.72	0.76	2	- 90	- 6
Υ, O	2.83	2.41	2.6	2.61	2.78	500	. c	2 2	0.30	0.88
P_0.	0.21	0.18	0.18	0.0	0.35	9	21.7	2 2	7.7	2.4
ြင့်	2	2	2.24	20.00	S	Š	2 5	2 2	0.27	0.22
1			! !) i	}	Š	Š	3	2.93	2.7

INDIVIDUAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE J

TRACE		AB 1	٦	LAB II	≤	LAB III	Ž	≥	Y	LAB V
ELEMENTS	RUN	HUN 2	HUN 1	RUN 2	RUN 1	RUN 2	RUN 1	RUN 2	HUN 1	RUN 2
As	1.03	2.9	3.42	3.34	2	8	8		2.1	2.2
œ	311.53	257.9	186.96	179.35	230	220	200	210	222	205
Ba	3.22	27.94	54.1	57.7	54.7	55.6	21	49	2	51.6
Be	1.61	1.5	1.15	1.19	4.	4.1	1.1	1.2	1.47	1.43
P)	0.88	1.01	9.0	0.65	<0.3	<0.3	<0.4	<0.4	0.417	0.276
ؙڹ	34.38	26.86	26.3	26.97	20.6	26.5	30	28	56	33.3
Ço	6.45	5.48	3.65	3.59	3.49	3.13	ო	6	2.52	2.63
Cu	8.81	10.75	9.35	9.18	<39.2	<35.2	t	o	13.1	13.9
<u> </u>	0.01	0.01	111,15	110.27	100	110	4.35	2	-6	87
Hg.	0.18	<0.1	0.117	0.111	0.1	0.1	60.0	0.09	0.113	0.107
M	17.19	35.46	53.4	51.8	30.6	28.2	45	45	42.6	43.8
O :	10.74	7.52	7.07	7.04	16.7	15.6	ß	រព	5.2	5.4
Z	21.48	19.34	16.12	16.55	15.3	13.2	61	17	18.3	21.5
Pb	<0.6	6.81	11,16	10.85	16	12	Ξ	=	7.6	7
Sp	<0.0	8 .0>	0.51	0.49	0.49	0.421	⊽	٧	2	2
, ge	1.93	2.79	4.16	3.99	က	6	6	Q.	2.5	2.5
>	45.12	36.54	32.32	33.8	33.5	32.1	36	36	38.5	38.6
PROXIMATE & ULTIMATE	ATE				% DHY BASIS	BASIS				
ASH	12.2	12.17	12.13	12.16	11.75	11.77	11.89	11.87	11.84	11.85
CARBON	69.43	69.07	70.45	70.4	70.01	69.92	69.56	69.4	68.98	69 34
HYDROGEN	4.78	5.7	4.86	4.84	4.88	4.95	4.43	4.47	4.77	4.73
NITHOGEN	1.29	L	1.26	1.26	1.37	1.42	1.27	1.31	1.32	1.25
SULFUR	3.52	4.05	3.46	3.42	3.53	2.15	3.42	3.44	3.44	3.39
CHLORINE	0.04	0.04	0.08	0.075	0.079	0.076	S	2	0.11	0.01
9tu/lb	10161	11035	12502	12493	12493	12515	12446	12451	12410	12422
					% DRY ASH	ASH				
MAJOR ASH ELEMENTS	IIS									
SiO ₁	7.17	43.52	48.35	48.95	2	S	48.17	QX	47.5	48.2
Al ₂ O ₃	5.65	13.51	18.95	18.67	18.56	17.23	18.57	S	17.6	17.8
Ti0,	1.09	6.0	0.94	0.93	6.0	0.74	0.94	2	6.0	6.0
Fe ₂ O ₃	15.11	13.89	17.2	17.23	14.94	14.01	S	2	16.4	16.8
CBO	1.85	1.98	6.55	6.45	2.21	2.1	<u>Q</u>	2	5.3	5,5
MgO	0.15	0.28	1.06	1.04	0.92	0.74	Q	S	_	-
Na ₂ O ₃	0.69	6.0	0.93	0.91	0.85	0.82	1.01	2	0.99	-
Č.	1.7	2.02	2.17	2.15	1.47	1.25	2.05	2	2.1	2.1
o.	0.28	0.24	0.27	0.29	0.51	0.55	2	S	0.24	0.28
S S	Q N	Ş	2.98	2.88	9	2	욷	2	5.86	6.05

INDIVIDUAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE K

PPM DRY WHOLE COAL BASIS

				E		י מכאר מ	200			
HACE		AB I		LAB =		LAB III	PP (≥	₹	LAB V
ELEMENIS	HON 1	AUN 2	NO.	RUN 2	HUN 1	RUN 2	BUN 1	RUN 2	RUN 1	RUN 2
As	2.49	2.8	3.18	3.22	****	8	8	2	6.	2.8
co :	228.69	238.84	173	167.32	200	180		200	201	205
Ba	32.22	32,19	48.5	46.7	61.1	57.4		49	50.1	56.5
Be	1.66	1.77	1.34	1.42	1.7	1.7	1.2	4.4	1.69	2.37
5	2.18	2.08	1.01	96.0	<0.3	<0.3		<.04	0.564	0.184
٠ ت	33.26	33.23	35.54	33.49	36.9	34.2		38	30.5	38.1
රි (4.57	4.88	3.44	3.68	3.67	3.42		က	1.82	3.84
n i	11.43	11.42	9,61	9.7	<35.4	<33.9	60	0	13.6	15.9
<u>u</u> . :	0.01	0.01	128.14	134.87	110	120	9	2	96	89
ð.	0.18	0.19	0.107	0.105	0.011	0.011	0,0	0.12	0.121	0.095
S	28.07	28.04	39.9	39.9	27.3	28.5		38	33.9	40.8
OM:	7.07	7.58	7.39	7.38	17.6	18.4		9>	. EQ.	6.9
Ž	17.67	17.65	17.46	17.52	13.5	12.2	18	19	17.4	23
Pb	9.77	14.54	15.25	15.61	18	€	15	16	10.2	<u>ي</u> دن
as ·	<0.8	<0.8	0.68	0.73	0.657	0.597	₹	٧	2	2
.	2.81	3.53	5,56	4.94	က	က		S		2.2
>	46.78	45.69	38.76	4	44.8	46.8	45	48	48.6	57.9
PROXIMATE & ULTIMATE	VTE				% DRY BASIS	SASIS				
ASH	12.59	12.38	12.63	12.6	12,44	12.49	12.47	12.46	12 44	12.62
CARBON	68.06	81.55	70.23	70.02	69.61	69 21	68 88	68.92	69.7	58 03
HYDROGEN	4.98	4.6	4.82	4.87	16.4	0	4.55	4.53	4 69	4.7
NITROGEN	1.33	1.35	1.34	1.32	1.43	1.36	1.29	1.35	4 33	. 20
SULFUR	4	3.88	9.6	3.43	3.51	3,54	3.48	3.45	3.44	98.8
CHLORINE	0.04	0.03	0.073	0.09	0.086	0.088	2	2	0.07	0.07
Btu/lb	11326	11013	12359	12363	12391	12411	12392	12369	12364	12388
					% DRY ASH	ASI				
MAJOR ASH ELEMENTS	ည									
SiO,	46	46.73	51.78	51.75	S	오	48.95	2	50.6	52
Al ₂ O ₃	15.6	17.43	19.36	19.39	18.74	17	18.5	2	18.6	18.4
170 <u>,</u>	0.94	0.98	0.99	0.98	0.85	0.71	1.68	QX	6.0	-
Fe ₂ O ₃	14.17	15.59	19.07	18.9	1.74	1.59	2	ş	17.5	17.4
CaO	1.5	1.41	3.81	3.68	1.92	1.81	2	Q	ຕ	3.5
MgO	0.3	0.26	1.09	1.09	0.74	0.81	2	2	***	-
Na ₂ O ₃	0.7	0.27	0.77	0.76	0.0	0.7	0.77	S	0.92	0.82
۲. ۲.	2.19	2.32	2.36	2.35	1.71	2.05	1.95	2	2.2	2.2
	0.26	0.27	0.31	0.28	0.59	0.51	2	9	0.39	0.32
og S	O Z	2	1.87	1.82	2	웆	Q	2	3.56	3.54

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INDIVIDUAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE L

TRACE	ב	LAB 1	ב	LABII	148	B III	IAB IV	<u>></u>	¥	IAB V
ELEMENTS	RUN 1	RUN 2	BUN 1	RUN 2	BUN 1	HUN 2	BUN 1	RUN 2	RUN 1	RUN 2
As	14.26	10.18	13.18	13.29	7	50	æ	2	10.9	10.7
☎ .	81.46	98.77	62.87	64.7	79	72	29	63	63.9	50.1
Ва	25.46	27.49	32.7	32.9	34.4	34.1	30	30	2	93
De C	1.32	1.63	66 0	1.05	1.5		1-		1.43	1.44
PO	0.09	0.12	0.15	0.15	<0.3	<0.3	<0.2	<0.2	0.088	0.054
ŏ	16.29	20.36	15.08	14.92	17	16.5	<u>2</u>	16	11.7	6.17
လ	6.11	19.67	4.54	4.43	5.18	5.56	4	4	4.49	4.33
Cu	7.33	8.96	6.91	6.76	<34.9	<32.6	7	7	Ŧ	10.6
u.	<100	×100	61.87	61.71	9	50	2	2	52	52
Τā	<0.1	0.19	0.155	0.154	0.12	0.12	0.1	0.1	0.185	0.176
M n	15.27	18.33	16.3	16.3	19.3	17.5	1	18	6.6	19.2
Mo	<2	3.56	1.58	1.54	1.07	2.02	<3	6	2	2
Z	13.24	16.29	12.39	12.18	19.3	16.7	4	12	14.3	14.7
РЪ	3.46	3.67	6.67	6.55	15	5 3	9	9	4.7	€.
QS	<0.8	<0.8	0.67	99'0	0.546	0.597	٧	V	2	Ç
%	1.93	2.14	2.65	2.74	R	8	8	S		2.3
>	30,55	37.67	24.64	24.07	32.7	32.5	28	27	32,6	32,3
					2040 700 >	01010				
PROXIMATE & ULTIMATE	IATE					Sico				
ASH	11.58	11.56	11.45	11.53	11.61	11.61	11.45	11.38	11.49	1167
CARBON	71.12	71.51	72.74	72.82	72.69	72.38	71.92	71.97	71.59	71.67
HYDROGEN	5.17	5.41	4	4.98	5.03	5.05	4.88	4.87	4.82	4.81
NITROGEN	1.36	1.37	1.39	1.42	1.43	1.42	14.	1.38	134	1.23
SULFUR	3.41	3.52	3.12	3.17	3.26	3.29	3.08	3,15	3.29	3.25
CHLORINE	0.05	90.0	0.091	0.078	0.099	960.0	S	2	0.1	0.09
Btu/Ib	12539	13308	13004	13009	12925	12950	12977	12973	12925	12936
					% DRY ASH	/ ASH				
MAJOR ASH ELEMENTS										
siO ₃	39.57	47.19	45.66	45.89	2	2	45.42	S	45.1	44.3
Al ₂ O ₃	19.93	23.29	21.77	21.86	21.55	21.56	22.07	2	21.2	20.7
10,	0.94	1.07	0.97	0.98	96'0	1.08	0.97	S	0.9	-
Fe ₂ O ₃	22.63	26.45	26.21	26.12	21.83	21.53	Q N	2	25.4	25.2
CaO	0.5	9.0	1.28	1.29	1.21	1.17	Q	2	1.2	1.2
Obw	0.26	0.28	2.0	0.71	0.68	0.69	S	2	0.73	0.71
Na ₂ O,	0.37	0.38	0.41	0.41	0.36	0.33	0.5	S	0.57	0.52
Ŏ,	1.7	2.02	<u>0</u> .	1.92	1.58	1.42	1.83	Ŝ	6.1	1.8
P.O.	0.11	0.13	<u>.</u>	0.1	0.24	0.21	S	2	0.19	0.21
် တွေ		2	1.64	1.62	9	S	S	<u>Q</u>	1.42	1.4

INDIVIDUAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE M

TRACE	_	AR I	-	I AB II	III OVI	=	V 041	2	-	3
ELEMENTS	RUN 1	RUN 2	RUN 1	RUN 2	BUN 1	RUN 2	RUN 1	RUN 2	RUN 1 RU	RUN 2
As	1.36	1.36	1.74	1.75	8	-	-	Q	0.54	0.52
8	101.72	105.45	26.13	31,55	66	8	97	9	79.6	612
Ba	161.27	173.68	438.5	451.3	559	589	120	140	445	503
	0.52	0.5	0.52	0.53	0,4	0.4	0.3	0.4	0.363	0.319
8	<0.06	>0.06	0.1	0.11	<0.3	<0.3	<0.4	<0.4	0.068	2
ٔ ن	5.21	5.09	4.8	4.76	4.94	5.01	6	4	e e	8 8
_ු	<2.0	2.73	1.19	1,16	0.619	0.641	-	-	2	0.86
z	10.42	10.3	8.21	8.21	<36.7	<41.6	7	E	11.5	11.6
u.	<100	× 100	50.01	53.25	4	40	Ş	2	39	66
H _G	<0.1	<0.1	0.082	0.08	70.0	0.07	90.0	0.06	0.102	0.088
Z 2	119.09	119.09	184.4	186.5	126.3	132.7	140	160	141	141
M o	7.57	7.2	6.93	7.33	18.7	19.8	ស	4	5.7	(m)
Ź	4.09	4.47	3.6	3.56	7.91	40.4	-	8	S	S
Pb	4.09	4.84	5.49	5.44	7	60	· vo	ı ıc	(C)	0
Sb	<0.8	<0.8	0.49	0.5	0.479	0.481	. ⊽	· V	Ş	Ş
క్రి	<0.6	<0.6	0.98	0.95	-	-	; -	Ę	-	2
>	99.6	10.67	9.3	9.35	8.68	9.07	· cc) a	or or	9
							•	•)	3
PROXIMATE & ULTIMATE	ATE				% DRY BASIS	ASIS				
ASH	11.94	12.07	11.74	11.88	11.54	11.49	11.43	11.46	11.53	11.62
CARBON	67.62	67.2	68.81	68.56	68.36	68.49	67.86	67 79	67.51	67.67
HYDROGEN	7.29	6.03	4.72	4 75	4 72	4 70	0 F0	A 5.8		5.5
NITROGEN	6	-	28.0	700			80.5	90.4	5. J	00.4 0.4
	00.0	- 6	5 6	n c	- ·		0.50 0.50	0.95	[.	<u></u>
IN INC	g c	0.03	8. c	86.0	CO. 5	20.0	0.94	96.0	0.98	0.98
OILCOURE Dings	0.01	0.0	20.02	20.02 20.02	<0.1 1	<0.01	2	2	0.04	0.04
ar/na	06801	6333	11/4/	11743	11/38	11707	11775	11745	11670	11662
					* DRY ASH	ASH.				
MAJOR ASH ELEMENTS	ITS									
SiO ₂	40.07	41.85	43.44	43.5	2	2	43,29	2	40.3	40.9
Al ₂ O ₃	8.64	7.77	18.96	18.97	15,34	16.2	18.98	Q	19.5	1.61
Tio,	0.81	98'0	0.81	0.81	1.29	1.23	0.84	2	8	80
Fe ₂ O ₃	4.75	4.85	7.05	7.64	5.21	6.02	Q	2	5.5	50.00
CaO	2.76	2.16	12.82	12.83	3.75	4.21	2	2	114	4.11
MgO	1.45	1.11	40.4	4.02	96.0	0.99	Q	2	39	3.9
Na ₂ O ₃	0.24	0.24	0.29	0.32	0.26	0.29	0.32	2	0.32	0.38
K ,0	0.84	0,46	0,5	0.51	0.37	0.44	0.48	S	0.49	0.51
P ₂ O ₃	0.31	0.31	0.29	0.29	0.64	9.0	욮	Q	0.29	0.27
ွင့်	9	2	1.77	11.84	2	문	2	2	14.48	14.08
ı								!		! ! :

INDIVIDUAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE N

HINN HUN Z HUN I HUN Z HUN I HUN Z HUN I HUN Z HUN I HUN Z HUN I HUN Z HUN I HUN Z HUN I HUN Z HUN I HUN Z	TRACE		AB I	-		5	B E	LAB	≥ 8	Š	LAB V
1183 1007 1189 1171 4 5 3 ND 8.9 361.24 349.18 4106 452 73 773 390 460 754 0.11 0.01 0.07 0.51 0.51 0.08 0.08 0.6 0.04 0.01 0.12 0.07 0.05 0.05 0.08 0.08 0.0 0.04 0.01 0.13 0.01 0.01 0.01 0.03 0.04 0.06 0.06 0.01 0.14 0.07 0.05 0.05 0.04 0.06 0.04 0.01 0.15 0.01 0.01 0.01 0.01 0.03 0.04 0.01 0.16 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.17 0.01 0.02 0.02 0.02 0.02 0.01 0.01 0.18 0.02 0.02 0.02 0.02 0.01 0.01 0.01 0.19 0.02 0.02 0.02 0.01 0.01 0.01 0.10 0.02 0.02 0.02 0.02 0.02 0.01 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.10 0.02 0.0	ELEMENTS	NON	HUN 2	HUN 1	HUN 2	HUN 1	RUN 2	HUN 1		HUN 1	Z
1893 14918 41.06 482 145 145 150 140 136 30124 3055 6955 6655 773 7779 390 400 774 0.31	٧s	11.83	10.07	11,69	11.71	4	D	n	Q	60	101
MATE & ULTIMATE S615	5 0	199.3	149.18	41.06	49.2	145	145	150	140	136	124
0.97 0.77 0.51 0.51 0.6 0.8 0.8 0.6 0.6 0.71 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Ва	361.24	335.65	695.5	655	73	77.9	390	460	754	729
10.11 -0.006 0.13 0.13 -0.04 -0.04 -0.04 -0.01	Be	76.0	0.77	0.51	0.51	0.8	0,8	0.6	9.0	0.711	1 13
10.09	PS	0.11	>0.06	0.13	0.13	<0>	<0.4	<0.4	<0.4	0.11	2
15	ŏ	10.09	7.71	8.01	8.45	90'6	8.67	60	50	6.4	· 60
1158	රි	4.73	3.11	2.78	2.67	1.85	1.95	-	-	1.27	1.51
- (100	Çn	11.58	8.95	7.72	7.57	<39.7	<40.7	7	7	16.2	13.2
137.02 105.67 15.08 14.7 15.1 10.1 0.15 0.15 0.15 12.0 13	u.	×100	×100	62.27	62.91	50	50	2.05	2	54	56
137.2 10567 150.8 147.9 83.1 96.5 130 130 120 7.22 5.59 7.3 7.49 15.5 16.4 4 6.6 0.142 7.22 5.59 7.3 7.49 15.5 16.4 4 5.32 3.61 2.99 2.6 7.3 7.49 15.5 16.4 4 5.32 3.61 2.99 2.6 7.3 7.49 15.5 16.4 4 5.32 3.61 2.99 2.6 10.7 10.79 0.672 0.704 <1 1.0 ND 1.56 21.16 16.16 15.72 15.79 19.4 19.2 16 17 16 21.16 16.15 15.79 15.99 19.4 19.2 16 17 16 3.6 5.8 5.8 5.9 7 5.9 6 5.9 2 5.9 5.9 6 5.9 2 5.9 6.9 6 3.6 1.0 1.0 1.1 16.15 16.6 16.7 16.6 17.0 17 3.6 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 3.6 1.0 1.1 16.1 16.1 16.1 16.1 16.1 16.1	Hg	<0.1		0.129	0.167	0.11	0.1	0.13	0.13	0.153	0.155
3.99 3.85 2.82 2.88 10.5 11 <6 <6 0.142 3.61 2.98 2.82 2.88 10.5 11 <6 <6 0.142 3.61 2.98 2.87 2.98 1.55 16.4 4 4 5.32 4.08 4.08 0.77 0.79 0.672 0.704 <1 <1 ND 1.56 21.16 16.16 15.72 15.78 19.4 19.2 16 17 16 16.73 16.96 16.11 16.15 16.64 16.74 16.69 17.06 17.	Z.	137.02		150.8	147.9	93.1	96.5	130	130	120	124
722 5.59 7.3 7.49 15.5 16.4 4 4 5.32 COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB COB <	Mo	3.99		2.82	2.88	10.5	Ξ	9>	9	0.142	0.44
ASH ELEMENTS 2.86 2.6 2.5 9 9 9 3 3 1.97	Ž	7.22		7.3	7.49	15.5	16.4	4	4	10 13 13	4 1
COLD COLD COLD COLD COLD COLD COLD COLD COLD COLD COLD COLD COLD COLD COLD COLD COLD	Pb	3.61	2.98	2.6	2.5	O	60	· 0	· 67	1 97	500
MATE & ULTIMATE MATE & ULTIMATE & ULTIMATE MATE & ULTIMATE & ULTIMATE MATE & ULTIMATE & ULTIMATE MATE & ULTIMATE & ULTIMATE MATE & ULTIMATE	QS QS	8.0>	<0.8	0.77	0.79	0.672	0.704	` ⊽	, <u>r</u>	S	2
## PASH STATE & ULTIMATE WATE & 16.96 16.11 16.15 16.64 16.46 16.74 16.59 17.06 17.06 17.06 17.06 19.06 19.02 17.06 17.00 17	Se	0.95		1,03	1.03	₹	V	· •	S	+-	2
## DRY BASIS ## DRY ASII ## DRY BASIS ## DRY ASII ## DRY BASIS ## DRY ASII ## DRY BASIS ## DRY ASII ## DRY BASIS ## DRY ASII ## DRY BASIS ## DRY ASII ## DRY BASIS ## DRY ASII ## DRY BASIS ## DRY ASII ## DRY BASIS ## DRY ASII ## DRY BASIS ## DRY ASII ## DRY BASIS ## DRY ASII ## DRY BASIS ## DRY ASII ## DRY BASIS ## DRY ASII ## DRY BASIS ## DRY ASII ## DRY BASIS ## DRY ASII ## DRY BASIS ## DRY ASII ## DRY BASIS ## D	>	21.18		15.72	15.78	19.4	19.2	· <u>4</u>	ţ		<u> </u>
## PARTE & ULTIMATE 16.73 16.96 16.11 16.15 16.64 16.46 16.74 16.69 17.06 56.35 56.36 59.77 59.64 59.26 59.22 56.96 59.26 GEN				1)	2	-	2	•	<u> </u>	7.01
16.73 16.96 16.11 16.15 16.64 16.46 16.74 16.69 17.06 16.03 4.36 59.77 59.64 59.26 59.22 58.96 59.26 59.26 GEN 6.03 4.36 4.23 4.25 4.28 4.31 4.06 40.2 3.8 GEN 0.82 0.82 0.91 0.91 1.06 1.05 0.81 0.77 1.02 R 1.02 1.02 1.15 1.13 1.18 1.16 1.13 1.14 1.13 IND ND III 1.16 1.13 1.14 1.13 ASH ELEMENTS 4.36 4.23 4.25 4.28 4.31 4.06 40.2 3.8 F. 1.13 1.14 1.13 1.14 1.13 ASH ELEMENTS 4.36 4.136 40.88 ND ND 39.59 ND 39.59 4.36 3.6 12.34 12.09 12.98 13.13 12.28 ND 12.1 5.22 4.19 7.09 7.06 6.25 6.38 ND ND 15.1 6.54 9.89 17.58 17.35 4.77 5.06 ND ND 15.1 1.23 1.34 4.8 4.73 1.11 1.05 ND ND 15.1 6.94 0.82 0.87 0.84 0.83 0.91 0.85 ND 0.95 1.29 0.14 0.13 0.14 ND ND ND ND 15.1 1.1 ND ND ND 15.1 1.1 ND ND 15.1 1.1	PROXIMATE & ULTIM	IATE				⊁ DRY	BASIS				
NA 58.35 58.36 59.77 59.64 59.26 59.22 58.96 59.25 59.26 OBZ	ASH	16.73		16.11	16.15	16.64		16.74	16.69	17.06	17.32
OGEN 6.03 4.36 4.23 4.25 4.28 4.31 4.06 4.02 3.6 GEN 0.082 0.91 0.91 1.06 1.05 0.81 0.77 1.02 R 1.02 1.02 1.15 1.13 1.14 1.13 1.14 1.13 IINE ND ND <0.02	CARBON	58.35		59.77	59.64	59,26		58.96	59.22	59.26	59 64
GEN 0.82 0.82 0.91 0.91 1.06 1.05 0.81 0.77 1.02 1.02 1.02 1.02 1.02 1.02 1.03 1.18 1.16 1.13 1.14 1.13 1.02 1.02 1.02 1.02 0.01 0.01 0.04 0.05 0.00 0.04 0.05 0.00 0.04 0.05 0.00 0.04 0.05 0.00 0.04 0.05 0.00 0.04 0.05 0.00 0.04 0.05 0.00 0.04 0.05 0.04 0.	HYDROGEN	6.03	4.36	4.23	4.25	4.28		4.06	4.02	4 F	2 0 2
H 102 1.02 1.15 1.13 1.18 1.16 1.13 1.14 1.13 ND ND <0.02 <0.02 <0.01 <0.01 ND 0.04 9107 7314 9867 9881 9924 9906 9906 9906 9894 9892 ** DRY ASH ASH ELEMENTS ASH ELEMENTS ASH ELEMENTS ASH ELEMENTS ASH ELEMENTS ASH ELEMENTS ASH ELEMENTS ASH ELEMENTS ASH ELEMENTS ASH ELEMENTS ASH ELEMENTS ASH ELEMENTS ASH ELEMENTS ASH ELEMENTS ASH ELEMENTS ASH ELEMENTS ASH T2.09 12.98 13.13 12.28 ND 12.1 12.1 12.1 12.1 12.1 12.1 12.1 12.	NITROGEN	0.82	0.02	0.91	0.91	106		. C	7.00	•	60.0
ASH ELEMENTS ASH T2.09	SULFUR	1 02	1 02	1.5	4 13	4		- 6		20.1	n (n
ASH ELEMENTS 46.27 34.56 41.36 40.88 ND ND 39.59 ND 39.6 4.36 3.6 12.34 12.09 12.98 13.13 12.28 ND 12.1 6.52 4.19 7.09 7.06 6.25 6.38 ND ND 6.6 4.9 3.9 17.58 17.35 4.77 5.06 ND ND 15.9 1.23 1.34 4.8 4.73 1.11 1.05 ND ND 15.9 1.29 0.94 0.82 0.87 0.84 0.8 0.61 0.85 ND 0.95 1.79 1.24 1.37 1.33 1.19 1.36 1.26 ND ND 15.1 ND ND 14.56 14.4 ND ND ND ND 15.11 1.29 ND ND 14.56 14.4 ND ND ND ND 15.11	CHLORINE	2	2	<0.02	200>	200		2 2	- 2	5.13	21.6
** DRY ASH 46.27 34.56 41.36 40.88 ND ND 39.59 ND 39.6 4.36 3.6 12.34 12.09 12.98 13.13 12.28 ND 12.1 6.57 0.44 0.43 0.42 0.44 0.53 0.48 ND 0.5 5.22 4.19 7.09 7.06 6.25 6.38 ND ND 6.6 4.9 3.9 17.58 17.35 4.77 5.06 ND ND 15.9 1.23 1.34 4.8 4.73 1.11 1.05 ND ND 4.7 6.94 0.82 0.87 0.84 0.8 0.81 0.85 ND 0.95 1.79 1.24 1.37 1.33 1.19 1.36 1.26 ND ND 1.4 0.19 0.14 0.13 0.12 0.33 0.31 ND ND 15.11	Btu/lb	9107	7314	9867	9881	9924		9066	9894	9892	9885
ASH ELEMENTS 4.36 4.37 4.39 4.39 4.30						i					
46.27 34.56 41.36 40.88 ND ND 39.59 ND 39.6 4.36 3.6 12.34 12.09 12.98 13.13 12.26 ND 12.1 0.57 0.44 0.42 0.44 0.53 0.48 ND 0.5 5.22 4.19 7.09 7.06 6.25 6.38 ND ND 6.6 4.9 3.9 17.58 17.35 4.77 5.06 ND ND 4.7 1.23 1.34 4.8 4.73 1.11 1.05 ND ND 4.7 0.94 0.82 0.87 0.84 0.8 0.81 0.85 ND 0.95 1.79 1.24 1.37 1.33 1.19 1.36 1.26 ND ND 1.4 ND ND 10.4 0.12 0.33 0.31 ND 1.51 1.3	MA MB ASH ELEMEN	OT.				HO K	L ASH				
4.36 3.6 12.34 12.99 12.99 13.13 12.28 ND 12.1 0.57 0.44 0.42 0.44 0.53 0.48 ND 12.1 5.22 4.19 7.09 7.06 6.25 6.39 ND ND 6.6 4.9 3.9 17.58 17.35 4.77 5.06 ND ND 15.9 1.23 1.34 4.8 4.73 1.11 1.05 ND ND 4.7 0.94 0.82 0.87 0.84 0.8 0.81 0.85 ND 0.95 1.79 1.24 1.37 1.33 1.19 1.36 1.26 ND 1.4 0.19 0.14 0.13 0.12 0.33 0.31 ND ND 15.11	SiO.		34 56	41.36	AO AB	S	5	02 06	2	ć	
0.57 0.44 0.42 0.44 0.53 0.48 ND 12.1 5.22 4.19 7.09 7.06 6.25 6.38 ND ND 6.6 4.9 3.9 17.58 17.35 4.77 5.06 ND ND 15.9 1.23 1.34 4.8 4.73 1.11 1.05 ND ND 4.7 0.94 0.82 0.87 0.84 0.8 0.81 0.85 ND 0.95 1.79 1.24 1.37 1.33 1.19 1.36 1.26 ND 1.4 0.19 0.14 0.13 0.12 0.33 0.31 ND ND 15.11	70 7	4.36		10.94	00.01	2 2	2 5	40.09	2 5	0.60	4.65
5.22 4.19 7.09 7.06 6.25 6.39 ND 0.5 4.9 3.9 17.58 17.35 4.77 5.06 ND ND 15.9 1.23 1.34 4.8 4.73 1.11 1.05 ND ND 4.7 0.94 0.82 0.87 0.84 0.8 0.81 0.85 ND 0.95 1.79 1.24 1.37 1.33 1.19 1.36 1.26 ND 1.4 0.19 0.14 0.13 0.12 0.33 0.31 ND 0.16 ND ND 14.56 14.4 ND ND ND ND 15.11	Tio	0.67		2.5	60.7	2.30	2.5	12.20	€ :	12.1	12.2
5.22 4.19 7.09 7.06 6.25 6.38 ND ND 6.6 4.9 3.9 17.58 17.35 4.77 5.06 ND ND 15.9 1.23 1.34 4.8 4.73 1.11 1.05 ND ND 4.7 0.94 0.82 0.87 0.84 0.8 0.81 0.85 ND 0.95 1.79 1.24 1.37 1.33 1.19 1.36 1.26 ND 1.4 0.19 0.14 0.13 0.12 0.33 0.31 ND 0.16 ND ND 14.56 14.4 ND ND ND 15.11	- [] - ()	ָהָי נְיִהְיִי ביים		5 (S	0.42	0.44	0.53	0.48	S	0.5	0.5
4.9 3.9 17.58 17.35 4.77 5.06 ND ND 15.9 1.23 1.34 4.8 4.73 1.11 1.05 ND ND 4.7 0.94 0.82 0.87 0.84 0.8 0.81 0.85 ND 0.95 1.79 1.24 1.37 1.33 1.19 1.36 1.26 ND 1.4 0.19 0.14 0.13 0.12 0.33 0.31 ND ND 0.18 ND ND 14.56 14.4 ND ND ND ND 15.11	֖֖֖֖֖֖֖֖֖֓֞֞֞֓֞֓֞֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓	27.0		7.09	7.06	6.25	6.38	2	2	6.6	6.6
1.23 1.34 4.8 4.73 1.11 1.05 ND ND 4.7 0.94 0.82 0.87 0.84 0.8 0.81 0.85 ND 0.95 1.79 1.24 1.37 1.33 1.19 1.36 1.26 ND 1.4 0.19 0.14 0.13 0.12 0.33 0.31 ND ND 0.18 ND ND 14.56 14.4 ND ND ND ND 15.11	Car Car	4 .00		17.58	17.35	4.77	5.06	2	2	15.9	16
0.94 0.82 0.87 0.84 0.8 0.81 0.85 ND 0.95 1.79 1.24 1.37 1.33 1.19 1.36 1.26 ND 1.4 0.19 0.14 0.13 0.12 0.33 0.31 ND ND 0.18 ND ND 14.56 14.4 ND ND ND ND 15.11	O ^S	1.23		4 .8	4.73	1.1	1.05	2	2	4.7	4.7
1.79 1.24 1.37 1.33 1.19 1.36 1.26 ND 1.4 0.19 0.14 0.13 0.12 0.33 0.31 ND ND 0.16 ND ND 14.56 14.4 ND ND ND ND 15.11	0 e :	0.94	0.82	0.87	0.84	0.8	0.61	0.85	2	0.95	0.92
0.19 0.14 0.12 0.33 0.31 ND ND 0.16 ND ND 14.56 14.4 ND ND ND ND 15.11	o, Y	1.79	1 24	1.37	1.33	1.19	1.36	1.26	오	4.	4.
N ON ON ON ON ON ON ON ON ON ON ON 15:11	P ₂ O ₃	0.19	o	0.13	0.12	0.33	0.31	욷	2	0.18	0.15
	တ်	욷		14.56	14.4	2	2	2	2	15.11	14.94

INDIVIDUAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE O

TRACE	_	- H	-	AD II	14.	=	-	2	-	:
ELEMENTS	RUN 1	BUN 2	RUN 1	RUN 2	RUN 1	RUN 2	RUN 1	HUN 2	RUN 1	RUN 2
As	46.12	35.85	34.96	36.04	2	8	7.6	S	20.4	7
8	99.41	74.78	58.5	62.38	73	11	72	2	, 40 1. 10 1. 10	47.8
Ba	53.29	48.15	84.8	86.2	107	5	92	6	Z	. E
Be 	2.97	2.25	1.9	2.03	2.7	2.4	2.1	2.4	2.58	2.61
5	0.11	90.0	0.14	0.13	<0,3	<0.3	<0.4	~0.4	0.11	2
ن ن	22.55	18.44	20.68	19,39	21	22.6	20	8	13.3	13.9
လို (9.74	9.12	5.9	6.16	29.9	7.72	6 0	7	4.6	5.8
Ö,	23.57	18.44	17.81	18.62	×31	<32.6	22	22	22.7	23.5
ш.;	0.01	0.1	80.03	68.12	8	06	2	2	73	73
G.	0.14	0 .0	0.248	0.273	0.23	0.23	0.2	0.5	0.399	0.353
X	26.64	21.51	27.2	24.8	27.4	30.4	30	31	26	26.4
o X	10.25	5.33	4.05	4.09	5.09	5.68	9	\ \ \	1.85	279
Z	27.67	21.51	21.12	22.1	54.5	61.9	56	25	23.7	24 1
Pb	9.94	11.27	15.29	15.14	17	20	6	.	10.5	0.7
Sb	2.15	1.43	2.09	2.17	1.85	1.78	8		2.6	2.4
å	2.05	2.15	3.39	3.37	8	က	п	2		, ,
>	44.07	33.8	28.47	30.13	32.3	32.1	82	5 9	35.6	36.6
PROXIMATE & ULTIMATE	ATE				% DRY BASIS	SASIS				
ASH	13.29	13.46	13.32	13.3	13.28	13.4	13.12	13.18	19.31	13.46
CARBON	69.61	69.56	71.35	71.16	71.19	71.46	70.38	70.79	70.5	70.66
HYDROGEN	5.06	5.24	4.82	4.78	4.91	īŪ	4.6	4 65	4.76	4 70
NITROGEN	1.3	1.31	1.34	1.47	1.41	1.37	1.36	1.38	1.33	4.25
SULFUR	3.08	3.1	2.92	2.97	3.02	2.89	3.01	3.04	60.0	
CHLORINE	0.05	0.05	0.13	0.13	0.127	0.13	2	S	0.12	
Btu/lb	11774	11530	12737	12720	12654	12655	12690	12708	12644	12637
					M DRY ASH	ACH				
MAJOR ASH ELEMENTS	TS				2	5				
SiO ₂	52.88	39.14	46.16	46.9	QN	8	42.89	2	45.3	Ā
Al ₂ O ₃	24.76	20.13	23.46	23.32	20.52	20.27	21.3	2	22.5	200
10,	1.29	96.0	1.09	1.08	1.03	1.02	2.32	2	1	-
Fe ₂ O ₃	23.15	17.41	22.28	22.17	20.6	22.79	2	2	24	21.4
CBO	1.19	0.97	1.84	9 .1	1.31	1.22	2	2	1.7	1.7
Og M	0.37	0.44	0.88	0.87	0.83	0.77	2	9	0.85	0.85
O S	0.24	0.21	0.31	0.29	0.25	0.25	0.36	2	0.47	0.44
ο.	2.51	2.11	2.32	2.32	2.27	2.33	1.72	9	2.2	2.2
o,	0.53	0 .4	0.48	0.47	16.0	0.85	오	2	0.49	0.53
Š,	2	9	1.83	1.75	2	오	2	2	1.74	174
									,	:

INDIVIDUAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE P

TRACE	لب	1 7 8 I		I AB II	-	II 48			•	:
ELEMENTS	RUN 1	RUN 2	HUN 1	RUN 2	RUN 1	HUN 2	RUN 1	RUN 2	RUN 1	LAB V RUN 2
٧s	1.75	2.19	2.48	2.6	-	-	•	-		
6	89.74	90.81	75.17	75.9	· 6	- 11	- C	2 1	, K.	2.4
8	82.08	79.87	397.2	377.8	495	482	290	• 6	45.2	65.9
S	1.42	1.42	1.14	1.16	-	1 4	0° +	7	con con	4/6
8	90.0 8	2.95	×.01	<0.1	4 .0>	40>	<u> </u>		1.32	SE. 1
، ت	10.84	10.72	9.42	6.6	10.8	, a	9	9.0	6.010	₹;
o l	6.24	6.24	4.15	4	434	9.70	2 4	3 C	9.7	4.7
no i	13.13	14.22	11.56	11.49	<39.2	<35.7	, .	n Ç	2.74	3.41
_ ;	0.01	×100	87.98	88.66	9	6	: <u>S</u>	2 5	13.7	13.4
ß,	<0.1		0.082	0.089	0.07	800	5	2 6	000	8
C .	51.44		90.6	90.6	82.5	79.1	78	90.5		C.0.5
0	2.96		1.68	1.66	<19.6	< 17 B	5 \$	2 4	7.7.	4.0
Ž į	8.54		7.28	8,23	<14.7	<13.4) kr) "	90.4	⋛ ;
e e	7.33		9,45	9.63	1	a	, C	o	9.0 7.0	5 1
g c	1.42		1.7	1.73	1.77	1.55	5 0	n -	0.12	- 5
9	1.2		1,59	1.72	-	-	٠.۷	- 2	0.7	2
>	26.27	27.35	22,37	23.81	26.1	21.6	, ec	2	7 (C)	0.20
					3	5	8	8	21	26.1
PROXIMATE & ULTIMATE	\TE				* DRY BASIS	BASIS				
ASH	20.56	20.54	20.58	20.6	20.44	20.43	20.24	00.00	6	ć
CAHBON	60.52	61.06	62.04	62.16	62 33	62.4	64 FB	50.53	50.51	20.73
HYDROGEN	5.12	5.39	4.65	458	0 T	101	00.10	01.24	90.Fo	61.27
NITROGEN	1.02	1 02	800	7	,	0.4	4.01	4.65	4.51	4.58
SULFUR	0.61	0.64	5.0	- 020		1.15	1.08	-	1.09	1.08
CHLORINE	0.0	5 6	÷ 6	0.072	C.0	0.7	0.69	7.0	0.7	0.71
Btu/lb	1032	0.00	20.02	×0.02	×0.01	<0.01	2	2	0.04	0.04
!		n C	2		708/2	10870	10852	10865	10857	10830
					% DRY ASH	ASH				
MAJOH ASH ELEMENTS						•				
SO.	57.03	55.93	61.79	61.01	2	2	60.75	50.54	and the contract of the contra	0
Z.	16.09	15.09	22.5	22,16	22.53	19.93	22.08	21.79	22.1	9 6
2 2	0.98	0.98	0.95	0.93	-	1.04	0.94	000	7	¥0.8
5	4.1	3.88	4.84	4.86	4.	4.35	Ş	S	- 7	- 4
	2.31	2.01	4.57	4.51	2.38	2.52	£	2	† ¢	
	0.32	0.28	1.34	1.31	0.93	0.91	S	S		
	0.13	0.11	0.27	0.26	0.26	0.24	0.28	000	7.0	7.0
o, i	1.09	1.03	1.39	1.39	1.32	1.28	-	1 27	7.0	0.27
	0.03	0.04	0.04	0.04	0.02	0 03	Ş	<u> </u>	5 5	5.0
်ဝွှ	Q	2	3.61	3.52	2	2	2	2 5	5 5 8 8	D.C.
						<u>}</u>	<u>}</u>	<u>}</u>	3.96	0,0

INDIVIDUAL LABORATORY ANALYSES OF ROUND ROBIN SAMPLE Q

CHICARITY OF		1 7 8 –	_	178 II	≤	LAB III	₹	≥ 8	5	LAB V
	NO.	HON 2	NON	NON 2	HUN -	FUN 2	NON T	RUN 2	HUN 1	RUN 2
As	4.72	5.67		4.43	60	6	9	Q	2.3	6.0
60 1	235.98	288.74		135,55	160	180	160	170	140	150
- Ba	39.69	41.71		50.8	56.8	67.1	20	47	48.6	50.2
8	1.93	2.35		1.18	1.5	<u>+</u>	1.2	1.2	1.44	1.48
ပ်	0.55	1.39	0.66	0.63	<0.2	<0.2	<0.3	<0.3	0.286	0.089
٠ ت	25.74	32.08		20.28	21.9	21.5	22	22	19.2	17.4
ු ු	7.08	8.77		3.59	3.88	4.23	4	, ro	2.79	2.29
, J	12.87	18.18		10.79	<34.3	<34.8	12	12	15.3	15.3
LL :	<100	<100		80.89	90	90	S	2	70	75
BH.	<0.1	0.18		0.109	20.0	0.07	0.09	0.08	0.117	0.113
~	33.25	34.22		33.2	29.7	29.3	31	30	26.6	26.9
OM:	6.54	60.6		5.1	9'8>	<8.7	9>	9	46.4	4
Ž	21.45	24.6		15.24	28.4	29.7	18	9	17.3	16.5
g. ;	6.22	1.39		10.68	=	12	-	5	8.8	6.2
age	<0.8	<0.8		0.58	0.445	0.596	⊽	⊽	1.78	2
% ;	1.39	2.03	٠	2.91	ಣ	_(C)	N	S	2.4	1.87
>	48.27	57.75		32.81	36.6	35.7	39	39	4	39.4
					3	0				
PROXIMATE & ULTIMATE	/TE				A UNI BASIS	DASIS				
ASH	10.61	10.58	10.65	10.76	10.56	10.55	10.46	10.51	10.62	10.64
CARBON	66.15	69.69	72.54	72.7	72.68	72.58	71.32	716	71.05	74.03
HYDROGEN	6.38	5.87	4.89	4,89	5.11	50.5	A.71	4 73	4 77	27.4
NITROGEN	1.41	1.42	1.48	1.48	1.52	1.45	1.37	1.36	1.34	131
SULFUR	3.25	3.25	2.77	2.76	2.78	2.86	2.9	000	78.0	
CHLORINE	0.07	0.08	0.139	0.137	0.148	0.136	2	S	0	
Btu/Ib	12206	11290	12901	12875	12785	12769	12815	12809	12768	12733
					A DRY ASH	HSH.				
MAJOR ASH ELEMENTS	Z.									
sio,	99.09	69.31	50.76	50.64	2	2	49.64		50.1	50.2
A ₁ O ₃	24.82	26.73	22.2	22.07	19.79	19.71	21.62		21.7	21.5
TO.	1.37	1.64	1.11	1.01	0.27	0.27	1.07		5.	1.2
Fe ₂ O,	18.79	21.68	16.92	16.92	16.53	16.39	2		15.4	
O	1.7	1.56	3.31	3.4	2.22	2.01	2		2.9	6
Q ^B M∷	0.34	0.28	1.03	1.04	0.69	99'0	2		•	
Na ₁ O ₃	0.91	1.01	0.87	0.89	0.7	0.81	0.81		0.9	0.91
Č.	2.92	3.41	2.58	2.56	6:1	2.04	2.38	Q	2.5	2.4
O. J.	0.22	0.3	0.5	0.21	0.39	0.43	2		0.21	0.21
S S	2	2	2.23	2.32	S	2	2		2.82	2.9

APPENDIX B

INTRALABORATORY TRACE ELEMENT REPEATABILITY AS PERCENT DIFFERENCE

Laboratory Repeatability Samples A & J

TRACE ELEMENTS	LAB I	LAB II	LAB III	LAB IV	LAB V	MEAN	SDEV	PRSD
CLLMLIATO				· · · · · · · · · · · · · · · · · · ·				
As	31.0%	1.9%	0.0%	0.0%	6.7%	7.9%	13.2%	166.3%
В	7.7%	1.0%	6.5%	11.5%	14.3%	8.2%	5.1%	62.0%
Ba	65.2%	6.3%	29.7%	12.2%	63.1%	35.3%	27.7%	78.5%
Ве	57.1%	6.6%	7.4%	16.0%	2.1%	17.8%	22.5%	126.2%
Cd	9.1%	7.5%		ļ	27.9%	14.8%	11.4%	76.7%
Cr	12.4%	4.4%	3.5%	17.3%	16.8%	10.9%	6.6%	61.0%
Co	0.5%	6.9%	1.5%	50.0%	23.2%	16.4%	20.9%	127.2%
Cu		6.9%		23.3%	2.6%	10.9%	10.9%	99.8%
F	İ	2.2%	4.9%		24.6%	10.6%	12.2%	115.8%
Hg)	18.7%	10.5%	10.5%	5.3%	11.3%	5.5%	49.1%
Mn	36.7%	1.5%	2.8%	18.2%	2.2%	12.3%	15.3%	124.4%
Мо	11.2%	2.3%	8.4%	50.0%	9.0%	16.2%	19.2%	118.6%
Ni	11.0%	3.3%	6.1%	20.0%	11.1%	10.3%	6.3%	61.5%
Pb	21.8%	1.9%	54.5%	12.8%	7.8%	19.8%	20.8%	105.1%
Sb	İ	4.9%	7.1%		ļ	6.0%	1.6%	26.2%
Se	32.6%	12.5%	18.2%	0.0%	17.4%	16.1%	11.7%	72.7%
V	6.7%	13.2%	6.6%	17.7%	1.4%	9.1%	6.4%	69.7%
Average	23.3%	6.0%	11.2%	18.5%	14.7%	13.8%	7.9%	57.8%

Laboratory Repeatability Samples B & K

TRACE	LABI	LAB II	LAB III	LAB IV	LAB V	MEAN	SDEV	PRSD
ELEMENTS	!			1				
		0.00/	0.00/	a= -a/	22.40(04.454	00.00/	450 504
As	3.7%	0.6%	0.0%	85.7%	32.1%	24.4%	36.8%	150.5%
В	10.3%	11.8%	33.0%	2.5%	3.2%	12.2%	12.4%	101.6%
Ba	10.5%	2.0%	15.2%	8.2%	13.6%	9.9%	5.2%	52.4%
Be	8.4%	1.8%	12.5%	3.8%	9.5%	7.2%	4.4%	60.5%
Cd	86.4%	0.0%	Ì	1	67.7%	51.4%	45.5%	88.5%
Cr	7.3%	1.9%	2.0%	6.9%	7.1%	5.0%	2.8%	55.9%
Co	7.3%	1.6%	0.1%	0.0%	3.1%	2.4%	3.0%	123.9%
Cu	0.2%	0.5%	J	5.1%	9.5%	3.8%	4.4%	115.4%
F		5.2%	0.0%		0.5%	1.9%	2.8%	149.1%
Hg		14.8%	163.6%	4.3%	2.3%	46.3%	78.4%	169.5%
Mn	12.0%	0.9%	3.9%	2.7%	6.8%	5.2%	4.3%	82.8%
Мо	2.3%	1.4%			9.9%	4.5%	4.7%	102.6%
Ni	8.3%	1.6%	54.0%	12.7%	9.6%	17.2%	20.9%	121.6%
Pb	84.5%	3.8%	14.9%	3.3%	2.1%	21.7%	35.5%	163.5%
Sb		2.2%	1.5%]	1.8%	0.5%	25.0%
Se	28.1%	10.1%	15.4%	100.0%	7.3%	32.2%	38.7%	120.4%
٧		2.1%	2.4%	4.3%	7.0%	4.0%	2.3%	56.9%
				į				
Average	20.7%	3.7%	22.7%	17.2%	12.0%	14.8%	23.8%	160.7%

Laboratory Repeatability Samples C & L

TRACE ELEMENTS	LABI	LAB II	LAB III	LAB IV	LAB V	MEAN	SDEV	PRSD
_								
As	93.4%	0.7%	22.2%	28.6%	16.6%	32.3%	35.7%	110.6%
В	1.0%	1.8%	5.8%	19.9%	15.5%	8.8%	8.5%	96.2%
Ва	5.7%	2.3%	15.2%	15.4%	71.2%	22.0%	28.1%	128.1%
Be	10.0%	12.0%	18.2%	8.7%	5.8%	10.9%	4.6%	42.5%
Cd	27.0%	35.3%	i	,	76.0%	46.1%	26.2%	56.9%
Cr	13.1%	8.5%	5.5%	22.9%	5.7%	11.1%	7.2%	65.0%
Co	13.4%	0.0%	6.6%	40.0%	2.2%	12.4%	16.2%	130.5%
Cu	9.6%	1.9%		13.3%	2.3%	6.8%	5.6%	83.1%
F	i	2.9%	8.7%		6.5%	6.0%	2.9%	48.8%
Hg	17.1%	6.3%	13.3%	33.3%	25.3%	19.1%	10.5%	55.0%
Mn	8.8%	1.5%	1.9%	22.2%	1.3%	7.2%	9.0%	125.7%
Мо	62.9%	4.7%	16.3%	İ	Ì	28.0%	30.8%	110.2%
Ni	9.9%	0.3%	52.2%	14.3%	3.5%	16.0%	20.9%	130.6%
Pb	46.9%	2.0%	66.7%	22.2%	12.5%	30.1%	26.4%	87.7%
Sb	į	2.2%	9.5%	1		5.9%	5.1%	87.6%
Se	15.9%	6.7%	28.6%	0.0%	54.8%	21.2%	21.6%	102.0%
V	10.1%	2.4%	7.5%	18.2%	1.7%	8.0%	6.7%	84.1%
Average	23.0%	5.4%	18.5%	19.9%	20.0%	17.2%	11.6%	67.9%

Laboratory Repeatability Samples D & M

TRACE ELEMENTS	LABI	LAB II	LAB III	LAB IV	LAB V	MEAN	SDEV	PRSD
	[
As	13.7%	9.0%		0.0%	1.9%	6.1%	6.4%	103.5%
В	7.2%	32.8%	5.4%	7.0%	23.3%	15.1%	12.3%	81.2%
Ва	0.3%	3.8%	15.2%	20.7%	3.9%	8.8%	8.7%	99.1%
Be	0.2%	19.9%	0.0%	15.4%	16.6%	10.4%	9.6%	91.8%
Cd	ļ	40.0%			32.5%	36.2%	5.3%	14.7%
Cr	3.2%	12.3%	12.7%	13.3%	1.1%	8.5%	5.9%	69.1%
Co		0.4%	11.9%		11.0%	7.8%	6.4%	82.1%
Cu	1.6%	11.9%		6.5%	12.2%	8.0%	5.0%	62.7%
F	į	6.6%	22.2%		5.3%	11.3%	9.4%	83.2%
Hg	}	11.6%	13.3%	50.0%	1.6%	19.1%	21.2%	110.9%
Mn	8.3%	1.0%	26.8%	3.3%	5.9%	9.0%	10.3%	113.7%
Мо	1.5%	9.7%	55.0%	20.0%	7.4%	18.7%	21.3%	113.9%
Ni	2.2%	4.5%	52.1%	0.0%	İ	14.7%	25.0%	170.0%
Pb	13.8%	0.4%	0.0%	0.0%	0.0%	2.8%	6.1%	216.4%
Sb	ļ	3.1%	8.7%			5.9%	4.0%	67.5%
Se	İ	5.9%		0.0%	ŀ	2.9%	4.1%	141.4%
V	10.1%	12.1%	1.6%	5.7%	3.1%	6.5%	4.5%	68.7%
			15.001	4.5.5			- 151	
	5.6%	10.9%	17.3%	10.9%	9.0%	11.3%	7.1%	63.0%

Laboratory Repeatability Samples E & N

TRACE ELEMENTS	LAB I	LAB II	LAB III	LAB IV	LAB V	MEAN	SDEV	PRSD
As	86.9%	0.8%	0.0%	85.7%	7.7%	36.2%	45.8%	126.6%
B	17.1%	0.0%	3.4%	7.1%	10.6%	7.6%	6.6%	86.2%
Ba	41.2%	1.6%	163.0%	8.6%	4.7%	43.8%	68.5%	156.3%
Be	12.8%	34.8%	13.3%	8.0%	29.3%	19.6%	11.7%	59.4%
Cd	8.7%	26.1%	10.070	2.075	26.8%	20.5%	10.2%	49.9%
Cr	7.8%	7.4%	1.2%	0.0%	0.0%	3.3%	4.0%	121.5%
Co	24.6%	4.7%	0.5%	40.0%	31.7%	20.3%	17.1%	84.3%
Cu	11.8%	8.3%		0.0%	24.9%	11.2%	10.3%	92.0%
F		7.0%	18.2%		0.9%	8.7%	8.8%	100.6%
Hg		2.3%	47.3%	32.3%	21.2%	25.8%	18.9%	73.5%
Mn	15.4%	0.6%	3.7%	7.4%	0.8%	5.6%	6.1%	110.2%
Мо	12.9%	3.2%	38.0%		50.7%	26.2%	21.9%	83.7%
Ni	7.3%	1.4%		11.8%	66.0%	21.6%	29.9%	138.4%
Pb	109.8%	10.6%	72.0%	28.6%	96.7%	63.5%	42.8%	67.4%
Sb		4.6%	58.6%		į	31.6%	38.2%	120.9%
Se	ļ	10.2%		0.0%	70.6%	26.9%	38.2%	141.7%
V	81.0%	9.4%	19.0%	5.9%	0.6%	23.2%	33.0%	142.3%
Average	33.6%	7.8%	33.7%	_18.1%	27.7%	23.3%	19.5%	83.9%

Laboratory Repeatability Samples F & O

TRACE ELEMENTS	LAB I	LAB II	LAB III	LAB IV	LAB V	MEAN	SDEV	PRSD
	25.00(0.004	40.50	44.004	0.404	44.00	4.504	400 701
As	38.9%	0.6%	13.7%	11.8%	6.1%	14.2%	14.7%	103.5%
В	6.5%	5.8%	0.7%	13.3%	14.5%	8.2%	5.7%	70.1%
Ba	7.1%	7.6%	14.7%	4.7%	53.0%	17.4%	20.2%	116.1%
Be	4.3%	9.5%	26.7%	4.3%	0.6%	9.1%	10.3%	113.9%
Cd	6.1%	20.4%	ļ		16.7%	14.4%	7.4%	51.6%
Cr	9.8%	30.2%	5.2%	2.5%	6.8%	10.9%	11.1%	102.0%
Co	11.0%	2.3%	16.2%	0.0%	24.3%	10.8%	10.0%	92.7%
Cu	2.7%	5.7%		7.1%	10.3%	6.4%	3.1%	48.9%
F		21.1%	5.4%		13.1%	13.2%	7.8%	59.3%
Hg	8.7%	6. 3%	8.3%	22.2%	12.9%	11.7%	6.3%	54.3%
Mn	15.1%	2.3%	14.1%	0.0%	0.6%	6.4%±	7.5%	117.5%
Мо	11.7%	6.8%	36.4%		30.0%	21.2%	14.2%	67.1%
Ni	13.9%	2.6%	71.6%	3.8%	1.1%	18.6%	30.1%	161.5%
Pb	97.8%	2.9%	20.9%	11.4%	16.4%	29.9%	38.5%	129.0%
Sb	29.7%	4.4%	11.4%	0.0%		11.4%	13.1%	115.1%
Se	21.3%	3.0%	22.2%	0.0%	39.1%	17.1%	16.0%	93.2%
v	5.4%	4.5%	8.2%	27.2%	2.1%	9.5%	10.2%	107.3%
Average	18.1%	8.0%	18.4%	7.7%	15.5%	13.6%	9.8%	72.6%

Laboratory Repeatability Samples G & P

TRACE ELEMENTS	LAB I	LAB II	LAB III	LAB IV	LAB V	MEAN	SDEV	PRSD
As	21.3%	0.4%	0.0%	66.7%	82.3%	34.1%	38.2%	112.0%
В	6.0%	16.8%	8.0%	5.9%	2.7%	7.9%	5.3%	67.6%
Ва	12.9%	5.9%	10.3%	6.2%	0.7%	7.2%	4.7%	65.1%
Be	3.6%	17.1%	8.0%	4.3%	6.9%	8.0%	5.4%	68.0%
Cd	į				165.0%	165.0%	į	
Cr	9.9%	18.8%	2.4%	0.0%	3.4%	6.9%	7.6%	109.9%
Co	18.0%	1.5%	5.9%	0.0%	26.3%	10.3%	11.4%	110.3%
Cu	79.1%	9.7%		4.9%	6.1%	24.9%	36.2%	144.9%
F		4.2%	11.8%	İ	29.7%	15.2%	13.1%	86.1%
Hg	į	10.5%	6.5%	13.3%	3.9%	8.6%	4.2%	48.8%
Mn	6.7%	10.0%	3.1%	4.3%	0.5%	4.9%	3.6%	73.4%
Mo	80.4%	4.1%		1	86.0%	56.8%	45.7%	80.5%
Ni	16.2%	4.0%		9.5%	3.1%	8.2%	6.0%	73.8%
Pb	30.9%	5.1%	18.2%	10.0%	0.9%	13.0%	11.9%	91.4%
Sb	13.5%	0.3%	9.8%	40.0%	98.5%	32.4%	39.8%	122.7%
Se		4.4%	0.0%	į	92.0%	32.2%	51.9%	161.4%
V	0.2%	8.6%	8.2%	3.6%	3.3%	4.8%	3.6%	74.4%
Average	23.0%	7.6%	7.1%	13.0%	36.0%	25.9%	18.9%	73.1%

Laboratory Repeatability Samples H & Q

TRACE ELEMENTS	LAB I	LAB II	LAB III	LAB IV	LAB V	MEAN	SDEV	PRSD
As	96.4%	3.6%	0.0%	0.0%	27.7%	25.5%	41.3%	161.7%
В	30.8%	1.4%	3.0%	6.3%	3.0%	8.9%	12.4%	139.5%
Ва	14.4%	0.6%	17.1%	1.0%	4.1%	7.4%	7.8%	104.1%
Ве	28.9%	8.4%	30.8%	4.1%	1.4%	14.7%	14.1%	95.7%
Cd	77.1%	8.1%			15.7%	33.6%	37.8%	112.5%
Cr	27.6%	0.5%	0.5%	0.0%	1.7%	6.0%	12.1%	199.6%
Co	11.0%	0.1%	4.0%	0.0%	2.6%	3.6%	4.5%	126.6%
Cu	19.1%	3.1%		0.0%	2.3%	6.1%	8.8%	143.0%
F		14.1%	0.0%		2.1%	5.4%	7.6%	141.0%
Hg	18.2%	5.5%	33.3%	42.9%	6.3%	21.2%	16.6%	78.0%
Mn	29.4%	3.4%	30.2%	1.6%	0.9%	13.1%	15.3%	116.4%
Мо	20.6%	0.1%			18.3%	13.0%	11.2%	86.4%
Ni	18.0%	0.3%	73.1%	5.7%	3.9%	20.2%	30.3%	150.1%
Pb	33.1%	1.0%	24.4%	4.4%	10.2%	14.6%	13.6%	93.2%
Sb		3.3%	3.8%	į	100.0%	35.7%	55.7%	155.9%
Se	9.8%	2.5%	40.0%	0.0%	22.7%	15.0%	16.5%	110.2%
V	30.5%	2.1%	0.4%	1.3%	0.8%	7.0%	13.1%	187.8%
							į	
Average	31.0%	3.4%	18.6%	5.2%	13.2%	14.8%	15.2%	103.2%

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Laboratory Repeatability
All Coals

TRACE ELEMENTS	LAB I	LAB II	LAB III	LAB IV	LAB V	MEAN	SDEV	PRSD
As	48.2%	2.2%	4.5%	34.8%	22.6%	22.5%	19.7%	87.6%
В	10.8%	8.9%	8.2%	9.2%	10.9%	9.6%	1.2%	12.4%
Ba	19.7%	3.8%	35.1%	9.6%	26.8%	19.0%	12.6%	66.6%
Be	15.7%	13.8%	14.6%	8.1%	9.0%	12.2%	3.4%	28.2%
Cd	26.8%	17.2%		3.1,0	53.6%	32.5%	18.9%	58.0%
Cr	11.4%	10.5%	4.1%	7.9%	5.3%	7.8%	3.2%	40.3%
Co	10.7%	2.2%	5.9%	16.3%	15.5%	10.1%	6.1%	60.2%
Cu	15.5%	6.0%	·	7.5%	8.8%	9.4%	4.2%	44.5%
F	!	7.9%	8.9%		10.3%	9.0%	1.2%	13.6%
Hg	5.5%	9.5%	37.0%	26.1%	9.8%	17.6%	13.4%	76.3%
Mn	16.6%	2.6%	10.8%	7.5%	2.4%	8.0%	6.0%	74.7%
Мо	25.4%	4.0%	19.3%	8.8%	26.4%	16.8%	10.0%	59.7%
Ni	10.9%	2.2%	38.6%	9.7%	12.3%	14.7%	13.9%	94.3%
Pb	54.8%	3.5%	34.0%	11.6%	18.3%	24.4%	20.4%	83.3%
Sb	5.4%	3.1%	13.8%	5.0%	24.8%	10.4%	9.0%	86.7%
Se	13.5%	6.9%	15.5%	12.5%	38.0%	17.3%	12.0%	69.5%
V	18.0%	6.8%	6.7%	10.5%	2.5%	8.9%	5.8%	65.3%
Average	19.3%	6.5%	17.1%	12.3%	17.5%	14.7%	6.9%	46.6%

Average Repea	itability by Coals
Coal	Avg
A&J	13.8%
B&K	14.8%
C&L	17.2%
D&M	11.3%
E&N	23.3%
F&O	13.6%
G&P	25.9%
Н&Q	14.7%

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DOE COAL ROUND ROBIN TRACE ELEMENT REPEATABILITY RESULTS % of Individual Lab Analysis Within Repeatability Ranges

Repeatability Range	Lab I	Lab II	Lab III	Lab IV	Lab V	All Labs
Less than 10%	31.0	79.0	42.0	46.0	52.0	50.0
10 to 20%	24.0	14.0	19.0	17.0	15.0	18.0
20 to 30%	8.0	2.0	7.0	7.0	11.0	7.0
30 to 50%	7.0	4.0	6.0	6.0	3.0	5.0
Greater than 50%	10.0	0.0	9.0	4.0	12.0	7.0
Non Determined	20.0	1.0	18.0	21.0	7.0	13.0

APPENDIX E: ANALYTICAL PROTOCOL

Introduction

This appendix contains brief descriptions of the analytical methods used. The analogous water, solid, and gas methods are described together.

Methods used for sample analysis are presented in Table E-1. Most of the laboratory methods identified in this document were published by the United States Environmental Protection Agency in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," Third Edition, or "Methods for Chemical Analysis of Water and Wastes." Additional methods identified were published in "Criteria for Identification of Hazardous and Extremely Hazardous Wastes," "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act," 40 CFR 136, 49 FR 209 (26 October 1984), Annual Book of ASTM Standards, Volume 4.08, and "Standard Methods for the Examination of Water and Wastewater."

Extraction Methods

Extraction/digestion methods for liquid and solid matrices are briefly described in this section.

Method SW3005¹ Acid Digestion of Aqueous Samples for Analyses by ICP

This method is an acid digestion procedure used to prepare water samples for metals analysis. The digested samples can be analyzed for total recoverable and dissolved metals determination by either flame (FLAA) or inductively coupled plasma atomic emission spectroscopy (ICP-AES). Samples may be analyzed for the following metals:

Aluminum	Cadmium	Iron	Nickel	Thallium
Antimony	Calcium	Lead	Potassium	Vanadium
Arsenic	Chromium	Magnesium	Selenium	Zinc
Barium	Cobalt	Manganese	Silver	
Beryllium	Copper	Molybdenum	Sodium	

Table E-1
Analytical Methods Used During Sampling Activities at Plant Yates

Analytical Method **Parameter** Water Gas Solids NA A-D3173² **Moisture Content** NA EPA M5/M17 Particulate Loading NA NA **EPA** Particle Size Distribution NA Ultimate NA NA ASTM D-31763 **Proximate** NA NA ASTM D-31724 Carbon NA NA ASTM D-53735 Sulfur NA NA ASTM D-4239° Heating Value NA NA ASTM D-2015⁷ Chloride E300.0 E300.0 SM4500-CI-D8 Fluoride E340.2 E340.2 E340.29 Phosphate E365.2 E365.2 NA E300.0 E300.0 E300.010 Sulfate Sulfite E377.111 E377.1 NA Ammonia E350.1 E350.2 NA Cyanide, Total SW9012 SW9012 NA **ICP-AES Metals** SW601012 SW6010 SW6010 **ICP-MS Metals** SW6020 SW6020 SW602013 Metals NA NA INAA Metals NA NA **GDMS** Arsenic SW7060 SW7060 SW706014 Cadmium SW7131 SW7131 SW713115 Lead SW7421 SW7421 SW742116 SW747117 Mercury SW7470 SW7471 SW774018 SW7740 Selenium SW7740 Aldehydes SW8315 E0011a NA SW8240 Volatile Organic Compounds SW8240 NA SW8270 SW827019 Semivolatile Organic Compounds SW8270 Polychlorinated Dioxins and Furans Method 23 Method 23²⁰ NA Radionuclides NA NA E901.1/900.021

NA = Not Applicable.

^{*} Method abbreviations include ASTM = American Society of Testing and Materials, EPA = EPA "Methods for Chemical Analysis of Water and Wastes," SM = "Standard Methods for the Examination of Water and Wastewater," and SW = SW-846 "Test Methods for Evaluating Solid Waste."

For analysis of total recoverable metals, the entire sample is acidified at collection time with nitric (HNO₃) acid to a pH <2. At the time of analysis, a 50-mL aliquot of the sample is heated with 1 mL of 1:1 nitric acid and 5 mL of hydrochloric acid and reduced to a specific volume. The sample must not be boiled because antimony is volatile and easily lost. The digestate is then adjusted to a final volume of 50 mL with reagent water.

For analysis of dissolved metals, the samples are filtered through a 0.45 μ m filter immediately upon collection in the field, and acidified with nitric (HNO₃) acid to a pH < 2. For analysis, the sample is digested as described above.

Modified Method SW3020²² Acid Digestion of Aqueous Samples for Analyses by Graphite Furnace Atomic Absorption Spectroscopy

Water samples are digested according to a modification of method SW3020. In Method SW3020, the sample is treated in a manner similar to that described in Method SW3005 except that 1 mL of 1:1 HNO₃ and 5 mL of H_2O_2 are used.

Microwave Assisted Acid Digestion of Solids

Microwave assisted digestion is applicable to the preparation of solid samples and water samples containing solids for metals analysis by FLAA or GFAA or ICP. A representative sample of up to 0.5 g (wet weight) is digested with concentrated nitric acid for 60 minutes using microwave heating in a suitable laboratory microwave unit. The sample is placed in a Teflon PFA vessel with 10 mL of concentrated acid. The vessel is capped and heated in the microwave unit for three 20-minute intervals with 5-minute cooling period between each heating period. After the samples are cooled and vented, 5 mL of hydrofluoric acid and 1 mL of hydrochloric acid are added and the sample is digested for 15 minutes. After cooling, the vessel contents are diluted to volume and analyzed by the appropriate SW-846 method. A separate sample is dried for a total solids and/or percent moisture determination.

Some samples can contain diverse matrix types, which may present specific analytical problems. Spiked samples and any relevant standard reference material are processed to aid in determining whether the method is applicable to a given matrix.

SW3500 Series Methods Organic Extraction and Sample Preparation

The SW3500 series methods are used to quantitatively extract nonvolatile and semivolatile organic compounds from various sample matrices. Prior to analysis, a sample of a known volume or weight is solvent extracted, then dried and concentrated in a Kuderna-Danish apparatus.

Method SW3510²³ Separatory Extraction

Method SW3510 is designed to quantitatively extract nonvolatile and semivolatile organic compounds from liquid samples using standard separatory funnel techniques. The sample and extracting solvent must be immiscible in order to yield recovery of target compounds. Subsequent cleanup and detection methods are described in the organic analytical method that will be used to analyze the extract.

Samples are adjusted to a specified extraction pH and extracted with the appropriate solvent for the analytical method. Methylene chloride should be employed when a solvent is not specified.

Method SW3520²⁴ Liquid-Liquid Extraction

Method SW3520 is designed to quantitatively extract nonvolatile and semivolatile organic compounds from liquid samples using standard liquid/liquid techniques. The sample and extracting solvent must be immiscible in order to yield recovery of target compounds. Subsequent cleanup and detection methods are described in the organic analytical method that will be used to analyze the extract.

Samples are adjusted to a specified extraction pH and extracted with the appropriate solvent for the analytical method. Methylene chloride should be employed when a solvent is not specified.

Method SW3540²⁵ Soxhlet Extraction

Method SW3540 is a procedure for extracting nonvolatile and semivolatile organic compounds from solids such as soils and sludges. The Soxhlet extraction process ensures intimate contact of the sample matrix with the extraction solvent. Extraction is accomplished by mixing the solid sample with anhydrous sodium sulfate, placing it in an extraction thimble or between two plugs of glass wool, and extracting it with an appropriate solvent in the Soxhlet extractor. Methylene chloride should be employed when a solvent is not specified. The extract is dried and concentrated, and then treated using a clean-up method, or analyzed directly by the appropriate measurement technique.

Method SW3550²⁶ Sonication Extraction

Method SW3550 is a procedure for extracting nonvolatile and semivolatile organic compounds from solids such as soils and sludges. The sonication process ensures intimate contact of the sample matrix with the extraction solvent. Extraction is accomplished by mixing the solid sample with anhydrous sodium sulfate, mixing with the extraction medium, and dispersing into the solvent by sonication. The extract is dried and then concentrated.

The resulting solution may then be cleaned up or analyzed directly using the appropriate technique.

Method SW5030²⁷ Purge-and-Trap Method

Method SW5030 is used to determine the concentration of volatile organic compounds (VOCs) in a variety of liquid and solid matrices. It is based upon a purge-and-trap gas chromatographic procedure. The method is applicable to the types of samples collected for this project. The success of this method depends on the level of interferences in the sample; results may vary due to the large variability and complexity of some matrices.

A direct purge-and-trap can be performed for low-concentration samples. If higher concentrations are expected, a portion of the solid sample is dispersed in methanol to dissolve the volatile organic constituents. A portion of the methanol solution is combined with water in a purging chamber. An inert gas is then bubbled through the solution at ambient temperature to transfer the volatile components to the vapor phase. The vapor is swept through a sorbent column where the volatile components are trapped. After purging is completed, the sorbent column is heated and backflushed with inert gas to desorb the components onto a gas chromatographic column. The gas chromatographic column is heated to elute the components that are detected by the appropriate detector.

Organic and Inorganic Analytical Methods for Water and Solid Samples

Method ASTM D-3173 Percent Moisture

Percent moisture was determined for solid samples undergoing analysis for organic and inorganic analytes. The percent moisture must be known so that the analytical results can be reported on a dry weight basis (i.e., $\mu g/kg$ or mg/kg). The sample is weighed, dried, and then re-weighed. Percent moisture is calculated as:

Method E300.0 Anions (CI, F and SO_a) by Ion Chromatography

Water samples were analyzed for fluoride, chloride, and sulfate anions by ion chromatography using U.S. EPA Method 300.0. Ion chromatography is a rapid method for separating and analyzing complex solutions of ionic species. The technique employs a carbonate/bicarbonate eluent and ion exchange resins to separate individual ions, and a suppressor column to remove the eluent ions. The detection and quantitation of the anions is performed conductimetrically.

Method E350.1 Nitrogen, Ammonia

Ammonia nitrogen in water samples were measured by U.S. EPA Method 350.1. This method is an automated colorimetric procedure in which alkaline phenol and hypochlorite react with ammonia to form an indophenol blue complex that is proportional to the ammonia concentration. The blue color is intensified with sodium nitroprusside and is measured at 630-660 nm.

Method SW9012²⁸ Cyanide, Total

Water and impinger samples were analyzed for total cyanide using SW9012. Cyanide as hydrocyanic acid (HCN) is released from cyanide complexes by means of an reflux-distillation under highly acidic conditions. The released cyanide is absorbed into a scrubber containing sodium hydroxide solution. The cyanide ion in the absorbing solution is then determined using an automated UV colorimetry. The colorimetric procedure is sensitive to about 0.02 mg/L.

Method 365.2²⁹ Total Phosphate

Total phosphate was determined on acid-preserved water samples using EPA Method 365.2. Complexed phosphates are digested to the ortho-phosphate form by heating with sulfuric acid and potassium persulfate. The ortho-phosphate is reacted with ammonium molybdate and antimony potassium tartrate to form an antimony-phospho-molybdate complex which is reduced to an intensely blue-colored complex by ascorbic acid. The sample intensity is measured at 650 or 880 nm and compared with the intensity of a standard phosphate solution.

Method SW6010³⁰ ICP Metals

Samples are analyzed for trace elements or metals using SW6010. Analysis for most metals requires digestion of the sample with acid. This digestion is performed as SW846 Method 3005 for water or SW846 Method 3050 for solids. Following digestion, the trace elements are simultaneously or sequentially determined using ICP-AES.

Methods SW7060³¹/SW7041³²/SW7131³³/SW7421³⁴/SW7740³⁵/SW7841³⁶ Graphite Furnace Atomic Absorption Metals Analyses for Arsenic, Cadmium, Lead, and Selenium

Graphite furnace AA spectrometry was used to measure concentrations of arsenic (As), cadmium (Cd), lead (Pb), and selenium (Se) in the water and solid samples. The samples are extracted using SW3020 or SW3050 as appropriate. Discrete aliquots of sample extract are deposited in a graphite tube furnace in microliter amounts. The graphite tube is

resistively heated by an electrical current. The sample solution is dried and charred to remove sample matrix components, and then atomized at temperatures sufficient to vaporize the element of interest. Matrix modification is used to eliminate interference effects, and may also enhance the vaporization efficiency and allow lower detection limits. This method usually has a linear analysis range at the ppb or sub-ppb level.

Method SW7470³⁷/SW7471³⁸ Mercury - Manual Cold-Vapor Technique

Liquid (water and impinger) and solid samples were analyzed for mercury using SW7470 and SW7471, respectively. This method is a cold-vapor flameless AA technique based on the absorption of radiation by mercury vapor. Mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an AA spectrophotometer. Mercury concentration is measured as a function of absorbance.

Instrumental Neutron Activation Analysis (INAA)

Neutron activation is a non-destructive technique that measures the number and energy of gamma and X-rays emitted by the radioactive isotopes produced in the sample matrix by irradiation with thermal neutrons. The samples require no special preparation except for encapsulation in high purity polyethylene vials prior to irradiation. Both samples and standards of the elements of interest are irradiated in a nuclear reactor. Each sample is then counted on a gamma ray detector to produce its characteristic gamma ray spectrum. Quantitation of sample concentration is done by comparison with the energy spectra from those standards run simultaneously with the unknown samples.

This technique is applicable to determining bulk composition and is feasible for very small sample quantities. The method does not introduce any contaminating or interfering substances, and it provides a multi-element analysis. It is not applicable to those elements that have either extremely short half-lives, or those elements, such as lead, that do not produce radioactive isotopes.

Glow Discharge Mass Spectrometry (GDMS)

Glow discharge mass spectrometry was used as an alternative to INAA for determining the bulk composition of the size fractionated fly ash samples. In this technique, the sample is mixed with silver powder and is pressed into the shape of a pin to serve as a conducting electrode in a low-pressure argon plasma ionization chamber. Sample atoms are sputtered into the plasma and then ionized. The plasma is a constant matrix in which the ionization efficiencies of the elements also remain constant. The ionization efficiencies expressed as relative sensitivity factors (RSFs) are used to convert ion intensities to elemental concentrations. The application of this technique to fly ash particles has been demonstrated successfully, and it can provide a complete analysis on the target list, including fluorine, beryllium, and lead, that cannot be determined by INAA.

EPA Method 0011A³⁹ Aldehydes

Aldehydes in the gas, liquid, and solid samples were determined using EPA Method 0011A. Samples collected in dinitrophenylhydrazine (DNPH) are extracted with methylene chloride and then solvent exchanged to acetonitrile. The acetonitrile is concentrated and analyzed by high performance liquid chromatography as the DNPH adduct.

Method SW8240⁴⁰ Volatile Organic Compounds

Volatile, or purgeable, organics in water and by VOST in the gas streams were analyzed using Method SW8240. This method uses a purge-and-trap GC/MS technique. An inert gas is bubbled through the water samples to transfer the purgeable organic compounds from the liquid to vapor phase. The vapor is then swept through a sorbent trap where the purgeable organics are trapped. The trap is backflushed and heated to desorb the purgeable organics onto a gas chromatographic column where they are separated and then detected with a mass spectrometer. VOST samples are thermally desorbed from the resin/charcoal traps and analyzed directly.

Method SW8270⁴¹ Semivolatile Organic Compounds

Semivolatile organics, also known as base/neutral and acid extractables (BNA), were analyzed using Method SW8270. These techniques quantitatively determine the concentration of a number of semivolatile organic compounds. Organic compounds are extracted from the sample with methylene chloride at a pH greater than 12 to obtain base/neutral extractables. Acid extractable compounds are obtained from the sample by extraction with methylene chloride at a pH of 2 or less. Both base/neutral and acid extracts are then concentrated by removal of the methylene chloride through evaporation. Compounds of interest are separated and quantified using a GC/MS.

Method 23⁴² Chlorinated Dioxins and Furans

Flue gas and gas particulate samples were analyzed for chlorinated dioxins and furans using Method 23. The dioxins and furans are extracted from the samples with toluene using the soxhlet extraction described in Method 23. The extracts are cleaned by passing the solvent through alumina, silica gel, and carbon columns. The cleaned extracts are concentrated and injected onto the a fused silica capillary column of a gas chromatograph/mass spectrometer.

References

- U.S. Environmental Protection Agency. Office of Solid Waste. "Method 3005: Acid Digestion of Waters for Total Recoverable or Dissolved Metals for Analysis by Flame Atomic Absorption Spectroscopy or Inductively Coupled Plasma Spectroscopy," Test Methods for Evaluating Solid Waste. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 2. American Society for Testing and Materials. "Test Method for Moisture in the Analysis Sample of Coal and Coke," 1991 Annual Book of ASTM Standards. Section 5, Vol. 5.05, Method D-3173. Philadelphia, PA (1991).
- 3. American Society for Testing and Materials. "Standard Practice of Ultimate Analysis of coal and Coke," 1991 Annual Book of ASTM Standards. Section 5, Vol. 5.05, Method D-3176-89. Philadelphia, PA (1991).
- 4. American Society for Testing and Materials. "Standard Practice of Proximate Analysis of Coal and Coke," 1991 Annual Book of ASTM Standards. Section 5, Vol. 5.05, Method D-3172-89. Philadelphia, PA (1991).
- 5. American Society for Testing and Materials. "Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Laboratory Samples of Coal and Coke," 1991 Annual Book of ASTM Standards. Section 5, Vol. 5.05, Method D-5373. Philadelphia, PA (1991).
- 6. American Society for Testing and Materials. "Test Method for Sulfur in the Analysis Sample of Coal and Coke Using High Temperature Tube Furnace Combustion Methods," 1991 Annual Book of ASTM Standards. Section 5, Vol. 5.05, Method D-4239. Philadelphia, PA (1991).
- 7. American Society for Testing and Materials. "Standard Test Method for Gross Calorific Value of Coal and Coke by the Adiabatic Bomb Calorimeter," 1991 Annual Book of ASTM Standards. Section 5, vol. 5.05, Method D-2015-85. Philadelphia, PA (1991).
- 8. American Public Health Association, et al. "4500-Cl D. Potentiometric Method," Standard Methods for the Examination of Water and Wastewater. 17th ed. Washington, D.C. (1989).
- 9. U.S. Environmental protection Agency. Environmental Monitoring and Support Laboratory. "Fluoride, Method 340.2 (Potentiometric, Ion Selective Electrode)," *Methods for Chemical Analysis of Water and Wastes*. EPA-600/4-79-020. Cincinnati, OH (March 1983).

- J.W. O'Dell, J.D. Pfaff, M.E. Gales, and G.D. McKee. U.S. Environmental Protection Agency. Environmental Monitoring and Support Laboratory. "Test Method: The Determination of Inorganic Anions in Water by Ion Chromatography--Method 300.0." EPA-600/4-84-017. Cincinnati, OH (March 1984).
- 11. U.S. Environmental Protection Agency. Environmental Monitoring and Support Laboratory. "Sulfite, Method 377.1 (Titrimetric)," *Methods for Chemical Analysis of Water and Wastes*. EPA-600/4-79-020. Cincinnati, OH (March 1983).
- 12. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 6010: Inductively Coupled Plasma Atomic Emission Spectroscopy," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 13. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 6020: Inductively Coupled Plasma Mass Spectrometry," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 14. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 7060: Arsenic (AA, Furnace Technique)," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 15. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 7131: Cadmium (AA, Furnace Technique)," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 16. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 7421: Lead (AA, Furnace Technique)," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 17. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 7471: Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 18. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 7740: Selenium (AA, Furnace Technique)," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 19. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 8270: Gas Chromatography/Mass Spectrometry for Semivolatile Organics: Capillary Column Technique," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 20. 40 CFR 266, Appendix IX: Methods Manual for Compliance with the BIF Regulations. "Determination of Polychlorinated Dibenzo-p-Dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) from Stationary Sources (Method 23)."

- 21. U.S. Environmental Protection Agency. Methods 901.1 and 900.0. Prescribed Procedures for the Measurement of Radioactivity in Drinking Water. EPA-600/4/80-032 (1980).
- 22. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 3020: Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by GFAA Spectroscopy," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 23. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 3510: Separatory Funnel Liquid-Liquid Extraction," Test Methods for Evaluating Solid Waste. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 24. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 3520: Continuous Liquid-Liquid Extraction," *Test Methods for Evaluating Solid Waste*. SW-484, 3rd ed. Washington, D.C. (November 1986).
- 25. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 3540: Soxhlet Extraction," *Test Methods for Evaluating Solid Waste*. SW-484, 3rd ed. Washington, D.C. (November 1986).
- 26. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 3550: Sonication Extraction," *Test Methods for Evaluating Solid Waste*. SW-484, 3rd ed. Washington, D.C. (November 1986).
- U.S. Environmental Protection Agency. Office of Solid Waste. "Method 5030: Purge-and-Trap," Test Methods for Evaluating Solid Waste. SW-484, 3rd ed. Washington, D.C. (November 1986).
- 28. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 9012: Total and Amenable Cyanide (Colorimetric, Automated UV)," *Test Methods for Evaluating Solid Waste*. SW-484, 3rd ed. Washington, D.C. (November 1986).
- 29. U.S. Environmental Protection Agency. Environmental Monitoring and Support Laboratory. "Phosphorus, All Forms, Method 365.2 (Colorimetric, Ascorbic Acid, Single Reagent)," *Methods for Chemical Analysis of Water and Wastes*. EPA-600/4-79-020. Cincinnati, OH (March 1983).
- U.S. Environmental Protection Agency. Office of Solid Waste. "Method 6010: Inductively Coupled Plasma Atomic Emission Spectroscopy," Test Methods for Evaluating Solid Waste. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 31. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 7060: Arsenic (AA, Furnace Technique)," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).

- 32. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 7041: Antimony (Atomic Absorption, Furnace Technique)," Test Methods for Evaluating Solid Waste. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 33. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 7131: Cadmium (AA, Furnace Technique)," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 34. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 7421: Lead (AA, Furnace Technique)," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 35. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 7740: Selenium (AA, Furnace Technique)," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 36. U.S. Environmental Protection Agency, Office of Solid Waste. "Method 7841: Thallium (AA, Furnace Technique)." *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. November 1986.
- 37. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 7470: Mercury in Liquid Waste (Manual Cold-Vapor Technique)," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 38. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 7471: Mercury in Solid or Semisolid Waste Manual Cold-Vapor Technique," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 39. 40 CFR 266, Appendix IX: Methods Manual for Compliance with the BIF Regulations. "Analysis for Aldehydes and Ketones by High Performance Liquid Chromatography (HPLC) (Method 0011A)."
- 40. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 8240: Gas Chromatography/Mass Spectrometry for Volatile Organics," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 41. U.S. Environmental Protection Agency. Office of Solid Waste. "Method 8270: Gas Chromatography/Mass Spectrometry for Semivolatile Organics: Capillary Column Technique," *Test Methods for Evaluating Solid Waste*. SW-846, 3rd ed. Washington, D.C. (November 1986).
- 42. 40 CFR 266, Appendix IX: Methods Manual for Compliance with the BIF Regulations. "Determination of Polychlorinated Dibenzo-p-Dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) from Stationary Sources (Method 23)."

APPENDIX F: ERROR PROPAGATION AND UNCERTAINTY CALCULATIONS

An error propagation analysis was performed on calculated results to determine the contribution of process, sampling, and analytical variability and measurement bias to the overall uncertainty in the result. This uncertainty was determined by propagating the bias and precision error of individual parameters through the calculation of the results. This uncertainty does not represent the total uncertainty in the result since some important bias errors are unknown and have been assigned a value of zero for this analysis. Also, the uncertainties calculated apply only over the period of time during which the measurements were made.

The procedure described below is based on ANSI/ASME PTC 19.1-1985, "Measurement Uncertainty."

Nomenclature

```
r = Calculated result, a function of several parameters; S_{pi} = Sample standard deviation of parameter i; <math>\theta_i = Sensitivity of the result to parameter i; <math>\beta_{pi} = Bias \ error \ estimate for parameter i; <math>v_i = Degrees \ of \ freedom \ in \ parameter i; <math>v_r = Degrees \ of \ freedom \ in \ result; 
S_r = Precision \ component \ of \ result \ uncertainty; 
S_r = Bias \ component \ of \ result \ uncertainty; 
S_r = Student \ "t" \ factor \ (two-tailed \ distribution \ at \ 95\%); 
S_r = Uncertainty \ in \ r; \ and
```

 N_i = Number of measurements of parameter i.

Appendix F: Error propagation & Uncertainty Calculations

For a result, r, the uncertainty in r is calculated as:

$$U_{r} = \sqrt{\beta_{r}^{2} + (S_{r} * t)^{2}}$$
 (F-1)

The components are calculated by combining the errors in the parameters used in the result calculation.

$$\beta_{r} = \sqrt{\sum_{i=1}^{j} (\theta_{i} * \beta_{\overline{p}i})^{2}}$$
 (F-2)

$$S_{r} = \sqrt{\sum_{i=1}^{j} (\theta_{i} * S_{\overline{pi}})^{2}}$$
 (F-3)

The sensitivity of the result to each parameter is found from a Taylor series estimation method:

$$\theta_i = \frac{\partial r}{\partial p_i} \tag{F-4}$$

Or using a perturbation method (useful in computer applications):

$$\theta_i = \frac{r_{P_i + \Delta P_i} - r_{P_i}}{\Delta P_i}$$
 (F-5)

The standard deviation of the average for each parameter is calculated as:

$$S_{\overline{p}i} = \frac{S_{pi}}{\sqrt{N}} \tag{F-6}$$

The degrees of freedom for each parameter is found from

$$\mathbf{v}_{i} = \mathbf{N}_{i} - 1 \tag{F-7}$$

and the degrees of freedom for the result if found by weighing the sensitivity and precision error in each parameter.

$$v_{r} = \frac{S_{r}^{4}}{\sum_{i=1}^{j} \left[\frac{(S_{\overline{p}i} \times \theta_{i})^{4}}{v_{i}} \right]}$$
 (F-8)

The student "t" in Equation 1 is associated with the degrees of freedom in the result.

The precision error terms are easily generated using collected data. The bias error terms are more difficult to quantify. The percentage bias assumed in certain flow rates is based on how accurately particular flows were felt to be measured. For example, the coal flow rate was measured by counting (nominally) 500 lb buckets. While this method has good precision, there is likely to be a bias. A 5% bias is therefore assumed for the coal flow rate to account for the uncertainty. Similarly, measurements of slurry flow rates in FGD systems are quite precise, but are frequently biased. For this reason a 20% bias was assumed for limestone and JBR blowdown slurry flow rates. The following conventions were used for this report:

- 5% bias in coal flow rates.
- 20% bias in limestone slurry and JBR blowdown slurry flow rates.
- No bias in gas flow rates.
- No bias in analytical results unless the result is less than detection limit. Then one-half the detection limit is used for both the parameter value and its bias in calculations.

In addition to the assumptions about bias errors referred to above, the calculations also assume that the population distribution of each measurement is normally distributed and that the samples collected reflect the true population.

Also, the uncertainty calculated is only for the average value over the sampling period. The uncertainty does not represent long-term process variations. In other words, the calculated uncertainty does not include a bias term to reflect the fact that the sampled system was probably not operating (and emitting) at conditions equivalent to the average conditions for

that system over a longer period (in other words, autocorrelation may be important). An example of the confidence interval calculation is provided below.

Confidence Interval Calculations

The following example shows an example calculation for the 95% confidence interval for emission factor. This procedure utilizes the same method outlined earlier in this appendix. The example uses concentration data for mercury in the stack gas.

$$E = \frac{(Q_{gas} * C_{i,s}) + (Q_{gas} * C_{i,v})}{H_{coal} * F_{coal} * (1-C_{w,coal})} * 2204.6$$
 (F-9)

where:

 $E = Emission factor in 1b/10^{12} Btu;$

 $Q_{\text{stackgas}} = Gas flow rate, Nm³/hr;$

 $C_{i,a} = Solid-phase conc., \mu g/Nm³;$

 $C_{i,v}$ = Vapor-phase conc., $\mu g/Nm^3$;

H_{coal} = Coal higher heating value, Btu/lb on a dry basis;

 $F_{coal} = Coal feed rate, lb/hr;$

 $C_{w,coal}$ = Coal water content, weight fraction; and

2204.6 = Conversion from μ g/Btu to lb/10¹² Btu.

The values used to calculate the emission factor and the confidence interval are as follows:

Parameter

	Q _{stackgas} Nm³/hr	C _{i,s} μg/Nm³	$C_{i,v}$ $\mu g/Nm^3$	H _{ooal} Btu/lb	C _{w,coal} g/g	F _{coal} lb/hr
Mean	456,000	0.00707	3.04	12,700	0.117	91,000
S,	3,990	0.00638	0.11	260	0.0087	3,200
$S_{\overline{p}}$	2,310	0.00451	0.064	150	0.0050	380
N	3	2	3	3	3	71
$oldsymbol{eta_{\mathtt{p}}}$	0	0	0	0	0	4,540
θ	6.6x10 ⁶	0.99	0.99	-2.3x10 ⁴	2.73	-3.2x10 ^s -
V _p	2	1	2	2	2	70

The calculation of the sensitivity, θ , for the vapor-phase concentration is shown below:

Vapor-phase analytical: 2.92 μg/Nm³

$$3.13 \ \mu g/Nm^3$$

$$3.07 \, \mu g/Nm^3$$

$$N = 3$$

$$Mean = \Sigma C_{i,v} / N = 3.04$$

$$S_p = \sqrt{[\Sigma(C_{i,v} - Mean)^2/(N-1)]} = 0.11$$

$$S_{\bar{p}} = \frac{0.11}{\sqrt{3}} = 0.064$$

As explained above, the β for analytical results is set equal to zero.

$$\beta_p = 0$$

Next, calculate the sensitivity using perturbation method. The perturbation is equal to the standard deviation:

$$\theta = [r_{Ci,v=3.15} - r_{Ci,v=3.04}] / 0.11 = [3.109 - 3.00] / 0.11$$
$$= 0.99$$

Similar calculations are performed for each parameter.

Appendix F: Error propagation & Uncertainty Calculations

The precision component is then found by root-sum-squaring the product of the normalized standard deviations and their respective sensitivities.

$$S_{r} = \sqrt{\left(\theta_{Q_{-}} S_{C_{-}}\right)^{2} + \left(\theta_{C_{L}} S_{C_{-}}\right)^{2} + \left(\theta_{C_{L}} S_{C_{-}}\right)^{2} + \left(\theta_{H_{-}} S_{H_{-}}\right)^{2} + \left(\theta_{F_{-}} S_{F_{-}}\right)^{2} + \left(\theta_{C_{-}} S_{C_{-}}\right)^{2}}$$

$$S_{r} = 0.066$$

The bias component is found using the same equation substituting βp for the Sp term.

$$\beta_{r} = \sqrt{\left(\theta_{Q_{\text{max}}} \beta_{Q_{\text{max}}}\right)^{2} + \left(\theta_{C_{L}} \beta_{C_{L}}\right)^{2} + \left(\theta_{C_{L}} \beta_{C_{L}}\right)^{2} + \left(\theta_{H_{\text{max}}} \beta_{H_{\text{max}}}\right)^{2} + \left(\theta_{F_{\text{max}}} \beta_{F_{\text{max}}}\right)^{2} + \left(\theta_{C_{\text{max}}} \beta_{C_{\text{max}}}\right)^{2}}$$

$$\beta_{\rm r} = 0.14$$

The uncertainty in the result is then

$$U_r = \sqrt{\beta_r^2 + \left(t \times S_r\right)^2}$$
 (F-12)

To calculate the Student t factor, the degrees of freedom must be calculated using the following equation:

$$v_{r} = \frac{S_{r}^{4}}{\sum_{i=1}^{j} \frac{\left(S_{pi} \theta_{i}\right)^{4}}{V_{pi}}}$$

$$= 2.7$$

The Student t factor for a two-tailed 95% confidence interval with 2.7 degrees of freedom is 3.2. The uncertainty in the emission factor can now be calculated.

$$U_r = \sqrt{(0.14)^2 + (3.2 \times .066)^2}$$

$$= 0.25$$

The emission rate is calculated as 3.0 lb/10¹² Btu.

The value is reported as $3.0 \pm 0.3 \text{ lb/}10^{12} \text{ Btu}$.

APPENDIX G: TREATMENT OF NONDETECTS, VALUES OUTSIDE OF THE CALIBRATION RANGE, AND BLANKS

Treatment of nondetects (analytical results for which the concentration of the species of interest is below the detection limit of the method) and blank values is of critical importance in this program because detection levels and blank concentrations are often on the same order of magnitude as sample values. When the results are then used for risk assessments or policy decisions, treatment of the data becomes important. This discussion describes how blank and nondetect values are to be treated in presenting/developing reported results.

Nondetects

The discussion presented below explains how averages, sums, and reported emission values are to be calculated for all species given various combinations of detected and nondetected values.

All values detected. The arithmetic average or sum is taken, as appropriate. No special techniques required.

All values below the detection limit. For individual test runs or species, the data are to be reported as "ND < (detection limit)." For cases where all three runs are below the detection limit, the average is reported as nondetected less than the average detection limit of the three runs.

Some values are detected and some are nondetects. As an approximation, half of the detection limit for nondetect values and the actual value for detects will be used to determine reported values. As an example of averaging, an average for three test runs with results of 10, 8, and ND < 6 would be 7. As an example for summing (such as for mercury fractions), individual species values of 50, ND < 1, and ND < 2 would be summed to provide a value of 50 + 0.5 + 1, or 51.5. In reporting these types of sums or average no "<" sign is used. The only exception to this rule occurs when the average is less than the highest detection limit of the nondetected values. In this case, the average is reported as "ND < (the highest detection limit)." For example, 5, ND < 4, and ND < 3 would be reported as "ND < 4."

This approach is also used to obtain test train totals which required analyses of separate fractions for each individual run. Specifically, the volatile, metals, and anion test train totals for each run are obtained by addition of test train fractions which were analyzed separately.

Fractions from the volatile test train included separate analyses of the tenax and tenax/charcoal tubes for each sample period. Separate analyses were conducted on the filterable and gaseous test train components for both the metals and anion test trains.

Detection limit ratio. These methods of treating the data may result in some loss of information in going from raw data to final values. Specifically, what is often lost is the amount of a final emission value that is attributable to detection limits and the amount that is attributable to measured values. In order to quantify and present this information, all results in this report are presented along with the "Detection Limit Component Ratio," which is calculated as the ratio of the contribution of detection limit values to a final emission result.

For example, a set of three values of 16, ND <6, and ND <5 should be reported as 7, with a detection limit ratio of 26% [(3+2.5)/(16+3+2.5)], while a set of values of 12, ND <6, and 9 should be reported as 8, with a detection limit ratio of 13 percent. The different ratios provide insight as to the extent something is "really there" and, it is hoped, can help provide better information to those making decisions on risk and policy issues.

Values Outside the Calibration Range

It is possible that the reported lab data will be outside the calibration range of the instrument. Data reported below the lower detection limit will be flagged with a qualifier (e.g., "J"). Data with the "J" flag will have been tentatively identified and tentatively quantified. Data reported above the upper detection limit will be flagged with a qualifier (e.g., "E"). Data with the "E" flag will have been positively identified and tentatively quantified. Data with both qualifiers will be estimates. Consider J and E values to be quantitatively representative when calculating averages. Neither flag should cause a value to be weighted more or less important. The J and E data qualifiers should appear in the respective laboratory analytical report. The data qualifiers need not appear on the calculated data summaries.

Blank Values

The level and treatment of blank values is important in interpreting data, since in some cases species are detected but not at levels significantly higher than blanks. In these cases, measured values may not represent emissions, but rather just limitations of the method. However, most of the test methods used in this program either do not allow subtraction of blanks or are silent on how to treat blank values.

When a method does not specify how the sample will be blank-corrected, the appropriate blank train values should be subtracted. Laboratory and site/reagent blanks will be analyzed and the results evaluated for identification of contamination. If a sample compound is blank-corrected, the data will be flagged by a "B." If the value is blank-corrected below the detection limit, it should be reported as "ND < (detection limit) BC." A "C" flag indicates

that the blank value was greater than the sampled value. In no case should the blank-corrected values be reported below the method detection limit.

APPENDIX H: DETAILED ANALYTICAL RESULTS

Appendix H: Detailed Analytical Results

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ESP Inlet
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Raw Coal
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Limestone Slurry Solids
JBR Underflow Slurry Solids
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JBR Underflow Slurry Filtrate
Limestone Slurry Filtrate
Cooling Water
Coal Pile Run-Off

Gas Stream Data

SAMPLE STREAM: ESP INLET

Analyte	<u>.</u>	Analyticat Method	##	- Run	E		Run		Run		Average	* 5	Ratio
orifice Latering		Versy	S/Nm3	, a	۷ ا		9.017		9.533		8 057	- 53	
Rainen Potalis		5))		2		<u>.</u>		}		7000	3	
Reduced Species	Ammonia as N	EPA 350.1	ug/Nm3	27.	98 B		32.33	6	26.65	∞	83	7.38	
Reduced Species	Hydrogen Cyanide	SW 9012	ug/Nm3	0.043	£ -		0.221	7	0.199	7	0.154	0.24	
Anions - Vapor Phase	Chloride	EPA 300.0	ug/Nm3	127,702	202		105,013		102,681		111,799	34,338	
Anions - Vapor Phase	Fluoride	EPA 340.2	ug/Nm3	7,8	99		8,946		8,123		8,311	1,401	
Anions - Vapor Phase	Sulfate	EPA 300.0	ug/Nm3	7,339	547		7,389,801		7,662,782		7,464,043	432,118	
Anions - Particulate	Chloride	EPA 300.0	ug/Nm3	3,703	33		10,334		4,333		6,123	9,094	
Anions - Particulate	Fluoride	EPA 340.2	ug/Nm3	0.2	48 B		2.01	60	1.72	1 0	1.33	2.35	
Anions - Particulate	Sulfate	EPA 300.0	ug/Nm3	52,2	<u>35</u>		124,668		61,094		79,338	98,145	
Anions - Total	Chloride	EPA 300.0	ug/Nm3	131,	\$		115,347		107,014		117,922	30,799	
Anions - Total	Fluoride	EPA 340.2	ug/Nm3	7,8	98		8,948		8,124		8,313	1,403	
Anions - Total	Sulfate	EPA 300.0	ug/Nm3	7,391,798	798		7,514,469		7,723,876		7,543,381	417,161	
Radionuclides	Actinium-228 @ 338 KeV	EPA 901.1	pCi/g	¥ v	10		35		\$		24.7	35.9	1.8
Radionuclides	Actinium-228 @ 911 KeV	EPA 901.1	bCl/g	=	"		8		72		20.3	14.6	
Radionuclides	Actinium-228 @ 968 KeV	EPA 901.1	pCVg	۸ 2	^1		प्र		£		29.3	41.0	13%
Radionuclides	Bismuth-212 @ 727 KeV	EPA 901.1	pCivg	< 37		٧	£	v	88	•	39.3	:	100%
Radionuclides	Bismuth-214 @ 1120.4 KeV	EPA 901.1	pCi/g	γ γ	10	v	73	v	24	v	24.3	:	100%
Radionuclides	Bismuth-214 @ 1764.7 KeV	EPA 901.1	pCi/g	~	_	v	8		8		49.3	70.9	11 %
Radionuclides	Bismuth-214 @ 609.4 KeV	EPA 901.1	pCi/g	74	_		78		32		28.0	17.4	
Radionuclides	K-40 @ 1460 KeV	EPA 901.1	pCl/g	17	0		150		380		233	317	
Radionuclides	Lead-210 @ 46 KeV	EPA 901.1	bCi/g	24	_		8		2		79.0	32.5	
Radionuclides	Lead-212 @ 238 KeV	EPA 901.1	pCi/g	=			20		5 6		19.0	18.8	
Radionuclides	Lead-214 @ 295.2 KeV	EPA 901.1	pCi/g	24	_		16		32		24.0	19.9	
Radionuclides	Lead-214 @ 352.0 KeV	EPA 901.1	pCi/g	24	_		ಜ		29		25.3	7.99	
Radionuclides	Radium-226 @ 186.0 KeV	EPA 901.1	pCi/g	110	0		130		150		130	20	
Radionuclides	Thallium-208 @ 583 KeV	EPA 901.1	pCi/g		~ !		19		20		17.0	10.8	
				ESP Inlet - Page	t - Pag	le 1							

SAMPLE STREAM: ESP INLET

Anaivte		Analytical		Run	Œ.	s	Run		86%	占
Group	Specie	Method	Units	-		2	•	Average	5	Ratio
Radioniclides	Thallium-208 @ 860 KeV	EPA 901.1	pCl/g		^		29 >	< 66.7	;	100%
Radionuclides	Thorium-234 @ 1001 KeV	EPA 901.1	b Sod	88	7	ıΩ	8	79.3	34.8	
Radionuclides	Thorium-234 @ 63.3 KeV	EPA 901.1	bC/kg	88	Ŋ	22	88	69.3	42.8	
Radionuclides	Uranium-235 @ 143 KeV	EPA 901.1	pci/g	8	u>	4	88	69.3	42.8	٠
Part Metals by Wt	Aluminum	SW 6010	₿/6n	94,401	94;	94,503	102,093	666'96	10,961	
Part Metals by Wt	Antimony	ICP-MS	6/6n	3.24	6	89	4.68	3.61	2.36	
Part Metals by Wt	Arsenic	SW 7060	5/6n	4	4	4	S	44.9	11.6	
Part Metals by Wt	Barium	SW 6010	8∕8n	447	ភ	¥	530	494	1 06	
Part Metals by WI	Beryllium	SW 6010	5/Sn	Ξ	-	0	=	10.4	0.57	
Part Metals by Wt	Boron			1	•		ı			
Part Metals by Wt	Cadmium	SW 7131	6/6n	2.76	2.	20	3.21	2.68	1.43	
Part Metals by Wt	Calcium	SW 6010	6/6n	19,815	17,	647	16,792	18,085	3,871	
Part Metals by Wt	Chromium	SW 6010	6/6n	183	ស	6	223	318	8	
Part Metals by Wt	Cobatt	SW 6010	₿/6n	3	n	<u></u>	34	31	0.83	
Part Metals by Wt	Copper	SW 6010	6/6n	98	E D	'n	98	98	2.64	
Part Metals by Wt	Iron	SW 6010	6/6n	102,776	87,	367	82,002	90,715	26,792	
Part Metals by Wt	Lead	SW 7421	6/6n	7	7	Ģ.	98	79	6	
Part Metals by Wt	Magnesium	SW 6010	6/6n	4,549	4.6	119	4,910	4,692	476	
Part Metals by Wt	Manganese	SW 6010	6/6n	248	ĸ	6	223	237	32	
Part Metals by Wt	Mercury	SW 7471	₫/gn	0.63	*	92	99.0	0.79	0.59	
Part Metals by Wt	Molybdenum	SW 6010	6/6n	17	4		4	ક્ષ	93	
Part Metals by Wt	Nickel	SW 6010	ng/g	99	ස	36	179	226	245	
Part Metals by Wt	Phosphorus	SW 6010	D/D n	161	ಸ	92	569	228	1	
Part Metals by Wt	Potassium	SW 6010	6/6n	16,630	17,	647	18,125	17,467	1,897	
Part Metals by Wt	Selenium	SW 7740	6/6n	12	-	80	4	5	7.01	
Part Metals by Wt	Sodium	SW 6010	6/6n	5,196	5,1	121	5,042	5,120	192	
Part Metals by Wt	Strontium	SW 6010	6/6n	319	ਲੌ	50	325	324	12	
Part Metals by Wt	Titanium	SW 6010	6/6n	5,811	6,1	172	6,446	6,143	792	
Part Metals by Wt	Vanadium	SW 6010	6/6n	310	ñ	0	306	308	5.74	
Part Metals by Wt	Zinc	SW 6010	6/6n	391	4	61	458	423	\$	
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Gas Stream Data

SAMPLE STREAM: ESPINLET

Analyte		Analytical		Run	Run	Run		95%	5
Group	Specie	Method	Units	-	2	8	Average	5	Ratio
Part Metals by Vol	Aluminum	SW 6010	ug/Nm3	784,242	852,556	973,562	870,120	238,184	
Part Metals by Vol	Antimony	ICP-MS	ug/Nm3	26.92	26.10	44.68	32.56	26.08	
Part Metals by Vol	Arsenic	SW 7060	ug/Nm3	339	397	477	404	172	
Part Metals by Vol	Barium	SW 6010	ug/Nm3	3,713	4,550	5,053	4,438	1,682	
Part Metals by Vol	Beryllium	SW 6010	ug/Nm3	87	91	100	83	16	
Part Metals by Vol	Boron			1	i	ı			
Part Metals by Vol	Cadmium	SW 7131	ug/Nm3	ន	19	3	24	15	
Part Metals by Vol	Calcium	SW 6010	ug/Nm3	164,612	159,202	160,128	161,314	7,188	
Part Metals by Vol	Chromium	SW 6010	ug/Nm3	1,518	4,959	2,127	2,868	4,562	
Part Metals by Vol	Cobalt	SW 6010	ug/Nm3	254	281	291	275	8	
Part Metals by Vol	Copper	SW 6010	ug/Nm3	718	763	823	768	131	
Part Metals by Vol	Iron	SW 6010	ug/Nm3	853,821	788,179	781,972	166 209	96,905	
Part Metals by Vol	read	SW 7421	ug/Nm3	283	717	819	708	286	
Part Metals by Vol	Magnesium	SW 6010	ug/Nm3	37,788	41,671	46,820	42,093	11,256	
Part Metals by Vol	Manganese	SW 6010	ug/Nm3	2,062	2,157	2,126	2,115	121	
Part Metals by Vol	Mercury	SW 7471	ug/Nm3	5.23	10	6.44	2.08	5.56	
Part Metals by Vol	Molybdenum	SW 6010	ug/Nm3	139	371	435	315	387	
Part Metals by Vol	Nickel	SW 6010	ug/Nm3	1,327	3,062	1,704	2,031	2,267	
Part Metals by Vol	Phosphorus	SW 6010	ug/Nm3	1,338	2,305	2,564	2,069	1,606	
Part Metals by Vol	Potassium	SW 6010	ug/Nm3	138,151	159,202	172,840	156,731	43,416	
Part Metals by Vol	Selenium	SW 7740	ug/Nm3	103	162	1 34	133	73	
Part Metals by Vol	Sodium	SW 6010	ug/Nm3	43,168	46,195	48,080	45,814	6,156	
Part Metals by Vol	Strontium	SW 6010	ug/Nm3	2,651	2,967	3,100	2,906	572	
Part Metals by Vol	Třaníum	SW 6010	ug/Nm3	48,274	55,677	61,471	55,141	16,434	
Part Metals by Vol	Vanadium	SW 6010	ug/Nm3	2,575	2,793	2,916	2,761	429	
Part Metals by Vol	Zinc	SW 6010	ug/Nm3	3,247	3,784	4,371	3,801	1,397	
Motole Vanor	Aluminum	SW 6010	ug/Nm3	72	8 1821 B	220	146	937	
Metals, Vapor	Antimony	ICP-MS	ug/Nm3	1.07	0 1000 3 8	0.044 B	0.56	6.50	
Metals, Vapor	Arsenic	SW 7060	ng/Nm3 <	0.19	> B 2701 3	0.14 C	> 0.08	:	100%
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Gas Stream Data

SAMPLE STREAM: ESP INLET

Analyte		Analytical		Run		Run	Run				32%	占
Group	Specie	Method	Units	-		2	60			Average	ਹ	Ratio
Motole Money	Baring	SW 6010	Em/Nm3	78.0	Œ	H 22 H	211	60		46	7.85	
Metals, Vapor	Beodium	SW 6010	na/Nm3	0.076	····	8 22	0.037	ר ו		90.0	0.25	
Metals, Vapor	Boron	SW 6010	ug/Nm3	7,330	· co	7,080	5,451	60		6,390	11,939	
Metals, Vapor	Cadmium	SW 7131	ug/Nm3	< 0.07	ပ	667 8	0.18	8		0.11	0.93	16%
Metals, Vapor	Calcium	SW 6010	ng/Nm3	788		5,333 8	305	Φ		297	90	
Metals, Vapor	Chromium	SW 6010	ug/Nm3	22	60	102. B	0.65	8		11.33	136	
Metals, Vapor	Cobalt	SW 6010	ug/Nm3	0.30	٦	• 122 C	c 0.74	O	v	12	;	22%
Metals, Vapor	Copper	SW 6010	ug/Nm3	1.01	~ ~	8 C1	1.26	8		1.13	1.59	
Metals, Vapor	Iron	SW 6010	ug/Nm3	146	60	1,321 8	128	8		137	118	
Metals, Vapor	Lead	SW 7421	ug/Nm3	< 0.24	ပ	251 8	. 0.17	ပ	v	0.10	;	100%
Metals, Vapor	Magnesium	SW 6010	ug/Nm3	19	æ	156 55	22	Ø		20.50	2	
Metais, Vapor	Manganese	SW 6010	ug/Nm3	< 0.12	ပ	(3 B	د 0.09	ပ	v	0.05	;	100%
Metals, Vapor	Mercury	CVAA	ug/Nm3	5.09	ω	8 PZS	2.97	6		5.53	5.59	
Metals, Vapor	Molybdenum	SW 6010	ug/Nm3	< 1.36	ပ	1.4	0.63	7	v	0.66	;	52%
Metals, Vapor	Nickel	SW 6010	ug/Nm3	13	6	E3	2,15	ပ		7.18	78	%
Metals, Vapor	Phosphorus	SW 6010	ug/Nm3	< 18	ပ	45 8	13	ပ	v	7.80	;	100%
Metals, Vapor	Potassium	SW 6010	ug/Nm3	0.84	ပ ပ	208 B	21	6 0		10.74	131	7%
Metals, Vapor	Selenium	SW 7740	ug/Nm3	< 0.25	ပ	0.21	0.18	ပ	v	0.25	:	100%
Metals, Vapor	Sodium	SW 6010	ug/Nm3	214	ω	8 27	270	82		242	326	
Metals, Vapor	Strontium	SW 6010	ug/Nm3	1.68		3.3 8	2.32	œ		2.00	4	
Metals, Vapor	Titanium	SW 6010	ug/Nm3	3.31	60	д 3	4	6		8.89	۲	
Metals, Vapor	Vąnadium	SW 6010	ug/Nm3	96.0	60	n R	1.45	8 0		1.20	က	
Metals, Vapor	Zinc	SW 6010	ug/Nm3	94	 	B 22	9	8		સ	185	
Total Metals	Aluminum	SW 6010	ug/Nm3	784,314	_	854,177	973,781			870,757	238,039	
Total Metals	Antimony	ICP-MS	ug/Nm3	27.98		26.68	44.72			33.13	52	
Total Metals	Arsenic	SW 7060	ug/Nm3	340		407	477			408	17	
Total Metals	Barium	SW 6010	ug/Nm3	3,713		4,562	5,055			4,443	1,686	
Total Metals	Beryllium	SW 6010	ug/Nm3	88		35	\$			83	9	
Total Metals	Boron(vapor only)	SW 6010	ng/Nm3	7,330		7,080	5,451			6,620	2,536	
Total Metals	Cadmium	SW 7131	ug/Nm3	54		19	સ			ĸ	4	
				ESP Inlet - Page 4	- Page	4						
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SAMPLE STREAM: ESP	INLET
AMPLE STREAN	
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Analyte		Analytical		Run	Run	Run		%96 %96	占
Group	Specie	Method	Units	-	2	6	Average	ច	Ratio
	•		į	•		000	700	9	
Total Metals	Calcium	SW 6010	ng/Nm3	164,900	164,535	160,433	103,269	701,0	
Total Metals	Chromium	SW 6010	ug/Nm3	1,540	5,061	2,127	2,909	4,686	
Total Metals	Cobalt	SW 6010	ug/Nm3	254	283	293	712	₽	
Total Metals	Copper	SW 6010	ug/Nm3	719	77.3	825	277	131	
Total Metals	lron	SW 6010	ug/Nm3	853,967	789,500	782,099	808,522	98,206	
Total Metals	Lead	SW 7421	ug/Nm3	290	719	819	710	58 6	
Total Metals	Magnesium	SW 6010	ug/Nm3	37,807	41,859	46,842	42,169	11,243	
Total Metals	Manganese	SW 6010	ug/Nm3	2,063	2,170	2,127	2,120	<u>\$</u>	
Total Metals	Mercury	SW 7471	ug/Nm3	6	5	12	13	5.60	
Total Metals	Molybdenum	SW 6010	LB/Nm3	141	382	436	321	391	
Total Metals	Nickel	SW 6010	ug/Nm3	1,341	3,115	1,707	2,054	2,328	
Total Metals	Phosphorus	SW 6010	ug/Nm3	1,356	2,350	2,578	2,095	1,614	
Total Metals	Potassium	SW 6010	ug/Nm3	138,153	159,411	172,861	156,808	43,476	
Total Metals	Selenium	SW 7740	ug/Nm3	40	162	135	134	72	
Total Metals	Sodium	SW 6010	ng/Nm3	43,382	46,422	48,349	46,051	6,222	
Total Metals	Strontium	SW 6010	ug/Nm3	2,653	2,999	3,102	2,918	282	
Total Metals	Titanium	SW 6010	ug/Nm3	48,277	55,771	61,485	55,178	16,457	
Total Metals	Vanadium	SW 6010	ug/Nm3	2,576	2,820	2,917	2,771	437	
Total Metals	Zinc	SW 6010	ng/Nm3	3,293	3,842	4,388	3,841	1,360	
На Уарог. Вюот	Mercury, Elemental	CVAFS	ug/Nm3	2.43	2.36	1,15	8.	1.78	
Ha Vapor, Bloom	Mercury II	CVAFS	ug/Nm3	4.38	3.46	4.45	4.10	1.37	
Hg Vapor, Bloom	Mercury, Methyl	CVAFS	ug/Nm3	0.10	0.28	0.57	0.31	0.59	
Hg Vapor, Bloom	Mercury, Total	CVAFS	ug/Nm3	6.91	6.09	6.17	6.39	1.12	
Extract Metals, Nitric	Antimony	ICP-MS	₿/ϐn	2.37	3.04	2.62	2.68	0.85	
Extract Metals, Nitric	Arsenic	ICP-MS	6/6n	36.33	63.18	28.23	\$	₹	
Extract Metals, Nitric	Barium	ICP-MS	6∕6n	181	287	192	220	1	
Extract Metals, Nitric	Beryflium	ICP-MS	5/6n	3.36	5.14	3.83	4.11	2.29	
Extract Metals, Nitric	Boron	ICP-MS	5/5n	1,495	1,871	1,181	1,516	857	
Extract Metals, Nitric	Cadmium	ICP-MS	6/6n	< 0.72	2.28	4.03	2.22	4.57	% 23%
			E	ESP Inlet - Page 5	rc.				

SAMPLE STREAM: ESP INLET

		Analytical			Run	-	Run		Run		% 96	占
Grain	Specie	Method	Units		-		2		8	Average	ច	Ratio
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Extract Metals Nitric	Chromium	ICP-MS	Ø/Bn	`,	35.93	e.	6.16	•	14.92	ଷ	සි	
Cotron Matale Nitrin	Cohatt	ICP-MS	p/dn		3.75	J ,	.51		1.81	5.03	9.95	
Extract Metals Nitric	Cooper	ICP-MS	5/bin	•••	28.83	4	7.95	Ţ	95'6	32	36	
Extract Motals Nitric	pead	ICP-MS	מלקם	•	22.90	ø	2.80	•	32.06	ඉ	25	
Extract Metals Nitric	Mandanese	ICP-MS) D		138	•	54	_	90.04	120	87	
Extract Metals Nitric	Mercury	ICP-MS) () ()	v	1.92	•	180		64.11	3 5	226	0.4%
Extract Metals Nitric	Molybdenum	ICP-MS	5/6n	••	34.16	9	9.84	•	24.60	€	59	
Extract Metals Within	Nickel	ICP-MS	5/6n	•	53.31	W.	0.81	•	31.25	ŧ\$	8	
Extract Metals Nitric	Selenium	ICP-MS	b/bn	v	23.43	^	2.58	v	23.92	53	:	100%
Extract Metals, Nitric	Vanadium	ICP-MS	6/6n	•	107.21	73	20.17	-	09.68	146	160	
Subject Control of the Control of th	Actimony	ICP-MS	naja		0.66	Ū	0.73		0.73	0.71	60.0	
Extract Metals, Gastric	Arsenic	ICP-MS	g p/on	v	0.65	v	99.0	v		> 0.68	;	400%
Extract Metals, Castric	Barien	ICP-MS	, p/gn		81.68		103		126	103	22	
Extract Metals, Gastric	Beryllium	ICP-MS	6/6n		06:0		.39		1.13	1.14	0.61	
Extract Metals Gastric	Boron	ICP-MS	6/6n		669		969		669	969	4.55	
Extract Metals Gastric	Cadmium	ICP-MS	5/5n		0.55	•	2.91		2.01	1.82	2.97	
Extract Metals, Cosmo	Chromium	ICP-MS	6/6n		28.99	43	1.89		21.52	23	13	
Extract Metaks Gastric	Cobalt	ICP-MS	6/6n		1.21		2.37		1.80	1.80	4	
Extract Metals, Castric	Copper	ICP-MS	5/6n		8.57	_	2.41		8.89	96'6	5.29	
Extract Metals: Gastric	Lead	ICP-MS	₿/₿n		5.63	-	3.36		9.12	9.37	9.62	
Extract Motale Gastric	Manganese	ICP-MS	6/6n		87.97	(4)	6.41		55.76	8	92	
Extract Metals, Gastric	Mercury	ICP-MS	6/6n		1.63	•	3.23		0.84	1.90	3.03	
Extract Metals, Gastric	Molybdenum	ICP-MS	5/Sin		20.75	τ,	8.48		28.60	8	22	
Extract Metals Gastric	Nickel	ICP-MS	6/6n		6.17	•	0.16		4.58	5	7	
Extract Metals Gastric	Selenium	ICP-MS	₿/Ĝn	v	0.84	v	98.0	v	0.92	0.88	;	100%
Extract Metals, Gastric	Vanadium	ICP-MS	6/6n	٧	0.34	•	0.36	v	0.37	0.36	:	100%
Change the state of the state o	Antimony	CP-MS	5,6n		0.44		1.30		0.65	0.80	1,11	
Exilact incides, accident	Arsenic	ICP-MS	B/Bn		1.16		0.73		1.17	1.02	0.63	
Extract Metals, Actio	Barium	ICP-MS	B/Bn		34.39	•	33.34		56.47	₩	8	
			}	ESP 1	ESP Inlet - Page 6	9						

Gas Stream Data

SAMPLE STREAM: ESP INLET

Analyte		Analytical		Run	Run	Run		%96	늄
Group	Specie	Method	Units	-	2	8	Average	5	Ratio
Extract Motels Analis	Becellin	SP-MS	D/DH1	012	95	0.28	0.32	0.54	
Extract Metale Acetic	Boron	CP-MS	0/00	706	1.04	1.086	1,010	236	
Extract Metals, Acetic	Cadmium	ICP-MS	5/B	0.62	2.97	1.17	1.65	2.86	
Extract Metals, Acetic	Chromium	ICP-MS	6/6n	5.32	11.11	5.67	7.37	8.07	
Extract Metals, Acetic	Cobalt	ICP-MS	6/6n	1.19	1.86	1.37	1.48	0.87	
Extract Metals, Acetic	Copper	ICP-MS	6/6n	5.56	17.04	10.24	10.95	14.35	
Extract Metals, Acetic	Lead	ICP-MS	6/6n	0.14	0.37	0.11	0.21	0.35	
Extract Metals, Acetic	Manganese	ICP-MS	6/6n	72.92	31.05	50.15	51.37	52.09	
Extract Metals, Acetic	Mercury	ICP-MS	6/6n	0.17	. .56	0.39	0.71	1.86	
Extract Metals, Acetic	Molybdenum	ICP-MS	ō/ōn	0.39	3.91	90.0	1.45	5.30	
Extract Metals, Acetic	Nickel	ICP-MS	6/Bn	6.62	11.09	8.19	8.64	5.63	
Extract Metals, Acetic	Selenium	ICP-MS	5/6n	< 0.54	0.23	0.17 J	< 0.54	:	41%
Extract Metals, Acetic	Vanadium	ICP-MS	6/6n	1.45	1.05	1.88	1.46	1.03	
				•		100	1	;	
Metals by Size, >10 um	Aluminum	SW 6010	₿/₿n	98,300	103,000	125,000	108,767	35,411	
Metals by Size, >10 um	Antimony	ICP-MS	6/6n	2.53	1.71	1.82	2.02	1.10	
Metals by Size, >10 um	Arsenic	SW 7060	6/6n	29.80	23.30	25.00	8	8.37	
Metals by Size, >10 um	Barium	SW 6010	6/6 n	459	521	565	515	132	
Metals by Size, >10 um	Beryllium	SW 6010	6/6n	11.20	10.70	7.09	5	5.57	
Metals by Size, >10 um	Cadmium	SW 7131	6/6n	2.03	29.	1.32	1.66	0.88	
Metals by Size, >10 um	Calcium	SW 6010	6/6n	19,500	20,000	26,700	22,067	986'6	
Metals by Size, >10 um	Chromium	SW 6010	6/6n	185	182	185	184	4.30	
Metals by Size, >10 um	Cobalt	SW 6010	6/6n	30.30	33.40	33.30	32	4.38	
Metals by Size, >10 um	Copper	SW 6010	6/6n	97.80	84.90	79.60	87	ន	
Metals by Size, >10 um	tron	SW 6010	6/6n	102,000	101,000	103,000	102,000	2,484	
Metals by Size, >10 um	Lead	SW 7421	6/6n	59.40	47.80	45.30	51	19	
Metals by Size, >10 um	Magnesium	SW 6010	6/6n	4,860	4,900	6,300	5,353	2,037	
Metals by Size, >10 um	Manganese	SW 6010	6/6n	241	230	243	238	11	
Metals by Size, >10 um	Mercury	SW 7471	5/6n	0.32	0.69	0.48	0.50	0.47	
Metals by Size, >10 um	Molybdenum	SW 6010	₫/ĝn	7.27	20.80	21.40	16	8	
Metals by Size, >10 um	Nickel	SW 6010	6/6n	133	124	106	121	¥	
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Analyte		Analytical		Run		Run		Run		% 96	占
Group	Specie	Method	Units	-		2		•	Average	5	Ratio
Metals by Size >10 um	Phosphorus	SW 6010	6/6n	< 72.60	v	72.20	v	72.20	27 >	:	100%
Metals by Size, >10 um	Potassium	SW 6010	5/6n	17,800		17,900		19,700	18,467	2,656	
Metals by Size, >10 um	Selenium	SW 7740	6/6n	6.47		10.70		15.00	1	=	
Metals by Size, >10 um	Silicon	SW 6010	₿/6n	223,000		223,000		209,000	218,333	20,081	
Metals by Size, >10 um	Sodium	SW 6010	6/ôn	5,470		4,330		4,060	4,620	1,859	
Metals by Size, >10 um	Strontium	SW 6010	6/6n	340		330		402	357	97	
Metals by Size, >10 um	Titanium	SW 6010	6/6n	6,340		6,210		5,900	6,150	295	
Metals by Size, >10 um	Vanadium	SW 6010	6/Gn	310		296		274	293	ਨ	
Metals by Size, >10 um	Zinc	SW 6010	6 <i>/</i> 6n	346		276		243	288	131	
Metals by Size, 10-3 um	Aluminum	SW 6010	6/6n	123,000		107,000		123,000	117,667	22,949	
Metals by Size, 10-3 um	Antimony	ICP-MS	6/ 6 n	6.04		4.19		4.19	4.81	5.66	
Metals by Size, 10-3 um	Arsenic	SW 7060	6/6n	82.90		72.10		57.90	7	ਲ	
Metals by Size, 10-3 um	Barium	SW 6010	6/6n	575.00		572.00		745.00	831	246	
Metals by Size, 10-3 um	Beryllium	SW 6010	6/6n	16.50		11.30		10.50	13	8.09	
Metals by Size, 10-3 um	Cadmium	SW 713	ნ/ნი	7.30		5.84		4.40	5.84	3.60	
Metals by Size, 10-3 um	Calcium	SW 6010	₿/B'n	14,500		15,000		26,300	18,600	16,578	
Metals by Size, 10-3 um	Chromium	SW 6010	6/6n	225		215		213	218	9	
Metals by Size, 10-3 um	Cobalt	SW 6010	₿/Ĝn	45.70		42.40		41.40	£4	5.59	
Metals by Size, 10-3 um	Copper	SW 6010	B/Bn	152		140		135	142	22	
Metals by Size, 10-3 um	Iron	SW 6010	6/6n	60,700		29,300		72,900	64,300	18,584	
Metals by Size, 10-3 um	Lead	SW 7421	₿/₿n	157		\$		26	119	83	
Metals by Size, 10-3 um	Magnesium	SW 6010	₿/₿'n	6,460		6,480		6,110	6,350	517	
Metals by Size, 10-3 um	Manganese	SW 6010	6/6n	228		217		238	526	ጸ	
Metals by Size, 10-3 um	Mercury	SW 7471	₿/ɓn	0.22		0.60		09'0	0.47	0.5 24	
Metals by Size, 10-3 um	Molybdenum	SW 6010	6/6n	55.90		51.90		30.50	\$	ਝ	
Metals by Size, 10-3 um	Nickel	SW 6010	₿/Bn	182		128		145	152	66	
Metals by Size, 10-3 um	Phosphorus	SW 6010	5/6n	< 72.80	v	72.60	v	72.50	s 73	:	100%
Metals by Size, 10-3 um	Potassium	SW 6010	6/6n	23,300		21,500		20,700	21,833	3,308	
Metals by Size, 10-3 um	Selenium	SW 7740	₿/6n	6.29		2.39	v	1.15	3.09	7.25	%9
Metals by Size, 10-3 um	Silicon	SW 6010	₿/6n	236,000		231,000		225,000	230,667	13,683	
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Gas Stream Data

SAMPLE STREAM: ESP OUTLET

Analyte		Analytical		Run			Run			Run				32%	占
Group	Specie	Method	Units	-			~			-			Average	5	Ratio
			;	i	•		ļ	•			1			į	
Part Metals by Vol	Molybdenum	SW 6010	ug/Nm3	8.	α		0.07	p		7.7	מ		80.0	17.1	
Part Metals by Vol	Nickel	SW 6010	ng/Nm3	2	60	,	ଷ	æ		SS SS	6		23	5.68	
Part Metals by Vol	Phosphorus	SW 6010	ug/Nm3	N	•	600000	5	<u>~</u>			œ		001	ì	
Part Metals by Vol	Potassium	SW 6010	ug/Nm3	(30)		000000	2,150	a			e		2,150	ı	
Part Metals by Vol	Selenium	SW 7740	ug/Nm3	142			4	ac		61	6		82	131	
Part Metals by Vol	Sodium	SW 6010	ug/Nm3	9.		******	803	<u>~</u>	۰	٠	o		803	1	
Part Metals by Vol	Strontium	SW 6010	ug/Nm3	38	4	000000	\$	<u>~</u>	·	8	o		\$	1	
Part Metals by Vol	Titanium	SW 6010	ug/Nm3	8			719	2 2		198	6		757	727	
Part Metals by Vol	Vanadium	SW 6010	ug/Nm3	51.35	80		5	æ		58.42	₽		ኔ	Ξ	
Part Metals by Vol	Zinc	SW 6010	ug/Nm3	£0 ,		2000	108	æ		220	o		108	ı	
Metals, Vapor	Aluminum	SW 6010	ug/Nm3	8	₩		8	20		12	8		88	4	
Metals, Vapor	Antimony	ICP-MS	ug/Nm3	0.021	80		0.018	œ		0.025	6		0.02	0.010	
Metals, Vapor	Arsenic	SW 7060	ug/Nm3	< 0.17	ပ	٧	0.19	ပ	v	0.18	ပ	v	0.18	:	100%
Metals, Vapor	Barium	SW 6010	ug/Nm3	0.81	60		69.0	æ		1.50	8		8	1.08	
Metals, Vapor	Beryllium	SW 6010	ug/Nm3	0.12	7	٧	0.16	ပ	v	0.16	ပ	v	0.16	:	27%
Metals, Vapor	Boron	SW 6010	ug/Nm3	7,482	8		6,621	&		6,617	80		906'9	1,237	
Metals, Vapor	Cadmium	SW 7131	ug/Nm3	> 0.06	ပ		0.25	ဆ	v	0.07	ပ		0.10	0.31	21%
Metals, Vapor	Calcium	SW 6010	ug/Nm3	224	80		171	œ		158	8		184	87	
Metals, Vapor	Chromium	SW 6010	ug/Nm3	0.99	6 0	v	0.73	ပ	v	0.70	ပ	v	0.73	;	42%
Metals, Vapor	Cobatt	SW 6010	ug/Nm3	99'0	7	v	6.	ပ		0.45	_	v	1,00	;	31%
Metals, Vapor	Copper	SW 6010	ug/Nm3	> 0.99	ပ		1.39	20		1.28	8		1.06	1.21	16%
Metals, Vapor	<u>lon</u>	SW 6010	ug/Nm3	ጽ	8		3	8		87	8		S	78	
Metals, Vapor	lead	SW 7421	ug/Nm3	< 0.21	ပ		0.88	Œ	v	0.22	ပ		0.37	1.1	%
Metals, Vapor	Magnesium	SW 6010	ug/Nm3	15	ω		우	∞		Ξ	Φ		12	6.40	
Metals, Vapor	Manganese	SW 6010	ug/Nm3	< 0.10	ပ	v	0.12	ပ	v	0.11	ပ	v	0.11	;	100%
Metals, Vapor	Mercuny	CVAA	ug/Nm3	6.04	80		5.18	æ		5.54	8		5.59	1.07	
Metals, Vapor	Molybdenum	SW 6010	ug/Nm3	0.55	7	v	1.36	ပ		09:0	_	v	1.36	;	37%
Metals, Vapor	Nickel	SW 6010	ug/Nm3	< 2.57	ပ	v	2.90	O		1.87	_	v	2.90	;	20%
Metals, Vapor	Phosphorus	SW 6010	ug/Nm3	۰ 16	ပ	v	18	O	v	17	ပ	v	17	;	100%
Metals, Vapor	Potassium	SW 6010	ug/Nm3	7	80	v	0.84	ပ	v	0.81	ပ		75	5	₹
•				ESP Outlet - Page	ilet - F	age	೮								
H						J									

Specie Method Units 1 2 3 Average CI Schemlum SW 7740 ug/Mm3 4 16 B 241 B 224 C 6 22 C C 022 C C 022 C C 022 C C 022 C C 022 C C 022 C C 022 C C 022 C C 022 C C 022 C C 022 C C 022 C C 023 C C 023 C C 023 C C 023 C C 023 C C 023 C C 023 C C 023 C C 023 C C 023 C C 023 C C 023 C C 023 C C 023 C C 023 C C	Analyte		Analytical		œ	Run		Run		-	Run		1		398 %	占 ;
Selentum SW 7740 ug/hm3 C C C C C C C C C C C C C C C C C C C	Group	Specie	Method	Units				7	1		9		Á	verage	ច	Ratio
Soleinum SW 9710 ug/hm3 4 U.22 U S			1			8	,	C	Ç		124	ن	v	23	;	100%
Significant Service Control of Paris 1	tals, Vapor	Selenium	SW 7740	UQ/NEG	-	3	,	0.63	> 1) c		287	Jan	
Strontlum SW 6010 ug/hmis 1.48 B 1.31 B 1.28 B 1.38 0.26 Varnadium SW 6010 ug/hmis 1.26 B 4.01 B 2.52 3.28 Zinc SW 6010 ug/hmis 1.27 B 4.01 B 0.26 1.27 B 1.23 B 1.27	tals Vapor	Sodium	SW 6010	ug/Nm3	4	16 B		241	1 0	. •	\$	2		107	707	
Triantium SW 6010 ug/Mm3 2.16 B 138 B 401 B 253 336 Vanadium SW 6010 ug/lm3 14 B 138 B 401 B 253 336 Znc SW 6010 ug/lm3 14 B 131 B 59 B 62 123 Antimony ICP-MS Ug/lm3 0.344 0.377 0.463 16.57 0.408 0.119 Barlum SW 6010 ug/lm3 1.414 16.14 16.14 19.43 16.57 0.408 0.119 Beryllium SW 6010 ug/lm3 1.434 16.14 17.75 1.745 1.757 1.738 1.604 Arsenic SW 6010 ug/lm3 1.434 16.14 1.73 1.742 0.483 16.57 0.408 0.119 Beryllium SW 6010 ug/lm3 1.434 16.14 1.73 1.742 0.483 1.577 1.748 1.7481 1.	tale Vapor	Strontium	SW 6010	ug/Nm3	-	•		<u>1.3</u>	1	•	28	ø		1.36	0.28	
Aurandum SW 6010 ug/hm3 1.35 B C 669 C 116 B 0.98 1.33 Zinc Zinc SW 6010 ug/hm3 1,41 B 113 B 69 B 69 1,23 Atuminam SW 6010 ug/hm3 1,41 B 1,13 B 69 B 69 1,23 Assentic SW 6010 ug/hm3 1,41 B 1,2179 1,433 1,439 -7 Beron(vapor Omly) SW 6010 ug/hm3 1,46 1,73 1,439 -7 Cachmum SW 6010 ug/hm3 1,46 1,73 1,439 -7 Cachmum SW 6010 ug/hm3 1,46 1,24 1,73 1,439 -7 Cachmum SW 6010 ug/hm3 1,46 1,24 1,72 1,439 -7 Cachmum SW 6010 ug/hm3 1,62 1,24 1,43 1,33 Cachmum SW 6010 ug/hm3	idis, vapor	Titanium	SW 6010	ua/Nm3	2	.16 B		1.38	80	•	<u>1</u> .0	D.		2.52	3.36	
Authinory (CP-MS up/Mm3 (2004) (12.179 (16.97) (12.179 (16.97) (12.179 (16.97) (12.179 (16.97) (12.179 (16.97) (12.179 (16.97) (12.179 (16.97) (12.179 (16.97)	tals, Vapor	Transfer of	SW 6010	un/Nm3	_	35	٧	0.69	ပ	_	1,18	6 0		96.0	1.33	12%
Attention SW 6010 ug/km3 0.384 0.377 0.463 12.778 0.408 d. 12.179 0.463 1.657 0.408 d. 12.179 0.3463 1.657 0.408 d. 12.179 0.3463 1.657 0.408 d. 12.179 0.3463 1.657 0.408 d. 12.179 0.3463 1.657 0.408 d. 12.179 0.3463 1.657 0.408 d. 12.179 0.3463 1.657 0.3463 1.657 0.3463 0.3	als, Vapor	Variacium	SW 6010	ug/Nm3	•	4		113	6		20	83		62	123	
Aluminum (1974) 1974(1) 1944(1) 1944 (1944) 1944 (1944) 1944(1) 1944 (1944) 1944(1) 19	arg, erbor							42 479	99900		068			12,179	ţ	
Artitimony (10PAMS tophina) 14,334 (13,17) (13,44) (16,17) (13,44) (16,17) (17,18) (17	al Metals	Aluminum	OLOG MS	CILL I			×	7 2 2 2	u:		463			608	0.119	
Barium SW 6010 ug/hm3 14.13 16.14 17.5	Fotal Metals	Antimony	ICP-MS	ng/Nm3	Ö	3		0.377		•	3 5			48.F7	28	
Barrium SW 6010 ug/lm3 100 75 117 173 <	al Metals	Arsenic	SW 7060	ug/Nm3	1	1.13	***	16.14	224		2			16.37	5	
Beryllium SW 6010 ug/Nm3 1,74 6,621 6,671 6,906 1,73 6,906 1,73 6,906 1,73 6,906 1,73 6,906 1,73 6,906 1,73 6,906 1,73 6,906 1,73 1,73 6,906 1,73 1,73 6,906 1,73 <th< td=""><th>al Metals</th><td>Barium</td><td>SW 6010</td><td>ug/Nm3</td><td></td><td>8</td><td></td><td>55</td><td></td><td></td><td></td><td></td><td></td><td>85 F</td><td>ŧ</td><td></td></th<>	al Metals	Barium	SW 6010	ug/Nm3		8		55						85 F	ŧ	
Boron(Vapor Only) SW 6010 ug/Nm3 7,482 6,621 6,617 6,540 6,540 Cadmium SW 6010 ug/Nm3 1,32 0,05 1,32 0,05 1,32 Cadmium SW 6010 ug/Nm3 1,623 23 23,43 1,34 1,32 1,34	al Metals	Beryllium	SW 6010	ug/Nm3		3		1.73	-					6/:L		
Cadmium SW 7131 ug/Nm3 0.47 1.32 0.58 1.32 Calcium SW 6010 ug/Nm3 1.663 1.946 1.72 1.946 1.34 Chromium SW 6010 ug/Nm3 1.73 4.95 5.74 4.95 Copper SW 6010 ug/Nm3 1.73 1.72 18.03 17.26 Lead SW 6010 ug/Nm3 1.652 19 1.72 18.03 17.26 Magnesium SW 6010 ug/Nm3 1.652 19 1.62 6.88 </td <th>at Metals</th> <td>Boron(Vapor Only)</td> <td>SW 6010</td> <td>ug/Nm3</td> <td>7</td> <td>482</td> <td>900</td> <td>6,621</td> <td></td> <td></td> <td>,617</td> <td>******</td> <td></td> <td>906.0</td> <td>157.</td> <td></td>	at Metals	Boron(Vapor Only)	SW 6010	ug/Nm3	7	482	900	6,621			,617	******		906.0	157.	
Calcium SW 6010 ug/Nm3 1,946 1,946 1,946 1,948 1,948 1,948 1,948 1,948 1,948 1,948 1,948 23.43	at Metals	Cadmium	SW 7131	ug/Nm3	•	Q		1.32			8			1.32	ŧ	
Chocwilum SW 6010 ug/lm3 £5.60 23 23.45 4.95 £5.20 4.95 8.58 8.58 8.58 8.58 8.58 8.58 8.58 8.58 8.58 8.58 8.58 8.58 8.58 8.71 8.71 8.71 8.71 8.71 8.71 8.71 8.71 8.71 8.71 8.71 8.71 8.72 8.71 8.71 8.71 8.71 8.71 8.71 8.71 8.71 8.71 8.71 8.71 8.71 8.72 8.71 8.72 8.72 8.72 8.72 8.72	Metals	Calcium	SW 6010	ug/Nm3		683		1,948						9 9	ŧ	
Cobalt SW 6010 ug/Nm3 16.53 17.22 18.03 17.26 Lon SW 6010 ug/Nm3 16.53 17.22 18.03 17.26 Iron SW 6010 ug/Nm3 6.806 8.069 8.668 8.587 Magnesium SW 6010 ug/Nm3 15.22 19 16.34 19.21 Manganese SW 6010 ug/Nm3 8.456 32.60 34.27 34.15 Mohybdenum SW 6010 ug/Nm3 22.86 21.55 26.46 23.62 Phosphorus SW 6010 ug/Nm3 1.43 6.153 2.150 2.150 2.150 Phosphorus SW 6010 ug/Nm3 1.43 6.080 2.150 2.150 Phosphorus SW 6010 ug/Nm3 1.44 1.044 2.150 2.150 Selenium SW 6010 ug/Nm3 1.4 1.044 1.044 1.044 Sitrontium SW 6010 ug/Nm3 1.4 1.044 1.044 1.044	Metals	Chromium	SW 6010	ug/Nm3		9		ឌ			9			23.43	ŧ	
Copper SW 6010 ug/lm3 16.53 17.22 18.03 17.20 Iron SW 6010 ug/lm3 46.69 8,069 8,885 8,587 Magnesium SW 6010 ug/lm3 44.6 668 34.27 34.15 Manganese SW 6010 ug/lm3 6.153 5.302 5.683 5.713 Manganese SW 6010 ug/lm3 6.153 5.302 5.683 5.713 Morbdenum SW 6010 ug/lm3 8.436 9.352 8.317 8.702 Nickel SW 6010 ug/lm3 2.266 21.55 26.46 23.62 Potassium SW 6010 ug/lm3 2.150 2.150 2.150 2.150 Sodium SW 6010 ug/lm3 2.150 44.14 40.90 2.150 Sodium SW 6010 ug/lm3 2.150 44.74 1.044 21.44 Sitontium SW 6010 ug/lm3 594 720 865 760	at Metals	Coball	SW 6010	ug/Nm3		2		35		Ì				S 5	1 6	
Iron SW 6010 ug/hm3 8,808 8,069 8,885 8,585 9,597 Lead SW 7421 ug/hm3 446 668 442 668 442 Manganesium SW 6010 ug/hm3 35.60 32.60 34.27 34.15 Manganesium SW 6010 ug/hm3 6.153 5.302 5.883 5.713 Manganesium SW 6010 ug/hm3 22.86 21.55 26.46 21.50 Nickel SW 6010 ug/hm3 22.86 21.55 26.46 21.50 Selenium SW 6010 ug/hm3 22.46 21.50 22.150 Selenium SW 6010 ug/hm3 22.45 1.044 24.74 Sodium SW 6010 ug/hm3 23.50 44.13 60.80 62.51 Strontium SW 6010 ug/hm3 33.50 34.77 44.74 44.74 Strontium SW 6010 ug/hm3 34.50 35.50 36.50 Titanium SW 6010 ug/hm3 35.50 36.40 36.50 Titanium SW 6010 ug/hm3 35.50 36.40 36.50 Titanium SW 6010 ug/hm3 36.40 720 865 760 Titanium SW 6010 ug/hm3 36.40 44.74 44.74 Titanium SW 6010 ug/hm3 36.40 44.74 Tanalam SW 6010 ug/hm3 36.40 44.74 Titanium SW 6010 ug/hm3 36.40 44.74 Titanium SW 6010 ug/hm3 36.40 44.74 Titanium SW 6010 ug/hm3 44.74 44.74 Titanium SW 6010 ug/hm3 44.74 44.74 Titanium SW 6010 ug/hm3 44.74 44.74 Titanium SW 6010 ug/hm3 44.74 44.74 Titanium SW 6010 ug/hm3 44.74 44.74 Titanium SW 6010 ug/hm3 44.74 44.74 Titanium SW 6010 ug/hm3 44.74 44.74 Titanium SW 6010 ug/hm3 44.74 44.74 Titanium SW 6010 ug/hm3 44.74 44.74 Titanium Tit	at Metals	Copper	SW 6010	ng/Nm3		5.53		17.22			3.00 10.00 10.00			87.7	6.	
Lead SW 7421 ug/Nm3 152. 19 16.26 688 Magnesium SW 6010 ug/Nm3 35.60 32.60 34.27 34.15 Manganese SW 6010 ug/Nm3 6.153 5.302 5.683 5.713 Molybdenum SW 6010 ug/Nm3 6.153 2.362 8.317 8.702 Nickel SW 6010 ug/Nm3 2.286 21.55 26.46 23.62 Phosphorus SW 6010 ug/Nm3 2.286 21.55 26.46 23.62 Potassium SW 6010 ug/Nm3 4.43 6.080 82.51 108.72 Sodium SW 6010 ug/Nm3 4.413 6.0.80 82.51 2.150 Sodium SW 6010 ug/Nm3 2.44 44.13 6.0.80 82.51 Strontium SW 6010 ug/Nm3 6.0.80 44.14 44.74 44.74 44.74 Strontium SW 6010 ug/Nm3 6.0.80 7.04 7.04 44	at Metals	lron	SW 6010	ug/Nm3		808	***	8 ⁰ 069			Ç			,00°,0	<u>-</u>	
Magnesium SW 6010 ug/Nm3 466 668 4.27 34.15 Manganese SW 6010 ug/Nm3 6.153 5.302 5.683 5.713 Molybdenum SW 6010 ug/Nm3 6.153 5.302 5.683 5.713 Nickel SW 6010 ug/Nm3 22.86 21.55 26.46 23.62 Phosphorus SW 6010 ug/Nm3 7.09 1.99 1.90 1.98.72 Phosphorus SW 6010 ug/Nm3 7.150 2.150 2.150 2.150 Selenium SW 6010 ug/Nm3 1.43 44.13 60.80 82.51 Sodium SW 6010 ug/Nm3 2.150 2.150 2.150 82.51 Sodium SW 6010 ug/Nm3 2.150 44.74 1.044 44.74 Strontlum SW 6010 ug/Nm3 694 720 865 760 Titanium SW 6010 ug/Nm3 694 720 865 760	al Metals	Lead	SW 7421	ug/Nm3		22		<u>6</u>			8			17.51	ì	
Manganese SW 6010 ug/Nm3 35.60 32.60 34.27 34.13 Mercury SW 7471 ug/Nm3 6.153 5.302 5.683 5.713 Molybdenum SW 6010 ug/Nm3 6.436 9.352 8.317 8.702 Nickel SW 6010 ug/Nm3 22.86 21.55 26.46 23.62 Potassium SW 6010 ug/Nm3 7.00 2.150 2.150 108.72 Selenium SW 6010 ug/Nm3 4.43 60.80 82.51 2.150 Sodium SW 6010 ug/Nm3 23.60 44.74 1.044 1.044 Strontium SW 6010 ug/Nm3 694 720 66.80 760 Titanium SW 6010 ug/Nm3 694 720 66.50 760 Titanium SW 6010 ug/Nm3 694 720 66.50 760	al Metals	Magnesium	SW 6010	ug/Nm3		9	***	99			9			8 3	1 6	
Mercury SW 7471 ug/Nm3 6.153 5.302 5.683 9.713 Molybdenum SW 6010 ug/Nm3 8.436 9.352 8.317 8.702 Phosphorus SW 6010 ug/Nm3 22.86 21.55 26.46 23.62 Phosphorus SW 6010 ug/Nm3 20.86 21.55 26.46 23.62 Potassium SW 6010 ug/Nm3 20.40 2,150 2,150 2,150 Sodium SW 6010 ug/Nm3 4.4 1,044 2,150 2,150 Titanium SW 6010 ug/Nm3 4.4 7 4.74 4.74 Titanium SW 6010 ug/Nm3 694 720 865 760 Titanium SW 6010 ug/Nm3 ESP Outlet - Page 4 720 865 760	al Metals	Manganese	SW 6010	ug/Nm3		2.60		32.60			34.2/			5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5	4 6	
Molybdenum SW 6010 ug/Nm3 8.436 9.352 8.317 0.702 Nickel SW 6010 ug/Nm3 22.86 21.55 26.46 23.62 Phosphorus SW 6010 ug/Nm3 20.40 2,150 2,376 109.72 Potassium SW 6010 ug/Nm3 143 44.13 60.80 82.51 Sodium SW 6010 ug/Nm3 20.00 1,044 21.50 24.74 Strontlum SW 6010 ug/Nm3 20.00 44.74 44.74 44.74 Titanium SW 6010 ug/Nm3 694 720 865 760 Titanium SW 6010 ug/Nm3 ESP Outlet - Page 4. 720 865 760	al Metals	Mercury	SW 7471	ug/Nm3		153		5.302		,	5.683			5.7.3	8 5	
Nicke SW 6010 ug/Nm3 22.86 21.55 26.46 23.02 Phosphorus	al Metals	Molybdenum	SW 6010	ug/Nm3		.436 8.		9.352			5.317			0.102	F 6	
Phosphorus SW 6010 ug/Nm3 109 134 104.12 Potassium SW 6010 ug/Nm3 2,150 2,150 2,150 2,150 Selenium SW 7740 ug/Nm3 143 44.13 60.80 82.51 Strontium SW 6010 ug/Nm3 2,20 44.74 1,044 44.74 Strontium SW 6010 ug/Nm3 694 720 865 760 Titanium SW 6010 ug/Nm3 694 720 865 760	al Metals	Nickel	SW 6010	ug/Nm3	000000000000000000000000000000000000000	2.86	***	21.55			9			20.02	0.32	
Potassium SW 6010 ug/Nm3 7047 2,150 44,13 60,80 82.51 Selenium SW 6010 ug/Nm3 42,4 1,044 712 1,044 Strontlum SW 6010 ug/Nm3 694 720 865 760 Titanium SW 6010 ug/Nm3 694 720 865 760	al Metals	Phosphorus	SW 6010	ug/Nm3		8		\$			3			106.72	;	
Selenium SW 7740 ug/Nm3 43 44.13 60.80 62.51 Sodium SW 6010 ug/Nm3 33.76 44.74 1,044 44.74 44.74 44.74 44.74 44.74 44.74 44.74 770 865 760 Titanium SW 6010 ug/Nm3 694 720 865 760 ESP Outliet - Page 4 Annual March 100 44.74 44.74 44.74 760	al Metals	Potassium	SW 6010	ng/Nm3		3	***	2,150						06L'2	ış	
Sodium SW 6010 ug/Nm3 (24 1,044 212 1,044 Strontlum SW 6010 ug/Nm3 694 720 865 760 Titanium SW 6010 ug/Nm3 694	al Metais	Selenium	SW 7740	ug/Nm3	***************************************	143	00000	4.5			99.80			62.51	5	
Strontlum SW 6010 ug/Nm3 \$2,20 44,74 44,74 44,74 Titanium SW 6010 ug/Nm3 694 720 865 760 ESP Outlet - Page 4	al Metals	Sodium	SW 6010	ug/Nm3		**		<u>-</u> 8			212			<u>4</u>	ı	
Titanium SW 6010 ug/Nm3 694 720 865 760 700 FSP Outlet - Pace 4	a Metals	Strontium	SW 6010	ug/Nm3		D		44.74			9			44.74	1 5	
ESP Outlet - Page	a Metals	Titanium	SW 6010	ug/Nm3		694		720			965			8	2 57	
					ESP D	Outlet	- Pan									

SAMPLE STREAM: ESP OUTLET

Analyte		Analytical		Run	Run	Run		*9 6	ᡖ
Group	Specie	Method	Units	1	2		Average	ਹ	Ratio
Total Metale	Weney.	CW ROTO		22.70	54	909	54.47	÷	
Con Inclais		3		600000000000000000000000000000000000000	5	80.65	ξ *	=	
Total Metais	Zinc	SW 6010	ug/Nm3		23	23.04	221.22	ı	
Hg Vapor, Bloom	Mercury, Elemental	CVAFS	ug/Nm3		2.60	2.38	250	0.28	
Hg Vapor, Bloom	Mercury II	CVAFS	ug/Nm3		3.78	3.64	4.16	96.1	
Hg Vapor, Bloom	Mercury, Methyl	CVAFS	ug/Nm3		0.75	0.42	0.63	0.45	
Hg Vapor, Bloom	Mercury, Total	CVAFS	ug/Nm3	8.32	7.14	6.43	7.30	2.36	
Extract Metals, Nitric	Antimony	ICP-MS	6/6n	4.790	2.379	2.471	3.21	3.39	
Extract Metals, Nitric	Arsenic	ICP-MS	6/6n	2.	116	88	98.39	39.98	
Extract Metals, Nitric	Barium	ICP-MS	6/6n	316	322	315	318	8.38	
Extract Metals, Nitric	Beryflium	ICP-MS	6/6n	3,992	8.127	4.183	5.43	5.80	
Extract Metals, Nitric	Boron	ICP-MS	6/6n	2413	1987	1430	1,943	1,225	
Extract Metals, Nitric	Cadmium	ICP-MS	6/6n	14	.	1.521	9.79	17.83	
Extract Metals, Nitric	Chromium	ICP-MS	6/6n	82	\$	47	2	6	
Extract Metals, Nitric	Cobatt	ICP-MS	₿/₿n	8	85	5	17	3.76	
Extract Metals, Nitric	Copper	ICP-MS	6/6n	113	91	6	86	33	
Extract Metals, Nitric	Lead	ICP-MS	₿/ϐn	126	120	102	116	ਲ	
Extract Metals, Nitric	Manganese	ICP-MS	6/6n	2,584	197	132	971	3,471	
Extract Metals, Nitric	Mercury	ICP-MS	B/Bn	8.782	1.784	< 1.853	3.83	10.71	89% 9%
Extract Metals, Nitric	Molybdenum	ICP-MS	₿/₿n	72	8	2	72	7	
Extract Metals, Nitric	Nickel	ICP-MS	₿/₿n	ક્ક	83	ន	2	46	
Extract Metals, Nitric	Selenium	ICP-MS	B/Bn	× 24 ×		83	< 23.26	:	100%
Extract Metals, Nitric	Vanadium	ICP-MS	₿/₿n	325	339	152	272	52	
Extract Metals, Gastric	Artimony	ICP-MS	₿/₿'n	1.024	0.769	1.068	0.95	0.40	
Extract Metals, Gastric	Arsenic	ICP-MS	6/6n	> 0.668	0.629	× 0.684	> 0.66	:	100%
Extract Metals, Gastric	Barium	ICP-MS	₿/₿'n	115	129	132	125	ଷ	
Extract Metals, Gastric	Beryllium	ICP-MS	6/6n	2.829	2.909	2.416	2.72	99.0	
Extract Metals, Gastric	Boron	ICP-MS	6/6n	198	792	814	822	88	
Extract Metals, Gastric	Cadmium	ICP-MS	₿/₿n	4.803	7.294	5.486	5.86	3.20	
				ESP Outlet - Page	e 5				

Gas Stream Data

SAMPLE STREAM: ESP OUTLET

Analyte		Analytical		Run	Run	Run		% 6	Z
Group	Specie	Method	Units	1	2	67	Average	ច	Ratio
Extract Motels Contries	į	9	•	;	•				
Extract metals, Gasing	Chromain	CF-MX	ng/g	25	83	4	ĸ	18	
Extract Metals, Gastric	Cobalt	ICP-MS	g/gu	5.432	6.286	4.678	5.47	2.00	
Extract Metals, Gastric	Copper	ICP-MS	6/6n	ଞ୍ଚ	96	83	8	673	
Extract Metals, Gastric	Lead	ICP-MS	g/gu	8	35	8	8	707	
Extract Metals, Gastric	Manganese	ICP-MS	6/6n	64	84	4	\$	10.69	
Extract Metalls, Gastric	Mercury	ICP-MS	₿⁄₿'n	0.479	0.345	0.318	850	22	
Extract Metals, Gastric	Motybdenum	ICP-MS	ō/ōn	62	8	95	3	11 70	
Extract Metals, Gastric	Nickel	ICP-MS	ō/6n	88	47	8 8	;	3	
Extract Metals, Gastric	Selentum	ICP-MS	0,6n	17	7	5 9	3 €	£ 8.83	
Extract Metals, Gastric	Vanadium	ICP-MS	6/6n	127	152	68	12.27	78.53	
Extract Metals, Acetic	Antimony	ICP-MS	₿/₿∩	1.023	0.882	0.721	0.88	0.38	
Extract Metals, Acetic	Arsenic	ICP-MS	5/50	5.183	2.711	2.250	8	392	
Extract Metals, Acetic	Barium	ICP-MS	6/6n	5	88	49	4 1	13.45	
Extract Metals, Acetic	Beryllium	ICP-MS	B/Gn	1.197	0.976	0.769	96.0	0.53	
Extract Metals, Acetic	Boron	ICP-MS	B/Bn	677	1000	942	206	284	
Extract Metals, Acetic	Cadmium	ICP-MS	6/6n	3,243	22	3.394	9.57	26.91	
Extract Metals, Acetic	Chromium	(CP-MS	6/6n	21	. 21	16	19.47	7.19	
Extract Metals, Acetic	Cobalt	ICP-MS	6/6n	4.566	9.437	4.058	6.02	7.38	
Extract Metals, Acetic	Copper	ICP-MS	6/6n	19	19	16	17.90	4.94	
Extract Metaks, Acetic	Lead	ICP-MS	6/6n	1.950	1.220	1.317	1.50	96.0	
Extract Metals, Acetic	Manganese	ICP-MS	6/6n	38	£	98	88	8.45	
Extract Metals, Acetic	Mercury	ICP-MS	6/6n	0.309	0.019 J	0.077 J	0.13	0.38	
Extract Metals, Acetic	Molybdenum	ICP-MS	6/6n	9.913	1.379	2.010	4.43	11.81	
Extract Metals, Acetic	Nickel	ICP-MS	6/6n	23	83	23	83	1.03	
Extract Metals, Acetic	Selenium	ICP-MS	8/6n	3.938	2.786	5.471	4.07	3.35	
Extract Metals, Acetic	Vanadium	ICP-MS	₿/ôn	9.440	2.758	1.856	4.68	10.29	
Metals by Size, > 10 um	Aluminum	SW 6010	₿/6n	70,100	99,700	79,300	72,033	16.195	
Metals by Size, > 10 um	Antimony	ICP-MS	6/6n	3.58	2.74	3.17	3.17	10.	
Metals by Size, > 10 um	Arsenic	SW 7060	6/6n	82	4	6	64	72	
			ш	ESP Outlet - Page	30e S				
			l	•					

Analyte		Analytical		Run	Run	Run		96%	ដ
Group	Specie	Method	Units	1	2	8	Average	ਠ	Ratio
;			1	Ş	,	Ş	Ş	Ş	
Metals by Size, > 10 um	Barlum	SW 6010	5/6n	409	झे	4 74	285	5	
Metals by Size, > 10 um	Beryllium	SW 6010	6/6n	1 8	40.4	8.05	5	18	
Metals by Size, > 10 um	Cadmium	SW 7131	6/6n	4.03	2.76	4.03	3.61	1.82	
Metals by Size, > 10 um	Calcium	SW 6010	6/6n	15,800	12,800	13,500	14,033	3,899	
Metals by Size, > 10 um	Chromium	SW 6010	₿/ɓn	197	219	223	213	ક્ષ	
Metals by Size, > 10 um	Cobalt	SW 6010	6/6n	4	92	93	32	6	
Metals by Size, > 10 um	Copper	SW 6010	5/6n	117	3	35	102	83	
Metals by Size, > 10 um	tron	SW 6010	5/6n	95,000	203,000	169,000	155,667	137,187	
Metals by Size, > 10 um	Lead	SW 7421	5/6n	98	62	88	2	ਲ	
Metals by Size, > 10 um	Magnesium	SW 6010	6/6n	3,000	3,920	4,270	3,730	1,630	
Metals by Size, > 10 um	Manganese	SW 6010	6/6n	536	1,160	723	727	1,070	
Metals by Size, > 10 um	Mercury	SW 7471	6/ 6 n	0.59	09'0	0.45	0.55	0.21	
Metals by Size, > 10 um	Molybdenum	SW 6010	5/Sn	94	37	47	43	13	
Metals by Size, > 10 um	Nickel	SW 6010	6/Sn	174	50	109	129	86	
Metals by Size, > 10 um	Phosphorus	SW 6010	₿/₿'n	s 71	۰ ۲	× 74	× 71	;	100%
Metals by Size, > 10 um	Potassium	SW 6010	6/6n	15,500	13,300	15,000	14,600	2,865	
Metals by Size, > 10 um	Selenium	SW 7740	₿/Bri	9/	245	ফ্র	158	210	
Metals by Size, > 10 um	Silicon	SW 6010	6/6n	207,000	145,000	174,000	175,333	27,068	
Metals by Size, > 10 um	Sodium	SW 6010	₿/Bn	7,310	4,640	4,450	5,467	3,973	
Metals by Size, > 10 um	Strontium	SW 6010	6/6n	306	267	305	76 2	88	
Metals by Size, > 10 um	Tifanium	SW 6010	6/6n	6,170	4,640	4,940	5,250	2,014	
Metals by Size, > 10 um	Vanadium	SW 6010	6/đn	340	247	272	286	120	
Metals by Size, > 10 um	Zinc	SW 6010	B/6n	517	346	378	414	828	
Metals by Size, 10 - 3 um	Aluminum	SW 6010	6/6n	75,800	119,000	120,000	104,933	62,693	
Metals by Size, 10 - 3 um	Anlimony	ICP-MS	5/6n	8.95	8.65	8.12	8.57	1 .85	
Metals by Size, 10 - 3 um	Arsenic	SW 7060	6/6n	132	124	125	127	=	
Metals by Size, 10 - 3 um	Barium	SW 6010	6/6n	603	899	616	623	8	
Metals by Size, 10 - 3 um	Beryllium	SW 6010	₿/ôn	83	5	15	8	5	
Metals by Size, 10 - 3 um	Cadmium	SW 7131	6/6n	12	9	9	=	2.39	
Metals by Size, 10 - 3 um	Calcium	SW 6010	₫/gu	13,500	14,700	13,700	13,967	1,597	
				ESP Outlet - Page	- Page 7				

Gas Stream Data

SAMPLE STREAM: ESPOUTLET

Analyte		Analytical		Run	Run	Run		%96	占
Group	Specie	Method	Units	-	2	6	Average	ਠ	Ratio
Metals by Size, 10 - 3 um	Chromium	SW 6010	6/6n	282	297	246	275	ß	
Metals by Size, 10 - 3 um	Coball	SW 6010	₿/₿n	S	S S	84	5	₽	
Metals by Size, 10 - 3 um	Copper	SW 6010	6/6n	165	187	157	170	ස	
Metals by Size, 10 - 3 um	Iron	SW 6010	6/6n	006'09	009'69	28,700	63,067	14,320	
Metals by Size, 10 - 3 um	Lead	SW 7421	6/6n	193	190	189	191	5.17	
Metals by Size, 10 - 3 um	Magnesium	SW 6010	6/6n	3,190	009'9	5,100	4,963	4,246	
Metals by Size, 10 - 3 um	Manganese	SW 6010	6/6n	253	334	255	281	115	
Metals by Size, 10 - 3 um	Mercuny	SW 7471	6/6n	97.0	< 0.48	0.36	< 0.48	;	18%
Metals by Size, 10 - 3 um	Molybdenum	SW 6010	6/6n	8	&	70	8	53	
Metals by Size, 10 - 3 um	Nickel	SW 6010	6/6n	245	192	197	211	23	
Metals by Size, 10 - 3 um	Phosphorus	SW 6010	6/6n	193	220	272	228	8	
Metals by Size, 10 - 3 um	Potassium	SW 6010	6/6n	18,500	24,300	21,100	21,300	7,217	
Metals by Size, 10 - 3 um	Selenium	SW 7740	₿/6n	28	8	3	\$	ဆ	
Metals by Size, 10 - 3 um	Silicon	SW 6010	6/6n	211,000	227,000	216,000	218,000	20,335	
Metals by Size, 10 - 3 um	Sodium	SW 6010	6/6n	8,080	8,420	7,280	7,927	1 .	
Metals by Size, 10 - 3 um	Strontium	SW 6010	6/6n	319	413	363	365	117	
Metals by Size, 10 - 3 um	Titanium	SW 6010	6/6n	6,540	7,220	6,810	6,857	821	
Metals by Size, 10 - 3 um	Vanadium	SW 6010	6/6n	505	548	475	206	6	
Metals by Size, 10 - 3 um	Zinc	SW 6010	6/6n	1,090	1,120	1,030	1,080	114	
Metals by Size, < 3 um	Aluminum	SW 6010	6/6n	123,000	125,000	117,000	121,667	10,343	
Metals by Size, < 3 um	Antimony	ICP-MS	6/6n	13.10	13.78	13.17	13	,	
Metals by Size, < 3 um	Arsenic	SW 7060	6/6n	183	198	226	202	25	
Metals by Size, < 3 um	Barium	SW 6010	5/Sn	773	782	719	758	82	
Metals by Size, < 3 um	Beryllium	SW 6010	6 /6n	4	4	18	15	5.02	
Metals by Size, < 3 um	Cadmium	SW 7131	6/6n	23	83	17	21	8.04	
Metals by Size, < 3 um	Calcium	SW 6010	6/6n	17,100	16,000	15,400	16,167	2,142	
Metals by Size, < 3 um	Chromium	SW 6010	6/6n	326	784	528	290	84	
Metals by Size, < 3 um	Cobatt	SW 6010	5/6n	69	88	22	64	15	
Metals by Size, < 3 um	Copper	SW 6010	6/6n	332	222	2	250	2	
Metals by Size, < 3 um	Iron	SW 6010	6/6n	70,300	67,000	66,500	67,933	5,130	
				ESP Outlet - Page	age 8				
				; 					

Gas Stream Data

SAMPLE STREAM: ESPOUTLET

Analyte		Analytical			Run		Run		Run			86%	2
Group	Specie	Method	Units		-	-	2	ĺ	6		Average	5	Ratio
Metals by Size, < 3 um	Lead	SW 7421	5/6n		311		236		124		224	234	
Metals by Size, < 3 um	Magnesium	SW 6010	6/6n		7,870		080'		,160		6,703	3,462	
Metals by Size, < 3 um	Manganese	SW 6010	6/6n		327		325		306		319	83	
Metals by Size, < 3 um	Mercury	SW 7471	6/6n		44.0		0.32		0.40		0.39	0.15	
Metals by Size, < 3 um	Molybdenum	SW 6010	6/8n		138		117		86		118	6	
Metals by Size, < 3 um	Nickel	SW 6010	5/Bn		259		727		220		235	25	
Metals by Size, < 3 um	Phosphorus	SW 6010	6/6n		528		773	_	,160		820	792	
Metals by Size, < 3 um	Potassium	SW 6010	₿/Bin		25,100	N	2,500	7	0,500		22,700	5,730	
Metals by Size, < 3 um	Selenium	SW 7740	6/6n		79		55		2 5		8	a	
Metals by Size, < 3 um	Silicon	SW 6010	6/6n		213,000	×	000'60	÷	9,000		207,000	17,915	
Metals by Size, < 3 um	Sodium	SW 6010	6/Bn		9,490		3,240	1-	,210		8,313	2,837	
Metals by Size, < 3 um	Strontium	SW 6010	5/60		460		439		389		429	5	
Metals by Size, < 3 um	Titanium	SW 6010	6/6n		6,880	•	3,820	•	096'		6,887	174	
Metals by Size, < 3 um	Vanadium	SW 6010	6/6n		852		781		899		191	231	
Metals by Size, < 3 um	Zinc	SW 6010	6/6n		1,790	•	1,580	-	,570		1,647	306	
Organics, Aldehydes	Acetaldehyde	BIF-0011	ug/Nm3		2.38		1.22		0.14		1.24	2.78	
Organics, Aldehydes	Fomaldehyde	BIF-0011	ug/Nm3		1.01		0.40		0.11		0.50	1.15	
		02007910	6.11	,	Ş	,			Š	,	7 9 9		7000
Organics, Semi-Volatile	1,2,4,5-1 etrachioropenzene	0/70 AAS	CHIN/BU	v	701	v	8		2	v	<u> </u>	:	ŝ
Organics, Semi-Volatile	1,2,4-Trichlorobenzene	SW 8270	ng/Nm3	٧	186	v	184		197	v	189	;	
Organics, Semi-Volatile	1,2-Dichlorobenzene	SW 8270	ng/Nm3	v	245	v	243		213	v	234	:	100%
Organics, Semi-Volatile	1,2-Diphenylhydrazine	SW 8270	ng/Nm3	v	31,477	က v	471,1	e,	3,586	v	32,079	;	100%
Organics, Seml-Volatile	1,3-Dichlorobenzene	SW 8270	ng/Nm3	v	2 2	v	123		241	v	窓	;	100%
Organics, Semi-Volatile	1,4-Dichlorobenzene	SW 8270	ng/Nm3	v	254	v	252		197	v	235	;	100%
Organics, Semi-Volatile	1-Chloronaphthalene	SW 8270	ng/Nm3	v	203	v	201		180	v	195	:	100%
Organics, Semi-Volatile	1-Naphthylamine	SW 8270	ng/Nm3	٧	491	v	486		682	v	553	:	100%
Organics, Semi-Volatile	2,3,4,6-Tetrachlorophenol	SW 8270	ng/Nm3	v	158	v	157 <		156	v	157	:	100%
Organics, Semi-Volatile	2,4,5-Trichlorophenol	SW 8270	ng/Nm3	٧	104	v	103		171	v	126	;	100%
Organics, Semi-Volatile	2,4,6-Trichlorophenol	SW 8270	ng/Nm3	v	110	v	109 A		170	v	130	;	100%
Organics, Semi-Volatile	2,4-Dichlorophenol	SW 8270	ng/Nm3	v	139	v	138		191	v	156	:	400%
				ESP	Outlet - Page	ge 9							

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Gas Stream Data

SAMPLE STREAM: ESPOUTLET

Analyte		Analytical			Run		Run		Run			36 %	5
Group	Specie	Method	Units		1		2		60		Average	ಶ	Ratio
Organics, Semi-Volatile	2,4-Dimethylphenol	SW 8270	ng/Nm3	٧	346	v	343	v	437	v	375	:	100%
Organics, Semi-Volatile	2,4-Dinitrophenol	SW 8270	ng/Nm3	٧	2,203	٧	2,182	٧	. .	v	1,930	:	100%
Organics, Semi-Volatile	2,4-Dinitrotoluene	SW 8270	ng/Nm3	٧	173	٧	171	v	198	v	181	:	100%
Organics, Semi-Votatile	2,6-Dichlorophenol	SW 8270	ng/Nm3	٧	228	v	225	٧	172	v	208	;	100%
Organics, Semi-Volatile	2,6-Dinitrotoluene	SW 8270	ng/Nm3	٧	60	٧	108	٧	289	v	169	:	100%
Organics, Semi-Votatile	2-Chloronaphthalene	SW 8270	ng/Nm3	v	102	v	101	٧	132	v	112	;	100%
Organics, Semi-Volatite	2-Chtorophenol	SW 8270	ng/Nm3	٧	240	٧	238	٧	213	v	231	:	100%
Organics, Semi-Volatile	2-Methylnaphthalene	SW 8270	ng/Nm3	٧	208	v	206	٧	122	٧	67)	:	100%
Organics, Semi-Volatile	2-Methylphenol(o-cresol)	SW 8270	ng/Nm3		2,487		2,837		10,378		5,234	11,076	
Organics, Semi-Volatile	2-Naphthylamine	SW 8270	ng/Nm3	٧	614	٧	608	v	537	v	586	;	100%
Organics, Semi-Volatile	2-Nitroaniline	SW 8270	ng/Nm3	v	127	٧	125	v	23	٧	158 821	:	100%
Organics, Semi-Volatile	2-Nitrophenol	SW 8270	ng/Nm3	v	138	v	137	v	175	v	150	;	100%
Organics, Semi-Volatile	2-Picotine	SW 8270	ng/Nm3	v	343	٧	340	~	278	•	320	;	100%
Organics, Semi-Volatile	3,3'-Dichlorobenzidine	SW 8270	ng/Nm3	v	154	٧	153	٧	112	•	140	:	100%
Organics, Semi-Volatile	3-Methylcholanthrene	SW 8270	ng/Nm3	٧	246	٧	244	v	168	v	219	;	100%
Organics, Semi-Volatile	3-Nitroaniline	SW 8270	ng/Nm3	•	160	٧	159	v	132	v	150	;	400%
Organics, Semi-Volatile	4,6-Dinitro-2-methylphenol	SW 8270	ng/Nm3	v	249	٧	247	v	144	v	214	;	100%
Organics, Semi-Volatile	4-Aminobiphenyl	SW 8270	ng/Nm3	v	235	v	233	~	400	v	289	:	100%
Organics, Semi-Volatile	4-Bromophenyl phenyl	SW 8270	ng/Nm3	٧	144	v	142	v	163	•	149	:	100%
Organics, Semi-Volatile	4-Chloro-3-methylphenol	SW 8270	ng/Nm3	v	228	ν	225	v	173	v	509	;	100%
Organics, Semi-Volatile	4-Chlorophenyl phenyl ether	SW 8270	ng/Nm3	v	166	v	1	~	141	v	157	:	100%
Organics, Semt-Volatite	4-Methyiphenol(p-cresol)	SW 8270	ng/Nm3		2,068		1,443		1,679		1,730	784	
Organics, Semi-Volatile	4-Nitroaniline	SW 8270	ng/Nm3	٧	152	v	151	•	204	v	169	:	100%
Organics, Semi-Volatile	4-Nitrophenol	SW 8270	ng/Nm3	v	218	v	215	v	315	v	249	;	100%
Organics, Semi-Volatile	7,12-Dimethylbenz(a)anthracene	SW 8270	ng/Nim3	v	604	v	599	v	74	v	220	:	100%
Organics, Semi-Volatile	Acenaphthene	SW 8270	ng/Nm3	v	150	ν	149	v	94	v	130	:	100%
Organics, Semi-Volatile	Acenaphthylene	SW 8270	ng/Nm3	v	7	v	2	v	45	•	¥	:	100%
Organics, Semi-Volatile	Acetophenone	SW 8270	ng/Nm3		3,525		2,930		3,322		3,259	751	
Organics, Semi-Volatile	Aniline	SW 8270	ng/Nm3	v	294	٧	291	v	207	•	7 <u>9</u> 2	;	100%
Organics, Semi-Volatile	Anthracene	SW 8270	ng/Nm3	•	183	ν	181	•	124	•	惡	:	100%
Organics, Semi-Volatile	Benzidine	SW 8270	ng/Nm3	v	6,295	ν	6,235	v	6,717	v	6,416	:	100%
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SAMPLE STREAM: ESP OUTLET

Analyte	Analytical			Run		Run		Run			%96	占
Specie	Method	Units		-		2		6		Average	5	Ratio
Benzo(a)anthracene	SW 8270	ng/Nm3	٧	162	v	161	v	151	v	158	;	100%
Benzo(a)pyrene	SW 8270	ng/Nm3	٧	121	٧	119	v	174	V	138	;	100%
Benzo(b)fluoranthene	SW 8270	ng/Nm3	٧	179	v	171	v	305	v	220	;	100%
Benzo(g,h,l)perylene	SW 8270	ng/Nm3	٧	153	٧	152	V	343	v	216	:	100%
Benzo(k)/luoranthene	SW 8270	ng/Nm3	٧	305	٧	302	v	336	٧	314	1	100%
Benzoic acid	SW 8270	ng/Nm3		123,074		105,679		160,875		129,876	70,107	
Benzył alcohol	SW 8270	ng/Nm3		12,685	٧	337	V	205		4,319	18,001	7 %
Butylbenzylphthalate	SW 8270	ng/Nm3		409		324		274		336	170	
Chrysene	SW 8270	ng/Nm3	٧	211	v	500	V	180	v	200	:	100%
Di-n-octy/phthalate	SW 8270	ng/Nm3	٧	287	٧	284	٧	118	v	230	:	100%
Dibenz(a,h)anthracene	SW 8270	ng/Nm3	٧	149	٧	148	V	272	٧	190	:	100%
Dibenz(a,j)acridine	SW 8270	ng/Nm3	٧	183	٧	181	٧	283	•	216	;	100%
Dibenzofuran	SW 8270	ng/Nm3	v	128	٧	127	v	180	v	145	:	100%
Dibutyiphthalate	SW 8270	ng/Nm3	V	155		209	٧	109	v	155	;	39%
Diethyiphthalate	SW 8270	ng/Nm3		434	v	501	٧	173		191	525	24%
Dimethylphenethylamine	SW 8270	ng/Nm3	٧	37,772	v	37,409	v	40,303	v	38,494	;	100%
Dimethylphthalate	SW 8270	ng/Nm3	٧	88	٧	87	V	113	v	8	ţ	100%
Diphenylamine	SW 8270	ng/Nm3	٧	166	٧	2 81	V	93	٧	141	;	100%
Ethyl methanesulfonate	SW 8270	ng/Nm3	٧	158	٧	157	v	228	•	181	;	100%
Fluoranthene	SW 8270	ng/Nm3	v	201	٧	199	v	158	•	186	•	100%
Fluorene	SW 8270	ng/Nm3	٧	901	٧	501	٧	128	V	113	;	100%
Hexachlorobenzene	SW 8270	ng/Nm3	٧	74	v	73	V	1 05	v	7	;	100%
Hexachlorobutadiene	SW 8270	ng/Nm3	٧	220	v	218	v	172	v	203	;	100%
Hexachlorocyclopentadiene	SW 8270	ng/Nm3	٧	2,808	٧	2,781	v	1,978	v	2,522	:	100%
Hexachloroethane	SW 8270	ng/Nm3	v	187	V	185	٧	213	٧	195	;	100%
Indeno(1,2,3-cd)pyrene	SW 8270	ng/Nm3	٧	391	v	\$	v	447	v	259	;	100%
isophorone	SW 8270	ng/Nm3	٧	8	٧	8	v	207	v	129	:	100%
Methyl methanesulfonate	SW 8270	ng/Nm3	٧	15,738	٧	15,587	v	16,793	•	16,039	;	100%
N-Nitroso-di-n-butylamine	SW 8270	ng/Nm3	٧	412	v	408	v	211	V	344	:	100%
N-Nitrosodimethylamine	SW 8270	ng/Nm3	٧	419	٧	415	V	26 <u>4</u>	v	36c	:	100%
N-Nitrosodiphenylamine	SW 8270	ng/Nm3	٧	178	٧	176	٧	06	v	148	:	100%
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Gas Stream Data

SAMPLE STREAM: ESP OUTLET

占	Ratio	100%	9	3		100%	100%	100%	100%	100%	100%		100%	100%	100%	100%	100%	100%		100%	100 %		100%	100%	100 %	100%	100%	100%	100%	100%	100%	100%	
%96 8	ਠ	;		; ;	1,025	;	•	:	;	;	;	14,959	:	:	;	:	!	;	41,311	:	:	84	:	:	;	:	;	;	:	;	;	:	
	Average	230	790	ţ :	1,097	502	134	587	280	156	182	8,541	181	143	308	185	196	241	14,853	30	189	289	528	528	228	528	228	528	528	228	528	2,642	
		٧	•	,		v	v	v	v	v	v		v	v	٧	v	v	v		v	•		٧	v	v	٧	v	V	٧	v	v	v	
Run	8	88	Ę	3	1,562	283	126	8	533	13	157	15,449	18	137	197	2 6	129	768	33,922	22 0	244	806	537	537	537	537	537	537	537	537	537	2,683	
		٧	,	,		v	٧	٧	v	v	٧		v	٧	٧	v	v	٧		v	•		٧	v	٧	٧	¥	٧	٧	v	٧	¥	
Run	2	334	į	t	773	165	138	645	593	168	19	2,767	230	146	362	175	228	226	3,367	174	161	269	536	236	536	536	536	536	536	536	536	2,681	12
		٧	,	,		v	V	٧	v	v	٧		v	٧	٧	v	V	V		v	٧		v	v	٧	v	v	v	v	٧	v	٧	Page
Run	-	236	2	167	957	166	139	652	272	170	961	4,407	233	147	365	171	230	522	7,271	176	162	757	512	512	512	512	512	512	512	512	512	2,561	Outlet - Page
	1	٧	,	,		٧	٧	٧	٧	v	v		V	v	٧	v	v	٧		v	٧		٧	٧	v	٧	V	٧	٧	٧	٧	v	ESP
	Units	5mW/va		SING	ng/Nm3	ng/Nm3	ng/Nm3	ng/Nm3	ng/Nm3	ng/Nm3	ng/Nm3	ng/Nm3	ng/Nm3	ng/Nm3	ng/Nm3	ng/Nm3	ng/Nm3	ng/Nm3	ng/Nm3	ng/Nm3	ng/Nm3												
Analytical	Method	SW 8270	0.000	0170 AAC	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240												
	Specie	N_Nitroextinguation		N-INITIOSOPIDALIQUE	Naphthalene	Nitrobenzene	Pentachlorobenzene	Pentachtoronitrobenzene	Pentachlorophenol	Phenacetin	Phenanthrene	Phenol	Pronamide	Pyrene	Pyridine	bis(2-Chloroethoxy)methane	bis(2-Chloroethyl)ether	bis(2-Chloraisopropyl)ether	bis(2-Ethylhexyl)phthalate	p-Chloroaniline	p-Dimethylaminoazobenzene	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2-Butanone	
Analyte	Group	Occasion Comi Molatila	Cigamos, company	Organics, semi-voration	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Semi-Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	,

Gas Stream Data

SAMPLE STREAM: ESP OUTLET

Analyte		Analytical			Run		Run		Run			86%	占
Group	Specie	Method	Units		-		2		6		Average	5	Ratio
Organics, Volatile	2-Hexanone	SW 8240	ng/Nm3	٧	2,561	v	2,681	v	2,683	v	2,642	:	100%
Organics, Volatile	4-Methyl-2-Pentanone	SW 8240	ng/Nm3	v	2,561	ν	2,681	٧	2,683	٧	2,642	:	100%
Organics, Volatile	Acetone	SW 8240	ng/Nm3	٧	2,561	v	2,681	٧	2,683	v	2,642	;	100%
Organics, Volatile	Benzene	SW 8240	ng/Nm3		1,366		1,555		1,502		1,474	243	
Organics, Volatile	Bromodichloromethane	SW 8240	ng/Nm3	v	512	٧	536	v	537	v	528	;	100%
Organics, Volatile	Bromoform	SW 8240	ng/Nm3	v	512	٧	536	v	537	v	528	:	100%
Organics, Volatile	Bromomethane	SW 8240	ng/Nm3	v	654	٧	536	٧	537	v	576	;	100%
Organics, Volatile	Carbon Disulfide	SW 8240	ng/Nm3		2,356		6,901		948		3,402	7,730	
Organics, Volatile	Carbon Tetrachloride	SW 8240	ng/Nm3	٧	512	v	536	v	537	v	528	;	100%
Organics, Volatile	Chlorobenzene	SW 8240	ng/Nm3	v	512	٧	536	v	537	v	528	;	100%
Organics, Volatile	Chloroethane	SW 8240	ng/Nm3	٧	512	٧	536	v	537	v	528	:	100%
Organics, Volatile	Chloroform	SW 8240	ng/Nm3	٧	512	٧	536	٧	537	v	528	:	100%
Organics, Volatile	Chloromethane	SW 8240	ng/Nm3	٧	512	v	536	v	537	v	528	:	100%
Organics, Votatile	Dibromochloromethane	SW 8240	ng/Nm3	v	512	v	536	v	537	v	528	;	100%
Organics, Volatife	Ethyl Benzene	SW 8240	ng/Nm3	v	512	v	536	v	537	v	528	:	100%
Organics, Volatile	Methylene Chloride	SW 8240	ng/Nm3		18,300		47,739		31 659		32,566	36,621	
Organics, Volatile	Styrene	SW 8240	ng/Nm3	v	512	٧	536	v	537	v	528	:	100%
Organics, Volatile	Tetrachloroethene	SW 8240	ng/Nm3		1,021		786		644		817	473	
Organics, Volatile	Toluene	SW 8240	ng/Nm3		688		1,341		1,502		1,177	1,071	
Organics, Volatile	Trichloroethene	SW 8240	ng/Nm3	٧	512	v	536	v	537	v	528	:	100%
Organics, Volatile	- Trichlorofluoromethane	SW 8240	ng/Nm3	v	512		679	v	537	v	537	;	44%
Organics, Volatife	Vinyf Acetate	SW 8240	ng/Nm3	v	2,561	v	2,681	v	2,683	v	2,642	;	100%
Organics, Volatile	Vinyt Chloride	SW 8240	ng/Nm3	٧	512	v	536	v	537	v	528	;	100%
Organics, Volatile	cis-1,3-Dichloropropene	SW 8240	ng/Nm3	v	512	v	536	v	537	v	528	;	100%
Organics, Volatifie	m,p-Xylene	SW 8240	ng/Nm3		789	v	536	v	537	v	537	:	40%
Organics, Volatile	o-Xylene	SW 8240	ng/Nm3	٧	512	v	536	v	537	v	528	;	100%
Organics, Volatile	trans-1,2-Dichloroethene	SW 8240	ng/Nm3	٧	512	٧	536	v	537	v	528	;	100%
Organics, Volatile	trans-1,3-Dichloropropene	SW 8240	ng/Nm3	v	512	v	536	v	537	v	528	;	100%

Vote: Shaded data has been invalidated due to high background in filter substrate. Shaded data is not included in "average" data calculation.

ESP Outlet - Page 13

Analyte	i e	Analytical	Units		Run 1		Run		Run			Average	% T	DL
Particulate Loading		Grav	g/Nm3		0.0192		0.0118		0.0125			0.0145	0.0101	
	14	FOAC ACT	C 11(4) C 1		18 73	٥	ď	a	80	а		5	.	
Reduced Species	Ammonia as r	1.000	CHINIS		10.12	0		٥	00 00	0		7.1.	70.01	
Reduced Species	Cyanide	SW 9012	ug/Nm3		4.87		8.55		71.99			88	93.74	
Anions - Vapor Phase	Chloride	EPA 300.0	ug/Nm3		294		914		14			540	819	
Anions - Vapor Phase	Fluoride	EPA 340.2	ug/Nm3		126		86		150			124	8	
Anions - Vapor Phase	Sulfate	EPA 300.0	ug/Nm3	7	754,933		633,232		650,180			679,449	163,764	
Anions - Particulate	Chloride	EPA 300.0	ug/Nm3		345.2		203.6		93.4			214	314	
Anions - Particulate	Fluoride	EPA 340.2	ug/Nm3		0.057		0.063		0.032			0.051	0.041	
Anions - Particulate	Sulfate	EPA 300.0	ug/Nm3		9,961	80	4,121	80	3,633	6 0		5,905	8,748	
Anions - Total	Chloride	EPA 300.0	ug/Nm3		640		1,118		504			754	801	
Anions - Total	Fluoride	EPA 340.2	ug/Nm3		125.9		96.5		149.8			124	8	
Anions - Total	Sulfate	EPA 300.0	ug/Nm3	2	54,894		637,353		653,814			685,353	172,349	
Radionuclides	K-40 @ 1460 KeV	EPA 901.1	pCi/g	٧	26	v	8		29		v	82	ı	47%
Part Metais by Wt	Aluminum	SW 6010	5/5n		9807		14,330	æ	13,177	œ		13,754	7,328	
Part Metals by Wit	Antimony	ICP-MS	6/ 6 n		\$		4.22	œ	3.33	6		3.77	5.66	
Part Metals by Wt	Arsenic	SW 7060	6/6n		96	8	87	∞	76	80		₩	7	
Part Metals by Wt	Barium	SW 6010	6/6n	¥	2	6	303	6	126	80		214	1,120	
Part Metals by Wt	Beryllium	SW 6010	6/6n		8		3.11	ω	2.77			2.94	2.12	
Part Metals by Wt	Boron	SW 6010	₿/Bn	1		3	1		ŀ			:	:	
Part Metals by Wt	Cadmium	SW 7131	₿/Ĝn	¥		ú	32	æ	84	60		4	79	
Part Metals by Wt	Calcium	SW 6010	6/6n		988	153	16,154	8	21,087	₩		18,621	31,343	
Part Metals by Wt	Chromium	SW 6010	6/6n	v		6	93	60	265	8		329	2,995	
Part Metals by Wt	Cobalt	SW 6010	6/6n			e	18	7	< 37	ပ	v	37	;	52%
Part Metals by Wt	Copper	SW 6010	6/6n	٠			8	8	52	6 0		56	6	
Part Metals by Wt	Iron	SW 6010	₫/6n		8.478	14 2	9,994	æ	13,386	œ		11,690	21,547	
				Stac	Stack - Page	e 1								

Analytical Method
SW 742
SW 6010
SW 7471
SW 6010
SW 6010
SW 6010
SW 6010
SW 7740
SW 6010
ICP-MS
SW 7060
SW 6010
SW 6010
SW 7131
SW 6010
SW 7421
SW 6010
SW 6010
SW 7471

Analyte		Analytical			Run			Run			Run				%96 8	占
Group	Specie	Method	Units		-			2						Average	5	Ratio
		C14/ 6040	(A) and		į	0		9	٥		8	α		6	284	
Fair Interals by Vol	Mickel	SW 6010	(A) (A) (A)			1 0			ם מ		3 5) a		30 38	4	
Fair integris by Vol		344 0010					,	3 6	י כ	,	7 6	، د	,	350	F	4004
Part Metals by Vol	Phosphorus	SW 6010	LIGNAM3				v	7. 7.	٠	v	8.5	. ر	v	60.7	: ;	ę S
Part Metals by Vol	Potassium	SW 6010	ug/Nm3		E	0		36.01	-,		44.37	7		40.19	53.13	
Part Metals by Vol	Selenium	SW 7740	ug/Nm3		52.88	6		9.76	60		15.68	6 0		26.11	58.07	
Part Metals by Vol	Sodium	SW 6010	ug/Nm3		100	•		48.23	6		69.62	œ		58.93	136	
Part Metals by Vol	Strontium	SW 6010	ug/Nm3		980	•		1.22	89		1.77	8		1.49	3.51	
Part Metals by Vol	Titanium	SW 6010	ug/Nm3		50 11	•		12.45	6 0		12.55	80		12.50	0.59	
Part Metals by Vol	Vanadium	SW 6010	ug/Nm3		1.469	æ		1.55	8		1.83	8		1.61	0.468	
Part Metals by Vol	Zinc	SW 6010	ug/Nm3	¥	36	٥		7.75	8		92'9	60		7.26	6.27	
Metale Varior	Atuminam	SW 6010	EmN/pii		80	æ	٧	8.70	c	٧	7.59	U	٧	8.70	;	20 20 20
Metals Vanor	Antimony	ICP-MS	ua/Nm3		0.012	<u> </u>		0.012			0.013	- 60		0.012	0.0019	!
Metals, Vapor	Arsenic	SW 7060	ug/Nm3	٧	0.156	O	v	0.201	ပ	v	0.176	ပ	٧	0.178	:	100%
Metals, Vapor	Barium	SW 6010	ug/Nm3	v	0.126	ပ		0.113	_	٧	0.142	ပ	v	0.142	:	54%
Metals, Vapor	Beryflium	SW 6010	ug/Nm3	٧	0.131	ပ	v	0.170	ပ		0.032	~	v	0.170	:	82%
Metals, Vapor	Boron	SW 6010	ug/Nm3		468	60		412	60		4	8		4	2	
Metals, Vapor	Cadmium	SW 7131	ug/Nm3	v	0.056	ပ	٧	0.073	ပ	٧	0.063	ပ	٧	0.064	:	100%
Metals, Vapor	Calcium	SW 6010	ug/Nm3	v	35.09	ပ		34.91	~	v	39.57	ပ	v	39.57	:	27%
Metals, Vapor	Chromium	SW 6010	ug/Nm3	v	0.590	ပ	v	0.763	ပ	v	999.0	ပ	v	0.673	:	100%
Metals, Vapor	Cobalt	SW 6010	ug/Nm3		0.218	7		0.211	_		0.751	_		0.394	0.770	
Metals, Vapor	Copper	SW 6010	ug/Nm3		2.32	6		0.910	_	v	1.02	ပ		1.25	2.36	14%
Metals, Vapor	lron	SW 6010	ug/Nm3		1.71	8	v	1.83	ပ	v	1.59	ပ	v	1.83	;	%0%
Metals, Vapor	Lead	SW 7421	ug/Nm3	٧	0.190	ပ	v	0.245	ပ	v	0.214	ပ	٧	0.216	:	100%
Metals, Vapor	Magnesium	SW 6010	ug/Nm3		5.55	8	v	6.98	ပ		5.27	-,	v	86.98	:	24%
Metals, Vapor	Manganese	SW 6010	ug/Nm3	v	0.094	ပ	v	0.121	ပ	v	0.106	ပ	v	0.107	1	400%
Metals, Vapor	Mercury	CVAA	ug/Nm3		2.92	6		3.13	8		3.07	8		3.04	0.269	
Metals, Vapor	Molybdenum	SW 6010	ug/Nm3		0.12	7		0.13	~		0.10	_		0.116	0.048	
Metals, Vapor	Nickel Nickel	SW 6010	ug/Nm3	v	2.34	ပ		2.88	_	v	2.64	ပ	v	2.64	;	46%
Metals, Vapor	Phosphorus	SW 6010	ug/Nm3	v	14.46	ပ	v	18.68	ပ	٧	16.31	ပ	v	16.48	;	100%
Metals, Vapor	Potassium	SW 6010	ug/Nm3		32.28	6	٧	98.0	ပ		77.56	8		36.76	96.28	0.4%
				Sta	Stack - Page	ge 3										

Analyte		Analytical			Run			Run			Run				%96	占
Group	Specie	Method	Units		-			~	1					Average	5	Ratio
Metals, Vapor	Selenium	SW 7740	ug/Nm3		0.11	7		0.84	80		1.40	æ		0.781	1.61	
Metals, Vapor	Sodium	SW 6010	ug/Nm3	٧	9.41	ပ	v	12.16	ပ	v	10.61	ပ	v	10.73	:	100%
Metals, Vapor	Stronfium	SW 6010	ug/Nm3	٧	0.0	ပ	٧	9.05	ပ	v	0.04	ပ	٧	0.045	;	100%
Metals, Vapor	Titanium	SW 6010	ug/Nm3	v	0.242	ပ		0.190	_	v	.273	ပ	v	0.273	:	58%
Metals, Vapor	Vanadium	SW 6010	ug/Nm3		0.422	7		0.420	7	0	.821	8		0.554	0.574	
Metals, Vapor	Zinc	SW 6010	ug/Nm3		1.1	æ		373	6 0		114	60		163	474	
Total Metals	Aluminum	SW 6010	ug/Nm3		41.53			175			215			36	251	
Total Metals	Antimony	ICP-MS	ug/Nm3		619			90.0			0.07			0.065	0.026	
Total Metals	Arsenic	SW 7060	ug/Nm3		1.13			1.13			06.1			1.19	0.236	
Total Metals	Barium	SW 6010	ug/Nm3	V	9			3.72			5.09			2.906	10.351	
Total Metals	Beryllium	SW 6010	ug/Nm3	¥	930			0.12			90.0			0.099	0.288	
Total Metals	Boron(vapor only)	SW 6010	ug/Nm3	700000000000000000000000000000000000000	4 68			412			₹			4	20	
Total Metals	Cadmium	SW 7131	ug/Nm3	v	011			0.46			0.79			0.625	2.152	
Total Metals	Catcium	SW 6010	ug/Nm3		151			228			357			292	825	
Total Metals	Chromium	SW 6010	ug/Nm3	v	441			1.49		-	9.37			5.431	50.05	
Total Metals	Cobatt	SW 6010	ug/Nm3		88			0.42			50.			0.735	4.000	
Total Metals	Copper	SW 6010	ug/Nm3		3			1.62			1.34			1.480	1.784	
Total Metals	lron	SW 6010	ug/Nm3		93)			120			215			1 68	603	
Total Metals	Lead	SW 7421	ug/Nm3	٠	0.00			0.57			0.65			0.610	0.543	
Total Metals	Magnesium	SW 6010	ug/Nm3		88			29.62		•	3.32			44.97	233	
Total Metals	Manganese	SW 6010	ug/Nm3		3.			3.46		_	1.1			7.284	48.623	
Total Metals	Mercury	SW 7471	ug/Nm3		282			3.14			3.07			3.107	0.439	
Total Metals	Molybdenum	SW 6010	ug/Nm3		5 4 0			1.32			1.70			1.512	2.393	
Total Metals	Nickel	SW 6010	ug/Nm3		S			4.4		-	5.52			41.48	£3	
Total Metals	Phosphorus	SW 6010	ug/Nm3		986		v	10.63		v	9.45		v	10.04	;	100%
Total Metals	Potassium	SW 6010	ug/Nm3		85,			36.44			122			79.19	543	
Total Metals	Selenium	SW 7740	ug/Nm3		52.99			10.60		_	7.08			27	27	
Total Metals	Sodium	SW 6010	ug/Nm3		271			54.31		,-	4.93			64.62	131	
Total Metals	Strontium	SW 6010	ug/Nm3		880			1.24			1.79			1.517	3.486	
Total Metals	Titanium	SW 6010	ug/Nm3		79			12.64		_	2.68			12.66	0.255	
				Sta	Stack - Page 4	ge 4										

Analyte		Analytical			Ren		•	Run		Run	e			%96	겁
Group	Specie	Method	Units		-			7					Average	5	Ratio
Total Metals	Vanadium	SW 6010	ug/Nm3		1.89		_	97		2.6	ю		2.17	40.	
Total Metals	Zinc	SW 6010	ug/Nm3				8	380.73		120.36	88		52	2 8.	
Hg Vapor, Bloom	Mercury, Elemental	CVAFS	ug/Nm3		2.98		63	8		22	a		2.78	1.07	
Hg Vapor, Bloom	Mercury II	CVAFS	ug/Nm3		0.33			.47		0.60	0		0.468	0.335	
Hg Vapor, Bloom	Mercury, Methyl	CVAFS	ug/Nm3		0.045		O	061		0.0	9 0		0.044	0.041	
Hg Vapor, Bloom	Mercury, Total	CVAFS	ug/Nm3		3.36		60	3.62		2.9	~		3.30	0.88	
Hexavalent Chromium	Chromium VI	Cr(VI) BIF	ug/Nm3	٧	0.18	v	v					٧	0.190	;	100%
Hexavalent Chromium	Total Chromium	SW 7191	ug/Nm3	٧	0.52	ပ	v	0.57	v O	0.59	ပ	٧	0.560	;	100%
Extract Metals, Nitric	Antimony	ICP-MS	₿/6n				ιci	782					5.78	:	
Extract Metals, Nitric	Arsenic	ICP-MS	8/ 6 n	ì			-	2				***	3	;	
Extract Metals, Nitric	Barium	ICP-MS	6/ 6 n				(,)	7				200	354	:	
Extract Metals, Nitric	Beryllium	ICP-MS	6/6n				ţ	250					10.25	;	
Extract Metals, Nitric	Boron	ICP-MS	6/6n				v	5				v ****	15.34	:	100%
Extract Metals, Nitric	Cadmium	ICP-MS	₿/₿n	·				75					67.00	:	
Extract Metals, Nitric	Chromium	ICP-MS	6/6n				•	4					43.77	:	
Extract Metals, Nitric	Cobalt	ICP-MS	6/6n		λ		o v	66				v	06.0	:	100%
Extract Metals, Nitric	Copper	(CP-MS	6/Bn					24				***	124	;	
Extract Metals, Nitric	Lead	ICP-MS	₿/₿n				-	=					90.84	;	
Extract Metals, Nitric	Manganese	ICP-MS	₿/₿n				(7)	8		44			328	;	
Extract Metals, Nitric	Mercury	ICP-MS	6/6n				۸ 7.	36				v ****	7.14	;	100%
Extract Metals, Nitric	Molybdenum	ICP-MS	6/6n				•			7. Y			51.40	;	
Extract Metals, Nitric	Nicket	ICP-MS	₿/₿'n				m	8					392	:	
Extract Metals, Nitric	Selenium	(CP-MS	6 /6n	٠	t.		v	7				v *****	86.88	;	100%
Extract Metals, Nitric	Vanadium	ICP-MS	₿/₿n		•		63	₽ <u>8</u>					382	;	
Extract Metals, Gastric	Antimony	(CP-MS	6/6n		2850		e,	294		2		****	3.37	:	
Extract Metals, Gastric	Arsenic	ICP-MS	6/6n	٧	Š		۸ ک	2.465				v ****	2.46	;	100%
Extract Metals, Gastric	Barium	ICP-MS	8/6n		R		7	4.				333352	214	;	
				Stac	Stack - Page 5	je 5									

Gas Stream Data

Analyte		Analytical		Run		re.	Run			% 96	占
Group	Specie		Units	-	Į	2	60	V	Average	5	Ratio
			8	\$4000000000000000000000000000000000000		•					
Extract Metals, Gastric	Beryllum	ICP-MS			4	96			4.20	:	
Extract Metals, Gastric	Boron	ICP-MS	5/6n	82	•	147	R		147	:	
Extract Metals, Gastric	Cadmium	ICP-MS	5,60	F. 5.		12			12.40	:	
Extract Metals, Gastric	Chromium	ICP-MS	5/6n	7		85	£		84.69	:	
Extract Metals, Gastric	Cobalt	ICP-MS	6/6n	14.75		1	147		10.92	:	
Extract Metals, Gastric	Copper	ICP-MS	5/0 n			51	X		51.26	;	
Extract Metals, Gastric	read	ICP-MS	6, 6 n	2		99	97.7		65.75	;	
Extract Metals, Gastric	Manganese	ICP-MS	6/ 6 n	87.	.,	349	¥		340	;	
Extract Metals, Gastric	Mercuny	ICP-MS	B/Bn	2200	o v	149	6500	v	0.15	:	100%
Extract Metals, Gastric	Molybdenum	ICP-MS	<i>5</i> /9n	-		€			48.58	:	
Extract Metals, Gastric	Nickel	ICP-MS	6/ 6 n		•	8	9770		169	;	
Extract Metals, Gastric	Selenium	ICP-MS	6/6n	2	•	5	278		1	;	
Extract Metals, Gastric	Vanadium	ICP-MS	6/6n	1986	۸ <u>۱</u>	304	975 0	v	1.30	;	100%
		:	*		(, , , , , , , , , , , , , , , , , , ,					į
Extract Metals, Acetic	Antimony	ICP-MS	 68	100	o v	4	2100	v	0.03	:	10% %
Extract Metals, Acetic	Arsenic	ICP-MS	6 / 9 1	97	o v	497	73.0	v	0.50	;	100%
Extract Metals, Acetic	Barium	ICP-MS	6/6n	28		17	æ		17.20	;	
Extract Metals, Acetic	Beryllium	ICP-MS	6/6n	2.148	8	.907	2.774		2.91	;	
Extract Metals, Acetic	Boron	ICP-MS	 5/8n	450	v	.82	ij	v	0.82	;	100%
Extract Metals, Acetic	Cadmium	ICP-MS	5/6n	2326	ιń	916	25.00		5.92	:	
Extract Metals, Acetic	Chromium	ICP-MS	6/ 6 n	90		36	57		36.41	:	
Extract Metals, Acetic	Cobalt	ICP-MS	6/6n	127	7	.465	404		7.47	;	
Extract Metals, Acetic	Copper	ICP-MS	6/6 n	2		2	7		63.85	;	
Extract Metals, Acetic	read	ICP-MS	5/ 6 n	5000	×	.033	c Other		20.03	;	
Extract Metals, Acetic	Manganese	ICP-MS		25.	•	470	62		470	;	
Extract Metals, Acetic	Mercury	ICP-MS	5/50	7910	ο ν	384	\$10 · ·	v	0.38	:	100%
Extract Metals, Acetic	Molybdenum	ICP-MS	6/6n	2667	m	454	6,267		3.45	:	
Extract Metals, Acetic	Nickel	ICP-MS	5/6n	**		99	R		66.17	:	
Extract Metals, Acetic	Selenium	ICP-MS	6/ 6 n			61			61.21	;	
Extract Melals, Acetic	Vanadium	ICP-MS	6/6n	•	v	.185	••	v ,	0.19	;	100%

SAMPLE STREAM: STACK

SAMPLE STREAM: STACK

Analyte		Analytical			Run		Run		Run			%96	ಕ
Group	Specie	Method	Units		+		2		60		Average	ᇙ	Ratio
Aldehydes	Acetaldehyde	BIF-0011	ug/Nm3		4.78		12.07		9.38		8.74	9.16	
Aldehydes	Fomaldehyde	BIF-0011	ug/Nm3		40.43		17.04		14.79		24	ક્ષ	
Organics, Semi-Volatiles	1,2,4,5-Tetrachlorobenzene	SW 8270	ng/Nm3	٧	192	٧	192	٧	621	٧	171	;	100%
Organics, Semi-Volatiles	1,2,4-Trichlorobenzene	SW 8270	ng/Nm3	v	961	v	961	v	2 61	v	196	;	100%
Organics, Semi-Volatiles	1,2-Dichlorobenzene	SW 8270	ng/Nm3	٧	259	v	259	٧	211	٧	243	;	100%
Organics, Semi-Volatiles	1,2-Diphenylhydrazine	SW 8270	ng/Nm3	٧	33,190	v	33,190	٧	33,190	٧	33,190	:	100%
Organics, Semi-Volatiles	1,3-Dichlorobenzene	SW 8270	ng/Nm3	v	131	v	131	٧	238	v	167	;	100%
Organics, Semi-Volatiles	1,4-Dichlorobenzene	SW 8270	ng/Nm3	٧	568	v	268	V	561	v	244	;	100%
Organics, Semi-Volatiles	1-Chloronaphthalene	SW 8270	ng/Nm3	٧	214	٧	214	. 🗸	178	v	202	:	100%
Organics, Semi-Volatiles	1-Naphthylamine	SW 8270	ng/Nm3	٧	518	v	518	٧	674	٧	570	:	100%
Organics, Semi-Volatiles	2,3,4,6-Tetrachiorophenol	SW 8270	ng/Nm3	٧	167	v	167	٧	154	v	1 83	;	100%
Organics, Semi-Volatiles	2,4,5-Trichlorophenol	SW 8270	ng/Nm3	v	110	٧	110	٧	169	v	129	:	100%
Organics, Semi-Volatiles	2,4,6-Trichlorophenol	SW 8270	ng/Nm3	٧	116	v	116	v	168	v	133	:	100%
Organics, Semi-Volatiles	2,4-Dichlorophenol	SW 8270	ng/Nm3	٧	147	٧	147	v	189	•	161	;	100%
Organics, Semi-Volatiles	2,4-Dimethytphenol	SW 8270	ng/Nm3	٧	365	v	365	v	431	v	387	;	100%
Organics, Semi-Volatiles	2,4-Dinitrophenol	SW 8270	ng/Nm3	٧	2,323	v	2,323	٧	1,387	v	2,011	;	100%
Organics, Semi-Volatiles	2,4-Dinitrotoluene	SW 8270	ng/Nm3	٧	183	٧	183	v	961	v	187	:	100%
Organics, Semi-Volatiles	2,6-Dichlorophenol	SW 8270	ng/Nm3	٧	240	٧	240	v	170	v	217	;	100%
Organics, Semi-Votatiles	2,6-Dinitrotoluene	SW 8270	ng/Nm3	٧	115	v	115	٧	286	٧	172	:	100%
Organics, Semi-Volatiles	2-Chloronaphthalene	SW 8270	ng/Nm3	٧	108	v	108	٧	130	v	115	:	100%
Organics, Semi-Volatiles	2-Chlorophenol	SW 8270	ng/Nm3	٧	254	v	254	٧	211	٧	239	;	100%
Organics, Semi-Volatiles	2-Methylnaphthalene	SW 8270	ng/Nm3	٧	219	v	219	٧	121	v	186	:	100%
Organics, Semi-Volatiles	2-Methylphenol(o-cresol)	SW 8270	ng/Nm3		1,404		4,414		3,034		2,951	3,744	
Organics, Semi-Volatiles	2-Naphthylamine	SW 8270	ng/Nm3	v	647	٧	647	v	53.	٧	808	:	100%
Organics, Semi-Volatiles	2-Nitroanlline	SW 8270	ng/Nm3	٧	133	v	133	٧	230	٧	162	:	100%
Organics, Semi-Volatiles	2-Nitrophenol	SW 8270	ng/Nm3	v	146	v	146	٧	173	v	155	:	100%
Organics, Semi-Volatiles	2-Picoline	SW 8270	ng/Nm3	٧	362	v	362	v	274	v	333	;	100%
Organics, Semi-Volatiles	3,3'-Dichlorobenzidine	SW 8270	ng/Nm3	٧	1 ය	٧	163	v	111	v	145	;	100%
Organics, Semi-Volatiles	3-Methylcholanthrene	SW 8270	ng/Nm3	v	790	v	200	v	16 6	٧	523	:	100%
Organics, Semi-Volatiles	3-Nitroantline	SW 8270	ng/Nm3	٧	189	٧	169	v	130	v	2 5	:	100%
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SAMPLE STREAM: STACK

Analyte		Analytical			Run		Run		Run			85%	占
Group	Specie	Method	Units		+		2		6		Average	ਠ	Ratio
Ordanics, Semi-Volatiles	4,6-Dinitro-2-methylphenol	SW 8270	ng/Nm3	v	263	v	263	v	143	v	223	:	400%
Organics, Semi-Volatiles	4-Aminobiphenyl	SW 8270	ng/Nm3	٧	248	v	248	v	395	٧	297	:	100%
Organics, Semi-Volatiles	4-Bromophenyl phenyl	SW 8270	ng/Nm3	v	151	v	151	v	161	•	154	;	100%
Organics, Semi-Volatiles	4-Chioro-3-methylphenol	SW 8270	ng/Nm3	v	240	v	240	v	171	v	217	;	100%
Organics, Semi-Volatiles	4-Chlorophenyl phenyl ether	SW 8270	ng/Nm3	٧	175	v	175	v	40	v	1 හි	;	100%
Organics, Semi-Volatiles	4-Methylphenol(p-cresol)	SW 8270	ng/Nm3		1,314		1,494	v	152		961	1,917	3%
Organics, Semi-Volatiles	4-Nitroaniline	SW 8270	ng/Nm3	٧	161	٧	161	v	201	V	174	:	100%
Organics, Semi-Volatiles	4-Nitrophenol	SW 8270	ng/Nm3	٧	229	v	229	v	311	v	257	:	100%
Organics, Semi-Volatiles	7,12-Dimethylbenz(a)anthracene	SW 8270	ng/Nm3	v	637	v	637	v	1	v	572		100%
Organics, Semi-Volatiles	Acenaphthene	SW 8270	ng/Nm3	٧	159	v	159	٧	6 6	v	136	;	100%
Organics, Semf-Volatiles	Acenaphthylene	SW 8270	ng/Nm3	٧	75	v	75	v	139	v	96	:	100%
Organics, Semi-Volatiles	Acetophenone	SW 8270	ng/Nm3		2,967		3,518		3,385		3,290	714	
Organics, Semi-Volatiles	Aniline	SW 8270	ng/Nm3	٧	310	v	310	v	204	٧	275	;	100%
Organics, Semi-Volatiles	Anthracene	SW 8270	ng/Nm3	٧	193	v	193	v	122	v	169	:	100%
Organics, Semi-Volatiles	Benzidine	SW 8270	ng/Nm3	v	6,638	v	6,638	v	6,638	v	6,638	:	100%
Organics, Semi-Volatiles	Benzo(a)anthracene	SW 8270	ng/Nm3	٧	171	v	171	٧	149	v	164	:	100%
Organics, Semi-Volatiles	Benzo(a)pyrene	SW 8270	ng/Nm3	v	127	v	127	v	172	٧	142	;	100%
Organics, Semi-Volatiles	Benzo(b)fluoranthene	SW 8270	ng/Nm3	v	189	v	189	v	301	v	226	;	100%
Organics, Semi-Volatiles	Benzo(g,h,i)perylene	SW 8270	ng/Nm3	v	162	v	162	•	339	V	521	:	100%
Organics, Semi-Volatiles	Benzo(k)fluoranthene	SW 8270	ng/Nm3	v	321	v	321	v	332	v	325	;	100%
Organics, Semi-Volatiles	Benzoic acid	SW 8270	ng/Nm3		120,481		116,498		118,821		118,600	4,970	
Organics, Semi-Volatiles	Benzyl alcohol	SW 8270	ng/Nm3		8,098	v	358	v	202		2,793	11,415	3%
Organics, Semi-Volatiles	Butylbenzytphthalate	SW 8270	ng/Nm3		325		335		243		301	52	
Organics, Semi-Volatiles	Chrysene	SW 8270	ng/Nm3	v	222	v	222	v	178	V	207	;	100%
Organics, Semi-Volatiles	Di-n-octylphthalate	SW 8270	ng/Nm3	v	302	v	302	v	117	v	241	;	100%
Organics, Semi-Volatiles	Dibenz(a,h)anthracene	SW 8270	ng/Nm3	v	157	v	157	v	569	٧	2 81	:	100%
Ordanics, Semi-Volatiles	Dibenz(a,j)acridine	SW 8270	ng/Nm3	v	193	v	193	v	279	٧	222	;	100%
Organics, Semi-Volatiles	Dibenzofuran	SW 8270	ng/Nm3	v	135	v	135	v	178	v	150	:	100%
Organics, Semi-Volatiles	DibutyAphthalate	SW 8270	ng/Nm3		253		208	v	901		172	5 60	10%
Organics, Semi-Volatiles	Diethylphthalate	SW 8270	ng/Nm3		298		194		213		235	137	
Organics, Semi-Volatiles	Dimethylphenethylamine	SW 8270	ng/Nm3	v	39,828	v	39,828	v	39,828	v	39,828	;	100%
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SAMPLE STREAM: STACK

Analytical	- Air		Run		Run 2		Run	Average	% E	Ratio
			•		4			Salar V		
SW 8270	270 ng/Nm3	٧	83	v	93		435	176	222	18%
SW 8270		v	175	v	175	v	92	> 147	;	100%
SW 8270	ng/Nm3	v	167	v	167	v	5 2	186	;	100%
SW 8270	ng/Nm3	٧	212	v	212	v	156	< 193	:	100%
SW 8270	ng/Nm3	v	112	v	112	v	82	> 116	1	100%
SW 8270	ng/Nm3	v	78	v	78	v	2	> 87	:	100%
SW 8270	ng/Nm3	v	232	v	232	v	021	< 211		100%
SW 8270	ng/Nm3	v	2,961	v	2,961	v	.955	< 2,625	;	100%
SW 8270	ng/Nm3	v	197	v	197	v	211	> 202		100%
SW 8270	ng/Nm3	٧	174	v	174	v	4	> 263	;	100%
SW 8270	ng/Nm3	v	8	v	88	v	204	< 132		100%
SW 8270	ng/Nm3	v	16,595	v	16,595	v	3,595	< 16,595	;	100%
SW 8270	ng/Nm3	v	435	v	435	v	506	< 359		100%
SW 8270	ng/Nm3	v	4	v	1	v	261	> 381		100%
SW 8270	ng/Nm3	v	188	v	188	v	68	< 155	:	100%
SW 8270	ng/Nm3	٧	249	v	249	v	217	< 239		100%
SW 8270	ng/Nm3	v	313	v	313	v	96	< 275		100%
SW 8270	ng/Nm3		1,955		1,470	_	.175	1,533		
SW 8270	ng/Nm3	v	175	v	175	v	279	< 210		100%
SW 8270	ng/Nm3	v	147	v	147	v	124	× 139		100%
SW 8270	ng/Nm3	v	289	v	282	v	458	< 611		100%
SW 8270	ng/Nm3	v	287	v	287	v	295	× 230		100%
SW 8270	ng/Nm3	v	179	v	179	v	128	× 162	:	100%
SW 8270	ng/Nm3	v	50 6	v	206	v	35	× \$		100%
SW 8270	ng/Nm3		5,277	•	11,417	_	1,285	9,326	w	
SW 8270	ng/Nm3	٧	245	v	245	v	80	× 190	:	100%
SW 8270	ng/Nm3	v	155	v	1 35	v	135	۰ 149	;	100%
SW 8270	ng/Nm3	v	385	v	385	v	35	< 322	:	100 %
SW 8270	ng/Nm3	v	187	v	187	v	201	< 191	;	100%
SW 8270	na/Nm3	v	243	v	243	v	127	^ 24	;	100%
SW 8270) b	٧	241	v	241	v	265	< 249	:	100%
	ng/Nm3									

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Analyte		Analytical			Run		Run		Run			% 306	占
Group	Specie	Method	Units		-		2		8	;	Average	ਹ	Ratio
aditaly/, imag animany	hie(2,Fthulhewd)nhthalate	SW R270	pg/Nm3		2005		080		1.019		1.374	1360	
Ordenics, com-vomice		CW 8270	nd/Nm3	٧	86	v	186	٧	247	٧	900	:	100%
Organics, Semi-Volatiles	p-Dimethylaminoazobenzene	SW 8270	ng/Nm3	· v	171	v	171	v	241	v	<u>\$</u>	,	100%
		0700	6.4		ó		Ē	,	572		673	807	74
Organics, Volatile	1.1.1-Incincionalisme	SVV 0240	CHING	,	- Se - Se - Se - Se - Se - Se - Se - Se	•	1.1	, ,	£ 55	٧	202	3 :	1004 W
Organics, volatile	1, 1, 2, 2-1 ett aci ikki vett lät lä 4, 4, 2, Trickforoathona	SW 8240	Cillingian SmM/po	/ V	£ 64	, v	23 82	· •	545	· •	527	;	200
Organics, Volatile	1.1-Dichloroethane	SW 8240	ng/Nm3	v	497	v	538	v	545	v	527	;	100%
Ordanics, Volatile	1,1-Dichloroethene	SW 8240	ng/Nm3	٧	497	v	538	v	545	v	527	;	400%
Organics, Volatile	1,2-Dichlorobenzene	SW 8240	ng/Nm3	v	497	v	538	٧	545	٧	227	:	100%
Organics, Volatile	1,2-Dichloroethane	SW 8240	ng/Nm3	v	497	v	538	v	545	•	272	:	100%
Organics, Volatile	1,2-Dichlaropropane	SW 8240	ng/Nm3	v	497	٧	538	v	545	•	527	•	100%
Organics, Volatile	1,3-Dichlorobenzene	SW 8240	ng/Nm3	٧	497	v	538	v	545	v	27	•	100%
Organics, Volatile	1,4-Dichlorobenzene	SW 8240	ng/Nm3	v	497	v	538	v	545	v	527	;	100%
Organics, Volatile	2-Butanone	SW 8240	ng/Nm3	٧	2,485	v	2,690	v	2,725	v	2,633	:	100%
Organics, Volatile	2-Hexanone	SW 8240	ng/Nm3	٧	2,485	v	2,690	v	2,725	v	2,633	:	100%
Organics, Volatile	4-Methyl-2-Pentanone	SW 8240	ng/Nm3	٧	2,485	v	2,690	v	2,725	v	2,633	;	100%
Organics, Volatile	Acetone	SW 8240	ng/Nm3		2,965	v	2,690		6,341		3,550	6,332	13%
Organics, Volatile	Benzene	SW 8240	ng/Nm3		1,153		1,329		1,435		1,306	355	
Organics, Volatile	Bromodichloromethane	SW 8240	ng/Nm3	v	497	v	538	v	545	•	527	:	100%
Organics, Volatife	Bromoform	SW 8240	ng/Nm3	v	497	v	538	v	545	v	272	;	100%
Organics, Volatile	Bromomethane	SW 8240	ng/Nm3	v	497	v	538	v	545	v	527	:	100%
Organics, Volatile	Carbon Disulfide	SW 8240	ng/Nm3		1,978		2,797		1,998		2,258	1,160	
Organics, Volatile	Carbon Tetrachloride	SW 8240	ng/Nm3	v	497	v	538	•	545	•	27	:	100%
Organics, Volatile	Chiorobenzene	SW 8240	ng/Nm3	v	497	v	538	v	5 2	V	527	;	100%
Organics, Volatile	Chloroethane	SW 8240	ng/Nm3	v	497	v	538	v	545	v	527	:	100%
Organics, Volatile	Chloroform	SW 8240	ng/Nm3	v	497	v	538	v	545	v	527	;	100%
Organics, Volatile	Chloromethane	SW 8240	ng/Nm3		7,880		10,034	v	545		6,062	12,741	%
Organics, Volatile	Dibromochloromethane	SW 8240	ng/Nm3	v	497	v	538	v	545	v	27	;	100%
Organics, Volatile	Ethyl Benzene	SW 8240	ng/Nm3	٧	497	v	538	v	545	¥	527	;	100%
Organics, Volatile	Methylene Chloride	SW 8240	ng/Nm3		242,946		110,653		22,912		125,503	275,181	
				Sta	Stack - Page 10	_							

SAMPLE STREAM: STACK

Analyte		Analytical			Run			Run		Run			%96	占
Group	Specie	Method	Units		-			2				Average	ਹ	Ratio
;	i			,			,	Ş	,	Ų	,	Ş		7004
Organics, Volatife	Styrene	SW 824U	DQ/NH2	v	ŧ,		v	8	,	2	•	75.	:	8
Organics, Volatile	Tetrachloroethene	SW 8240	ng/Nm3		2,494			664		1,272		1,477	2,315	
Organics, Volatile	Toluene	SW 8240	ng/Nm3		1,989			2,474		1,670		2,044	1,006	
Organics, Volatile	Trichtoroethene	SW 8240	ng/Nm3	v	497		v	538	v	3 5	٧	527	:	100%
Organics, Volatile	Trichlorofluoromethane	SW 8240	ng/Nm3		741			1,919		069		1,117	1,727	
Organics, Volatile	Vinyl Acetate	SW 8240	ng/Nm3	v	2,485		v	2,690	٧	2,725	v	2,633	;	100%
Organics, Volatile	Vinyl Chloride	SW 8240	ng/Nm3	٧	497		v	538	٧	545	V	527	:	100%
Organics, Volatile	cis-1,3-Dichtoropropene	SW 8240	ng/Nm3	٧	497		v	538	٧	545	٧	527	:	100%
Organics, Volatile	m,p-Xylene	SW 8240	ng/Nm3	v	544		v	538	٧	545	٧	542	:	100%
Organics, Volatile	o-Xylene	SW 8240	ng/Nm3	v	497		v	538	٧	545	V	527	:	100%
Organics, Volatile	trans-1,2-Dichloroethene	SW 8240	ng/Nm3	٧	497		v	538	v	545	٧	527	i	100%
Organics, Volatite	trans-1,3-Dichloropropene	SW 8240	ng/Nm3	v	497		v	538	٧	5 7 5	٧	527	:	100%
Ļ	000-01 8738 CC	0 71 00	pa(Nim3	•	0.0067		_	0.0656	٧	89000	٧	0.0364	;	100%
Distribution of the second of	700-11 9537607	3400 an	Curley .	į	0.0067			0230		0.0034	•	0.0330		5300
Dioxins/Furans	12346/8-HpCDF	HK-GCMS	ng/Nm3		0.000		٠ ر	0.020		0.0034	V	0.0230	:	R S
Dioxins/Furans	123478-HxCDD	HR-GCMS	ng/Nm3	٧	0.0067		v	0.0328	٧	0.0068	v	0.0154	;	100%
Dioxins/Furans	123478-HxCDF	HR-GCMS	ng/Nm3		0.0020		v	0.0164	v	0.0034	•	0.0164	:	83%
Dioxins/Furans	1234789-HpCDF	HR-GCMS	ng/Nm3	٧	0.0067		v	.0328	٧	0.0068	٧	0.0154	:	100%
Dioxins/Furans	123678-HxCDD	HR-GCMS	ng/Nm3	v	0.0034		v	.0230	٧	0.0034	٧	6600'0	:	100%
Dioxins/Furans	123678-HxCDF	HR-GCMS	ng/Nm3	v	0.0020		v	0.0131	v	0.0024	v	0.0058	;	100%
Dioxins/Furans	12378-PeCDD	HR-GCMS	ng/Nm3	v	0.0020		v	8600.	٧	0.0024	٧	0.0047	;	100%
Dioxins/Furans	12378-PeCDF	HR-GCMS	ng/Nm3	v	0.0013		v	9900.0	٧	0.0017	•	0.0032	;	100%
Dioxins/Furans	123789-HxCDD	HR-GCMS	ng/Nm3	v	0.0034		v	.0295	v	0.0034	v	0.0121	;	100%
Dioxins/Furans	123789-HxCDF	HR-GCMS	ng/Nm3	٧	0.0034		v	.0197	v	0.0034	٧	0.0088	;	100%
Dioxins/Furans	234678-HxCDF	HR-GCMS	ng/Nm3		0.0034		v	.0164		0.0030	٧	0.0164	:	26%
Dioxins/Furans	23478-PeCDF	HR-GCMS	ng/Nm3	v	0.0013		v	99001	v	0.0017	v	0.0032	;	100%
Dioxins/Furans	2378-TCDD	HR-GCMS	ng/Nm3	v	0.0017		v	9900'0	v	0.0017	•	0.0033	:	100%
Dioxins/Furans	2378-TCDF	HR-GCMS	ng/Nm3		0.0020	Σ	v	0.0033		0.0017	٧	0.0033	:	31%
Dioxins/Furans	ocpo	HR-GCMS	ng/Nm3		0.0168		v	0.1313	v	0.0102	٧	0.1313	;	81%
Dioxins/Furans	OCDF	HR-GCMS	ng/Nm3		0.0168		v	0.1313		0.0136 M	v	0.1313	;	%8%
Dioxins/Furans	Total HpCDD	HR-GCMS	ng/Nm3	v	0.0067		v	0.0656	٧	0.0068	٧	0.0264	:	100%
				7	A. D. C.	77								

Stack - Page 11

STACK
STREAM: S
SAMPLE

DL Ratio	59% 60% 56% 100% 64% 31%
36%	
Average	0.0295 0.0263 0.0164 0.0067 0.0067 0.0063
	v v v v v
Run 3	0.0034 0.0034 0.0030 0.0024 0.0068 0.0068
	v v v
Run 2	0.0295 0.0263 0.0164 0.0098 0.0066 0.0066
	v v v v v v
	Z Z Z
Ran +	0.0067 0.0101 0.0034 0.0023 0.0101 0.0101
Units	ng/Nm3 ng/Nm3 ng/Nm3 ng/Nm3 ng/Nm3 ng/Nm3
Analytical Method	HR-GCMS HR-GCMS HR-GCMS HR-GCMS HR-GCMS HR-GCMS
<u> </u>	Total HpCDF Total HxCDD Total HxCDF Total PeCDD Total PeCDF Total TCDD
Analyte	Dioxins/Furans Dioxins/Furans Dioxins/Furans Dioxins/Furans Dioxins/Furans

Note: Shaded data invalid due to high background in filter substrate. Shaded data not used in calculation of average. M= Maximum Estimated Concentration

Group Specie Anions Chloride Anions Fluoride Metals Atuminum	Method	Units	-	8	3.8	9d	Average	5	Ratio
•									
·		ļ	2560	644	0000	e e e e e e e e e e e e e e e e e e e	1 350	217	
		3	85	2	8	3	200.		
	D3761	6/6n	120	140	110	120	123	8	
	NAA.	na/a	12.847	15,153	14,863	13,778	14,287	3,121	
		D/On	0,77	0.56	0.52	0.49	0.62	0.33	
•		5/85	3.00	3.00	3.00	3.00	3.00		
		0,00	120	901	106	110	112	6	
		na/a	120	1.10	1.10	1.10	1.13	0.14	
	CPES	5/60	110	120	100	6	110	52	
_		0/80	7.16	7.89	7.20	6.89	7.42	102	
		0,00	0.700	0.200	0.700	0.200	0.533	0.717	
	INAA	o/on	2,793	3,611	2,624	2,677	3,010	1,311	
		6/6n	15.18	16.56	16.60	15.81	16.11	2.01	
		5/50	1.10	1.21	1.20	1.15	1.17	0.16	
		6/6n	1,169	1,180	1,269	1,427	1,206	136	
_	T INAA	0,6n	25.66	25.92	25.67	23.57	25.75	0.37	
		6/6n	3.99	4.12	4.13	3.80	4.08	0.19	
		0/6n	23.58	63.57	38.73	38.93	41.96	50.15	
		5/6n	0.300	0.294	0.305	0.306	0.299	0.014	
		6/6n	0.667	0.652	0.696	0.728	0.672	0.056	
		v 6/6n	2.09	1.99	1.94	1.05	< 2.09	:	21%
		B/Bn	12,989	13,405	12,074	11,827	12,823	1,69,	
Metals Lanthanum	_	5/6n	6.53	7.37	6.39	6.41	6.76	1.31	
Metals Lead		5/6n	8:00	8.00	11.00	9:00	00:6	4.30	
_		5/6 n	0.119	0.121	0.121	0.101	0.120	0.003	
_	INAA II	6/6n	653	641	989	630	099	57.87	
	Se INAA	6/6n	22.05	24.41	26.78	24.63	24.41	5.88	
	DGACVAA	5/ 0 n	0.040	0.040	0.050	0.040	0.043	0.014	
2	INAA mr	5/6 n	20.29	21.36	13.53	21.63	18.39	10.54	
Metals Neodymium	INAA mi	5/6n	7.09	9.32	7.50	11.38	7.97	2.95	
Metals	INAA	5/60	39.21	46.03	34.57	25.89	39.94	14.32	
Metals Phosphorus		6/6n	20	150	8	76	%	118	
	INAA.	6/6n	2,940	2,182	4,034	3,125	3,052	2,313	
Metals Rubidium		6/6n	19.71	22.53	20.40	19.57	20.88	3.66	
		המים	54.1	1.54	1.30	1.27	1.43	0.31	

Raw Coal - Page 1

Solid Stream Data

Specie Method Unital Your					!						Ċ			966	2
NAM ug/g 5.19 3.29 3.23 3.10 3.24 0.12 GFAA ug/g 2.00 2.00 3.00 2.00 2.33 1.43 NAA ug/g 6.74 7.17 646 6.62 6.04 NAA ug/g 6.74 7.17 646 6.20 6.00 2.00 NAA ug/g 6.37 6.42 84.97 6.25 6.04 NAA ug/g 0.37 0.186 0.20 0.20 0.20 0.20 NAA ug/g 0.17 0.186 0.177 0.20 0.20 0.00 NAA ug/g 0.17 0.186 0.177 0.174 0.179 0.008 NAA ug/g 1.64 1.75 2.65 2.74 1.678	ecie	Method	Units		- F		7		ee.		39		Average	ទី ច	Ratio
NAM ugg 319 329 320 012 GFAA ugg 2.00 2.00 0.15 2.00 0.13 1.43 GFAA ugg 6.74 777 646 6.25 6.04 1.43 NAA ugg 674 777 646 625 679 68.78 NAA ugg 673 0.13 0.13 0.13 0.174 0.173 0.174 NAA ugg 0.17 0.196 0.177 0.174 0.179 0.178 NAA ugg 0.17 0.196 0.174 0.174 0.179 0.178 NAA ugg 0.12 0.13 0.13 0.174 0.178 0.18 NAA ugg 0.15 0.20 0.20 0.20 0.20 0.178 NAA ugg 0.15 0.20 0.24 0.24 0.20 0.20 NAA ugg 0.15 0.25 0.24															
GFAA ugiq 2.00 2.00 3.00 2.00 2.33 1.43 INAA ugiq 6.039 < 0.69	ndium	¥W.	6/6n		3.19		3.29		3.23		3.10		3.24	0.12	
INAA ugg 0.39 < 0.15 0.41 INAA ugg 674 777 945 6.25 679 843 INAA ugg 637 9425 643 6207 679 878 INAA ugg 620 0.196 0.196 0.201 0.201 0.01 INAA ugg 6.26 0.74 0.177 0.174 0.179 0.178 0.01 INAA ugg 6.148 6.148 6.146 6.177 0.176 0.178 0.01 INAA ugg 6.28 6.175 6.28 6.28 6.03 0.178 0.1	enium	GFAA	5/6n		2.00		2.00		3.00		2.00		2.33	1.43	
INAA ugg 674 717 646 625 679 687 INAA ugg 637 9425 649 620 679 687 <td>ilver</td> <th>NAA</th> <th></th> <td></td> <td>0.39</td> <td>v</td> <td>0.69</td> <td>v</td> <td>0.15</td> <td>v</td> <td>0.62</td> <td>v</td> <td>0.41</td> <td>;</td> <td>100%</td>	ilver	NAA			0.39	v	0.69	v	0.15	v	0.62	v	0.41	;	100%
INAA ugg 63.77 94.25 64.97 64.97 64.97 64.95 14.25 14.40 14.25 14	odium	NA A	5/đn		674		717		646		625		679	88.78	
INAA ugg 0.20 0.196 0.201 0.205 0.201 0.010 INAA ugg 0.17 0.194 0.177 0.174 0.179 0.010 INAA ugg c 16.48 c 17.35 c 16.49 c 16.79 <td>rontium</td> <th>NAA</th> <th>6/6n</th> <td>_</td> <td>83.77</td> <td></td> <td>94.25</td> <td></td> <td>84.97</td> <td></td> <td>82.07</td> <td></td> <td>87.66</td> <td>14.25</td> <td></td>	rontium	NAA	6/6n	_	83.77		94.25		84.97		82.07		87.66	14.25	
INAA ugig 0.17 0.194 0.177 0.174 0.179 0.036 INAA ugig 2.60 2.74 2.65 2.67 0.18 INAA ugig 6.14.8 < 17.55	antatum	NA NA	5 /5n		0.20		0.196		0.201		0.205		0.201	0.010	
INAA ugg 2.60 2.74 2.65 2.65 2.67 0.18 INAA ugg < 16.48 < 17.55 < 16.31 < 15.48 < 16.78 INAA ugg < 16.48 < 17.55 < 16.31 < 15.48 < 16.78 INAA ugg < 16.48 < 17.76 40.34 < 1.56 1.70 INAA ugg 1.57 1.78 40.34 < 1.56 1.60 0.37 0.08 INAA ugg 0.77 0.78 0.78 0.79 0.74 0.78 0.79 0.73 INAA ugg 0.77 0.78 0.70 0.74 0.76 0.74 0.78 INAA ugg 0.77 0.78 0.78 0.74 0.74 0.78 INAA ugg 0.78 0.78 0.78 0.79 0.78 0.74 0.78 D0215 3.6 0.78 0.78 0.76 0.79	erbium	INAA	5/6n		0.17		0.194		0.177		0.174		0.179	0.036	
INAA ug/g < 16.48 < 17.55 < 16.31 < 15.48 < 16.78 INAA ug/g 814 829 806 890 850 17097 INAA ug/g 6.26 0.30 0.24 < 103	horium	INAA	5/6n		2.60		2.74		2.65		2.56		2.67	0.18	
INAA ugg 814 829 806 890 850 INAA ugg 0.26 0.30 0.24 < 1.03	重	NA NA			16.48	v	17.55	v	16.31	٧	15.48	v	16.78	:	100%
INAA ugig 0.26 0.30 0.24 < 1.03 0.27 1.60 INAA ugig 1.57 1.76 1.47 1.55 1.60 INAA ugig 0.77 0.79 0.66 0.70 0.74 INAA ugig 18.18 20.89 21.40 16.89 20.15 INAA ugig 108.46 70.19 77.67 92.33 85.44 D3174 % 11 12.59 12.87 12.15 12.15 D3176 % 11,3 70.41 70.65 70.73 70.81 D3176 % 14.34 4.74 4.75 4.76 4.76 D3176 % 1.43 1.42 1.44 1.51 1.45 D3176 % 1.43 1.44 1.51 1.45 1.45 D3177 % 1.43 1.44 1.51 1.45 1.45 D3177 % 1.43 1.251 1.2	Fitanium	NAA	B/Bn		814		626		808		068		920	170.97	
INAA uyg 1.57 1.78 1.47 1.55 1.60 INAA ugg 35.25 37.56 40.34 37.67 37.71 INAA ugg 0.77 0.78 0.66 0.70 0.74 37.71 INAA ugg 18.18 20.89 21.40 16.89 20.15 D3174 % 11 12.59 77.67 92.33 85.44 D3176 % 71.37 70.41 77.67 92.33 85.44 D3176 % 11.3 70.41 4.76 4.76 4.76 D3176 % 14.3 14.4 4.71 4.75 4.76 4.76 D3176 % 14.3 14.4 4.71 4.74 4.75 4.76 D3176 % 14.3 14.4 15.5 8.06 7.92 D3177 % 14.3 12.5 14.4 15.1 14.5 14.5 D2015 MAF Btu<	Tungsten	INAA	5,61		0.26		0:30		0.24	v	1.03		0.27	90.0	
INAA ug/g 35.25 37.56 40.34 37.67 37.71 INAA ug/g 0.77 0.79 0.66 0.70 0.74 <	Uranium	INAA	6 / 6 n		1.57		1.76		1.47		1.55		.	0.37	
INAA ug/g 0.77 0.78 0.68 0.70 0.74 HNAA ug/g 18.18 20.69 21.40 16.89 20.15 INAA ug/g 16.18 70.19 77.67 92.33 20.15 D3174 % 11 12.59 12.87 12.11 12.15 D3176 % 71.37 70.41 70.65 70.73 70.81 D3176 % 12.7 4.74 4.71 4.75 4.76 D3177 % 12.7 11.2 11.2 11.3 11.70 D3176 % 1.43 1.47 4.71 4.75 4.76 4.76 D3176 % 1.43 1.47 1.44 1.51 1.45 D3176 % 8.3 7.92 7.55 8.06 7.92 D3177 % 51.03 50.44 50.68 51.5 50.72 D2015 MAF Btu 14,287 14,400 <	/anadium	NA NA	6 /6n	(7	35.25		37.56		40.34		37.67		37.71	6.33	
tNAA ug/g 18.18 20.69 21.40 16.89 20.15 INAA ug/g 108.46 70.19 77.67 92.33 20.15 D3174 % 11 12.59 12.87 12.71 12.15 D3176 % 71.37 70.41 70.65 70.73 70.81 D3176 % 12.7 14.2 4.71 4.75 4.76 D3176 % 12.7 14.2 11.3 11.70 11.70 D3176 % 1.43 1.47 1.44 1.51 11.70 D3176 % 1.43 1.47 1.44 1.51 1.45 D3176 % 1.43 1.44 1.51 1.45 1.45 D3176 % 1.30 2.87 2.74 2.90 D30175 % 1.2,15 12,541 12,544 12,541 D2017 % 14,287 14,313 14,400 14,289 14,333	Ytterbium	NA A	6/6n		0.77		0.79		99'0		0.70		0.74	0.18	
INAA ug/g 77.67 92.33 85.44 D3174 % 11 12.59 12.21 12.15 D3176 % 71.37 70.41 70.65 70.73 70.81 D3176 % 4.84 4.74 4.71 4.75 4.76 D3176 % 12.7 11.2 11.2 11.3 11.70 D3176 % 1.43 1.47 1.44 1.51 1.45 D3176 % 1.43 1.47 1.44 1.51 1.45 D3176 % 3.06 2.87 2.78 2.74 2.90 D4239 % 51.03 50.44 50.68 51.5 50.72 D2015 MAF Btu 14,287 14,400 14,289 14,333 D2015 MAF Btu 14,287 14,400 14,289 14,333 D3175 % 37,97 36.87 36.29 37.13	Zinc	*NA A	5/6n	•	18.18		20.89		21.40		16.89		20.15	4 .30	
D3174 % 11 12.59 12.81 12.11 12.15 D3176 % 71.37 70.41 70.65 70.73 70.81 D3176 % 4.84 4.74 4.71 4.75 4.76 4.76 D3173 % 12.7 11.2 11.2 11.3 11.70 D3176 % 1.43 1.47 1.44 1.51 1.45 D3176 % 8.3 7.92 7.55 8.06 7.92 D4239 % 3.06 2.87 2.78 2.74 2.90 D3172 % 51.03 50.44 50.68 51.5 50.72 D2015 Blumb 12,715 12,511 12,547 12,544 12,591 D2015 MAF Blu 14,287 14,400 14,289 14,333 D3175 % 37,97 36.45 36.45 36.29 37.13	Zirconium	INAA	D/0n	-	08.46		70.19		77.67		92.33		85.44	50.40	
D3176 % 71.37 70.41 70.65 70.73 70.81 D3176 % 4.84 4.74 4.71 4.75 4.76 4.76 D3176 % 12.7 11.2 11.2 11.3 11.70 D3176 % 1.43 1.47 1.44 1.51 1.45 D3176 % 8.3 7.92 7.85 8.06 7.92 D4239 % 3.06 2.87 2.74 2.90 D3172 % 51.03 50.44 50.68 51.5 50.72 D2015 Bluulb 12,715 12,511 12,547 12,544 12,591 D2015 MAF Btu 14,287 14,313 14,400 14,289 14,333 D3175 % 37,97 36.87 36.45 36.29 37.13	% Ash	D3174	×		=		12.59		12.87		12.21		12.15	2.51	
D3176 % 4.84 4.74 4.71 4.75 4.76 D3173 % 12.7 11.2 11.2 11.3 11.70 D3176 % 1.43 1.47 1.44 1.51 1.45 D3176 % 1.43 7.92 7.55 8.06 7.92 D4239 % 3.06 2.87 2.74 2.90 D3172 % 51.03 50.44 50.68 51.5 50.72 D2015 Blunh 12,715 12,511 12,547 12,544 12,591 D2015 MAF Btu 14,287 14,313 14,400 14,289 14,333 D3175 % 37,97 36.87 36.45 36.29 37.13	% Carbon	D3176	*	,-	71.37		70.41		70.65		70.73		70.81	1.24	
03173 % 12.7 11.2 11.2 11.3 11.70 03176 % 1.43 1.47 1.44 1.51 1.45 03176 % 8.3 7.92 7.55 8.06 7.92 04239 % 3.06 2.87 2.74 2.90 03172 % 51.03 50.44 50.68 51.5 50.72 02015 Blunh 12,715 12,511 12,547 12,544 12,591 02015 MAF Blu 14,287 14,313 14,400 14,289 14,333 03175 % 37,97 36.87 36.45 36.29 37.13	Hydrogen	D3176	¥		4.84		4.74		4.71		4.75		4.76	0.17	
D3176 % 1.43 1.47 1.44 1.51 1.45 D3176 % 8.3 7.92 7.55 8.06 7.92 D4239 % 3.06 2.87 2.78 2.74 2.90 D3172 % 51.03 50.44 50.68 51.5 50.72 D2015 Blunlb 12,715 12,511 12,547 12,544 12,591 D2015 MAF Blu 14,287 14,313 14,400 14,289 14,333 D3175 % 37,97 36.87 36.45 36.29 37.13	6 Moisture	D3173	×		12.7		11.2		11.2		11.3		11.70	2.15	
D3176 % 8.3 7.92 7.55 8.08 7.92 D4239 % 3.06 2.87 2.78 2.74 2.90 D3172 % 51.03 50.44 50.68 51.5 50.72 D2015 Bluff 12,715 12,511 12,547 12,544 12,591 D2015 MAF Blu 14,287 14,313 14,400 14,289 14,333 D3175 % 37,97 36.87 36.45 36.29 37.13	6 Nitrogen	D3176	×		1.43		1.47		1.44		1.51		1.45	90.0	
D4239 % 3.06 2.87 2.78 2.74 2.90 D3172 % 51.03 50.44 50.68 51.5 50.72 D2015 Btu/h 12,715 12,511 12,547 12,544 12,591 D2015 MAF Btu 14,287 14,313 14,400 14,289 14,333 D3175 % 37,97 36.87 36.45 36.29 37.13	Dxygen (diff)	D3176	æ		8.3		7.92		7.55		8.06		7.92	0.93	
D3172 % 51.03 50.44 50.88 51.5 50.72 D2015 Btu/lb 12,715 12,511 12,547 12,544 12,591 D2015 MAF Btu 14,287 14,313 14,400 14,289 14,333 D3175 % 37,97 36,97 36,45 36,29 37.13	% Sulfur	D4239	*		3.06		2.87		2.78		2.74		2.90	0.38	
D2015 Btulb 12,715 12,591 12,544 12,591 D2015 NAF Btu 14,287 14,313 14,400 14,289 14,333 D3175 % 37,97 36,97 36,45 36,29 37.13	ed Carbon	D3172	×	•,	51.03		50.44		50.68		51.5		50.72	0.74	
D2015 MAF Btu 14,287 14,313 14,400 14,289 14,333 D3175 % 37,97 36.97 36.45 36.29 37.13	Heating Value	D2015	Btu/lb	-	2,715		12,511		12,547		12,544		12,591	271	
D3175 % 37,97 36.97 36.45 36.29 37.13	g Value (MAF)	D2015	MAF Btu	-	4,287		14,313		14,400		14,289		14,333	147	
	Volatile	03175	%	• •	37.97		36.97		36.45		36.29		37.13	1.92	

Sample Stream: Raw Coal

Anaiyte		Analytical		Run	Run	Run	Run		% 56	덛
Group	Specie	Method	Units	-	2	6	3d	Average	ច	Ratio
Anions	Chloride	04208	5/07	1,410	1,430	1,360	1,400	1,400	06	
Anions	Fluoride	D3761	5/6n	9	48	001	110	100		
Metals	Aluminum	INAA	5/60	13,856	14,674	14,977	15,511	14,502	1,441	
Metals	Antimony	INAA	5/60	0.68	0.57	0.57	0.65	0.61	0.16	
Metals	Arsenic	GFAA	5/60	2:00	3.00	2.00	3.00	2.33	1.43	
Metals	Barium	INAA	5/60	66.1	70.3	103	89.1	79.9	50.7	
Metals	Benyllium	ICPES	6/6n	1.10	1.10	1.10	1.20	1.10		
Metals	Boron	ICPES	0/00	9	001	9	120	5		
Metals	Bromine	INAA	6/60	7.25	7.67	7.38	8.24	7.44	0.53	
Metals	Cadmium	ICPES	5/61	0.30	06.0	0.30	0.40	0.30		
Metals	Calcium	INAA	6/60	1,764	1,941	2,717	2,365	2,141	1,260	
Metals	Cerium	INAA	6/80	15.3	14.7	17.4	16.7	15.8	3.5	
Metals	Cesium	INAA	6/60	1.16	104	1.31	1.13	1.17	0.34	
Metals	Chlorine	INAA	6/60	1,220	1,293	1,222	1,266	1,245	5 0	
Metals	Chromium	NA A	5/60	26.0	24.7	23.7	27.8	24.8	2.9	
Metals	Cobalt	NAA	6/60	3.81	2.63	4.08	4.01	3.51	1.92	
Metals	Copper	INAA	5/60	59.5	9.83	39.0	< 23.0	% 7 .	62.1	
Metals	Europium	NAA	5/ 5 n	0.32	0.27	0.32	0.29	0.30	0.08	
Metals	Hafnium	İNAA	6/60	99.0	99.0	0.78	0.83	0.70	0.16	
Metals	lodine	INAA	5/60	× 1.66	1.32	0.87	1.03	× 1.88	;	27%
Metals	kon	NA	6/60	11,814	10,938	11,390	11,939	1.38	1,089	
Metals	Lanthanum	INAA	6/60	6.76	7.02	7.15	7.44	9 6.9 9	0.49	
Metals	Lead	ICPES	5/60	9.00	8.00	7.00	9:00	8.00	2.48	
Metals	Lutetium	¥¥.	5/6n	0.13	0.11	0.11	0.12	0.12	0.03	
Metals	Magnesium	INAA	6/60	286	489	626	705	267	175	
Metals	Manganese	INAA	6/ôn	24.9	22.8	22.5	24.4	23.4	3.3	
Metals	Mercury	DGA/CVAA	6/8n	0.09	0.07	0.07	60.0	90:0 0:08	0.03	
Metals	Molybdenum	INAA	5/6n	23.6	19.5	23.8	21.8	22.3	6.1	
Metals	Neodymium	INAA	5/6n	8.55	8.70	6.17	8.11	7.81	3.53	
Metals	Nickel	INAA	6/60	59.9	32.7	27.5	46.4	30.0	6.39	
Metals	Phosphorus	ICPES	6/6n	77.0	87.0	0.69	0.68	94. 3	16.0	
Metals	Potassium	INAA	6/60	3,395	3,538	2,982	2,594	3,305	717	
Metals	Rubidium	INAA	5/6n	20.7	18.0	20.8	21.8	19.8	3.92	
Metals	Samarium	INAA	₿/₿n	1.45	1.37	1.37	1.53	1.40	0.12	
Metals	Scandium	INAA	6/6n	3.14	3.03	3.36	3.35	3.18	0.42	
Motok	Selenium	GFAA	0/00	2:00	2.00	3.00	3.00	2.33	1.43	
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Feed Coal - Page 1

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Analyte		Analytical		Run	Ŗ	<u>=</u>	u.	5		Run		95%		
Group	Specie	Method	Units	1	2			3		30	Average	다 당	Ratio	ţ
4	Silver	MAA	, e/c:		V	Ľ	v	67	v	0.48	A 0.57		, 2001 2008	%
Signal	5 4 6					2 5		2.0		643	25			
Metals	Sodium	A .	6/6n	8 8	3 6	7 9	., ,			500	150			
Metals	Etrontium	A S	D.	, o, I	- 6	o g	- (0.0		9.0	0.4.0			
Metals	antalum	N S	5/60	5 C	o (2 (•	- Y		0.20	9.0			
Metais	Terblum	AAN :	6/6n	0.18	S (و و	-	6.6		 1.4	0.18			
Metals	Thorium	NAA			7.7	2	~	3 ;		2.77	7.60			;
Metals	Ę	NA A	, B/Bn	× 15.6	۸ 16	- .	٧	6.2	v	17.2	× 15.9		•	%
Metals	Titanium	INAA	5/5n	912	&	80	Ο,	53		732	894			
Metals	Tungsten	NA A	6/6n	0.44	0	Q	۰ ۲	8 6.		0.29	× 1.08		•	46%
Metals	Uranium	INAA	5/6n	2.03	7	92	_	%		2.04	1.76			
Metals	Vanadium	NAN.	ø/on	39.3	4	0.	e	9.1		40.4	39.4			
Metals	Ytterbium	INAA	6/6n	0.71	0.	ដ	φ	584		0.73	2,195			
Metals	Zinc	INAA	B/Bn	18.1	8	O.	_	0.6		37.9	25.0			
Metals	Zirconium	INAA		< 61.8	147	9.	-	7.3		111.6	85.3		12%	*
Illimate/Drovingto	% Aeh	D3174	ð	10.5	113	er;	_	11.6		12.2	¥.	4.		
	1000	23476	2 2	2 2	: 2	! -	•	- -		7.3	72.0			
Offimate/Proximate		02176	e a	7.7		- 2	. *	2 2		207	7			
Ultimate/Proximate	% Hydrogen	031/6	,e ;	4.62	ď	2 !	•	3 4		50.4	50.4			
Ultimate/Proximate	% Nitrogen	03176	*	S.	-	Ω	- '	<u>C</u>		24.L	70.1			
Ultimate/Proximate	% Oxygen (diff)	03176	*	8.03	7.6	×	_	29		7.52	7.74			
Ultimate/Proximate	% Sulfur	D4239	*	2.87	2.6	ž.	8	8		2.66	2.74			
Ultimate/Proximate	Fixed Carbon	03172	×	51.4	49	.7	S.	1.4		50.8	50.8			
Ultimate/Proximate	Higher Heating Value	D2015	Btu/lb	12,721	12,6	660	5	.670		12,673	12,697			
Ultimate/Proximate	Heating Value (MAF)	D2015	MAF Btu	14,217	14.3	14	7	339		14,436	14,290			
Ultimate/Proximate	Volatile	03175	*	38.1	፠	O,	က	6.9		37.0	37.0			
Radionuclides	Actinium-228 @ 338 KeV	EPA901.1	S S S S	0.40	ö	2	0	.20		0.20	0.33			
Radionuclides	Actinium-228 @ 911 KeV	EPA901.1	pCi/g	0.30	0.0	2	•	Q		0.30	0.33			
Radionuclides	Actinium-228 @ 968 KeV	EPA901.1	pCi/g	9	Z	0	0	20		Q	0.07			
Radionuclides	Bismuth-212 @ 727 KeV	EPA901.1	bCi/g	9	Z	_	_	9		2	2			
Radionuclides	Bismuth-214 @ 1120.4 KeV	EPA901.1	bCiva	0.80	-	<u>o</u>	0	8		06:0	0.93			
Badionuclides	Bismuth-214 @ 1764.7 KeV	EPA901.1	pCi/g	9	0	2	_	ş		0.40	0.10			
Radionuclides	Bismuth-214 @ 609.4 KeV	EPA901.1	pCi/g	0.70	0.	R	0	2.0		0.60	0.67			
Radionuclides	K-40 @ 1460 KeV	EPA901.1	bCl/g	1.20	2.5	2	_	9		3.20	1.37			
Radionuclides	Lead-210 @ 46 KeV	EPA901.1	pCi/g	1.20). -	2	_	.70 07:		1.00	1.30			
Radionuclides	Lead-212 @ 238 KeV	EPA901.1	pCi/g	0.20	0	ຄ	0	.20		0.20	0.20			
Radionuclides	Lead-214 @ 295.2 KeV	EPA901.1	pCi/g	0.70	ö	æ	0	86		0.40	0.63			
Radionuclides	Lead-214@ 352.0 KeV	EPA901.1	PC//g	0.70	ŏ	2	0	8		0.50	0.63			
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Feed Coal - Page 2

Sample Stream: Feed Coal

95% DL Average Cl Ratio
Run 3d
Run 3
Run 2
Run 1
Units
Analytical Method Units
Specie
Analyte Group

Solid Stream Data

Sample Stream: Pulverizer Rejects

Analyte		Analytical		Run	Run	Run	Run		898	占
Group	Specie	Method	Units	-	2	6	34	Average	ਹ	Ratio
Anjons	Chloride	D4208	מאָפ	520	540	460	460	507	50	
Anions	Fluoride	D3761	6/6n	330	310	330	340	323	82	
Metals	Aluminum	INAA	5/5n	22,782	28,605	30,095	32,254	27,161	9,601	
Metals	Antimony	INAA	6/6n	1.03	1.35	.	1.14	1.24	0.45	
Metals	Arsenic	GFAA	6/6n	32.0	0.79	42.0	40.0	47.0	4.8	
Metals	Barium	INAA	g/gn	540	123	327	338	330	519	
Metals	Beryllium	ICPES	6/6n	1.90	1.90	0.60	1.10	1.47	1.86	
Metals	Boron	ICPES	g/gn	8	170	75	57	115	122	
Metals	Bromine	NAA	6/6n	4.85	4.42	3.65	4.98	4.31	1.51	
Metals	Cadmium	ICPES	6/6n	1.00	7.80	3.40	1.80	4.07	8.57	
Metałs	Calcium	INAA	5/6n	11,715	15,640	10,690	11,298	12,682	6,490	
Metafs	Cerinm	INAA	5/6n	52.9	33.1	30.7	33.6	29.9	90.6	
Metals	Cesium	INAA	6/6n	1.88	2.30	2.23	2.72	2.14	0.55	
Metals	Chlorine	NAA	B/Sin	554	643	529	648	282	125	
Metals	Chromium	NAA	₿øn	58.0	64.2	69.5	76.1	63.9	14.3	
Metals	Cobatt	INAA	5/6n	7.41	8.02	7.87	8.38	17.7	0.80	
Metals	Copper	INAA	6/6n	81.5	94.2	< 59.0	× 56.1	68.4	85.2	1 %
Metals	Europium	INAA	₿/₿n	0.59	0.65	0.67	0.67	0.64	0.1	
Metals	Hafnium	INAA	6/6n	2.30	1.82	2.34	2.47	2.15	0.73	
Metals	lodine	INAA	₿/₿n	4.	1.92	2.65	2.63	2:00	1.52	
Metals	Iron	INAA	6/6n	133,094	126,965	119,458	112,069	126,506	16,967	
Metals	Lanthanum	NAA	6,6n	14.5	17.4	16.5	16.6	16.2	3.7	
Metals	Lead	ICPES	₫/ðn	41.0	48.0	23.0	33.0	37.3	32.0	
Metals	Lutetium	INAA	6/6n	0.23	0.18	0.20	0.26	0.20	90.0	
Metals	Magnesium	INAA	B/Bin	1,226	1,467	1,420	1,696	1,371	318	
Metals	Manganese	INAA	6/6n	93.9	8 0.1	122	1 2	98.6	52.7	
Metals	Mercury	DGA/CVAA	B/Bn	0.26	060:0	0.040	0.21	0.130	0.287	
Metals	Molybdenum	NA NA	6/6n	18.36	17.3	4.07	4.17	13.2	19.8	
Metafs	Neodymium	NAA	6/6n	19.56	50.6	16.3	30.3	18.8	5.6	
Metafs	Nickel	INAA	6/6n	%	< 115	^ ই	117	< 115	;	%99
Metals	Phosphorus	ICPES	6/6n	1,200	2,500	780	066	1,493	2,228	
Metafs	Potassium	NAA	6/6n	2,707	5,303	8.54	4,558	2,673	6,577	
Metals	Rubidium	INAA	6/6n	41.0	36.4	36.3	6.04	37.9	9.9	
Metals	Samarium	INAA	₿/₿n	2.18	2.50	2.54	2.67	2.41	0.49	

Pulverizer Rejects - Page 1

Solid Stream Data

Sample Stream: Pulverizer Rejects	erizer Rejects													
Analyte		Analytical		Run		Run	_	Run	_	Run		6	95%	겁
Group	Specie	Method	Units	-		2		3		3d	Average		1	atio
					1	!	ז		•		Š		5	
Metals	Scandium	¥¥	6/6n	6 .60	ur)	23		5.22	-	6.32	2.6		2	
Metals	Sefenium	GFAA	5/6n	2.00	o	90.	_	00.0		2.00	8.6		g E	
Motale	Silver	NAA	no/a	06.1	٧	.87	v	1.94	٧	4 .	م ب			29%
Motole	Sodium	INAA	s/on	1.169	3)	964	-	,160	_	1,162	1.10		9	
	Stronting	NAM	0/00	308	(")	771	_	658		297	4		<u>.</u>	
Motors	Tantalsım	INAA	6/DD	0.43	0	157	_	0.55	_	0.48	0.5		8	
Metals	Terbiim	NAA	na/a	0.32	0	1,29	J	2.35	-	0.40	0.3		88	
Motors	Thorium	INAA	na/a	3.79	4	1.41	•	4.22	•	5.43	4.4		2	
Metals	Ę	INAA	b/bn	31.9	۸	70.7	v	29.5	٧	28.0	30.			49%
Motole	Titanium	INAA	o/an	1,993	_	936	7	,020	••	2,028	96.			
	Tundsten	INAA	6/pn	0.30	0	.49	v	0.74	٧	1.05	c 0.7.			2%
	Ilranium	INAA	6/on	3.84	ব	.95	•••	3.51		4.09	4.1		37	
Made	Vanadism	INAA	na/a	5.5	ψ,	9.0	~	51.8	-	66.2	26		7	
Motori	Viterhism	ANI	p/on	1.09	-	8 6.	•-	1.32		4.	4.		8	
Mobile	Zinc	INAA	p/pn	486	-	594	_	,503		559	1,18		82	
Metals	Zirconium	INAA	6/6n	294	••	251	-	448		240	330		528	
(Illimate/Organists	e. Carton	03176	*	39.5	(4)	9.6	**	36.6		38.4	8		Ŋ	
Ultimate/Proximate	% Sulfur	D3176	*	17.1	-	5.3	-	15.7		15.1	16.		ω	

Solid Stream Data

Sample Stream: Bottom Ash

A state of		Analytical		Rus		5	2	Run			%96	ಕ
Group	Specie	Method	Cnits	-		8	m	PE 3d		Average	ច	Ratio
			ļ.									
Anions	Chloride	SM407C	5/6n	172	v	8.66	163	9.66		128	2	13%
Anions	Fluoride	EPA 340.2	6/ 6 n	30.9		21.4	42.3	16.7		31.5	26.0	
1644	Alimimia	SW 6010	neafa	75 600		90.800	72.000	70.20	•	76.133	10,991	
Metals	Antimony	CP-MS	e pyon	1,21		1.15	. 6.	0.95		1.14	0.20	
Metals	Arsenic	SW 7060	5/80	4.28		8.67	8.49	4.92		7.15	6.17	
Metais	Barium	SW 6010	5/On	428		481	461	460		457	98	
Metals	Beryllium	SW 6010	ō/đn	8.47		8.17	6.30	6.51		7.65	2.92	
Metals	Вогол	KCPES	6/6n	360		240	250	240		283	165	
Metats	Cadmium	SW 7131	5,6n	0.29 J		0.18 J	0.49	0.29	-,	0.32	0.39	
Metals	Calcium	SW 6010	D/do	21,800		19,900	19,100	18,60	0	20,267	3,445	
Metals	Chromium	SW 6010	5/Bn	961		197	184	182		192	8	
Metals	Cobait	SW 6010	5/50	33.1		32.1	29.7	27.5		31.6	¥.	
Metals	Copper	SW 6010	5/6m	84.0		76.9	9.69	68.3		76.8	17.9	
Metals	ron	SW 6010	5/6n	144,000	•	127,000	120,000	118,00	Q	130,333	30,663	
Metals	Lead	SW 7421	5/ 6 n	20.2		21.2	18.2	18.3		19.9	3.8	
Metals	Magnesium	SW 6010	5/6n	3740		3850	3230	3070		3,607	822	
Metals	Manganese	SW 6010	6/6n	296		262	253	240		270	%	
Metals	Mercury	SW 7471	5/6n	0.0048	v	0.0109	o.0114	0.004	* ~	< 0.0114	:	70%
Metals	Molybdenum	SW 6010	6,80	4.57	v	2.89	< 2.97	4.52	•	c 2.97	:	36%
Metals	Nickel	SW 6010	5/8n	138		130	126	124		131	5	
Metais	Phosphorus	SW 6010	₿øn	906		413	470	420		396	202	
Metals	Potasslum	SW 6010	B/Bn	14,200		14,600	13,700	13,20	0	14,167	1,120	
Metals	Selenium	SW 7740	5/6n	< 1.13	v	1.13	< 1.16	× 1.14	•	1.14	:	100%
Metals	Silicon	SW 6010	6/6n	213,000	••	000,602	218,000	216,00	2	213,333	11,203	
Metals	Sodium	SW 6010	g/gin	3,850		3,610	3,380	3,300	_	3,613	3 2	
Metals	Strontium	SW 6010	Ø/Øn	280		297	264	260		280	Ŧ	
Metals	Titanium	SW 6010	D/Bn	5,450		5,810	5,400	5,430	_	5,553	226	
Metats	Vanadium	SW 6010	5/ôn	281		286	264	260		772	59	
Metals	Zinc	SW 6010	5/6n	216		229	194	186		213	4	
Himete@coximate	% Carbon	D3176	¥	1.18		1.53	4.29	3.46		2.33	4.23	
Ultimate/Proximate	% Suffer	D4239	*	0.053		0.052	0.340	0.133	_	0.148	0.412	
Radionuclides	Actinium-228 @ 338 KeV	EPA 901.1	pCi/g	2.1		2.1	2.1	2.2		2.1	0	
				Rottom Ash - Page	Ash - P	1 906						

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Analyte		Anaivtical			Run	2		Run	Run			95%	ដ
Group	Specie	Method	Units		+	2		60	3d	Av	Average	ច	Ratio
									,			1	
Radionuciides	Actinium-228 @ 911 KeV	EPA 901.1	200		2.3	2.2		2.1	2.0		2.2	0.2	
Radionuclides	Actinium-228 @ 968 KeV	EPA 901.1	B Cive		2.6	2.3		8.	2.4		2.2	0. 0.	
Radionuclides	Bismuth-212 @ 727 KeV	EPA 901.1	PCI'd		3.5	2.8		2.6	3.0		3.0	7	
Radionuclides	Bismuth-214 @ 1120.4 KeV	EPA 901.1	SC/Q		7.8	9.7		6.8	6.8	•	4.7	1.3	
Radionuclides	Bismuth-214 @ 1764.7 KeV	EPA 901.1	Š		7.4	7.3		5.8	6.5	_	6.8	2.2	
Radionuclides	Bismuth-214 @ 609.4 KeV	EPA 901.1	Š		7.7	7.1		6.5	6.7	•	7.1	1.5	
Radionuclides	K-40 @ 1460 KeV	EPA 901.1	D Cito		16	6 0		16	16		17	س	
Radionuclides	Lead-210 @ 46 KeV	EPA 901.1	D S S		1.2	L		1.6	1.6		4 .	0.5	
Radionuclides	Lead-212 @ 238 KeV	EPA 901.1	PCing		1.7	2.2		2.2	2.1	•	2.0	0.7	
Radionuclides	Lead-214 @ 295.2 KeV	EPA 901.1	Š		8.1	7.3		6.6	7.0		7.3	6.1	
Radionuclides	Lead-214@ 352.0 KeV	EPA 901.1	b Ci/g		8.2	7.8		6.8	7.1		7.6	1.8	
Radionuclides	Radium-226 @ 186.0 KeV	EPA 901.1	bCi/g		=	2		6.6	10		₽	1 .	
Radionuclides	Thallium-208 @ 583 KeV	EPA 901.1	DCI/G		2.3	2.3		2.0	2.2		2.2	0.4	
Radionucides	Thallium-208 @ 860 KeV	EPA 901.1	DCI/G		3.3	2.4		2	2.6		1.9	4.2	
Radionuclides	Thorium-234 @ 63.3 KeV	EPA 901.1	Si Od		6.1	5.53		5.7	5.0		5.8	9.0	
Radionuclides	Thorium-234 @ 92.6 KeV	EPA 901.1	bC//d		5.1	4.5		5.5	4.5		5.0	1 .3	
Radionuclides	Uranium-235 @ 143 KeV	EPA 901.1	PC!		0.26	0.28		0.38	0.25	•).31	0.16	
	ı												
Organics, Semi-Volatile	1,2,4,5-Tetrachlorobenzene	SW 8270	5 /0u	v	27.2	25.4	٧	16.9		v	23.2	:	100%
Organics, Semi-Volatile	1,2,4-Trichlorobenzene	SW 8270	10/0	v	27.8	25.9	•	25.6		٧	26.4	:	400%
Organics, Semt-Volatite	1,2-Dichlorobenzene	SW 8270	B/G	v	36.6	34.2	•	27.6		۷	32.8	:	100%
Organics, Semi-Volatile	1,2-Diphenylhydrazine	SW 8270	0 /6u	v	50	<u>\$</u>	v	5		v	<u>8</u>	:	100%
Organics, Semi-Volatile	1,3-Dichlorobenzene	SW 8270	0/6	v	18.6	17.4	•	31.2		v	22.4	:	100%
Organics, Semi-Volatile	1,4-Dichlorobenzene	SW 8270	0,6u	v	38.0	35.5	•	25.6		۷	33.0	:	100%
Organics, Semi-Volatile	1-Chloronaphthalene	SW 8270	0,00	v	30.3	28.3	•	23.3		v	27.3	:	100%
Organics, Semi-Volatile	1-Naphthylamine	SW 8270	5/64	v	73.3	68.5	•	88.2		v	76.7	:	100%
Organics, Semi-Votatile	2,3,4,6-Tetrachiorophenol	SW 8270	90	v	23.6	22.1	•	20.2		۷	22.0	:	100%
Organics, Semi-Volatile	2,4,5-Trichlorophenol	SW 8270	₿/Gu	v	15.5	14.5	•	22.1		·	17.4	:	100%
Organics, Semi-Volatile	2,4,6-Trichlorophenol	SW 8270	9/64	v	16.4	15.3	•	22.0		<u> </u>	67.1	:	100%
Organics, Semi-Volatile	2.4-Dichlorophenol	SW 8270	Døu	v	20.8	19.4	•	24.7		v	9.13	:	100%
Organics, Semi-Volatile	2,4-Dimethylphenol	SW 8270	5 / 6 u	v	51.7	48.3	•	56.5		v	52.2	;	100%
Ordanics, Semi-Volatile	2,4-Dinitrophenol	SW 8270	₽¢0	v	329	307	•	182		v	273	;	100%
Organics, Semi-Volatile	2,4-Dinitrololuene	SW 8270	5/6u	v	25.8	24.1	v	25.7		٧	25.2	:	100%
Organics, Semi-Volatile	2,6-Dichlorophanol	SW 8270	D/Gu	v	34.0	31.7	•	22.2		٧	29.3	:	100%
Organics, Semi-Volatile	2,6-Dinitrololuene	SW 8270	₿/Bu	v	16.3	15.2	v	37.4		۷	23.0	:	100%
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Solid Stream Data

Sample Stream: Bottom Ash

100% 100% 100% 100% 100% 100% 800 8 8 8 80 8 **10%** 80 100% 100% 8 80 8 265 * 8 Š 57% 겉 ខ្លុំ ច Average 39.9 24.0 23.4 22.6 20.7 82.2 20.9 45.0 19.7 21.1 30,7 20.8 29.4 22.1 34.5 77.4 18.4 12.9 22.0 25.5 20.0 39.5 44.3 43.4 37.2 19.1 5.5 88 E B 35.9 1,680 69.5 28.8 51.7 18.3 19.9 26.3 57.8 1.8 26.8 16.0 19.5 39.5 뙲 5.8 13.5 4.5 21.7 17.1 18.7 21.0 22.4 40.7 18.2 24.3 20.0 22.5 4.3 43.4 26.5 803 21.0 瀀 85.6 19.3 47.8 22.3 8 32.8 20.0 23.2 25.2 212 85.3 69 20.0 22.8 16.8 25.0 20.1 25.5 31.7 2.5 174 23.0 22.5 78.9 E 25.1 18.9 51.2 23.9 37.2 80.00 27.0 32.5 10.6 20.7 36.8 35.1 24.8 22.7 90.2 43.8 18.0 8 20.7 18.5 Š 8 ğ Š ğ Ş Ş Ş ş Š ş Š 5 Ş ş ş Š ş Ş Analytical SW 8270 7,12-Dimethylbenz(a)anthracene 4-Chlorophenyl phenyl ether 4,6-Dinitro-2-methylphenol 4-Chloro-3-methylphanol 4-Methylphenol(p-cresol) 2-Methylphenol(o-cresol) 4-Bromophenyl phenyl 3,3'-Dichlorobenzidine 3-Methylcholanthrene 2-Methylnaphthalene Benzo(b)fluoranthene Benzo(k)fluoranthene Butylbenzylphthalate Benzo(g,h,i)penylene 2-Chloronaphthalene Benzo(a)anthracene 2-Naphthylamine 4-Aminobiphenyl Benzo(a)pyrene Acenaphthylene 2-Chlorophenol Benzył akcohol 4-Nitrophenol Acenaphthene 2-Nitrophenol 3-Nitroaniline 4-Nitroaniline Acetophenone 2-Nitroantline Benzoic acid Anthracene 2-Picoline Benzidine Specie Aniline Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Votatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Organics, Semi-Volatile Analyte Group

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Analyte		Analytical			Run		Run		Run	Run			95%	ត
Group	Specie	Method	Cnits		_		2		8	3d		Average	5	Ratio
	dele Halanda e 10	CIAI 0370	e;	,	4	•	Q	١	Ť.		٧	20.7	:	7001
Organics, Serni-Volatine	C-11-Octable in the second	0.70 440	2	,	4.4	,	2	,	2 1		,	;		
Organics, Semi-Volatile	Dibenz(a,h)anthracene	SW 8270	Ş	٧	22.3	v	20.8	V	35.2		v	26.1	:	100%
Organics, Semi-Volatile	Dibenz(a_))acridine	SW 8270	₽/Gu	v	27.3	v	25.5	V	36.6		v	29.8	;	100%
Organics, Serni-Votatife	Dibenzofuran	SW 8270	₿/Bu	v	19.2	•	17.9	٧	23.3		•	20.1	:	100%
Organics, Semi-Volatile	Dibutytphthalate	SW 8270	0/Bu	v	23.2	v	21.6	•	14.1		•	19.6	:	100%
Organics, Semi-Volatile	Diethylphthalate	SW 8270	5/6u	v	15.8	٧	14.7	v	22.4		v	17.6	:	100%
Organics, Semi-Volatile	Dimethylphenethylamine	SW 8270	6/6u	٧	120	٧	120	•	120		v	120	;	100 %
Organics, Semi-Votatile	Dimethylphthalate	SW 8270	6/Bu	v	13.2	v	12.3	•	14.6		٧	13.4	:	100%
Organics, Semi-Volatile	Diphenylamine	SW 8270	6/6u	v	24.8	v	23.2	٧	12.0		v	20.0	:	100%
Organics, Semi-Volatile	Ethyl methanesulfonate	SW 8270	6/Bu	٧	23.6	v	22.1	v	29.5		v	25.1	:	100%
Organics, Semi-Volatile	Fluoranthene	SW 8270	5/Bu	v	30.0	v	28.0	•	20.5		v	26.2	:	100%
Organics, Semi-Volatile	Fluorene	SW 8270	₿/Đu		11.3	v	14.7	•	16.5		v	16.5	:	58%
Organics, Semi-Volatile	Hexachlorobenzene	SW 8270	6/ 6 u	v	11.0	٧	10.3	•	13.6		•	11.6	;	100%
Organics, Semi-Volatile	Hexachlorobutadiene	SW 8270	5/ 6 L	v	32.8	v	30.6	v	22.2		٧	28.5	:	100 %
Organics, Semi-Volatile	Hexachlorocyclopentadiene	SW 8270	6/6 u	٧	419	٧	391	•	256		•	355	;	100%
Organics, Semi-Volatile	Hexachloroethane	SW 8270	₿/Bu	v	27.9	v	26.1	٧	27.6		•	27.2	;	100 %
Organics, Semi-Votatile	Indeno(1,2,3-cd)pyrene	SW 8270	0/6u	v	24.7	v	23.0	•	57.8		v	35.2	;	100%
Organics, Semi-Volatile	Sophorone	SW 8270	5/6u	v	13,5	v	12.6	v	26.8		V	17.6	:	1 00%
Organics, Semi-Volatile	Methyl methanesulfonate	SW 8270	5/60	v	50.0	٧	20.0	•	20.0		v	20.0	:	100%
Organics, Semi-Volatile	N-Nitroso-di-n-butylamine	SW 8270	5/6 u	٧	61.6	v	57.5	•	27.3		v	48.8	;	100%
Organics, Semi-Volatile	N-Nitrosodimethylamine	SW 8270	6/ 6 u	v	62.5	v	58.4	•	34.2		v	51.7	:	100%
Organics, Semi-Volatile	N-Nitrosodiphenylamine	SW 8270	6/6 u	v	26.6	٧	24.8	•	11.7		٧	21.0	:	100 %
Organics, Semi-Volatile	N-Nitrosodipropylamine	SW 8270	5/6u	v	35.3	v	33.0	v	28.4		v	32.2	:	100%
Organics, Semi-Volatile	N-Nitrosopiperidine	SW 6270	₿/Ĝu	v	6.44	v	41.4	•	25.9		v	37.2	:	100%
Organics, Semi-Volatile	Naphthalene	SW 8270	6 / 6 u		52.2	v	32.0	v	20.8		v	32.0	:	34.8 8
Organics, Semi-Volatile	Nitrobenzene	SW 8270	8/6u	v	24.8	v	23.2	•	36.6		v	28.2	:	100%
Organics, Semi-Volatile	Pentachlorobenzene	SW 8270	5/64	v	20.8	٧	19.4	٧	16.3		v	18.8	;	100 %
Organics, Semi-Votatile	Pentachloronitrobenzene	SW 8270	6/6u	v	97.3	٧	8.06	•	0.09		v	82.7	:	100%
Organics, Semi-Volatile	Pentachlorophenol	SW 8270	B/Bu	٧	40.6	٧	37.9	v	38.6		•	39.0	:	100%
Organics, Semi-Volatile	Phenacetin	SW 8270	₿ø.	v	25.4	•	23.7	•	16.8		٧	22.0	:	100%
Organics, Semi-Volatile	Phenanthrene	SW 8270	6/6 u		31.1	V	27.3	v	20.3		v	27.3	:	43%
Organics, Semi-Volatile	Phenol	SW 8270	₿/Bu	v	18.7	٧	17.5	v	38.4		٧	24.9	;	100%
Organics, Semi-Votatile	Pronamide	SW 8270	₿/Bu	v	34.7	v	32.4	•	10.5		V	25.9	;	100%
Organics, Semi-Votatile	Pyrene	SW 8270	₿/Ĝu	v	22.0	v	20.5	•	17.7		٧	20.1	:	100%
Organics, Semi-Volatile	Pyridine	SW 8270	6/Bu	v	54.5	•	50.9	٧	25.6		v	43.7	:	100%

Bottom Ash - Page 4

Sample Stream: Bottom Asn	Asn													
Analyte	Specie	Analyticat Method	Units	1	Run 1		Run 2		Run	Run 3d		Average	0 % C	Or. Ratio
	Ling Orlandamathana	CV ROTO	שטים	v	26.4	٧	24.7	٧	26.3		v	25.8	:	100%
Organics, Semi-Volatie	OIS(Z-CIIIOCOERITOXY)/IIIEIIIII	SW 8270	R.A.		34.4	٧	32.1	٧	16.6		v	27.7	:	100%
Organics, Semi-Volatile		SW 8270	A 0/00		34.1	٧	31.9	٧	34.7		٧	33.6	:	100%
Organics, Semi-Volatile	DIS(2-Chiorosophopy) Surial	CM 8270	3 5		280		157.0	٧	25.2		v	86.0	:	76%
Organics, Sermi-Volatile	bis(z-Etnyinexyi)pyruhaiate	SW 8270	2 0		26.3	٧	24.5	v	32.4		•	27.7	:	100%
Organics, Semi-Volatile	p-Cinicipalities o-Dimethylaminoazobenzene	SW 8270	o/bu	v	24.2	٧	22.6	v	31.5		٧	26.1	:	100%
Organica, Connection			,											

Sample Stream: Sluiced Fly Ash

Analyte		Analytical		Run	Run	Run	Run		85%	占
Group	Specie	Method	Units	-	2	80	3d	Average		Ratio
			į			,	Ş			,
Anions	Chlorine	0.04₹0	600	8	3	3	455	3	:	Š
Anions	Fluorine	EPA 350.2	6/6n	77.2	129	91.0	V	99.1	9.99	
		0100	,	468	90	101 600	9	7008	7 003	
MCLAIS		00000	3	904,400	600	SOC'101	20.10	36.6	100	
Metals	Antimony	CP-MS	0	3.28	4.26	2.63	2.74	3.39	2.04	
Metals	Arsenic	SW 7060	6/6 n	53.1	6.77	50.9	50.8	9.09	37.2	
Metals	Barium	SW 6010	B/Bn	456	522	209	510	496	87.4	
Metals	Beryllium	SW 6010	₿/Bn	11.1	12.4	<u>ග</u>	10.1	11.1	3.09	
Metals	Boron	ICPES	5/5n	280	410	430	450	473	231	
Metals	Cadmium	SW 7131	₿/₿n	3.89	5.41	3.07	3.26	4.12	2.95	
Metals	Calcium	SW 6010	5/61	14,285	12,877	14,185	13,709	13,782	1,952	
Metals	Chromium	SW 6010	5/ôn	186	193	176	174	185	21.4	
Metals	Cobaff	SW 6010	6/6n	38.8	37.6	34.3	35.7	36.9	5.82	
Metais	Copper	SW 6010	6/6n	110	110	93.4	88.7	ş	23.4	
Metals	iron	SW 6010	₿/₿'n	96,371	79,073	92,353	83,968	89,266	22,491	
Metals	Lead	SW 7421	₿/₿n	81.4	<u>5</u>	68.2	8.69	83.2	39.8	
Metals	Magnesium	SW 6010	₿/6n	4,778	4,829	5,040	5,010	4,882	345	
Metals	Manganese	SW 6010	6/6n	262	225	248	231	245	45.5	
Metals	Mercury	SW 7471	₽⁄ôn	0.091	0.188	0.156	0.181	0.145	0.122	
Metals	Molybdenum	SW 6010	đ/đn	< 14.3	13.2	3.9	2.59	< 14.3	;	29%
Metals	Nickel	SW 6010	6/6n	151	149	128	151	143	35	
Metals	Phosphorus	SW 6010	6/6n	8.53	J 72.5	124	0.86	68.3	143	
Metals	Potassium	SW 6010	6∕6n	18,208	18,611	17,807	17,539	18,209	666 6	
Metals	Selenium	SW 7740	6/6n	8.14	16.7	11.2	11.0	12.0	10.8	
Metais	Silicon	SW 6010	6/6n	218,294	222,330	216,296	213,699	218,973	7,636	
Metals	Sodium	SW 6010	6/6n	5,422	5,231	4,507	4,334	5,053	1,199	
Metals	Strontium	SW 6010	6/6n	315	336	315	313	322	30.3	
Metals	Titanium	SW 6010	6/ 6 n	6,277	6,650	950'9	6,209	6,328	745	
Metals	Vanadium	SW 6010	6/6n	335	345	301	293	327	97.6	
Metals	Zinc	SW 6010	₿/₿n	209	601	427	431	512	216	
•		02478	6	o c	7	ŭ	7		9	
Ultimate/Proximate	% Carbon	93.50	ę	9	8.*	t n n	ī,	ř	6.00	

Sluiced Fly Ash - Page 1

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Analyte		Analytical			Run	Run		Run	_	Run		95%		占
Group	Specie	Method	Units		-	2				3d	Average			뜮
								!	•	į	•			
Ultimate/Proximate	% Sulfur	D3176	*		0.115	0.146		0.140	o o	0.141	0.134	0.041	-	
Radionuclides	Actinium-228 @ 338 KeV	EPA 901.1	pCi/g		2.3	2.4		2.4	•	2.2	2.4	0.14	_	
Radionuclides	Actinium-228 @ 911 KeV	EPA 901.1	₽Ċ!⁄g		2.3	2.3		2.4		2.4	2.3	0.14	_	
Radionuclides	Actinium-228 @ 968 KeV	EPA 901.1	pCi/g		2.5	2.4		2.6	•	2.3	2.5	0.25		
Radionuclides	Bismuth-212 @ 727 KeV	EPA 901.1	5		2.2	3.0		2.6	•	3.0	2.6	36.O	_	
Radionuclides	Bismuth-214 @ 1120.4 KeV	EPA 901.1	g/j		7.2	6.9		5.4	_	5.4	6.5	2.40	_	
Radionuclides	Bismuth-214 @ 1764.7 KeV	EPA 901.1	PC//g		6.7	5.4		5.5	-	5.8	5.9	<u>8</u> .	_	
Radionuclides	Bismuth-214 @ 609.4 KeV	EPA 901.1	pCi/g		7.1	6.4		6.0	_	3.0	6.5	138	_	
Radionuclides	K-40 @ 1460 KeV	EPA 901.1			61	18		17		16	18.0	2.48	_	
Radionuclides	Lead-210 @ 46 KeV	EPA 901.1	bCi/d		6.2	7.6		5.5	·	9.1	6.4	2.66		
Radionuclides	Lead-212 @ 238 KeV	EPA 901.1	DCI/O		2.3	2.2		2.1		2.1	2.2	0.25		
Radionuclides	Lead-214 @ 295.2 KeV	EPA 901.1	PC PC		7.0	6.7		5.9	-	6.9	6.5	14.		
Radionuclides	Lead-214@ 352.0 KeV	EPA 901.1	DÇ!\Q		7.1	6.7		6.1	_	3.2	9.9	1.25		
Radionuclides	Radium-226 @ 186.0 KeV	EPA 901.1	DCI/O		9.9	=		8.7		9.3	6.6	2.86		
Radionuclides	Thallium-208 @ 583 KeV	EPA 901.1	Š.		2.3	2.3		2.1	•	2.2	2.2	0.29	_	
Radionuclides	Thallium-208 @ 860 KeV	EPA 901.1	PC!/g		3.0	2.9		3.0		9.5	3.0	0.14	_	
Radionuclides	Thorium-234 @ 63.3 KeV	EPA 901.1	PCI/g		6.0	8,5		5.2		5.3	6.6	4.28		
Radionuclides	Thorium-234 @ 92.6 KeV	EPA 901.1	5 /0		5.7	4.0		5.3		1.2	5.0	2.21		
Radionuclides	Uranium-235 @ 143 KeV	EPA 901.1	bC//g		0.16	0.23		0.28	o v	013	0.22	0.15		
Organics, Semi-volatife	1,2,4,5-Tetrachlorobenzene	SW 8270	6/6 u	v	27.5	25.7	v	17.4	v	17.5	< 23.5	;	5	100%
Organics, Semi-votatile	1,2,4-Trichlorobenzene	SW 8270	0/Bu	v	28.1	26.3	v	26.2	۷	6.3	< 26.9	1	5	%0
Organics, Semi-volatile	1,2-Dichlorobenzene	SW 8270	0/6u	v	37.0	34.6	v	28.3	۸	8.5	< 33.3	;	₽	%0
Organics, Semi-volatile	1,2-Diphenylhydrazine	SW 8270	5/6u	v	1 00	0	v	\$	v	8	۰ 5	,	₽	%
Organics, Semi-volatile	1,3-Dichlorobenzene	SW 8270	₿øu	v	18.8	: 17.6	v	31.9	v	2.1	< 22.8	;	5	%
Organics, Semi-volatile	1,4-Dichlorobenzene	SW 8270	6/6u	v	38.4	35.9	v	26.2	۷	6.3	< 33.5	;	₽	%
Organics, Semi-volatile	1-Chloronaphthalene	SW 8270	6/6 ⊔	v	30.6	28.6	v	23.9	۸	4.1	< 27.7	;	ō	%
Organics, Semi-volatile	1-Naphthylamine	SW 8270	8/Bu	٧	74.2	69.3	v	90.4	υ, V	4.0	< 78.0	;	₽	%
Organics, Semi-volatile	2,3,4,6-Tetrachtorophenol	SW 8270	6/6u	v	23.9	22.4	v	20.7	v	9.0	< 22.3	;	₽	%
Organics, Semi-votatile	2,4,5-Trichlorophenol	SW 8270	₿/gu	v	15.7	14.7	v	22.7	v	2.8	< 17.7	;	5	%0
Organics, Semi-volatile	2,4,6-Trichlorophenol	SW 8270	6/ 6 u	v	16.6	. 15.5	v	22.5	v	2.7	< 18.2	;	₽	%

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Solid Stream Data

Sample Stream: Sluiced Fly Ash

Specie Method Units 1 2 35 34 Average 2,4-Dichtcrophenol SW 8270 rigg < 21.1 < 18.7 < 25.3 < 25.5 < 22.0 2,4-Dichtcrophenol SW 8270 rigg < 33.3 < 18.9 < 57.9 < 89.2 < 22.4 2,4-Dichtcrophenol SW 8270 rigg < 34.4 < 24.4 < 26.3 < 25.8 < 25.8 2,6-Dichtcrophenol SW 8270 rigg < 34.4 < 24.4 < 22.1 < 22.9 < 22.9 < 25.8 2,6-Dichtcrophenol SW 8270 rigg < 18.4 < 22.1 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 2,Chlorrosphrihatene SW 8270 rigg < 18.4 < 14.4 < 17.5 < 17.7 < 18.8 < 22.4 2,Altropalities SW 8270 rigg < 23.1 < 4.4 < 17.5 < 17.7 < 17.7 < 18.8 2,Altropalities SW 8270 rigg < 23.1 < 24.4 < 17.8 < 17.8	Analyte		Analytical			Run	æ	E		Ren		Run			95%	占
2,4-Dichtorophenol SW 8270 rigin < 21,1	Group	Specie	Method	Units		1	2		ľ		ļ	3d		Average	ಶ	Ratio
2,4-Dichlorophenol SW 8270 ngg < 21.1 < 19.7 < 25.3 < 25.3 < 25.3 < 25.3 < 24.0 < 25.3 < 24.0 < 25.3 < 24.0 < 25.3 < 24.0 < 25.3 < 24.0 < 25.3 < 24.0 < 25.3 < 24.0 < 25.3 < 26.0 < 25.0 < 25.0 < 25.0 < 26.0 < 25.0 < 26.0 < 25.0 < 26.0 < 26.0 < 25.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0 < 26.0																
2.4-Dimentiyaphenol SW 8270 ngg < 52.3	Organics, Semi-volatile	2,4-Dichlorophenol	SW 8270	0/ 6 u	v	21.1	, 19	-	v	25.3	٧	25.5	V	22.0	:	100 %
2,4-Dinkrophenol SW 8270 ngg 333 < 311 < 186 < 187 2,4-Dinkrophenol SW 8270 ngg < 26.1 < 24.4 < 26.3 < 22.9 2,6-Dinkrophenol SW 8270 ngg < 16.4 < 15.4 < 28.3 < 22.9 < 22.9 2,6-Dinkrophenol SW 8270 ngg < 15.4 < 11.5 < 22.9 < 22.9 2,Chlorophenol SW 8270 ngg < 15.4 < 29.3 < 17.5 < 22.9 2,Authyphenolic-creaol SW 8270 ngg < 34.0 < 29.3 < 17.5 < 17.5 < 17.5 2,Authyphenolic-creaol SW 8270 ngg < 23.7 < 13.8 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5 < 17.5	Organics, Semi-votatile	2,4-Dimethylphenol	SW 8270	₿/B⊔	v	52.3	× 48	O)	v	57.9	v	58.2	v	53.0	;	100%
2,4-Dinitrotokeree SW 8270 ng/g < 26.1 < 24.4 < 26.3 < 26.5 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 < 22.9 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0	Organics, Semi-volatile	2,4-Dinitrophenol	SW 8270	D/0u	v	333	< 31	_	v	186	v	187	v	277	;	100%
2,6-Dichlorophenol SW 8270 ng/g < 34.4 < 22.1 < 22.8 < 22.9 2,6-Dichlorophenol SW 8270 ng/g < 16.4 < 17.4 < 28.3 < 28.9 < 22.9 2-Chlorophenol SW 8270 ng/g < 16.4 < 14.4 < 17.5 < 17.8 < 17.8 2-Chlorophenol SW 8270 ng/g < 36.3 < 29.3 < 16.2 < 17.6 < 17.8 < 17.8 < 17.8 < 17.8 < 17.8 < 17.8 < 17.8 < 17.8 < 17.9 < 29.5 < 29.5 < 29.5 < 29.5 < 18.9 < 17.9 < 18.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 < 17.9 <td>Organics, Semi-volatile</td> <td>2,4-Dinitrotoluene</td> <th>SW 8270</th> <th>5/6u</th> <td>v</td> <td>26.1</td> <td>< 24</td> <td>4</td> <td>v</td> <td>26.3</td> <td>٧</td> <td>26.5</td> <td>٧</td> <td>25.6</td> <td>;</td> <td>100%</td>	Organics, Semi-volatile	2,4-Dinitrotoluene	SW 8270	5/6u	v	26.1	< 24	4	v	26.3	٧	26.5	٧	25.6	;	100%
2.6 Dinitrotoluene SW 8270 righ < 15.4	Organics, Semi-volatile	2,6-Dichlorophenol	SW 8270	5/50	v	34.4	32	-	v	22.8	v	22.9	v	29.8	1	100 %
2-Chlororaphthalene SW 8270 ngg 4 4 17.5 6 17.6 7	Organics, Semi-volatile	2,6-Dinitrotoluene	SW 8270	6/60	v	16.4	د 15	₹.	v	38.3	v	38.6	v	23.4	;	100%
2-Chilotophenal SW 8270 ngg < 36.3	Organics, Semi-volatile	2-Chloronaphthatene	SW 8270	6/6 u	v	15.4	× 14	4	v	17.5	٧	17.6	v	15.8	;	100 %
2-Methylphenolic-reaol) SW 8270 ngg c 31.4 c 29.3 c 16.2 c 16.3 c 2-Methylphenolic-reaol) SW 8270 ngg c 25.4 c 23.7 c 13.8 c 13.9 c 2-Mathylphenol SW 8270 ngg c 20.9 c 18.8 c 29.5 c 29.7 c 29.7 c 13.9 c 29.7 c 29.7 c 13.9 c 29.7 c	Organics, Semi-volatile	2-Chlorophenol	SW 8270	₽ 6	v	36.3	र्ड ४	0	v	28.3	v	28.5	v	32.9	;	100%
2-Methylphenol(o-cread) SW 8270 ng/g < 25.4 < 23.7 < 13.8 < 13.9 < 13.9 < 2.4 < 13.7 < 13.9 < 13.9 < 2.4 < 23.7 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9 < 13.9	Organics, Semi-volatile	2-Methytnaphthalena	SW 8270	0/Bu	v	31.4	> 29	e	v	16.2	v	16.3	٧	25.6	;	100%
2-Nitroanline SW 8270 ng/g < 92.7 < 86.7 < 71.2 < 71.7 < 71.7 < 71.1 c. 2.1 introanline SW 8270 ng/g < 19.1 < 17.9 < 29.5 < 29.5 < 29.7 < 29.5 < 29.5 < 29.7 < 29.5 c. 29.5 < 29.7 < 29.5 c. 29.5 < 29.7 < 29.5 c. 29.5 c. 29.4 < 2.2 c. 2.4 introanline SW 8270 ng/g < 20.9 < 19.1 < 148.4 < 29.5 c. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29.4 < 2.2 d. 29	Organics, Semi-volatile	2-Methylphenol(o-cresol)	SW 8270	6 / 6 u	v	25.4	× 23	-	v	13.8	٧	13.9	٧	21.0	:	100%
2-Nitrophenol SW 8270 ng/g < 19.1 < 17.9 < 29.5 < 29.7 < 29.7 < 2-Nitrophenol SW 8270 ng/g < 20.9 < 19.8 < 23.2 < 23.4 < 23.4 < 22-Nitrophenol SW 8270 ng/g < 20.9 < 19.8 < 23.2 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4 < 23.4	Organics, Semi-volatile	2-Naphthylamine	SW 8270	DØ/Bu	v	92.7	88	7	v	71.2	v	71.7	v	83.5	:	100 %
2-Picoline SW 8270 ng/g < 51.8 < 48.4 < 36.8 < 37.4 < 53.4 < 5.4 2-Picoline SW 8270 ng/g < 51.8 < 48.4 < 36.8 < 37.1 < 44.9 3.3-Dehloroberaddine SW 8270 ng/g < 23.3 < 21.8 < 48.4 < 36.8 < 37.1 < 14.9 3.4-Dintrochemy phenyl SW 8270 ng/g < 37.2 < 24.2 < 24.2 < 24.2 < 14.8 < 14.9 4.6-Dintrochemy phenyl SW 8270 ng/g < 37.6 < 37.2 < 19.1 < 19.3 4.4-Minobibreny phenyl SW 8270 ng/g < 37.6 < 37.2 < 19.1 < 19.3 4.4-Minophenyl phenyl Phenyl SW 8270 ng/g < 37.6 < 37.2 < 19.1 < 19.3 4.4-Minophenyl phenyl Phenyl SW 8270 ng/g < 37.6 < 37.2 < 19.1 < 19.3 4.4-Minophenyl phenyl Phenyl SW 8270 ng/g < 37.1 < 20.3 < 21.5 < 21.5 < 21.7 < 19.3 4.4-Minophenyl phenyl Phenyl SW 8270 ng/g < 21.7 < 25.8 < 21.5 < 21.5 < 21.7 < 22.9 < 21.7 < 21.7 < 4.0 4.4-Minophenyl phenyl Phenyl Phenyl SW 8270 ng/g < 21.7 < 22.9 < 21.5 < 21.7 < 22.9 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 21.7 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 < 22.0 <	Organics, Semi-volatile	2-Nitroaniline	SW 8270	5/Bu	٧	19.1	< 17	O .	v	29.5	v	29.7	٧	22.2	;	700
2-Picoline SW 8270 ng/g < 51.8 < 48.4 < 36.8 < 37.1 < 4.8 3.3-Dichloroberacidine SW 8270 ng/g < 23.3 < 21.8 < 14.8 < 14.9 < 14.9 < 14.9 < 14.8 3.4-Dichloroberacidine SW 8270 ng/g < 37.2 < 21.8 < 14.8 < 14.9 < 14.9 < 14.9 < 14.8 3.4-Dichloroberacidine SW 8270 ng/g < 24.2 < 22.6 < 17.5 < 17.6 < 17.6 < 17.6 < 17.6 < 17.5 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.6 < 17.	Organics, Semi-volatile	2-Nitrophenof	SW 8270	6/6u	٧	20.9	× 19	9	v	23.2	v	23.4	v	21.2	:	100 %
3.3-Dichloroberzidine SW 8270 ng/g < 23.3 < 14.8 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9 < 14.9	Organics, Semi-volatile	2-Picoline	SW 8270	6 / 6 u	v	51.8	۸ 48	₹.	v	36.8	٧	37.1	٧	45.7	;	100 %
3-Methylcholanthrene SW 8270 ng/g < 37.2	Organics, Semi-volatile	3,3'-Dichlorobenzidine	SW 8270	6/6u	v	23.3	< 21.	80	٧	14.8	٧	14.9	v	20:0	:	100%
3-Nitroaniline SW 8270 ng/g < 24.2 < 22.6 < 17.5 < 17.6 < 4.6 Colorable SW 8270 ng/g < 24.2 < 22.6 < 17.5 < 17.5 < 17.6 < 4.6 Colorable SW 8270 ng/g < 37.6 < 35.2 < 19.1 < 19.3 < 19.3 < 4.6 Colorable SW 8270 ng/g < 21.7 < 20.3 < 21.5 < 21.7 < 20.3 < 21.5 < 21.7 < 4.6 Colorable SW 8270 ng/g < 21.7 < 20.3 < 21.5 < 21.7 < 21.7 < 21.7 < 21.5 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.	Organics, Semi-volatile	3-Methylcholanthrene	SW 8270	D/0u	v	37.2	₹ •	æ	v	22.3	V	22.4	٧	31.4	;	100 %
4,6-Dinitro-2-methylphenol SW 8270 ng/g 37.6 45.0 19.1 19.3 4-Aminobiphenyl SW 8270 ng/g 35.6 33.2 53.0 53.3 4-Bromophenyl phenyl SW 8270 ng/g 21.7 20.3 21.7	Organics, Semi-volatile	3-Nitroaniline	SW 8270	5/04	v	24.2	× 22	ω.	v	17.5	v	17.6	v	21.4	1	100 %
4-Aminobiphenyl SW 8270 ng/g < 21.7 < 20.3 < 53.0 < 53.3 < 4.4 4.4 A-minobiphenyl SW 8270 ng/g < 21.7 < 20.3 < 21.5 < 21.7 < 21.7 < 4.Chloro-3-methyphenol SW 8270 ng/g < 21.7 < 20.3 < 21.5 < 21.7 < 21.7 < 22.9 < 21.7 < 4.Chloro-3-methyphenol SW 8270 ng/g < 25.1 < 25.6 < 22.9 < 22.9 < 23.1 < 4.Chloro-phenyl phenyl ether SW 8270 ng/g < 25.1 < 25.6 < 20.4 < 20.4 < 20.6 < 20.6 < 4.Chlorophenyl phenyl ether SW 8270 ng/g < 23.0 < 21.5 < 21.5 < 27.0 < 27.2 < 4.Chlorophenyl phenyl ether SW 8270 ng/g < 23.0 < 21.5 < 21.5 < 27.0 < 27.2 < 20.6 < 27.2 < 4.Chlorophenol SW 8270 ng/g < 22.7 < 21.5 < 27.0 < 27.0 < 27.2 < 27.0 < 27.2 < 4.Chlorophenol SW 8270 ng/g < 22.7 < 21.2 < 12.1 < 12.1 < 12.1 < 12.2 < 4.Chlorophenol SW 8270 ng/g < 22.7 < 21.2 < 12.1 < 12.1 < 12.2 < 12.1 < 12.1 < 12.2 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 12.1 < 1	Organics, Semi-volatile	4,6-Dinitro-2-methylphenol	SW 8270	DØ/Gu	v	37.6	۰ ج	8	v	19.1	v	19.3	v	30.6	;	10%
4-Bromophenyl phenyl SW 8270 ng/g < 21.7 < 20.3 < 21.5 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7 < 21.7	Organics, Semi-volatile	4-Aminobiphenyl	SW 8270	ō/ōu	٧	35.6	, 33 33	2	v	53.0	٧	53.3	٧	40.6	;	100%
4-Chloro-3-methylphenol SW 8270 ng/g < 25.1 < 22.9 < 23.1 < 23.1 < 23.1 < 23.1 < 23.1 < 23.1 < 23.1 < 23.1 < 23.1 < 23.1 < 23.1 < 23.1 < 23.1 < 20.4 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6 < 20.6	Organics, Semi-volatile	4-Bromophenyl phenyl	SW 8270	0,0 u	v	21.7	× 20	e	v	21.5	٧	21.7	v	21.2	;	100%
4-Chlorophenyl phenyl ether SW 8270 ng/g < 25.1 < 23.5 < 18.7 < 18.9 < 4.4. Methylphenol(p-cresol) SW 8270 ng/g < 27.3 < 25.6 < 20.4 < 20.6 < 20.6 < 4.4.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 20.6 < 4.5.7 < 4.5.7 < 4.5.0 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7 < 4.5.7	Organics, Semi-volatile	4-Chioro-3-methylphenol	SW 8270	6/6u	v	34.4	8	<u>-</u>	v	22.9	v	23.1	v	29.8	•	100 %
4-Methylphenolip-cresol) SW 8270 ng/g < 27.3 < 25.6 < 20.4 < 20.6 < 4.05 4-Nitroanline SW 8270 ng/g < 23.0 < 21.5 < 27.0 < 27.2 < 42.0 7,12-Dimethylberz(a)anthracene SW 8270 ng/g < 91.3 < 85.3 < 59.2 < 59.6 < 42.0 Acenaphthylene SW 8270 ng/g < 10.7 < 10.0 < 18.6 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2 < 12.2	Organics, Semi-volatile	4-Chlorophenyl phenyl ether	SW 8270	B/Bu	v	25.1	× 23	ıΩ	v	18.7	v	18.9	v	22.4	:	100%
4-Nitroaniline SW 8270 ng/g < 23.0	Organics, Semi-volatile	4-Methylphenol(p-cresol)	SW 8270	D/0u	v	27.3	× 25	9	٧	20.4	v	20.6	٧	24.4	:	100%
4-Nitrophenol SW 8270 ng/g < 32.8	Organics, Semi-volatile	4-Nitroaniline	SW 8270	5/00	v	23.0	< 21.	S)	v	27.0	٧	27.2	٧	23.8	;	100% %
7,12-Dimethylberiz(a)anthracene SW 8270 ng/g < 91.3 < 85.3 < 59.2 < 59.6 < 4.6 Acenaphthrene SW 8270 ng/g < 22.7 < 12.2 < 12.1 < 12.2 < 4.2 Acetopherone SW 8270 ng/g < 21.8 < 20.4 < 24.9 < 25.0 < 4.9 Aniline SW 8270 ng/g < 44.4 < 41.5 < 27.4 < 27.6 < 47.6 Anthracene SW 8270 ng/g < 27.6 < 25.8 < 16.4 < 16.5 < 46.5 Benzidire SW 8270 ng/g < 20 < 20 < 20 < 20 < 20	Organics, Semi-volatile	4-Nitrophenol	SW 8270	₿/Bu	v	32.8	g v	7	v	41.7	٧	42.0	v	35.1	:	100 %
Acenaphthene SW 8270 ng/g < 22.7	Organics, Semi-volatile	7,12-Dimethylbenz(a)anthracene	SW 8270	6/64	v	91.3	۰ 88	ဗ	v	59.2	٧	59.6	٧	78.6	;	100 %
Aceraphthylene SW 8270 ng/g < 10.7	Organics, Semi-volatile	Acenaphthene	SW 8270	B/Bu	v	22.7	^ 21	7	v	12.1	٧	12.2	v	18.7	:	100%
Acetopherione SW 8270 ng/g < 21.8	Organics, Semi-volatile	Acenaphthylene	SW 8270	₿/Bu	v	10.7	۰ 5	0	v	18.6	٧	18.7	v	13.1	;	100 X
Aniline SW 8270 ng/g < 44.4 < 41.5 < 27.4 < 27.6 < Anthracene SW 8270 ng/g < 27.6 < 25.8 < 16.4 < 16.5 < 84.4 < 20 < 20 < 20 < 20 < 20 < 20 < 20 < 2	Organics, Semi-volatile	Acetophenone	SW 8270	5/6u	v	21.8	g v	4	v	24.9	v	25.0	v	22.4	;	100%
Anthracene SW 8270 ng/g < 27.6 < 25.8 < 16.4 < 16.5 < Berzidire SW 8270 ng/g < 20 < 20 < 20 < 20 <	Organics, Semi-votatile	Aniline	SW 8270	6/Bu	v	44.4	< 4t.	2	v	27.4	٧	27.6	٧	37.8	:	100%
Berzidine SW 8270 ng/g < 20 < 20 < 20 <	Organics, Semi-volatile	Anthracene	SW 8270	0/6u	v	27.6	۸ کځ	80	v	16.4	٧	16.5	v	23.3	:	100%
	Organics, Semi-volatile	Benzidine	SW 8270	5/6	v	20	×	_	v	20	v	20	v	20	;	100%

Sluiced Fly Ash - Page 3

Solid Stream Data

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Organics, Semi-volatile	Benzo(a)anthracene	SW 8270	B/Gu	v	24.5	v	22.9	v	20.0	v	70.7	v	C.77	:	<u>\$</u>
Organics, Semi-volatile	Benzo(a)pyrene	SW 8270	5/6 u	٧	18.2	v	17.0	v	23.1	v	23.2	v	19.4	:	100%
Organics, Semi-volatile	Benzo(b)fluoranthene	SW 8270	6/6u	v	27.0	v	25.3	v	40.4	٧	40.7	v	30.9	:	100%
Organics, Semi-volatile	Benzo(g,h,i)perylene	SW 8270	5/Bu	v	23.1	v	91.6	v	45.4	v	45.7	v	30.0	:	100%
Organics, Semi-volatile	Benzo(k)fluoranthene	SW 8270	6/6u	v	46.0	v	13.0	v	44.5	v	44.8	v	44.5	;	100%
Organics, Semi-volatile	Benzoic acid	SW 8270	0 / 0 u	v	188	v	176	v	1,720	v	1,730	v	695		100%
Organics, Semi-volatile	Benzył alcohoł	SW 8270	5/6u	v	51.3	v	18.0	v	27.2	v	27.3	v	42.2	:	100%
Organics, Semi-volatile	Butylbenzylphihalate	SW 8270	₿/Bu	v	18.7	v	17.5	v	27.8	v	28.0	v	21.3	;	100%
Organics, Semi-volatile	Chrysene	SW 8270	0,60	v	31.8	v	7.6	v	23.9	•	24.1	v	28.5	;	100%
Organics, Semi-volatile	Di-n-octyfphthalate	SW 8270	6/Bu	v	43.3	v	10.5	v	15.7	v	15.8	v	33.2	:	100%
Organics, Semi-volatile	Dibenz(a,h)anthracene	SW 8270	5/6u	v	22.5	v	7.1	v	36.1	v	36.3	v	26.6	:	100 %
Organics, Semi-volatile	Dibenz(a,j)acridine	SW 8270	6/Bu	v	27.6	v	25.8	٧	37.5	v	37.7	v	30.3	:	100%
Organics, Semi-volatile	Dibenzofuran	SW 8270	5/BL	v	19.4	v	18.1	v	23.9	٧	24.1	v	20.5	:	100%
Organics, Semi-volatile	DibutyIphthalate	SW 8270	5/64	v	23.4	v	1.9	v	14.4	v	14.5	v	19.9	:	100%
Organics, Semi-volatile	Diethylphthalate	SW 8270	₿/6u	v	16.0	v	4.9	٧	22.9	v	23.1	v	17.9	:	100%
Organics, Semi-volatile	Dimethylphenethylamine	SW 8270	₿/Bu	v	120	v	120	v	120	٧	120	٧	120	;	100%
Organics, Semi-volatile	Dimethylphthalate	SW 8270	6 /6u	v	13.3	v	12.4	v	15.0	٧	15.1	v	13.6	:	100%
Organics, Semi-volatile	Diphenylamine	SW 8270	5/Bu	v	25.1	v	3.5	٧	12.3	v	12.4	v	20.3	:	100%
Organics, Semi-volatile	Ethyl methanesulfonate	SW 8270	D/01	v	23.9	v	12.4	v	30.2	v	30.4	v	25.5	:	100%
Organics, Semi-volatile	Fluoranthene	SW 8270	B/Bu	٧	30.3	v	28.4	v	21.0	v	21.1	v	26.6	;	100%
Organics, Semi-votatile	Fluorene	SW 8270	6/6u	v	16.0	v	14.9	v	16.9	v	17.0	v	15.9	;	100%
Organics, Semi-volatile	Hexachlorobenzene	SW 8270	D/Du	v	11.1	v	10.4 4.0	v	14.0	v	14.1	v	11.8	:	100 %
Organics, Semi-volatile	Hexachlorobutadiene	SW 8270	D/Du	v	33.2	v	31.0	v	22.8	v	22.9	v	29.0	;	100%
Organics, Semi-volatile	Hexachlorocyclopentadiene	SW 8270	6/6u	v	424	v	386	v	262	v	264	v	36	:	10%
Organics, Semi-volatile	Hexachloroethane	SW 8270	5/6 u	v	28.2	v	26.4	v	28.3	v	28.5	v	27.6	;	100%
Organics, Semi-volatile	Indeno(1,2,3-cd)pyrene	SW 8270	5 /6u	v	25.0	v	23.3	v	59.2	٧	59.6	v	35.8	;	100%
Organics, Semi-volatile	Isophorone	SW 8270	6/Su	v	13.6	v	12.8	v	27.4	٧	27.6	v	17.9	:	100%
Organics, Semi-volatile	Methyl methanesulfonate	SW 8270	₿/Ĝu	v	8	v	20	v	8	v	20	v	යි	:	100%
Organics, Semi-volatile	N-Nitroso-di-n-butylamine	SW 8270	₿/Bu	v	62.3	v	38.2	v	28.0	٧	28.2	v	49.5	:	100%
Organics, Semi-volatile	N-Nitrosodimethylamine	SW 8270	6/8 u	٧	63.2	v	99.1	v	35.0	v	35.2	v	52.4	;	100%
Organics, Semi-volatile	N-Nitrosodiphenylamine	SW 8270	B/Gu	v	26.9	v	25.2	v	12.0	٧	12.1	v	21.4	;	100%
Organics, Semi-volatile	N-Nitrosodipropylamine	SW 8270	5/Gu	v	35.7	v	33.4	v	29.1	v	29.3	v	32.7	:	100%

Sluiced Fly Ash - Page 4

Sample Stream: Sluiced Fly Ash

Analyte		Analytical			Run		Run		Run		Ru			95%	占
Group	Specie	Method	Units		1		2		9		3d		Average	ច	Ratio
Organics, Semi-volatile	N-Nitrosopheridine	SW 8270	5/6u	v	44.8	v	41.9	v	56.6	V	26.7	v	37.8	:	100%
Organics, Semi-volatile	Naphthalene	SW 8270	0/6u	v	34.7	v	32.4	v	21.3	v	21.4	v	29.5	;	100%
Organics, Semi-volatile	Nitrobenzene	SW 8270	6 / 6 L	v	25.1	v	23.5	٧	37.5	v	37.7	v	28.7	;	100%
Organics, Semi-volatile	Pentachtorobenzena	SW 8270	5 / 6 L	v	21.1	v	19.7	٧	16.6	v	16.8	v	19.1	:	100%
Organics, Semi-volatile	Pentachloronitrobenzene	SW 8270	6/64	v	98.4	v	92.0	٧	61.4	v	61.8	v	83.9	;	100%
Organics, Semi-volatile	Pentachlorophenol	SW 8270	5 / 6 L	v	41.1	v	38.4	٧	39.6	v	39.8	v	39.7	:	100%
Organics, Semi-volatile	Phenacetin	SW 8270	5/64	v	25.7	v	24.0	v	17.2	v	17.3	v	22.3	;	100%
Organics, Semi-volatile	Phenanthrene	SW 8270	g/gn	v	29.6	v	27.6	٧	20.8	v	21.0	v	26.0	:	100%
Organics, Semi-volatile	Phenol	SW 8270	6/6u	v	19.0	v	17.7	٧	39.3	v	39.6	v	25.3	:	100%
Organics, Semi-votatile	Pronamide	SW 8270	D/Ou	v	35.1	v	32.8	v	10.7	٧	10.8	٧	26.2	;	100%
Organics, Semi-volatile	Pyrene	SW 8270	D/Du	v	22.2	v	20.8	٧	18.2	v	18.3	v	20.4	:	100%
Organics Semi-volatile	Pyridine	SW 8270	5/6 L	v	55.1	v	51.6	٧	26.2	v	26.3	v	44.3	:	100%
Organics, Semi-volatile	bis(2-Chloroethoxy)methane	SW 8270	5/Su	v	26.7	v	25.0	v	27.0	v	27.2	v	26.2	;	100%
Organics, Semi-volatile	bis(2-Chloroethyl)ether	SW 8270	5/Su	v	34.8	v	32.5	٧	17.0	v	17.2	٧	28.1	:	100%
Organics Semi-volatile	bis(2-Chloroisopropyt)ether	SW 8270	6/6u	v	34.5	v	32.3	v	35.5	٧	35.8	v	34.1	;	100%
Organics, Semi-volatile	bis(2-Ethylhexyl)phthalate	SW 8270	5/6 u		431		259	٧	25.9	v	26.0		234	522	2%
Organics, Semi-volatile	p-Chloroaniline	SW 8270	g/gu	v	56.6	v	24.8	v	33.2	v	33.4	v	28.2	1	10%
Organics, Semi-volatile	p-Dimethylaminoazobenzene	SW 8270	5/Gu	v	24.5	v	22.9	٧	32.3	٧	32.5	v	26.6	;	100%

Sample Stream: ESP Hopper Ash-Field 1

Analyte		Analytical		Run	Run	Run	Run		95%	占
Group	Specie	Method	Units	-	2	6	PE	Average	ਹ	Ratio
Anione	Chloride	SM407C	o/on	474	523	08 66 v	665	349	846	2%
Anions	Fluoride	EPA 340.2	6 /6n	70.8	87.7	110	Ħ	89.5	64	ļ
			1						;	
Metals	Aluminum	SW 6010	5/60	104,000	113,224	74,047	102,201	97,091	50,884	
Metals	Antimony	ICP-MS	5/6n	3.42	2.94	2.61	2.50	2,99	<u>1</u>	
Metals	Arsenic	SW 7060	6/6n	50.0	41.0	45.6	48.3	45.5	11.2	
Metais	Barium	SW 6010	B/Bn	461	564	456	505	494	152	
Metals	Beryllium	SW 6010	B/Bn	10.8	12.2	9.60	15.9	10.9	3.26	
Metals	Cadmium	SW 7131	5/67	3.59	3.06	3.14	3.29	3.26	0.72	
Metals	Calcium	SW 6010	6/ 6 n	19,900	18,837	15,030	18,737	17,922	6,362	
Metals	Chromium	SW 6010	6/60	182	196	171	181	183	31.2	
Metals	Cobalt	SW 6010	₿/₿n	33.8	35.8	32.5	33.9	34.0	4.13	
Metals	Copper	SW 6010	6/6n	104.0	104.2	86.3	88.8	98.2	25.6	
Metals	Iron	SW 6010	6/6 n	97,800	88,275	84,268	88,975	90,114	17,269	
Metaks	Lead	SW 7421	5/6 n	75.2	67.3	74.5	67.8	72.4	10.8	
Metals	Magnesium	SW 6010	6/6n	5,400	5,010	3,337	5,080	4,582	2,723	
Metals	Manganese	SW 6010	6/6n	243	211	203	215	219	52.0	
Metałs	Mercury	SW 7471	6/6 n	60.0	0.12	0.16	0.15	0.12	0.09	
Metals	Molybdenum	SW 6010	6/6n	25.3	32.8	17.6	22.8	25	18.8	
Metals	Nickel	SW 6010	6/6n	140	118	124	124	127	27.9	
Metals	Phosphorus	SW 6010	6/6n	\$	< 71.7	15 0	< 69.7	26.7	1 43	12%
Metals	Potassium	SW 6010	0/60	18,600	17,535	16,132	18,136	17,422	3,075	
Metals	Selenium	SW 7740	6/5n	8.60	7.88	11.4	10.4	9.30	4 .68	
Metals	Silicon	SW 6010	6/6n	217,000	238,472	212,423	200,395	222,632	34,552	
Metals	Sodium	SW 6010	5/6n	5,630	5,361	4,679	4,870	5,223	1,217	
Metals	Strontium	SW 6010	5/6n	330	368	272	325	323	52	
Metals	Fitanium	SW 6010	6/ 6 n	6,120	6,042	6,192	5,932	6,118	187	
Metals	Vanadium	SW 6010	₿/₿n	322	302	283	298	305	37.4	
Metals	Zinc	SW 6010	6/6n	472	406	422	394	433	85.8	
Radionuclides	Actinium-228 @ 338 KeV	EPA 901.1	ğ Ö	2.3	2.1	2.0	9.	2.1	4.0	
Radionuclides	Actinium-228 @ 911 KeV	EPA 901.1	₽Ci∕g	2.3	2.0	2.0	2.3	2.1	0.4	
Radionuclides	Actinium-228 @ 968 KeV	EPA 901.1	PĊi/g	2.8	2.4	2.1	1.8	2.4	6.0	
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Group	Specie	Method	Units	Ì	-	2		e		8	Ā	Average	히	Ratio
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Radionuclides	Bismuth-212 @ 727 KeV	EPA 901.1	Ş Ş		4.0	7.8		7.		1.7		6.0	<u> </u>	
Radionuclides	Bismuth-214 @ 1120.4 KeV	EPA 901.1	ğ		7.3	5.8		5.3		5.5		6.1	2.6	
Radionuclides	Bismuth-214 @ 1764.7 KeV	EPA 901.1	pCl/g		6.9	5.1		5.6		5.2		5.9	2.3	
Radionuclides	Bismuth-214 @ 609.4 KeV	EPA 901.1	g/IQd		7.2	5.6		9.0		5.5		6.2	2.1	
Radionuclides	K-40 @ 1460 KeV	EPA 901.1	b Q		6	16		9		19		17	4.3	
Radionuclides	Lead-210 @ 46 KeV	EPA 901.1	pCi/g		5.6	5.1		5.6		3.7		5.4	0.7	
Radionuclides	Lead-212 @ 238 KeV	EPA 901.1	pCiva		2.4	1.8		2.1		2.0		2.1	0.7	
Radionuclides	Lead-214 @ 295.2 KeV	EPA 901.1	pCI/g		6.8	5.7		5.9		5.8		6.1	1.5	
Radionuclides	Lead-214@ 352.0 KeV	EPA 901.1	pCI/g		7.2	5.6		5.9		6.0		6.2	2.1	
Radionuclides	Radium-226 @ 186.0 KeV	EPA 901.1	pCl/g		5	8.8		8.3		9.3		9.0	2.2	
Radionuclides	Thallium-208 @ 583 KeV	EPA 901.1	Š		2.2	2.0		2.0		2.1		2.1	6.0	
Radionuclides	Thallium-208 @ 860 KeV	EPA 901.1	pCi/g		2.7	2.3		1,2		2.7		2.1	6.	
Radionuclides	Thorium-234 @ 63.3 KeV	EPA 901.1	6/i2d		6.3	5.8 8.0		4.6		5.4		5.8	2.2	
Radionuciides	Thorium-234 @ 92.6 KeV	EPA 901.1	pCI/g		4.6	3.6		8.4		3.8		4.3	1.6	
Radionuclides	Uranium-235 @ 143 KeV	EPA 901.1	pCi/g		0.24	0.3		0.1		0.3		0.2	0.2	
Organice Semi-volatile	1 2 4 5-Tetrachlorobenzene	SW 8270	Da/a	v	19.2	13.0	•	12.9	V	13.0	v	15.0	:	100%
Organics, Semi-volatile	1,2,4-Trichlorobenzene	SW 8270	g/gr	v	> 19.6	19.6	v	19.5	V	19.6	v	19.6	1	100%
Organics, Semi-volatile	1,2-Dichlorobenzene	SW 8270	6/Bu	v	25.9 <	21.2	٧	21.1	٧	21.2	v	72.7	:	100%
Organics, Semi-volatife	1,2-Diphenythydrazine	SW 8270	5/Bu	v	9 <u>1</u>	5	•	\$	٧	0 0	v	5	;	100%
Organics, Semi-volatile	1,3-Dichlorobenzene	SW 8270	5/6u	v	13.2	23.9	v	23.8	v	23.9	v	20.3	:	100%
Organics, Semi-volatile	1,4-Dichlorobenzene	SW 8270	5/6 u	٧	26.8	19.6	v	19.5	٧	19.6	v	22.0	;	100 %
Organics, Semi-votatile	1-Chloronaphthalene	SW 8270	6/6u	v	21,4 <	17.9	v	17.8	٧	17.9	v	19.0	;	100%
Organics, Semi-volatile	1-Naphthylamine	SW 8270	6/64	v	51.8	67.7	v	67.4	٧	67.7	v	62.3	:	100%
Organics, Semi-volatile	2,3,4,6-Tetrachiorophenol	SW 8270	5/64	v	16.7	15.5	•	15.4	v	15.5	v	15.9	:	400%
Organics, Semi-volatile	2,4,5-Trichlorophenol	SW 8270	0/ 0 L	٧	11.0	17.0	v	16.9	٧	17.0	v	15.0	;	100%
Organics, Semi-volatile	2,4,6-Trichlorophenol	SW 8270	5/64	v	11.6	16.9	•	16.8	٧	16.9	v	15.1	:	100%
Organics, Semi-volatile	2,4-Dichlorophenol	SW 8270	B/Bu	v	14.7	19.0	v	18.9	v	19.0	v	17.5	:	100%
Organics, Semi-volatile	2,4-Dimethylphenol	SW 8270	Ø/Bu	v	36.5	43.3	v	43.1	٧	43.3	v	41.0	:	100%
Organics, Semi-volatile	2,4-Dinitrophenol	SW 8270	5/6	v	233	139	v	139	٧	139	v	170	;	100%
Organics, Semi-volatile	2,4-Dinitrotoluene	SW 8270	5/Bu	v	18.3	19.7	v	19.6	٧	19.7	v	19.2	;	100%
Organics, Semi-volatile	2,6-Dichlorophenot	SW 8270	₿/Bu	v	24.0	17.1	v	17.0	V	17.1	v	19.4	:	100%
Organics, Semi-volatile	2,6-Dinitrotoluene	SW 8270	0/00	v	1.5	28.7	•	28.6	v	28.7	v	22.9	;	100%
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Solid Stream Data

Sample Stream: ESP Hopper Ash-Field 1

Analyte		Analytical			Run		Run		Run		Run			95%	占
Group	Specie	Method	Units		1		2		60		34		Average	ਠ	Ratio
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Organics, Semi-volatile	2-Chtoronaphthalene	SW 8270	5/6 u	v	10.8	v	13.1	v	13.0	v	13.1	V	12.3	:	100%
Organics, Semi-volatile	2-Chlorophenol	SW 8270	5/Bu	v	25.4	v	21.2	٧	21.1	v	21.2	V	22.6	;	100%
Organics, Semi-volatile	2-Methylnaphthalene	SW 8270	6/6u	٧	21.9	v	12.1	v	12.1	v	12.1	v	15.4	;	100%
Organics, Semi-volatile	2-Methylphenol(o-cresol)	SW 8270	ng/g	v	17.7	٧	10.3	v	10.3	v	10.3	V	12.8	:	100%
Organics, Semi-votatile	2-Naphthylamine	SW 8270	6/6u	v	64.8	v	53.3	v	53.1	٧	53.3	¥	57.1	;	100%
Organics, Semi-volatile	2-Nitroaniline	SW 8270	5/8 u	٧	13.4	v	22.1	v	22.0	٧	22.1	v	19.2	;	400%
Organics, Semi-volatile	2-Nitrophenol	SW 8270	₿/Bu	v	14.6	٧	17.4	v	17.3	٧	17.4	v	16.4	:	100%
Organics, Semi-volatile	2-Picoline	SW 8270	9/8	٧	36.2	٧	27.6	٧	27.4	v	27.6	v	30.4	:	100%
Organics, Semi-volatile	3,3'-Dichlorobenzidine	SW 8270	ogu	v	16.3	v	11.1	v	11.1	v	11.1	v	12.8	;	100%
Organics, Semi-volatile	3-Methylcholanthrene	SW 8270	6/ 6 u	٧	26.0	٧	16.7	٧	16.6	v	16.7	v	19.8	;	100%
Organics, Semi-volatile	3-Nitroaniline	SW 8270	B/Su	v	16.9	v	13.1	v	13.0	v	13.1	v	14.3	;	100%
Organics, Semi-votatile	4,6-Dinitro-2-methylphenol	SW 8270	6/6u	v	26.3	٧	14.3	٧	14.3	v	14.3	V	18.3	;	100%
Organics, Semi-volatile	4-Aminobiphenyl	SW 8270	g/gu	٧	24.8	v	39.7	٧	39.5	•	39.7	v	34.7	;	100%
Organics, Semi-volatile	4-Bromophenyl phenyl	SW 8270	6/6u	٧	15.1	٧	16.1	٧	16.1	v	16.1	v	15.8	;	100%
Organics, Semi-volatile	4-Chtoro-3-methylphenol	SW 8270	B/Su	v	24.0	v	17.2	v	17.1	v	17.2	v	19.4	:	100%
Organics, Semi-volatile	4-Chlorophenyl phenyl ether	SW 8270	₽/gn	٧	17.5	v	14.0	v	14.0	•	14.0	v	15.2	;	100%
Organics, Semi-volatile	4-Methylphenol(p-cresol)	SW 8270	D/6u	v	19.1	v	15.3	٧	15.2	v	15.3	v	16.5	;	100%
Organics, Semi-volatile	4-Nitroaniline	SW 8270	₽⁄g⊓	٧	16.1	٧	20.2	v	20.1	v	20.2	v	18.8	;	100%
Organics, Semi-volatile	4-Nitrophenol	SW 8270	6/ 6 u	v	23.0	٧	31.2	v	31.1	v	31.2	v	28.4	;	100%
Organics, Semi-volatile	7,12-Dimethylbenz(a)anthracene	SW 8270	B/Bu	٧	63.8	v	44.3	٧	1.7	v	44.3	v	50.7	:	100%
Organics, Semi-volatile	Acenaphthene	SW 8270	6/6u	٧	15.9	•	200	٧	9.03	v	9.07	v	11.3	;	100%
Organics, Semi-volatile	Acenaphthylene	SW 8270	₿/gu	٧	7.5	٧	13.9	v	13.9	v	13.9	v	11.8	;	100%
Organics, Semi-volatile	Acetophenone	SW 8270	5/6L	v	15.2	•	18.6	v	18.6	v	18.6	v	17.5	;	100%
Organics, Servi-volatife	Anlline	SW 8270	0/6u	v	31.0	•	20.5	v	20.4	v	20.5	V	24.0	:	100%
Organics, Semi-volatile	Anthracene	SW 8270	6/6u	v	19.3	v	12.3	v	12.2	v	12.3	v	14.6	;	100%
Organics, Semi-volatile	Benzidine	SW 8270	6/6u	v	8	v	8	v	20	v	2	v	8	;	100%
Organics, Semi-volatile	Benzo(a)anthracene	SW 8270	ng/g	v	17.1	v	15.0	v	6.4	v	15.0	v	15.7	:	100 %
Organics, Semi-volatife	Benzo(a)pyrene	SW 8270	5/ 6 u	v	12.7	v	17.3	v	17.2	v	17.3	¥	15.7	;	100%
Organics, Semi-volatile	Benzo(b)fluoranthene	SW 8270	6/6u	v	18.9	v	30.3	٧	30.1	v	30.3	V	26.4	:	100%
Organics, Serni-volatile	Benzo(g,h,i)perylene	SW 8270	₿/Bu	v	16.2	٧	34.0	v	33.9	v	34.0	V	28.0	;	100%
Organics, Semi-volatile	Benzo(k)fluoranthene	SW 8270	6/60	v	32.2	v	33.3	v	33.2	v	33.3	v	32.9	;	100%
Organics, Semi-volatile	Benzoic acid	SW 8270	0/6 u	v	132	v	1,290	v	1,280	v	1,290	v	901	:	100%
Organics, Semi-volatile	Benzyl alcohol	SW 8270	6/6u	v	35.9	v	20.3	v	20.2	v	20.3	v	25.5	:	100 %
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Analyte		Analytical			Run		Run		Run		Run			95%	占
Group	Specie	Method	Units		-		2		6		34		Average	5	Ratio
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Organics, Semi-volatile	Butylbenzylphthalate	SW 8270	<u>8</u>	٧	13.1	v	20.8	v	8 .	٧	20.8	v	78.2	;	Š
Organics, Semi-volatile	Chrysene	SW 8270	6/Bu	v	22.2	v	17.9	v	17.8	v	17.9	v	19.3	;	100%
Organics, Semi-volatile	Di-n-octylphthalate	SW 8270	5/6	v	30.3	v	11.7	v	11.7	v	11.7	v	17.9	:	100%
Organics, Semi-votatile	Dibenz(a,h)anthracene	SW 8270	5/6 L	v	15.7	v	27.0	v	26.9	v	27.0	v	23.2	÷	100%
Organics, Semi-volatile	Dibenz(a,j)acridine	SW 8270	6/8u	v	19.3	v	28.1	v	27.9	v	28.1	v	25.1	;	100%
Organics, Semi-volatile	Dibenzofuran	SW 8270	B/Bu	v	13.6	v	17.9	v	17.8	v	17.9	v	16.4	;	100%
Organics, Semi-volatile	Dibutylphthalate	SW 8270	0/Bu	v	16.4	v	10.8	v	10.8	v	10.8	v	12.7	;	100%
Organics, Semi-volatile	Diethylphthalate	SW 8270	Ø/Bu	v	11.2	v	17.2	٧	17.1	v	17.2	٧	15.2	;	100%
Organics, Semi-volatile	Dimethylphenethylamine	SW 8270	5/6u	v	120	v	120	٧	120	v	120	v	120	;	100%
Organics, Semi-volatile	Direthylphthalate	SW 8270	5/6u	v	9.3	v	11.2	v	11.2	v	11.2	v	10.6	:	100%
Organics, Semi-volatile	Diphenylamine	SW 8270	DØ/đ	v	17.5	v	9.2	v	9.2	٧	9.2	v	12.0	;	100%
Organics, Semi-volatile	Ethyt methanesulfonate	SW 8270	g/gn	v	16.7	v	22.6	v	22.5	v	22.6	v	20.6	;	100%
Organics, Semi-volatife	Fluoranthene	SW 8270	6/6u	٧	21.2	v	15.7	v	15.6	v	15.7	٧	17.5	;	100%
Organics, Semi-volatile	Fluorene	SW 8270	₫/gu	v	11.2	v	12.7	v	12.6	v	12.7	v	12.2	;	100%
Organics, Semi-volatile	Hexachiorobenzene	SW 8270	0/Bu	v	7.8	v	10.5	٧	10.4	v	10.5	v	9.6	;	100%
Organics, Semi-votatile	Hexachlorobutadiene	SW 8270	6/64	v	23.2	v	17.1	٧	17.0	v	17.1	٧	19.1	;	100%
Organics, Semi-volatile	Hexachlorocyclopentadiene	SW 8270	6/64	v	296	v	196	v	195	v	96	v	229	1	100%
Organics, Semi-volatile	Hexachloroethane	SW 8270	D/0	v	19.7	v	21.2	v	21.1	v	21.2	v	20.7	;	100%
Organics, Semi-volatile	Indeno(1,2,3-cd)pyrene	SW 8270	₿/Ĝu	v	17.4	v	44.3	٧	44.1	v	44.3	v	35.3	;	100%
Organics, Semi-volatile	Isophorone	SW 8270	₿/Bu	٧	9.5	v	20.5	v	20.4	٧	20.5	٧	16.8	;	100%
Organics, Semi-volatile	Methyl methanesulfonate	SW 8270	ō/ōu	v	20	v	20	v	S	٧	20	v	ଛ	;	100%
Organics, Semi-volatile	N-Nitroso-di-n-butylamine	SW 8270	6/6u	v	43.5	v	21.0	v	20.9	v	21.0	v	28.5	;	100%
Organics, Semi-volatife	N-Nitrosodimethytamine	SW 8270	0/64	v	44.2	v	26.2	٧	26.1	٧	26.2	v	32.2	;	100%
Organics, Semi-volatile	N-Nitrosodiphenylamine	SW 8270	0/Bu	v	18.8	v	0.6	v	8.9	v	9.0	٧	12.2	1	100%
Organics, Semi-volatile	N-Nitrosodipropylamine	SW 8270	0 /6u	v	24.9	v	21.8	v	21.7	v	21.8	٧	22.8	:	100%
Organics, Semi-volatile	N-Nitrosopiperidine	SW 8270	6/Bu	v	34.3	v	19.9	v	19.8	v	19.9	•	23.7	;	100 %
Organics, Semi-volatile	Naphthalene	SW 8270	5/6u	v	24.2	v	15.9	٧	15.9	v	15.9	٧	18.7	;	100%
Organics, Semi-volatile	Nitrobenzene	SW 8270	5/6 u	v	17.5	v	28.1	v	27.9	v	28.1	٧	24.5	;	100%
Organics, Semi-volatile	Pentachlorobenzene	SW 8270	6/6u	v	14.7	v	12.5	v	12.4	٧	12.5	v	13.2	;	100%
Organics, Semi-volatile	Pentachloronitrobenzene	SW 8270	B/Bu	٧	68.8	v	46.0	v	45.8	v	46.0	v	53.5	;	100%
Organics, Semi-volatile	Pentachlorophenol	SW 8270	6/6u	v	28.7	v	29.6	v	29.5	٧	29.6	v	29.3	;	100%
Organics, Semi-volatile	Phenacetin	SW 8270	g/gu	٧	17.9	v	12.9	v	12.8	v	12.9	v	14.5	;	100%
Organics, Semi-votatile	Phenanthrene	SW 8270	6/6u	v	20.7	v	15.6	v	15.5	٧	15.6	v	17.3	;	100%
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ESP Hopper Ash (Field 1) - Page 4

Sample Stream: ESP Hopper Ash-Field 1

	Analytical			Run		Run		Run		Run			95%	占
Specie	Method	Units		1		2		8		PE		Average	ਹ	Ratio
Phenol	SW 8270	5/Bu	v	13.3	٧	29.4	٧	29.3	V	29.4	٧	24.0	:	100%
Pronamide	SW 8270	D/Gu	v	24.6	٧	8.03	٧	8.00	٧	8.03	v	13.5	;	100%
Pyrene	SW 8270	₿/Bu	v	15.5	٧	13.6	٧	13.5	٧	13.6	٧	14.2	;	100%
Pyridine	SW 8270	6/Bu	٧	38.5	v	19.6	٧	19.5	٧	19.6	٧	25.9	:	±00%
bis(2-Chloroethoxy)methane	SW 8270	0/64	٧	18.7	٧	20.2	٧	20.1	٧	20.2	V	19.7	:	100%
bis(2-Chloroethyl)ether	SW 8270	8 /8u	٧	24.3	v	12.8	V	12.7	٧	12.8	V	16.6	:	100%
bis(2-Chloroisopropyl)ether	SW 8270	₿/gu	٧	24.1	٧	26.6	٧	26.5	٧	26.6	٧	25.7	:	100%
bis(2-Ethythexyl)phthalate	SW 8270	6/04		3 20	٧	19.4	٧	19.3	٧	19.4		190	775	3%
p-Chloroaniline	SW 8270	D/Bu	٧	18.6	٧	24.8	٧	24.7	v	24.8	V	22.7	:	100%
p-Dimethyfaminoazobenzene	SW 8270	6/60	v	17.1	٧	24.2	٧	24.1	٧	24.2	V	21.8	;	100%

Sample Stream: ESP Hopper Ash-Field 2

Analyte		Analytical		Run	2	Run	œ	Run	Run			82%	占
Group	Specie	Method	Units			2		3	34		Average	5	Ratio
eccina	Chlodde	SIM407C	υ/ σ ε	6 8 v	8	02 08	8 v	08.66	08.68	٧	866	:	100%
200) i				}				,			8	:
Anions	Fluoride	EPA 340.2	ō/ōn	139	8	152.00	20	0	45.40		124.8	C 050	
1-4-4-	Alternion	0109 700	4/400	82 768	9	00	S	92 400	68 200		88 558	10 691	
Metals				}	3 ,	20,00	9	3			300		
Metals	Antimony	CP-MS	ğ	4	2	3.87	77	8	3.78		4 5	8. 8.	
Metals	Arsenic	SW 7060	5/6 n	74	.2	67.4	2	4.2	61.1		71.9	8.6	
Metais	Barium	SW 6010	6/6 n	4	6	203	ιΩ	26	467		493	88 .3	
Metals	Beryllium	SW 6010	D/Bn	\$	7.	16.5	÷	5.3	19.2		17.2	3.36	
Metals	Cadmium	SW 7131	5/ 6n	່ວ່	5	5.20	ι.	33	5.03		5.42	0.69	
Metals	Calcium	SW 6010	ō/ān	15,	30	16,000	15	92,	14,800	_	15,643	9 6	
Metals	Chromium	SW 6010	5/6n	*	7	193	2	71	<u>6</u>		219	11	
Metals	Cobatt	SW 6010	6/6n	4	ω .	45.5	4	1.3	38.8		42.7	6.04	
Metals	Copper	SW 6010	ø/øn	77	9	85	2	18	107		151	146	
Metals	fron	SW 6010	6/6n	83,	898	78,500	77	009	74,600		80,023	8,562	
Metals	Lead	SW 7421	6/6n	₽	9	87.0	Ō	7.7	97.3		0.96	20.5	
Metals	Magnesium	SW 6010	6/8n	9,6	27	4,170	₹	420	2,620		4,072	1,007	
Metals	Manganese	SW 6010	6/6n	23	2	212	7	8	206		216	24.6	
Metals	Mercury	SW 7471	6/6n	0.0	96	0.202	Ö	235	0.258		0.178	0.181	
Metals	Molybdenum	SW 6010	6/ 6 n	4	- -	35.5	9	4.	38.1		48.7	32.2	
Metals	Nickel	SW 6010	6/6n	#	9	166	-	4	1 5		158	31.1	
Metals	Phosphorus	SW 6010	6/6n	< 72	6.	71.4	~	1.3	< 72.7	v	71.9	:	100%
Metals	Potassium	SW 6010	5/6n	17.	36	17,800	8	909	16,000		18,112	1,064	
Metals	Selenium	SW 7740	5/6n	\$	-	17.3	-	7.5	16.2		16.6	3.27	
Metals	Silkon	SW 6010	6/6n	221	443	215,000	208	000'	218,00	•	215,148	15,459	
Metals	Sodium	SW 6010	6/6n	9,9	83	5,660	้เก๋	290	5,750		5,951	1,406	
Metals	Strontium	SW 6010	5/6 n	*	Ø.	333	e	\$	900		327	4	
Metals	Titanium	SW 6010	6/6 n	6,5	83	6,410	Ġ	980	6,650		6,451	291	
Metals	Vanadium	SW 6010	5/Sn	8	2	347	n	41	348		357	32	
Metals	Zinc	SW 6010	6/6n	8	2	570	S.	98	909		296	122	
: :	Velt 900 & 900 military	+ 100 AGE	Ç	6	~	c	r	č	7.6		c	7	
Kadionicides	Activities (6.530 Nev	17 A 201.1		ic	, •) (įç	i c		;		
Radionuclides	Actinium-228 @ 911 KeV	EPA 901.1	Š	7	•	7.7	•	7.U	6.3		7.7	n	
Radionuclides	Actinhum-228 @ 968 KeV	EPA 901.1	<u>0</u>	6	မ	2.6	2	<u>.</u> .	2.7		2.6	<u>.</u>	
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ESP Hopper Ash (Field 2) - Page 1

Solid Stream Data

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Analyte		Analytical			Run	_	Run		Run	Run		95%	占
Group	Specie	Method	Units		1		2		8	3d	Average	ច	Ratio
Radionuclides	Bismuth-212 @ 727 KeV	EPA 901.1	g Ö		3.4	••	2.4		2.7	2.7	2.8	<u>د.</u>	
Radionuclides	Bismuth-214 @ 1120.4 KeV	EPA 901.1	<u>8</u>		6.6	•	3.2		6.0	6.0	6.3	0.8	
Radionuclides	Bismuth-214 @ 1764.7 KeV	EPA 901.1	D/Od		6.1	•	5.6		5.4	9.6	5.7	6.0	
Radionuclides	Bismuth-214 @ 609.4 KeV	EPA 901.1	ğ		6.9	•	5.5		5.7	6.2	6.0	1.9	
Radionuclides	K-40 @ 1460 KeV	EPA 901.1	DCI/d		18		17		17	19	4	1.4	
Radionuclides	Lead-210 @ 46 KeV	EPA 901.1	pCi/g		7.8	•	ř.3		8.4	7.6	7.8	1.4	
Radionuclides	Lead-212 @ 238 KeV	EPA 901.1	pCi/g		1.8	•	9.		2.2	1.9	1.9	0.8	
Radionuclides	Lead-214 @ 295.2 KeV	EPA 901.1	g Q		9.9		5.8		5.7	6.0	6.0	1.2	
Radionuclides	Lead-214@ 352.0 KeV	EPA 901.1	2		6.6		5.7		6.0	6.4	6.1	77	
Radionuclides	Radium-226 @ 186.0 KeV	EPA 901.1	S S S S		-	•,	9.2		8.9	9.5	9.7	2.8	
Radionuclides	Thallium-208 @ 583 KeV	EPA 901 1	p Si Si Si		2.3	••	7		2.0	2.2	2.2	0.4	
Radionuclides	Thallium-208 @ 860 KeV	EPA 901.1	PC.		3.6	_	NO NO		3.1	2.6	2.2	4.8	
Radionuclides	Thorium-234 @ 63.3 KeV	EPA 901.1	PČ.		6.2	•	5.1		5.1	5.8	5.5	1.6	
Radionuclides	Thorium-234 @ 92.6 KeV	EPA 901.1	pCi/g		4.3	•	9.1		5.5	4.3	4.8	1.6	
Radionuclides	Uranium-235 @ 143 KeV	EPA 901.1	pCi/g		0.28	Ī	0.3		2.2	0.2	60	2.8	
Organics, Semi-volatile	1,2,4,5-Tetrachlorobenzene	SW 8270	6/6 u	v	19.3	~ v	3.0	v	13.0		< 15.1	;	100%
Organics, Semi-volatile	1,2,4-Trichlorobenzene	SW 8270	D/Bu	v	19.7	~	19.6	v	19.6		> 19.6	:	100%
Organics, Semi-volatile	1,2-Dichlorobenzene	SW 8270	₿/Bu	v	26.0	۷	1.1	v	21.1		< 22.7	;	100%
Organics, Semi-volatile	t,2-Diphenylhydrazine	SW 8270	₿/Bu	٧	<u>8</u>	v	100	v	100		^ 5	;	100%
Organics, Semi-volatile	1,3-Dichlorobenzene	SW 8270	₿/Bu	٧	13.2	2	23.9	v	23.9		× 20.3	;	100%
Organics, Semi-volatile	1,4-Dichlorobenzene	SW 8270	D/Gu	v	27.0	۸	19.6	v	19.6		< 22.1	;	100%
Organics, Semi-volatile	1-Chloronaphthalene	SW 8270	10 /0	v	21.5	۸	17.9	v	17.9		× 19.1	:	100%
Organics, Semi-volatile	1-Naphthylamine	SW 8270	0 /6u	v	52.1	v	67.6	v	97.9		< 62.4	:	100%
Organics, Semi-volatile	2,3,4,6-Tetrachlorophenol	SW 8270	D / D	v	16.8	۰ ۲	15.5	v	15.5		< 15.9	;	100%
Organics, Semi-volatile	2,4,5-Trichlorophenol	SW 8270	g/gr	v	11.0	۸	16.9	v	16.9		< 14.9	:	100%
Organics, Semi-volatile	2,4,6-Trichlorophenol	SW 8270	₿/Bu	v	11.7	۸	16.8	v	16.8		< 15.1	:	100%
Organics, Semi-volatile	2,4-Dichlorophenol	SW 8270	6/6u	v	14.8	~	18.9	v	18.9		< 17.5	:	100%
Organics, Semi-volatile	2,4-Dimethylphenol	SW 8270	₿/Bu	v	36.7	4	13.3	v	43.3		< 41.1	1	100%
Organics, Semi-volatile	2,4-Dinitrophenol	SW 8270	B/Gu	v	234	٧	139	v	139		× 171	;	100%
Organics, Semi-volatile	2,4-Dinitrotoluene	SW 8270	5/6 2	v	18.4	۸	19.7	v	19.7		< 19.3	:	100%
Organics, Semi-volatile	2,6-Dichlorophenol	SW 8270	B/Bu	v	24.1	۸	17.0	v	17.0		× 19.4	;	100%
Organics, Semi-volatile	2,6-Dinitrotoluene	SW 8270	D/Bu	v	11.6	v	8.7	v	28.7		× 23.0	;	100%
			Ц	1	ESP Honner Ash (Field 2) - Page	(Fiel	72). Pan	6					
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Solid Stream Data

Sample Stream: ESP Hopper Ash-Field 2

Analyte		Analytical			Run		Run		Run	Run			95%	占
Group	Specie	Method	Chits		-		2		8	34		Average	5	Ratio
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Organics, Seriil-Votatile		0170 140	7 2	,	0.2	,		,	-		•		•	3
Organics, Semi-volatile	2-Chlorophenol	SW 8270	₽ 6 /61	v	25.5	v	21.1	٧	21.1		V	22.6	;	100%
Organics, Semi-volatile	2-Methylnaphthalene	SW 8270	₿/Ĝu	v	22.0	•	12.1	v	12.1		٧	15,4	:	100%
Organics, Semi-volatile	2-Methyiphenol(o-cresol)	SW 8270	₿/Bu	v	17.8	v	10.3	v	10.3		٧	12.8	;	100%
Organics, Semi-volatile	2-Naphthylamine	SW 8270	5/6	v	65.1	v	53.3	v	53.3		٧	57.2	;	100%
Organics, Semi-volatile	2-Nitroaniline	SW 8270	5/64	٧	13.4	v	22.1	٧	22.1		v	19.2	;	100%
Organics, Semi-volatile	2-Nitrophenol	SW 8270	9/0	v	14.7	v	17.4	v	17.4		V	16.5	:	100%
Organics, Semi-volatile	2-Picoline	SW 8270	6 /6u	v	36.4	v	27.5	v	27.5		٧	30.5	:	100%
Organics, Semi-volatile	3,3'-Dichlorobenzidine	SW 8270	96	v	16.4	٧	11.1	٧	11.1		٧	12.9	:	100%
Organics, Semi-volatile	3-Methylcholanthrene	SW 8270	6/6u	v	26.2	v	16.6	v	16.6		٧	19.8	:	100%
Organics, Semi-votatile	3-Nitroaniline	SW 8270	5/60	٧	17.0	v	13.1	٧	13.1		V	14.4	;	100%
Organics, Semi-volatile	4,6-Dinitro-2-methylphenol	SW 8270	6/6u	v	26.5	v	14.3	v	14.3		٧	18.4	;	100%
Organics, Semi-volatile	4-Aminobiphenyl	SW 8270	0,04	v	25.0	v	39.6	v	39.6		v	34.7	;	100%
Organics, Semi-volatile	4-Bromophenyl phenyl	SW 8270	5,62	v	15.2	٧	16.1	v	16.1		٧	15.8	;	100%
Organics, Semi-volatile	4-Chloro-3-methylphenol	SW 8270	5/64	v	24.1	v	17.1	v	17.1		٧	19.4	;	100%
Organics, Semi-volatile	4-Chlorophenyl phenyl ether	SW 8270	5/6u	٧	17.6	v	14.0	v	14.0		٧	15.2	:	100%
Organics, Semi-volatile	4-Methylphenol(p-cresol)	SW 8270	8/6u	v	19.2	v	15.3	v	15.3		٧	16.6	:	100%
Organics, Semi-volatile	4-Nitroaniline	SW 8270	מאָסָר	v	16.2	v	20.2	v	20.2		V	18.9	:	100%
Organics, Semi-volatile	4-Nitrophenol	SW 8270	6 /6u	v	23.1	v	31.2	٧	31.2		٧	28.5	;	100%
Organics, Semi-votatile	7,12-Dimethylbenz(a)anthracene	SW 8270	0/Su	v	64.1	v	44.3	٧	44.3		٧	50.9	;	100%
Organics, Semi-volatile	Acenaphihene	SW 8270	5/61	v	16.0	v	90.6	٧	90.6		٧	11.4	:	100%
Organics, Semi-volatife	Acenaphthylene	SW 8270	5/ 5 u	٧	7.55	٧	13.9	v	13.9		V	11.8	;	100%
Organics, Semi-volatile	Acetophenone	SW 8270	g/gr	٧	15.3	v	18.6	٧	18.6		V	17.5	i	100%
Organics, Semi-volatile	Aniline	SW 8270	B∕G⊔	v	31.2	v	20.5	٧	20.5		V	24.1	;	100%
Organics, Semi-votatile	Anthracene	SW 8270	₿øu	٧	19.4	v	12.3	v	12.3		V	14.7	:	100%
Organics, Semi-volatile	Benzidine	SW 8270	6/6u	v	20.0	v	20.0	v	20.0		v	20.0	:	100%
Organics, Semi-volatile	Benzo(a)anthracene	SW 8270	6/60	v	17.2	v	15.0	v	15.0		V	15.7	:	100%
Organics, Semi-volatile	Benzo(a)pyrene	SW 8270	₿ø.	v	12.8	٧	17.2	v	17.2		V	15.7	;	100%
Organics, Semi-votatile	Benzo(b)fluoranthene	SW 8270	₽¢	v	19.0	v	30.2	٧	30.2		٧	26.5	;	100%
Organics, Semi-votatile	Benzo(g,h,i)perylene	SW 8270	₿/₿u	٧	16.3	v	34.0	v	34.0		V	28.1	;	100%
Organics, Semi-volatile	Benzo(k)fluoranthene	SW 8270	6/6 u	v	32.3	v	33.3	v	33.3		V	33.0	;	100%
Organics, Semi-votatile	Benzoic acid	SW 8270	Dø4	v	132	v	1,290	٧	1,290		٧	9	;	100%
Organics, Semi-volatile	Benzyl alcohol	SW 8270	B/Gu	v	36.1	v	20.3	٧	20.3		V	25.6	í	100%
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ESP Hopper Ash (Field 2) - Page 3

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Analyte		Analytical			Run		Run		Run	Run			95%	占
Group	Specie	Method	Units		-		2		3	PE PE		Average	5	Ratio
	D. 4. A	otro Mo	701	,	100	,	8	,	a Cc		•	4 C	;	100%
Organics, semi-votatile	DutyiDenzyiphthalate	200 000	2	,	- 2	,	O.	,	70.0		,	4 :	;	3
Organics, Semi-volatile	Chrysene	SW 8270	₿⁄gu	٧	22.3	· v	17.9	v	17.9		v	19.4	:	100%
Organics, Semi-volatile	Di-n-octylphthalate	SW 8270	₫/gu	v	30.4	v	11.7	v	11.7		v	17.9	;	100%
Organics, Semi-volatile	Dibenz(a,h)anthracene	SW 8270	₿/Ĝu	v	15.8	v	27.0	v	27.0		v	23.3	;	100%
Organics, Semi-volatile	Dibenz(a,j)acridine	SW 8270	5 / 6 L	٧	19.4	v	28.0	v	28.0		v	25.1	:	100%
Organics, Semi-volatile	Dibenzofuran	SW 8270	B/Su	٧	13.6	v	17.9	٧	17.9		v	16.5	;	100%
Organics, Semi-volatile	Dibutylphthalate	SW 8270	5/5 u	v	16.5	v	10.8	v	10.8		v	12.7	:	100%
Organics, Semi-volatile	Diethylphthalate	SW 8270	₿/Bu	v	11.2	v	17.1	v	17.1		v	15.1	:	400%
Organics, Semi-volatile	Dimethylphenethylamine	SW 8270	g/gu	v	120.0	^	20.0	v	120.0		v	120	;	400%
Organics, Semi-volatile	Dimethylphthalate	SW 8270	6 /6u	v	9.6	v	11.2	v	11.2		٧	10.6	;	100%
Organics, Semi-volatile	Diphenylamine	SW 8270	B/Bu	v	17.6	v	9.22	v	9.22		٧	12.0	:	100%
Organics, Semi-volatile	Ethyl methanesulfonate	SW 8270	₽/g⊓	v	16.8	v	22.6	٧	22.6		٧	20.7	;	100%
Organics, Semi-volatile	Fluoranthene	SW 8270	ng/g	٧	21.3	v	15.7	v	15.7		v	17.6	;	100%
Organics, Semi-volatile	Fluorene	SW 8270	ng/g	٧	11.2	v	12.7	v	12.7		v	12.2	;	100%
Organics, Semi-volatile	Hexachlorobenzene	SW 8270	₽¢/gn	٧	7.82	v	10.5	v	10.5		v	9.6	:	100%
Organics, Semi-volatile	Hexachlorobutadiene	SW 8270	₿/Ĝu	v	23.3	v	17.0	ν	17.0		٧	19.1	;	100%
Organics, Semi-volatile	Hexachiorocyclopentadiene	SW 8270	6/6u	٧	298	v	196	v	196		v	230	:	100%
Organics, Semi-volatile	Hexachloroethane	SW 8270	6/6u	v	19.8	v	21.1	v	21.1		٧	20.7	;	100%
Organics, Semi-volatile	Indeno(1,2,3-cd)pyrene	SW 8270	6/6u	v	17.5	v	44.3	v	44.3		v	35.4	;	100%
Organics, Semi-volatile	Isophorone	SW 8270	6/6 u	v	9.58	v	20.5	v	20.5		v	16.9	;	100%
Organics, Semi-volatile	Methyl methanesulfonate	SW 8270	5/6u	٧	50.0	v	20.0	v	50.0		v	20.0	;	100%
Organics, Semi-volatile	N-Nitroso-dl-n-butylamine	SW 8270	6/6u	٧	43.8	v	20.9	v	20.9		٧	28.5	;	100%
Organics, Semi-volatile	N-Nitrosodimethylamine	SW 8270	5/64	v	44.4	v	26.2	v	26.2		٧	32.3	;	100%
Organics, Semi-volatile	N-Nitrosodiphenylamine	SW 8270	6 /6u	v	18.9	v	9.96	v	8.96		٧	12.3	:	100%
Organics, Semi-volatile	N-Nitrosodipropylamine	SW 8270	₽⁄ga	v	25.1	v	21.8	v	21.8		٧	22.9	;	100%
Organics, Semi-volatile	N-Nitrosopiperidine	SW 8270	6/6 L	v	31.5	v	19.9	v	19.9		٧	23.8	;	100%
Organics, Semi-votatile	Naphthalene	SW 8270	6/6u	v	24.3	v	15.9	v	15.9		v	18.7	;	100%
Organics, Semi-volatile	Nitrobenzene	SW 8270	₿/Bu	v	17.6	v	28.0	v	28.0		v	24.5	;	100%
Organics, Semi-volatile	Pentachlorobenzene	SW 8270	5/0u	٧	14.8	v	12.5	v	12.5		v	13.3	;	100%
Organics, Semi-volatile	Pentachloronitrobenzene	SW 8270	6/6u	٧	69.1	v	46.0	v	46.0		v	53.7	;	100%
Organics, Semi-volatile	Pentachlorophenol	SW 8270	0,60	v	28.9	v	9.62	v	29.6		v	29.4	;	100%
Organics, Semi-volatile	Phenacetin	SW 8270	5/Su	v	18.0	v	12.9	٧	12.9		٧	14.6	;	100%
Organics, Semi-volatile	Phenanthrene	SW 8270	B/Bu	٧	20.8	v	15.6	v	15.6		٧	17.3	:	100%
			Ĭ		John Action	(5)		7						

ESP Hopper Ash (Field 2) - Page 4

占	Ratio	100%	100%	100%
%\$6	5	:	;	;
	Average	24.0	13.6	t 9+
		v	٧	٧
Run	34			

Solid Stream Data

Sample Stream: Raw Limestone

Analyte		Analytical		Run		Run		2	_	Rus				%96	占
Group	Specie	Method	Units	-		2		6		34			Average	ਹ	Ratio
Anions	Chloride	SM407C	B/Sn	157		189		6	_	2			179	47	
Anions	Fluoride	EPA 340.2	6/6n	52.5		56.5		67.4	4	40.20	8		8.88	19.2	
Metals	Aluminum	SW 6010	B/Bn	913		976		\$	Q	1,015			916	158	
Metals	Antimony	ICP-MS	6/6n	0.00885		0.01048		0.00	35	0.0064			0.00729	0.01042	
Metals	Arsenic	SW 7060	5/6n	0.342	v	0.327	•	. 0.3	£	< 0.327		٧	0.334	:	100%
Metals	Barium	SW 6010	6/6n	4.77		5.14		4		4.66			4.87	0.59	
Metals	Beryllium	SW 6010	₿/₿'n	0.145		0.141		0.1	24	0.140			0.137	0.028	
Metals	Boron	SW 6010	₿/₿n	3.71		3.97		2.9	60	3.95			3.54	<u>¥</u>	
Metals	Cadmium	SW 7131	6/6n	0.339		0.332		0.3	æ	0.325			0.332	0.016	
Metals	Calcium	SW 6010	6/6n	392,000		394,000		399,(8	408,333	_		395,000	8,957	
Metals	Chromium	SW 6010	6/ 6 n	9.64		29.6		0.	-	10.0			9.80	0.64	
Metals	Cobalt	SW 6010	6/6n	1.38		5.		-	~	1.32			1.30	0.62	
Metals	Copper	SW 6010	6/6n	1.01		1.57		4 .8	ဖ	1.81			1.48	1.07	
Metals	Iron	SW 6010	6/6 n	1760		1800		180	0	1,865			1,787	24	
Metals	Lead	SW 7421	5/6n	1.18		2		0.1	₩.	1.07			1.09	0.20	
Metals	Magnesium	SW 6010	6/6n	1220		1240		124	8	1,281			1,233	82	
Metals	Manganese	SW 6010	6/6n	208		506		ର୍ଷ	₩	215			202	7	
Metals	Mercury	SW 7471	6/6n	0.005	_	0.0 L	•	0.0	2	0.01	~		0.01	0.0	40%
Metals	Molybdenum	SW 6010	6/6n	0.219	v _	0.211	•	. 0.2	23	0.126	7	٧	0.222	:	20%
Metals	Nickel	SW 6010	5/6n	3.34		2.75		3.3	a	3.50			3.16	0.88	
Metals	Phosphorus	SW 6010	6/ 6 n	112		35		Ξ	60	84.17			5 0	સ	
Metaks	Potassium	SW 6010	6/ 6 n	342		372		37.	**	386			363	₹	
Metals	Selenium	SW 7740	6/6n	3.12		4.74		3.9	e	4.73			3.93	2.01	
Metals	Silicon	SW 6010	6/6n	479		392		₹	"	466			436	90	
Metals	Sodium	SW 6010	6/6n	ਖ਼		8.02		8		20.31			50.9	2.5	
Metals	Stronfium	SW 6010	6/6n	108		60		5	~	Ŧ			5	7	
Metals	Titanium	SW 6010	6/6n	75	v	0.148	•	0.15		< 0.15			ĸ	107	0.2%
Metals	Vanadium	SW 6010	6/6n	8.11		7.98		8.3	_	8.14			8.13	0.41	
Metals	Zinc	SW 6010	6/6n	8.65		8.75		8.8	6	90.6			8.74	27.0	

Raw Limestone - Page 1

Solid Stream Data

ime stone
am: Raw Li
Sample Stre

Analyte		Analytical		Run	Run	Run	Run		%96	占
Group	Specie	Method	Units	4-	2	6	PE PE	Average	5	Ratio
Ultimate/Proximate	Percent Moisture	D3173	% %	00:6	9.00	8.00	9.00	8.67	1.43	
Radionuclides	Actinium-228 @ 338 KeV	EPA 901.1	bCVg	0.26	0.39	0.26	0.33	0:30	0.19	
Radionuclides	Actinium-228 @ 911 KeV	EPA 901.1	bCl/g	0.2	Q	0.3	QN	0.2	4.0	
Radionuclides	Actinium-228 @ 968 KeV	EPA 901.1	pCi/g	Q	Q	2	QV	QN	:	
Radionuclides	Bismuth-212 @ 727 KeV	EPA 901.1	pCi/g	Q.	QN	QN	Q Q	QN	:	
Radionuclides	Bismuth-214 @ 1120.4 KeV	EPA 901.1	pCl/g	9	S	2	Q	Q	:	
Radionuclides	Bismuth-214 @ 1764.7 KeV	EPA 901.1	bcitg	0.17	0.41	0.37	2	0.32	0.32	
Radionuclides	Bismuth-214 @ 609.4 KeV	EPA 901.1	bCNg	0.21	0.1	0.14	0.10	0.15	0.14	
Radionuclides	K-40 @ 1460 KeV	EPA 901.1	bCi/d	99.0	Š	0.51	Q	0.39	98.0	
Radionuclides	Lead-210 @ 46 KeV	EPA 901.1	pCi/g	2	Q	0.74	Q	0.25	96.	
Radionuclides	Lead-212 @ 238 KeV	EPA 901.1	pCi/g	0.11	0.1	0.13	0.16	0.11	0.0	
Radionuclides	Lead-214 @ 295.2 KeV	EPA 901.1	bÇiQd	0.14	0.2	0.23	0.12	0.19	0.11	
Radionuclides	Lead-214@ 352.0 KeV	EPA 901.1	pCi/g	0.21	0.16	0.21	0.18	0.19	20.0	
Radionuclides	Radium-226 @ 186.0 KeV	EPA 901.1	pCi/g	9.0	99.0	Q	0.48	0.42	0.91	
Radionuclides	Thallium-208 @ 583 KeV	EPA 901.1	bCl/g	0.21	Q	Q	0.12	0.07	0.30	
Radionuclides	Thallium-208 @ 860 KeV	EPA 901.1	pCi/g	9	g	Q	2	Q	:	
Radionuclides	Thorium-234 @ 63.3 KeV	EPA 901.1	pCi/g	QN	QN	0.37	0.46	0.12	0.53	
Radionuclides	Thorium-234 @ 92.6 KeV	EPA 901.1	bCi/g	Ş	0.25	S	2	0.08	0.36	
Radionuclides	Uranlum-235 @ 143 KeV	EPA 901.1	pCI/g	Q	Q	QN	Q	ON.	;	

ND= Not Detected, (no detection limit specified)

Solid Stream Data

Sample Stream: Limestone Slurry Solids

Analyte		Analytical		Run		-	Run	Run			Run			%96	4
Group	Specie	Method	Units	-			2	6			34		Average	5	Ratio
Anions	Chloride	SM407C	6/6n	5,270		6	096	2,950			5,590		4,057	2891	
Anions	Fluoride	EPA 340.2	6/6n	99.50		Ψ	4.10	92.00			98.00		85.20	46.34	
Metals	Aluminum	SW 6010	6/6n	814		-	609	845			965		756	318	
Metals	Antimony	SW 6010	₿/₿n	0.020		0	020	0.018			0.014		0.019	0.003	
Metals	Arsenic	SW 7060	6/6n	o.34		v	3.32	< 0.34		v	0.36	v	0.33	;	100%
Metals	Barium	SW 6010	6/6n	5.67		4'	5.15	5.33			5.22		5.39	99.0	
Metals	Beryllium	SW 6010	6/6n	0.15		_	7.13	0.15			0.14		0.14	0.02	
Metaks	Boron	SW 6010	6/6n	241		-	194	172			258		202	88	
Metals	Cadmium	SW 7131	₿/₿n	0.61		_	.59	0.62			0.63		0.61	0.04	
Metals	Calcium	SW 6010	5/Sn	382,490		4	4,082	390,244		.,	377,174		392,272	27,173	
Metafs	Chromium	SW 6010	5/Sn	13.39		-	2.45	14.30			13.70		13.38	2.30	
Metals	Cobalt	SW 6010	6/6n	1.72		-	1.38	1.35			1.52			0.51	
Metals	Copper	SW 6010	6/6n	3.75		.,,	3.50	3.88			3.62		3.71	0.48	
Metals	ron	SW 6010	6/6n	2,571		2	214	2,738			2,620		2,508	965	
Metals	Lead	SW 7421	6/6n	96.0		•	1.94	1.03			1.09		96.0	0.11	
Metals	Magnesium	SW 6010	₿/Bn	1,456		-	306	1,397			1,457		1,386	187	
Metals	Manganese	SW 6010	6/6n	424		7	419	44			417		429	8	
Metals	Mercury	SW 7471	₿/6n	0.01	7	>	10.0	0.01	7		0.01	v	0.0	:	%6 %
Metals	Molybdenum	SW 6010	₫/ɓn	0.24		J	38	90.0	7	v	0.22		0.23	0.40	
Metals	Nickel	SW 6010	6/6n	3.88		w	60	5.12			3.63		4.03	2.54	
Metats	Phosphorus	SW 6010	6/6n	106		•	10	114			11		110	6	
Metals	Potassium	SW 6010	6/Bn	355		••	867	360			350		338	98	
Metals	Selenium	SW 7740	6/6n	8.11		-	.46	9.63			10.67		8.40	2.77	
Metals	Silicon	SW 6010	6/6n	398		••	563	435			491		365	224	
Metais	Sodium	SW 6010	₿/ɓn	62.37		ΐ	5.20	47.12			61.52		54.90	18.95	
Metals	Strontium	SW 6010	6/6n	113		•-	601	113			110		112	5.29	
Metals	Titanium	SW 6010	6/6n	< 0.17		۷	.16	< 0.16		v	0.16	v	0.16	:	100%
Metals	Vanadium	SW 6010	6/6n	7.83		4	1.72	7.63			7.65	,	6.73	4.32	
Metals	Zinc	SW 6010	₿/ϐn	10.04		w	1.82	10.51			9.95		9.79	2.17	

Limestone Slurry Solids - Page 1

Solid Stream Data

Sample Stream: JBR Underflow Sturry Solids

Analyte		Analytical			Run	æ	<u> </u>	Run		Run			35%	占
Group	Specie	Method	Units		-			60	į	34		Average	5	Ratio
Anions	Chloride	SM407C	5/6n		9,310	Q.	02	9,870		9,840		9,550	717	
Anions	Fluoride	EPA 340.2	D/On		684	77	7	789		594		750	143	
Anions	Sulfate	EPA 300.0	b/bn	LC)	000'00	493	000	496,000		495,000		496,333	8,725	
Anions	Sulfite	EPRI-FGD-M2	6/6n	v	240	< 240	v Q	240	V	240	V	240	:	100%
Metals	Afuminum	SW 6010	6/5n		1,031	Ξ.	2	1,081		1,064		1,099	1 0	
Metals	Antimony	ICP-MS	6/ 6 n		0.067	0.0	98	0.066		0.073		0.073	0.028	
Metals	Arsenic	SW 7060	5/6n	٧	0.40	ò v	۷ ۷	0.36	٧	0.39	v	0.41	:	100%
Metals	Barium	SW 6010	6/dn		3.61	4	Š	80.4		4 08		4.02	0 94	
Metals	Beryllium	SW 6010	₿/B'n		0.10	Ö	91	0.13		0.19		0.13	0.07	
Metals	Boron	SW 6010	5/6n		417	4	υ	413		422		425	£	
Metals	Cadmium	SW 7131	5/6n		0.26	0	24	0.24		0.23		0.25	0.04	
Metals	Calcium	SW 6010	6/6n	7	60,714	256	627	248,786		231,317		255,376	15,059	
Metals	Chromium	SW 6010	0/0n		10.39	12	41	11.10		11.07		11.30	2.54	
Metals	Cobalt	SW 6010	5/5n		06.0	-	6	0.87		1.23		66.0	0.43	
Metals	Copper	SW 6010	₿/₿n		2.48	ė	2	2.61		2.70		2.73	0.81	
Metais	lron	SW 6010	₿/₿'n		2,060	2,3	49	2,148		2,112		2,186	3 69	
Metals	Lead	SW 7421	6/6n		0.86	ö	1	0.75		0.87		0.84	0.21	
Metals	Magnesium	SW 6010	6∕6n		785	æ	Q	795		96/		813	102	
Metals	Manganese	SW 6010	6/6 n		100	¥	90	<u>\$</u>		5		103	11.08	
Metals	Mercury	SW 7471	6/6n		0.19	Ö	<u>5</u> 2	0.19		0.16		0.18	90.0	
Metals	Motybdenum	SW 6010	5/6 0		1.23	-	ĸ	1.58		1.2		1.48	0.56	
Metals	Nickel	SW 6010	₿/ôn		2.32	Ö	92	2.79		2.70		2.82	1.29	
Metals	Phosphorus	SW 6010	6/6n		74.76	92	17	96.48		74.26		87.80	28.57	
Metals	Potassium	SW 6010	₿/6n		238	9	o	312		319		307	\$	
Metals	Selenium	SW 7740	6/6n		25.71	25	06	25.00		20.40		25.54	1.18	
Metals	Silicon	SW 6010	6/6n		469	4	o	414		447		447	72.50	
Metals	Sodium	SW 6010	B/6n		82.62	87	7	82.04		89.21		84.12	7.75	
Metals	Strontium	SW 6010	6/6n		73.21	76	66	71.12		72.60		73.77	7.39	
Metals	Titanium	SW 6010	5/5n		20.12	24	10	18.57		23.37		20.93	7.08	
Metals	Vanadium	SW 6010	6/6n		9.01	5	73	9.85		8.90		9.85	2.14	
Metals	Zinc	SW 6010	5/5n		7.86	αö	8	8.33		66:6		8.36	1.30	

JBR Underflow Slurry Solids - Page 1

Solid Stream Data

Analyte		Analytical		Run	Run	Run	Run
Group	Specie	Method	Units	*	7	en	34

Analyte		Analyticai			Run		Run		Run		Run			95%	占
Group	Specie	Method	Units		1		2		3		3d		Average	ច	Ratio
Radionuclides	Actinium-228 @ 338 KeV	EPA 901.1	pCi/g		Q		2		9		2				
Radionuclides	Actinium-228 @ 911 KeV	EPA 901.1	₽ Q		Q.		Q		0.16		Q		0.05	0.23	
Radionuclides	Actinium-228 @ 968 KeV	EPA 901.1	Ď Š		Q		Q		9		Q				
Radionuclides	Bismuth-212 @ 727 KeV	EPA 901.1	pCi/g		Q		S		QN		Q				
Radionuclides	Bismuth-214 @ 1120.4 KeV	EPA 901.1	DC//d		0.40		Q		0.35		Q _N		0.25	0.54	
Radionuclides	Bismuth-214 @ 1764.7 KeV	EPA 901.1	B _C /Od		0.11		Q		0.22		0.35		0.11	0.27	
Radionuclides	Bismuth-214 @ 609.4 KeV	EPA 901.1	PC/g		0.14		<u>Q</u>		0.18		0.25		0.11	0.23	
Radionuciides	K-40 @ 1460 KeV	EPA 901.1	pCi/g		Q		Q		QN		0.79				
Radionuclides	Lead-210 @ 46 KeV	EPA 901.1	pCi/g		62.0		₽		Q		Q		0.26	1.13	
Radionuclides	Lead-212 @ 238 KeV	EPA 901.1	₽Ç Ç		70.0		60.0		0.11		0.13		0.09	90.0	
Radionuclides	Lead-214 @ 295.2 KeV	EPA 901.1	pCi/g		Q		0.16		Q.		0.16		0.05	0.23	
Radionuclides	Lead-214@ 352.0 KeV	EPA 901.1	pCi/g		0.17		0.11		0.14		0.16		0.14	0.07	
Radionuclides	Radium-226 @ 186.0 KeV	EPA 901.1	PC Sign		0.54		Q		0.45		ON		0.33	0.72	
Radionuclides	Thallium-208 @ 583 KeV	EPA 901.1	pCi/g		0.15		0.30		0.16		0.14		0.20	0.21	
Radionuclides	Thallium-208 @ 860 KeV	EPA 901.1	pCI/g		QN		Q		QN		0.92				
Radionuclides	Thorium-234 @ 63.3 KeV	EPA 901.1	pCi/g		Q		0.56		Q		Q.		0.19	0.80	
Radionuclides	Thorium-234 @ 92.6 KeV	EPA 901.1	pCi/g		Q		0.28		0.33		0.21		0.20	0.44	
Radionuclides	Uranium-235 @ 143 KeV	EPA 901.1	pCi/g		₽		Q		Q		9		Q		
Aldohudee	Acetaldehyde	SW 8315	D/OIL	v	5	٧	o c	٧	010	٧	9	v	ç	;	100%
Automyces		0141 0245	ָ ה ה	٠,	9 6	٠,	9 6	,	9 0	٠,		. ,	9 6		200
Aldenydes	Formaldenyde	CICS MS	6/6n	v	2 ∂	v	5.0	v	<u>⊇</u>	v	<u>2</u>	v	5	;	%
Semi-Volatiles	1,2,4,5-Tetrachlorobenzene	SW 8270	6/60	v	29	v	S	v	8			v	56	:	100%
Semi-Volatiles	1,2,4-Trichlorobenzene	SW 8270	6/60	v	29	v	31	v	30			v	စ္က	;	100%
Semi-Volatiles	1,2-Dichlorobenzene	SW 8270	0/64	v	38	v	40	v	32			v	37	:	100%
Semi-Volatiles	1,2-Diphenylhydrazine	SW 8270	₿/gu	v	50	v	901	v	1 00			v	₽	;	100%
Semi-Volatiles	1,3-Dichlorobenzene	SW 8270	6/6u	v	20	v	21	v	36			v	52	;	100%
Semi-Volatiles	1,4-Dichlorobenzene	SW 8270	6/6u	v	4	v	42	v	90			v	37	:	100%
Semi-Volatites	1-Chloronaphthalene	SW 8270	0/6u	v	32	v	33	v	27			v	31	:	100%
Semi-Votatiles	1-Naphthylamine	SW 8270	6/6u	v	77	v	81	v	102			v	87	;	100%
Semi-Volatifes	2,3,4,6-Tetrachiorophenol	SW 8270	0/60	v	25	٧	5 8	v	23			v	25	:	100%

JBR Underflow Slurry Solids - Page 2

Solid Stream Data

Sample Stream: JBR Underflow Slurry Solids

Analyte									ij					3
Group	Specie	Method	Units		-		2		60	PE.		Average	5	Ratio
Somi Volatilae	2.4 S. Trichlorophonol	SW 8270	ojou	v	5	٧	17	v	26		•	8	:	100%
	Paralle and Paralle and Paralle	2000	3		: !	,	: ;		: 8			1 8		
Semi-Volatiles	2,4,6-Trichlorophenol	SW 8270	₿/ðu	٧	1,	v	5	v	£		v	2	:	\$00L
Semi-Volatiles	2,4-Dichlorophenol	SW 8270	₽/g⊓	v	22	v	ន	•	59		v	52	:	100%
Semi-Volatiles	2,4-Dimethylphenol	SW 8270	5/ 0 u	v	Ŗ	v	22	•	85		٧	29	•	100%
Semi-Volatiles	2,4-Dinitrophenol	SW 8270	5/6 U	v	346	v	363	٧	210		v	306	:	100%
Semi-Volatiles	2,4-Dinitrotoluene	SW 8270	D/Gu	v	27	v	8	•	8		•	28	:	100%
Semi-Volatiles	2,6-Dichlorophenol	SW 8270	6/6u	v	36	v	88	٧	26		v	33	:	100%
Semi-Volatiles	2,6-Dinitrotoluene	SW 8270	0/Bu	٧	17	٧	18	v	43		v	26	:	100%
Semi-Votatiles	2-Chloronaphthalene	SW 8270	₽g/gr	٧	16	v	17	٧	20		v	18	:	100%
Semi-Volatiles	2-Chlorophenol	SW 8270	5/6 u	v	88	v	\$	٧	32		v	98	:	100%
Semi-Volatiles	2-Methylnaphthalene	SW 8270	B/Bu	v	33	v	34	•	18		٧	28	:	100%
Semi-Volatiles	2-Methytphenol(o-cresol)	SW 8270	6/6u	٧	92	٧	82	٧	16		v	23	;	100%
Semi-Votatiles	2-Naphthylamine	SW 6270	B/6u	v	8	٧	101	v	80		v	93	;	4001
Semi-Volatiles	2-Nitroaniline	SW 8270	0/6u	٧	20	٧	₽.	v	33		v	52	;	100%
Semi-Volatiles	2-Nitrophenol	SW 8270	5/04	v	22	٧	23	v	26		v	24	:	100%
Semi-Volatiles	2-Picoline	SW 8270	B/GL	v	75	v	24	v	42		v	51	:	100%
Semi-Volatiles	3,3'-Dichlorobenzidine	SW 8270	5/Bu	٧	24	v	82	٧	17		v	.22	•	100%
Semi-Volatiles	3-Methylcholanthrene	SW 8270	5/Su	v	33	v	4	v	22		v	35	:	100%
Semi-Volatiles	3-Nitroanifine	SW 8270	5/6u	v	52	v	8	v	20		v	24	:	100%
Semi-Volatiles	4,6-Dinttro-2-methylphenol	SW 8270	0/64	v	39	٧	4	v	22		٧	¥	:	100%
Semi-Volatiles	4-Aminobiphenyl	SW 8270	D/6u	v	37	v	କ୍ଷ	v	8		v	45	;	100%
Semi-Volatiles	4-Bromophenyl phenyl	SW 8270	D/Bu	v	23	v	24	v	24		•	23	:	100%
Semi-Votatiles	4-Chloro-3-methylpheno	SW 8270	B/Bu	v	88	v	8	٧	26		v	33	;	100%
Semi-Volatiles	4-Chlorophenyl phenyl ether	SW 8270	5/Su	v	56	٧	22	٧	21		v	25	;	100%
Semi-Volatiles	4-Methylphenol(p-cresol)	SW 8270	6/6 L	v	28	v	ଚ	v	23		v	27	:	100%
Semi-Volatiles	4-Nitroaniline	SW 8270	B/B∪	v	24	٧	123	٧	30		v	56	;	100%
Semi-Volatiles	4-Nitrophenol	SW 8270	B/Bu	v	34	v	8	v	47		v	38	:	100%
Semi-Volatiles	7,12-Dimethylbenz(a)anthracen	SW 8270	5/6u	v	88	v	8	v	29		٧	87	:	100%
Semi-Volatiles	Acenaphthene	SW 8270	6/Bu	v	54	v	ĸ	v	14		v	21	;	100%
Semi-Volatiles	Acenaphthylene	SW 8270	₿/gu	v	=	v	12	٧	21		v	5	:	100%
Semi-Volatiles	Acetophenone	SW 8270	6/6U	v	23	v	24	v	28		v	25	:	100%
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JBR Underflow Slurry Solids - Page 3

Solid Stream Data

Sample Stream: JBR Underflow Sturry Solids

Analyte		Analytical			Run		RG		Run	Run			95%	占
Group	Specie	Method	Units		-		2		3	3d		Average	ច	Ratio
Security Velletings	44-4	0700	qui	,	ç	`	ç	•	ç		٧	ģ	;	4004
Serni-Volaines		0/70 440	3	,	67	,	3	,	2		,	3	,	
Semi-Volatifes	Benzidine	SW 8270	B/Bu	v	29	v	8	v	20		V	20	:	100%
Semi-Volatiles	Benzo(a)anthracene	SW 8270	₿/Bu	٧	56	v	27	v	23		v	52	;	100%
Semi-Volatiles	Benzo(a)pyrene	SW 8270	₽/gu	v	6	v	20	v	26		٧	23	;	100 %
Serni-Volatiles	Benzo(b)fluoranthene	SW 8270	ng/g	٧	28	٧	30	v	46		v	ŧ	;	100%
Semi-Volatiles	Benzo(g,h,l)perylene	SW 8270	₫/gu	٧	24	٧	25	٧	51		٧	₹ 8	:	100%
Semi-Volatiles	Benzo(k)fluoranthene	SW 8270	a/gu	v	84	٧	20	٧	9		٧	49	;	100%
Semi-Volatiles	Benzoic acid	SW 8270	6/6u	v	2	v	205	٧	1,940		٧	780	:	100%
Semi-Volatiles	Benzył alcohol	SW 8270	g/gu	٧	23	v	26	v	31		v	47	:	400%
Semi-Volatiles	Butylbenzylphthalate	SW 8270	g/gu	v	6	v	20	٧	31		v	24	;	100%
Serni-Volatiles	Chrysene	SW 8270	g/gu	v	33	٧	35	v	27		v	32	:	100%
Semi-Volatiles	Di-n-octy/phthalate	SW 8270	9/84	٧	45	v	47	v	18		v	37	:	100%
Semi-Volatiles	Dibenz(a,h)anthracene	SW 8270	6/64	v	23	٧	25	v	41		٧	ස	:	100%
Serni-Volatiles	Dibenz(a,j)acridine	SW 8270	6/6u	ν	53	v	99	٧	42		v	34	;	100%
Serni-Volatiles	Dibenzofuran	SW 8270	9/00	v	20	٧	21	v	27		V	23	;	100%
Semi-Volatiles	Dibutyiphthalate	SW 8270	₿⁄₿u	v	24	v	26	v	16		v	23	;	100%
Semi-Volatifes	Diethylphthalate	SW 8270	g/gu	v	11	v	17	v	26		v	8	:	100%
Semi-Volatiles	Dimethylphenethylamine	SW 8270	₫/đu	v	120	v	120	v	120		v	120	:	100%
Serni-Volatiles	Dimethylphthalate	SW 8270	₽¢	v	4	v	15	v	17		٧	15	:	100%
Semi-Volatiles	Diphenylamine	SW 8270	Øøu	v	92	v	27	٧	14		V	22	;	100%
Semi-Volatiles	Ethyl methanesulfonate	SW 8270	5/6u	v	52	v	26	v	34		v	28	;	100%
Semi-Votatiles	Fluoranthene	SW 8270	B/Gu	٧	32	v	33	v	24		v	59	;	100%
Serni-Volatiles	Fluorene	SW 8270	0 /6u	٧	17	v	17	v	19		v	18	:	100%
Semi-Volatiles	Hexachlorobenzene	SW 8270	B/Bu	v	12	v	12	v	16		v	13	:	100%
Serni-Volatiles	Hexachtorobutadiene	SW 8270	g/gu	v	35	v	36	v	26		v	32	:	100%
Semi-Volatiles	Hexachlorocyclopentadiene	SW 8270	6/60	v	1	٧	462	v	296		V	400	:	100%
Serni-Volatiles	Hexachloroethane	SW 8270	8/Bu	٧	82	v	31	v	32		v	સ	:	100%
Semi-Volatites	Indeno(1,2,3-cd)pyrene	SW 8270	B/Bu	v	56	٧	27	v	29		v	40	;	100%
Serni-Volatiles	Isophorone	SW 8270	5/6u	v	4	٧	15	v	31		v	20	:	100%
Semi-Volatiles	Methyl methanesulfonate	SW 8270	₿/Bu	v	ଜ	v	8	٧	20		v	ଜ	:	100%
Semi-Votatiles	N-Nitroso-di-n-butylamine	SW 8270	6/6u	v	8	v	88	٧	32		v	55	:	100%
Semi-Volatiles	N-Nitrosodimethylamine	SW 8270	b/bu	v	8	v	69	v	40		٧	58	:	100%
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JBR Underflow Slurry Solids - Page 4

Solid Stream Data

Sample Stream: JBR Underflow Slurry Solids

占	Ratio	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	19%	100%	100%	400
95%	ਠ	;	:	:	:	:	:	:	:	:	;	:	:	:	:	:	:	:	334	:	:	
	Average	77	88	42	33	32	21	66	44	52	53	58	58	23	6	0	59	31	\$	6	31	
		v	٧	v	v	v	v	v	v	v	v	v	v	v	٧	v	v	٧		٧	٧	,
Run	PE																					
Run	3	4	33	8	24	42	19	69	45	19	24	4	12	21	8	29	æ	19	29	29	37	;
		v	v	٧	•	•	•	•	•	•	v	•	•	v	•	v	v	v	v	v	•	
Run	2	82	ဓ္ဌ	6	88	27	23	107	45	78	32	₽	æ	24	8	8	83	88	83	8	59	
		v	v	v	v	v	٧	٧	٧	٧	٧	v	٧	٧	٧	٧	٧	٧	٧	v	٧	
Run	-	28	37	47	8	5 6	22	102	43	27	31	2	37	23	22	0	58	98	262	0.03	28	+
		٧	v	v	v	v	v	v	v	v	v	•	٧	v	v	v	v	v		v	v	
	Units	ם/סנ	0/04	6/6 L	6/64	6/60	0/6u	₿/đu	1 0/g	₫/đu	₿/Bu	6/6u	6/6u	0/04	6/ 6 u	0/Bu	6/6u	6/6u	5/8 u	6/Bu	6/6u	
Analytical	Method	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	
	Specie	N-Nitrosodiphenylamine	N-Nitrosodipropytamine	N-Nitrosopiperidine	Naphthalene	Nitrobenzene	Pentachlorobenzene	Pentachloronitrobenzene	Penlachlorophenol	Phenacetin	Phenanthrene	Phenol	Pronamide	Pyrene	Pyridine	bis(2-Chloroethoxy)methane	bis(2-Chloroethyf)ether	bis(2-Chloroisopropyl)ether	bis(2-Ethylhexyl)phthalate	p-Chloroaniline	p-Dimethylaminoazobenzene	
Analyte	Group	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	Semi-Volatiles	

ND= Not Detected, (no detection limit specified).

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Analyte		Analytical			Run		Run			Run			Run				32%	占
Group	Specie	Method	Units		-		7			3a			ρę		•	Average	ច	Ratio
Reduced Species	Cyanide	SW 9012	lm/gn		0.0024	7	0.0026	~ ~		0.00084	7	J	0.0015	~		0.0019	0.0024	
Reduced Species	Ammonia as N	EPA 350.1	m/gn		0.194		0.255			0.164		_	0.151			0.204	0.115	
Anions	Chloride	EPA 300	m/bn		9.28		9.37			7.99			6			8.88	1.92	
Anions	Fluoride	EPA 340.2	m/dn		0.377		0.461			0.443		-	0.441			0.427	0.110	
Anions	Phosphate	EPA 365.2	m/6n	v	0.02		< 0.002		٧	0.02		0	0.00176	7	v	0.014	:	100%
Anions	Sulfate	EPA 300.0	m/gn		108		115			117			120			113	12	
Metals, Soluble	Aluminum	SW 6010	jw/dn		0.0167	-	0.0172	-3		0.00881	7	0	0.00481	7		0.014	0.012	
Metals, Soluble	Antimony	SW 6010	m/dn	v	0.0241		< 0.0241		٧	0.0241		v	0.0241		v	0.024	1	100%
Metals, Soluble	Arsenic	SW 7060	im/go	٧	0.000657		< 0.000657	<u>!=</u>	v	0.000657		ő	0.000657		v	99000:0	:	100%
Metals, Soluble	Barium	SW 6010	lm/gn		0.147		0.168			0.151			0.15			0.155	0.028	
Metals, Soluble	Beryllium	SW 6010	m/gn	v	0.000554		0.00058	80		0.00005	-	0	0.00018	-	v	0.00055	:	31%
Metals, Soluble	Boron	SW 6010	μ/gn		1.14		0.97			1.12			1.06			1.08	0.23	
Metals, Soluble	Cadmium	SW 7131	m/gn		0.0012		0.00058	~		0.00137		O	0.00196			0.0011	0.0010	
Metals, Soluble	Calcium	SW 6010	m/dn		31.4		32.8			34.2			33.6			32.8	3.478	
Metals, Soluble	Chromium	SW 6010	m/on	v	0.00249		< 0.00249	•		0.00218	_	o v	0.00249		٧	0.0025	:	53%
Metals, Soluble	Cobalt	SW 6010	m/gn	v	0.0034		× 0.0034	_		0.00228	_	0	0.00164	_	v	0.0034	1	% 09
Metals, Soluble	Copper	SW 6010	lm/gu		0.00364	_	0.00297	~ _		0.00667		o	0.00397			0.0044	0.0049	
Metals, Soluble	Iron	SW 6010	m/on		3.76		5.63			6.75			6.67			5.38	3.75	
Metals, Soluble	Lead	SW 7421	m/gn		0.0115		0.0035			9600.0		Ų	0.0132			0.0083	0.010	
Metals, Soluble	Magnesium	SW 6010	m/6n		3.06		3.09			3.19			3.15			3.11	0.17	
Metals, Soluble	Manganese	SW 6010	m/gu		0.458		0.606			0.603		_	0.593			0.556	0.210	
Metals, Soluble	Mercury	SW 7470	m/dn		0.00005		0.00008	6 0		0.00005		Ö	0.00002	_	_	900000	0.00004	
Metals, Soluble	Motybdenum	SW 6010	m/gn		0.0447		0.0319	_		0.0284		J	0.0248			0.035	0.021	
Metals, Soluble	Nickel	SW 6010	m/gn		0.0213		0.0172			0.0207		J	0.0191			0.020	0.0055	
Metals, Soluble	Phosphorus	SW 6010	m/6n		0.147		> 0.061			0.0179	_	v	0.061			0.065	0.177	16%
Metals, Soluble	Potassium	SW 6010	m/m		5.29		90'9			5.68			5.38			5.34	0.78	
Metals, Soluble	Selenium	SW 7740	ug/mi		0.0003	_	0.002			0.0033		J	0.0016			0.0019	0.0037	
Metals, Soluble	Silicon	SW 6010	m/gn		3.77		3.34			3.24			3.2			3.45	0.70	
Metals, Soluble	Sodium	SW 6010	m/gu		12.7		12.4			12.1			12			12.4	0.7	
Metals, Soluble	Strontium	SW 6010	m/gn		0.334		0.343			0.35		_	0.346			0.342	0.020	
Metals, Soluble	둗	SW 6010	m/dn	v	0.0144		0.0028	-	٧	0.0144		v	0.0144		v	0.014	:	84%
I.					Ash Po	\ pu	Ash Pond Water - Page 1	Page	_									

H-98-98-sample Stream: Ash Pond Water

Analyte		Analytical		Run		Run		Run		Run				%S6	占
Group	Specie	Method	Chits	-		7		39		39			Average	ច	Ratio
Metals, Soluble	Ttanium	SW 6010	m/gn	0.00042	_	< 0.00236		0.00031		0.00024	7	٧	0.0024	;	62%
Metals, Soluble	Vanadium	SW 6010	m/gn	0.00019	7	0.0118		0.00167		0.00116	-		0.0046	0.016	
Metals, Soluble	Zinc	SW 6010	m/6n	0.0109		0.00881	~	0.00995		0.0102			0.010	0.0026	
Metals, Total	Aluminum	SW 6010	ш/бn	0.0708		0.355		0.102		0.123			0.176	0.387	
Metals, Total	Antimony	SW 6010	m/gu	0.0146	7	0.0166	7	0.0241		0.0131	-		0.018	0.012	
Metals, Total	Arsenic	SW 7060	m/gn	0.0004	7	0.0004	7	0.0014		0.0014		_	0.00073	0.0014	
Metals, Total	Barium	SW 6010	E/dn	0.144		0.168		0.148		0.144			0.153	0.032	
Metals, Total	Beryllium	SW 6010	ım/gn	0.00013	7	9E-05	~	0.000554	٧	0.000554		•	0.00026	0.000639	
Metals, Total	Boron	SW 6010	lm/gu	0.976		1.02		1.1		966.0			1.03	0.16	
Metals, Total	Cadmium	SW 7131	lm/gu	0.00079		0.0036		0.00105		0.00083			0.0018	0.0039	
Metals, Total	Calcium	SW 6010	m/dn	32.6		34.8		33.8		32.7			33.7	2.7	
Metals, Total	Chromium	SW 6010	m/dn	0.00111	_	0.0018	7	0.00194		0.00175			0.0016	0.0011	
Metals, Total	Cobatt	SW 6010	m/gn	0.00674		0.00622		0.00619		0.00411			0.0064	0.00077	
Metals, Total	Copper	SW 6010	m/gn	0.00832		0.00866		0.00493		0.00869			0.0073	0.0051	
Metals, Total	Iron	SW 6010	m/gn	8.28		12.6		9.8		9.71			10.2	5.4	
Metals, Total	Lead	SW 7421	m/gn	< 0.0008		0.0435		0.0079		0.0039			0.017	0.057	%
Metals, Total	Magnesium	SW 6010	j⊞/ßn	3.11		3.26		3.13		3.02			3.17	0.20	
Metals, Total	Manganese	SW 6010	m/gn	0.487		0.647		0.531		0.497			0.555	0.205	
Metals, Total	Mercury	SW 7470	m/6n	7E-05		6E-05		2E-05		1E-05	7		5E-05	7E-05	
Metals, Total	Molybdenum	SW 6010	m/gn	0.0761		0.1		0.0761		0.0736			0.084	0.034	
Metals, Total	Nickel	SW 6010	m/gu	0.0296		0.0195		0.022		0.0269			0.024	0.013	
Metals, Total	Phosphorus	SW 6010	m/gu	0.0038	_	0.0326	7	0.0446	٧	0.061			0.027	0.052	
Metals, Total	Potassium	SW 6010	m/gn	5.87		5.99		5.36		5.4			5.74	0.83	
Metals, Total	Selenium	SW 7740	m/gn	900:0		0.0043		0.0041		0.0042			0.0048	0.0026	
Metals, Total	Silicon	SW 6010	m/gn	4.03		3.58		3.48		3.34			3.697	0.728	
Metals, Total	Sodium	SW 6010	m/gu	13		13.5		12		11.7			12.8	6 .	
Metals, Total	Strontium	SW 6010	m/gn	0.329		0.35		0.337		0.326			0.339	0.026	
Metals, Total	ם	SW 6010	m/6n	< 0.0144		< 0.0144		0.0144	٧	0.0144		v	0.014	:	20%
Metals, Total	Titanium	SW 6010	m/gn	0.00024	_	0.0008	-	0.001		0.00041	-	Ĭ	9,00068	0.0010	
Metals, Total	Vanadium	SW 6010	μ/βn	0.0286		0.0227		0.0202		0.0239			0.024	0.011	
Metals, Total	Zinc	SW 6010	m/gn	0.0128		0.0124		0.0107		0.011			0.012	0.0028	

Ash Pond Water - Page 2

Sample Stream: Ash Pond Water

Analytical
Method
SW 8315
SW 8315 ug/ml
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SW 8270 ug/L

Liquid Stream Data Summary

H-88-Sample Stream: Ash Pond Water

ᆸ	Ratio		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	34%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100 %	100%	100%	
82%	ច		:	:	:	:	;	:	:	:	:	:	;	•	:	:	:	;	:	:	;	:	:	:	:	:	;	:	;	:	;	:	:	;	:	
	Average)	0.453	0.636	0.479	0.522	0.512	0.754	1.68	0.398	0.283	0.480	0.804	0.496	8	0.480	0.418	999.0	0.650	0.953	15.3	0.898	0.619	0.608	0.703	0.573	0.652	0.440	0.425	0.39	120	0.291	0.432	0.548	0.566	
			٧	v	٧	٧	٧	٧	٧	٧	٧	٧	٧	ν	٧	٧	v	٧	٧	٧	٧	•	٧	٧	٧	v	٧	٧	٧	v	v	٧	V	٧	•	
Run	B		0.461	0.49	0.401	0.437	0.577	0.892	1.27	0.259	0.398	0.532	0.587	0.35	8	0.428	0.493	0.865	0.971	0.951	36.8	0.581	0.595	0.511	0.335	0.772	0.802	0.511	0.308	0.49	129	0.32	0.264	0.647	0.449	
			٧	٧	٧	٧	V	٧	٧	٧	٧	٧	٧	٧	v	V	٧	٧	V	٧	V	٧	V	V	v	٧	٧	V	V	٧	V	v	V	٧	٧	
Run	38		0.479	0.51	0.417	0.454	9.0	0.928	1.32	0.269	0.414	0.553	0.61	0.364	20	0.445	0.513	0.899	<u>5</u>	0.989	38.2	0.604	0.619	0.532	0.349	0,803	0.834	0.532	0.321	0.51	120	0.333	0.274	0.672	0.466	
			٧	٧	v	v	v	v	v	٧	٧	v	v	٧	v	v	v	٧	v	٧	٧	٧	٧	٧	٧	v	٧	٧	٧	v	٧	v	v	v	v	4
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2	7		0.438	900	0.508	0.553	0.465	0.66	1.8	0.4	0.2	 4.0	0.86	0.559	8	0.45	0.36	0.5	0.4	0.93	3.8	0.1	0.25	0.64	0.87	0.45	0.5	0.35	0.474	0.3	120	0.26	0.50	0.484	0.6	later.
			•	•	٧	•	•	٧	v	٧	•	v	•	٧	•	V	•	•	٧	v	٧	•	_	v	٧	•	٧	٧	V	٧	•	•	•	•	•	M puc
Run	-		0.443	0.702	0.513	0.558	0.47	0.671	1.86	0.464	0.219	0.446	906.0	0.564	20	0.5	0.372	0.552	0.473	0.94	3.84	£.	0.305	0.65	0.884	0.46	0.564	0.396	0.479	0.326	120	0.272	0.513	0.488	0.619	Ash Pond Water - Page
			•	٧	٧	v	v	٧	٧	٧	v	V	v	v	v	v	٧	v	٧	٧	٧	•		٧	v	٧	٧	٧	v	v	٧	٧	v	٧	٧	
	Units		ug/L	ug/L	ug/L	J/gn	ug/L	ug/L	ug/L	76	ug/L	ug/L	√gn	√gn	ug/L	ng/L	ng/L	ng/L	ug/L	√gn	√gn	√gn	ug/L	₽,Gn	₩	ng/L	UQ/L	ug/L	√g,	ng/L	√gn	ug/L	ug/L	η/βn	₽/Gn	
Analytical	Method		SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	
	Specie	-	4-Bromophenyl phenyl	4-Chloro-3-methylphenol	4-Chlorophenyl phenyl ether	4-Methylphenol(p-cresol)	4-Nitroaniline	4-Nitrophenol	7,12-Dimethyfbenz(a)anthracene	Acenaphthene	Acenaphthylene	Acetophenone	Aniline	Anthracene	Benzidine	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic acid	Benzył ałcohoł	Butylbenzylphthalate	Chrysene	Di-n-octylphthalate	Dibenz(a,h)anthracene	Dibenz(a,j)acridine	Dibenzofuran	Dibutylphthalate	Diethylphthalate	Dimethylphenethylamine	Dimethylphthalate	Diphenylamine	Ethyl methanesulfonate	Fluoranthene	
Analyte	Grado		Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatife	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-votatile	Organics, Semi-volatile	Organics, Semi-volatite	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatite	Organics, Semi-volatife	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Serni-volatifie	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatifle	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-votatile	Organics, Semi-volatile	Organics, Semi-votatile	Organics, Semi-volatifie	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatife	

Ash Pond Water - Page 4

Sample Stream: Ash Pond Water

Analyte		Analyticat			Run		Run		Run		Run			82%	占
Group	Specie	Method	Units		•		7		38		34	⋖	Average	ច	Ratio
											,				:
Organics, Semi-volatile	Fluorene	SW 8270	7g5	٧	0.326	v	0.323	v	0.376	٧	0.362	v	0.342	:	80
Organics, Semi-volatile	Hexachlorobenzene	SW 8270	ug/L	v	0.227	٧	0.225	v	0.311	v	0.299	v	0.254	:	100%
Organics, Semi-volatile	Hexachlorobutadiene	SW 8270	√gu	v	0.678	٧	0.671	v	0.507	v	0.488	v	0.619	:	100%
Organics, Semi-votatile	Hexachtorocyclopentadiene	SW 8270	ng/L	v	8.66	٧	8.58	٧	5.83	v	5.61	v	69.7	;	100%
Organics, Semi-volatile	Hexachloroethane	SW 8270	ug/L	v	0.577	V	0.571	v	0.629	٧	909.0	v	0.592	:	100%
Organics, Semi-volatile	Indeno(1,2,3-cd)pyrene	SW 8270	ug/L	٧	0.51	V	0.505	٧	1.32	٧	1.27	v	0.78	;	100%
Organics, Semi-volatile	Isophorone	SW 8270	ug/L	٧	0.279	v	0.276	v	0.61	v	0.587	v	0.388	;	100%
Organics, Semi-volatile	Methyt methanesulfonate	SW 8270	γģη	v	8	٧	20	٧	28	v	8	v	ଝ	;	100%
Organics, Semi-volatile	N-Nitroso-di-n-butylamine	SW 8270	rø/F	٧	1.27	v	1.26	٧	0.623	v	0.599	v	1.051	:	100%
Organics, Semi-volatile	N-Nitrosodimethytamine	SW 8270	ug/L	٧	1.29	٧	1.28	•	0.778	v	0.749	v	1,116	:	100%
Organics, Semi-volatile	N-Nitrosodiphenylamine	SW 8270	ug/L	v	0.55	v	0.544	٧	0.266	v	0.256	v	0.453	:	100%
Organics, Semi-volatile	N-Nitrosodipropylamine	SW 8270	ug/L	v	0.729	v	0.722	v	0.648	v	0.623	v	0.700	:	100%
Organics, Semi-votatile	N-Nitrosopiperidine	SW 8270	ug/L	v	0.916	٧	0.907	v	0.591	v	0.569	v	0.805	:	100%
Organics, Semi-volatile	Naphthalene	SW 8270	ng/L	v	0.708	ν	0.701	v	0.473	v	0.455	v	0.627	:	100%
Organics, Semi-volatile	Nitrobenzene	SW 8270	ng/L	v	0.513	v	0.508	v	0.834	v	0.802	v	0.618	;	100%
Organics, Semi-volatile	Pentachlorobenzene	SW 8270	ng/L	v	0.43	V	0.426	•	0.37	v	0.356	v	0.409	:	100%
Organics, Semi-volatile	Pentachloronitrobenzene	SW 8270	ug/L	v	2.01	V	1.99	v	1.37	٧	1.31	v	1.79	:	100%
Organics, Semi-volatile	Pentachlorophenol	SW 8270	ug/L	v	0.839	٧	0.831	v	0.88	v	0.847	v	0.850	;	100%
Organics, Semi-volatile	Phenacetin	SW 8270	rg/L	v	0.524	٧	0.519	v	0.382	v	0.368	v	0.475	:	100%
Organics, Semi-volatile	Phenanthrene	SW 8270	UQ/L	٧	0.604	V	0.598	v	0.463	¥	0.446	v	0.555	:	100%
Organics, Semi-volatile	Phenol	SW 8270	ug/L	v	0.387	v	0.384	v	0.874	v	0.841	v	0.548	:	100 %
Organics, Semi-volatile	Pronamide	SW 8270	ug/L	٧	0.717	٧	0.711	v	0.239	v	0.23	v	0.556	:	100%
Organics, Semi-volatile	Pyrene	SW 8270	ug/L	v	0.454	٧	0.45	v	0.404	v	0.389	v	0.436	:	100%
Organics, Semi-volatile	Pyridine	SW 8270	₩ V	v	1.13	V	1.12	v	0.582	v	0.56	v	0.944	;	100%
Organics, Semi-volatile	bis(2-Chloroethoxy)methane	SW 8270	ug/L	v	0.546	v	0.54	v	9.0	v	0.577	v	0.56	:	100%
Organics Semi-volatile	bis(2-Chloroethyl)ether	SW 8270	√g/L	v	0.711	v	0.704	v	0.379	v	0.365	v	0.598	:	100%
Organics, Semi-volatile	bis(2-Chloroisopropyl)ether	SW 8270	ng/L	v	0.705	٧	0.698	v	0.79	v	0.76	v	0.731	:	100%
Organics, Semi-volatile	bis(2-Ethylhexyt)phthalate	SW 8270	ηgη	v	1.78	V	1.76	v	0.575		447	v	1.37	;	100 %
Organics, Semi-volatile	p-Chloroaniline	SW 8270	ug/L	٧	0.543	v	0.537	v	0.738	v	0.71	v	909'0	;	100%
Organics, Semi-volatile	p-Dimethylaminoazobenzene	SW 8270	ng/L	v	0.5	v	0.495	v	0.719	v	0.691	v	0.571	;	100%
Organice Volatile	1 1 1-Trichforoethane	SW 8240	uo/L	v	ιΩ	v	က	٧	ស	v	S	٧	S.	;	100%
Organics, Volatile	1,1,2,2-Tetrachloroethane	SW 8240	UQ/L	٧	ស	٧	Ŋ	v	ις	v	S.	v	ς.	:	100%
· F					Ash Por	nd Wa	Ash Pond Water - Page	9							

Liquid Stream Data Summary

H-06-H Sample Stream: Ash Pond Water

占	Ratio	100%	100%	100%	100%	100%	100%	100%	100%	100%	28%	100%	4004	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	19%	100%	100%	100%	100%	100%	100%	100%	100%	100%
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		٧	٧	٧	٧	v	٧	v	v	v	v	v	v	٧	٧	v	v	v	v	٧	٧	٧	v	v	v	v	٧	v	v	٧	v	v	v
	Units	1/8 1/8	J/gn	₩,	ď,	ųg/L	ug/L	√g/L	ng/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	J/Bn	√g/L	7/6n	₽g/L	√g/L	ug/L	ug/L	ug/L	√gn	ug/L	ug/L	₽/gu	ug/L	ug/L	ug/L	ug/L	ug/L
Analytical	Method	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240
	Specie	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,2-Dichloroethene (total)	1,2-Dichloropropane	2-Butanone (MEK)	2-Hexanone	4-Methyl-2-pentanone (MIBK)	Acetone	Benzene	Bromodichloromethane	Bromoform	Bromomethane	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	Dibromochloromethane	Ethylbenzene	Methylene Chloride	Styrene	Tetrachioroethene	Toluene	Trichloroethene	Vinyl acetate	Vinyl chloride	Xylenes	cis-1,3-Dichloropropene	trans-1,3-Dichloropropene
Analyte	Group	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Votatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile

Ash Pond Water - Page 6

Sample Stream: Bottom Ash Sluice Filtrate

Analyte		Anatytical		Run		Run		Run		Sun Un			% 56	占
Group	Specie	Method	Units	-		2		38	[PE 3d		Average	5	Ratio
Bedured Species	Cvanide	SW 9012	ua/ml	0,0025	7	0.0017	7	0.0017	_	0.0025	_	0.0020	0.0011	
Reduced Species	Ammonia as N	EPA 350.1	ng/m	0.293		0.421		0.638		0.402		0.451	0.433	
Anione	Chloride	EPA 300	lm/bn	8.39		7.74		7.55		7.62		7.89	1.09	
Anions	Fluoride	EPA 340.2	E/go	0.272		0.268		0.302		0.302		0.281	0.046	
Anions	Phosphate	EPA 365.2	E/do	0.0396	٧	0.02		0.0264		0.0235		0.0253	0.0368	13%
Anions	Sulfate	EPA 300.0	lm/bn	67.5		8		82		79.1		80.5	34.4	
Metals Solutie	Atuminum	SW 6010	m/mn	0.182		0.302		0.431		0.399		0.305	0.309	
Metals Soluble	Antimony	SW 6010	m/gn	< 0.0241	•	0.0241	Ĭ	0.0241	v	0.0241	٧	0.0241	:	100%
Metals, Soluble	Arsenic	SW 7060	μ/gn	0.0028		0.0646		0.0031		0.004		0.024	0.088	
Metals, Soluble	Barium	SW 6010	m/gn	0.0744		0.14		0.0927	_	0.0919		0.102	0.084	
Metals, Soluble	Benyllium	SW 6010	lm/dn	< 0.000554	٧		•	< 0.000554	v	0.000554	٧	0.000554	;	100%
Metals, Soluble	Boron	SW 6010	m/dn	0.624		1.14		0.849		0.936		0.871	0.643	
Metals, Soluble	Cadmium	SW 7131	m/gn	< 0.000237		0.00173		0.00131	Ü	0.00179		0.00105	0.00208	4%
Metals, Soluble	Calcium	SW 6010	m/6n	29.1		38		47.4		44.5		38.5	22.8	
Metals, Soluble	Chromium	SW 6010	lm/gu	0.00211	_	0.00419		0.00301	J	0.00318		0.00310	0.00259	
Metals, Soluble	Cobalt	SW 6010	m/gn	c 0.0034	•	0.0034	•	0.0034	v	0.0034	٧	0.0034	;	100 %
Metals, Soluble	Copper	SW 6010	m/bn	0.00355	-	0.0116		0.0393	J	0.00533		0.0182	0.0466	
Metals, Soluble	Iron	SW 6010	m/on	0.0199		0.0439		0.0212	_	0.0059		0.0283	0.0335	
Metals, Soluble	Lead	SW 7421	lm/gu	600.0		900'0		0.016		0.017		0.010	0.013	
Metals, Soluble	Magnesium	SW 6010	lm/gu	2.07		2.98		1.71		4.8		2.25	.	
Metals, Soluble	Manganese	SW 6010	m/bn	0.07		0.0918		0.00172	0	0.00257		0.0545	0.1168	
Metals, Soluble	Mercury	SW 7470	E/6n	0.00007		0.00002	_	0.00003	0	0.00007		0.00004	0.00007	
Metals, Soluble	Molybdenum	SW 6010	m/gn	0.0472		0.11		0.0587		0.0593		0.0720	0.0831	
Metals, Soluble	Nickel	SW 6010	lm/gu	0.00016	_	0.011		0.00466	_	0.0026		0.0053	0.0135	
Metals, Soluble	Phosphorus	SW 6010	m/bn	0.0872		0.172		0.0791		0.197		0.113	0.128	
Metals, Soluble	Potassium	SW 6010	lm/gu	3.67		5.64		3.85		3.83		4.39	2.71	
Metals, Soluble	Selenium	SW 7740	m/dn	0.0038		0.0036		0.0043	_	0.0035		0.0039	0.0009	
Metals, Soluble	Silicon	SW 6010	m/gn	4.63		4.61		4.97		4 .8		4.74	0.50	
Metals, Soluble	Sodium	SW 6010	Jw/Bn	9.05		10.4		8.69		8.69		9.38	2.24	
Metals, Soluble	Strontium	SW 6010	lm/gu	0.194		0.423		0.225		0.22		0.281	0.309	
Metals, Soluble	重	SW 6010	m/gn	0.00499	٠ -	0.0144		0.00446	Ü	0.00236	٧	0.0144	:	43%
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Bottom Ash Sluice Filtrate - Page 1

Liquid Stream Data Summary

H-65 Sample Stream: Bottom Ash Sluice Filtrate

Analyte		Analytical	;		Run		Run		Run		Run		•	95%	占 ;
Group	Specie	Method	Chilts		-		2		33		30		Average	ច	Ratio
Metais, Soluble	Titanium	SW 6010	m/gn		0.00101 J		0.00226	٧	0.00102		0.00076 J		0.0013	0.0022	13%
Metals, Soluble	Vanadium	SW 6010	E/ga		0.0349		0.00712		0.0453		0.0444		0.0291	0.0490	
Metals, Soluble	Zinc	SW 6010	lm/gu		0.00339		0.0162		0.00565		0.00342		0.0084	0.0170	
Aldehydes	Acetaldehyde	SW 8315	E/go		9000		60:0		0.134		60:0		0.077	0.162	
Aldehydes	Formaldehyde	SW 8315	lm/gu		900'0		0.032		0.03		0.026		0.023	0.036	
Organics, Semi-volatile	1,2,4,5-Tetrachlorobenzene	SW 8270	ng/L	v	0.556	٧	0.578	٧	0.402	v	0.373	٧	0.512	;	100%
Organics, Semi-volatile	1,2,4-Trichlorobenzene	SW 8270	1/6 n	٧	0.568	V	0.591	٧	909:0	v	0.563	٧	0.588	:	100%
Organics, Semi-volatite	1,2-Dichlorobenzene	SW 8270	ng/L	v	0.749	•	0.779	٧	0.655	v	909'0	٧	0.728	;	100%
Organics, Semi-volatife	1,2-Diphenythydrazine	SW 8270	ng/L	v	5	٧	0 <u>0</u> 1	٧	<u>5</u>	v	5	٧	100	:	100%
Organics, Semi-volatile	1,3-Dichlorobenzene	SW 8270	ng/L	٧	0.381	٧	0.396	V	0.739	v	0.686	٧	0.505	:	100%
Organics, Semi-votatile	1,4-Dichlorobenzene	SW 8270	ng/L	v	0.777	٧	0.808	٧	909'0	v	0.563	٧	0.730	;	100%
Organics, Semi-votatile	1-Chloronaphthalene	SW 8270	J/6n	v	0.619	v	0.644	٧	0.554	v	0.514	٧	909'0	:	100%
Organics, Semi-volatile	1-Naphthylamine	SW 8270	√gv Mg/L	v	1.5	٧	1.56	٧	2.09	v	1.94	V	1.72	;	100%
Organics, Semi-volatile	2,3,4,6-Tetrachlorophenol	SW 8270	ng/L	٧	0.484	٧	0.503	٧	0.479	V	0.445	٧	0.489	:	100%
Organics, Semi-volatile	2,4,5-Trichlorophenol	SW 8270	ng/L	v	0.317	•	0.33	٧	0.525	v	0.487	٧	0.391	;	100%
Organics, Semi-volatile	2,4,6-Trichlorophenol	SW 8270	ng/L	٧	0.336	v	0.349	٧	0.522	٧	0.484	V	0.402	;	100%
Organics, Semi-votatile	2,4-Dichlorophenol	SW 8270	ng/L	v	0.426	v	0.443	٧	0.587	v	0.544	٧	0.485	;	100%
Organics, Semi-volatile	2,4-Dimethylphenol	SW 8270	ug/L	v	99:	•	1.1	٧	1.34	v	1.24	٧	1.17	;	100%
Organics, Semi-volatile	2,4-Dinitrophenol	SW 8270	ng/L	v	6.73	v	7	v	4.31	٧	4	٧	6.01	:	100%
Organics, Semi-volatile	2,4-Dinitrotoluene	SW 8270	ug/L	v	0.529	٧	0.55	V	609.0	٧	0.566	٧	0.563	;	100%
Organics, Semi-volatife	2,6-Dichlorophenol	SW 8270	ng/L	v	0.695	v	0.723	v	0.528	٧	0.49	٧	0.649	;	100%
Organics, Semi-volatile	2,6-Dinitrotoluene	SW 8270	ug/L	v	0.333	٧	0.346	V	0.888	٧	0.824	٧	0.522	:	100%
Organics, Semi-volatite	2-Chloronaphthalene	SW 8270	7 6n	v	0.312	v	0.324	٧	0.404	٧	0.375	٧	0.347	:	100%
Organics, Semi-volatife	2-Chlorophenol	SW 8270	√gn	v	0.735	v	0.764	v	0.655	v	909.0	٧	0.718	:	100%
Organics, Semi-volatile	2-Methylnaphthalene	SW 8270	ug/L	v	0.635	•	99.0	٧	0.375	v	0.348	V	0.557	;	100 %
Organics, Semi-volatile	2-Methylphenol(o-cresol)	SW 8270	ug/L	v	0.513	v	0.534	٧	0.32	v	0.297	٧	0.456	:	100%
Organics, Semi-volatile	2-Naphthylamine	SW 8270	ng/L	v	1.87	v	1.95	v	1.65	٧	1.53	٧	1.82	:	100%
Organics, Semi-volatile	2-Nitroaniline	SW 8270	ng/L	v	0.387	٧	0.402	٧	0.684	v	0.634	٧	0,491	:	100%
Organics, Semi-volatife	2-Nitrophenal	SW 8270	ug/L	v	0.423	v	0.44	٧	0.538	v	0.5	V	0.467	;	100%
Organics, Semi-volatife	2-Picoline	SW 8270	ng/L	v	. 6	•	1.09	٧	0.853	v	0.791	٧	0.998	:	100%
Organics, Semi-volatile	3,3'-Dichlorobenzidine	SW 8270	ug/L	v	0.471	v	0.49	٧	0.343	•	0.319	v	0.435	:	100%
			_	Botte	ottom Ash Sluice	Inice	Filtrate - Page	Pag	e 2						

Sample Stream: Bottom Ash Sluice Fittrate

Analyte	,	Analyticas	17.11		Run		Rgm 0		Run		Run			95%	႕ ;
Group	Specie	Method			-		2	1	2a		30		Average	5	Katio
Organics, Semi-volatile	3-Methylcholanthrene	SW 8270	ng/L	٧	0.753	v	0.783	v	0.515	v	0.478	v	0.684	:	100%
Organics, Semi-volatile	3-Nitroaniline	SW 8270	γģη	v	0.489	v	0.509	v	0.405	v	0.376	v	0.468	;	100%
Organics, Semi-volatile	4,6-Dinitro-2-methylphenol	SW 8270	ng/L	v	0.762	v	0.792	v	0.443	v	0.411	٧	999.0	;	100%
Organics, Semi-volatile	4-Aminobiphenyl	SW 8270	ng/L	٧	0.719	•	0.748	v	1.23	v	1.14	v	0.899	;	100%
Organics, Semi-volatile	4-Bromophenyl phenyl	SW 8270	-do/-	v	0.438	٧	0.456	v	0.499	v	0.463	v	0.464	:	400%
Organics, Semi-volatile	4-Chloro-3-methylphenol	SW 8270	ng/L	v	0.695	v	0.723	v	0.531	v	0.493	v	0.650	;	100%
Organics, Semi-volatile	4-Chlorophenyl phenyl ether	SW 8270	ng/L	v	0.508	٧	0.528	v	0.434	v	0.403	v	0.490	;	100%
Organics, Semi-volatile	4-Methylphenoi(p-cresol)	SW 8270	ng/L	٧	0.553	٧	0.575	v	0.473	٧	0.439	v	0.534	;	100%
Organics, Semi-volatile	4-Nitroaniline	SW 8270	ng/L	٧	0.465	v	0.484	v	0.625	v	0.58	v	0.525	;	100%
Organics, Semi-volatile	4-Nitrophenol	SW 8270	ug/L	٧	0.664	v	0.691	v	996.0	v	0.897	V	0.774	;	100%
Organics, Semi-volafile	7,12-Dimethylbenz(a)anthracene	SW 8270	ŋ∕gv	v	1.85	v	1.92	v	1.37	v	1.27	v	1.71	:	100%
Organics, Semi-volatile	Acenaphthene	SW 8270	ng/L	٧	0.46	v	0.478	v	0.28	v	0.26	v	0.406	:	100%
Organics, Semi-volatile	Acenaphthylene	SW 8270	ng/L	v	0.217	v	0.226	٧	0.431	v	9.4	v	0.291	;	100%
Organics, Semi-volatile	Acetophenone	SW 8270	7 /6n	v	0.441	v	0.459	v	0.576	v	0.535	v	0.492	;	100%
Organics, Semi-volatile	Aniline	SW 8270	rg/L	v	0.897	v	0.933	v	0.635	v	0.589	v	0.822	;	100%
Organics, Semi-volatile	Anthracene	SW 8270	ng/L	v	0.559	٧	0.581	v	0.379	v	0.352	v	0.506	;	100%
Organics, Semi-volatile	Benzidine	SW 8270	ng/L	v	20	v	20	v	20	٧	20	٧	20	;	100%
Organics, Semi-volatife	Benzo(a)anthracene	SW 8270	₽g/L	v	0.495	v	0.515	v	0.463	v	0.43	v	0.491	:	100%
Organics, Semi-volatife	Benzo(a)pyrene	SW 8270	ng/L	v	0.368	٧	0.383	v	0.534	v	0.496	٧	0.428	;	100%
Organics, Semi-volatife	Benzo(b)fluoranthene	SW 8270	ng/L	v	0.547	v	0.569	v	0.936	٧	0.869	٧	0.684	;	100%
Organics, Semi-volatife	Benzo(g,h,i)perylene	SW 8270	ng∕L	v	0.468	v	0.487	v	1.05	v	9260	٧	0.668	:	100%
Organics, Semi-volatife	Benzo(k)fluoranthene	SW 6270	ng√L	v	0.931	٧	996.0	v	1.03	٧	956.0	v	926.0	;	100%
Organics, Semi-volatife	Benzoic acid	SW 8270	ng/L	v	3.81	v	3.96	v	39.8	٧	36.9	٧	15.86	;	100%
Organics, Semi-volatile	Benzył alcohol	SW 8270	ng/L	v	1.04	v	1.08	v	0.629	v	0.584	٧	0.916	;	100%
Organics, Semi-volatile	Butylbenzylphthalate	SW 8270	ug/L	v	0.378	٧	0.393	v	0.644	v	0.598	v	0.472	;	100%
Organics, Semi-volatile	Chrysene	SW 8270	ng/L	v	0.643	٧	0.669	v	0.554	v	0.514	v	0.622	:	100%
Organics, Semi-volatile	Di-n-octylphthalate	SW 8270	ng/L	v	0.876	٧	0.911	v	0.363	v	0.337	v	0.717	;	100%
Organics, Semi-volatile	Dibenz(a,h)anthracene	SW 8270	ug/L	v	0.456	٧	0.474	v	0.836	v	0.776	٧	0.589	:	100%
Organics, Semi-volatile	Dibenz(a,j)acridine	SW 8270	ng/L	v	0.559	٧	0.581	v	0.868	v	0.806	v	0.669	:	100%
Organics, Semi-volatile	Dibenzofuran	SW 8270	ng/L	v	0.392	v	0.408	v	0.554	v	0.514	v	0.451	;	100%
Organics, Semi-volatile	DibutyIphthalate	SW 8270	rgv L	v	0.474	v	0.493	v	0.334	v	0.31	٧	0.434	:	100%
Organics, Semi-volatife	Diethyfphthalate	SW 8270	ng/L	v	0.323	v	0.336		1.06	v	0.493		0.463	1.2841	24%
Organics, Semi-volatile	Dimethylphenethylamine	SW 8270	ug/L	v	120	v	120	v	120	v	120	٧	120	;	100%
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Bottom Ash Sluice Filtrate - Page 3

H-6-5 Sample Stream: Bottom Ash Sluice Filtrate

Analyte		Analytical			Run		Run		Run		Run			95%	占
Group	Specie	Method	Units		-		2		38		34		Average	อ	Ratio
alfalou-imon ecinemy	Dimethylphibalate	CW 8270	[/6]	v	0.269	٧	0.28	v	0.346	٧	0.322	v	0.298	:	,00t
Organica, Semi-volatile	Diohendamine	SW 8270	1/on	v	0.508	٧	0.528		0.608	V	0.265	٧	0.528	:	46%
Organics, Semi-volatile	Ethyl methanesulfonate	SW 8270	ng/L	٧	0.484	٧	0.503	v	0.7	•	0.65	v	0.562	;	100%
Organics, Semi-volatife	Fluoranthene	SW 8270	ng/L	v	0.613	v	0.638		0.19 J	v	0.451	٧	0.638	;	77%
Organics, Semi-volatile	Fluorene	SW 8270	ng/L	٧	0.323	V	0.336	v	0.392	٧	0.364	v	0.350	;	100%
Organics, Semi-volatile	Hexachlorobenzene	SW 8270	ug/L	v	0.225	٧	0.234	v	0.324	٧	0.3	٧	0.261	:	100%
Organics, Semi-volatile	Hexachlorobutadiene	SW 8270	ug/L	٧	0.671	v	0.698	V	0.528	v	0.49	V	0.632	:	100%
Organics, Semi-volatile	Hexachlorocyclopentadiene	SW 8270	ug/L	v	8.58	v	8.92	v	6.07	v	5.64	٧	7.86	;	100%
Organics, Semi-volatile	Hexachloroethane	SW 8270	₩,	٧	0.571	V	0.594	v	0.655	v	0.608	v	0.607	:	100%
Organics, Semi-volatile	Indeno(1,2,3-cd)pyrene	SW 8270	ng/L	v	0.505	٧	0.525	v	1.37	٧	1.27	٧	0.800	:	100%
Organics, Semi-volatile	Isophorone	SW 8270	ug/L	v	0.276	v	0.287	v	0.635	٧	0.589	٧	0.399	:	100%
Organics, Semi-volatile	Methyl methanesulfonate	SW 8270	ug/L	v	2 2	٧	8	٧	ଝ	٧	20	v	8	;	100%
Organics, Semi-volatile	N-Nitroso-di-n-butylamine	SW 8270	ng/L	v	1.26	•	1.31	v	0.648	v	0.602	v	1.07	:	100%
Organics, Semi-volatile	N-Nitrosodimethyłamine	SW 8270	ng/L	v	1.28	V	1.33	v	0.81	٧	0.752	v	1.14	:	100%
Organics, Semi-volatile	N-Nitrosodiphenylamine	SW 8270	ng/L	v	0.544	•	0.566		0.621	v	0.257	V	0.566	;	47%
Organics, Semi-volatile	N-Nitrosodipropylamine	SW 8270	ug/L	v	0.722	v	0.751	V	0.674	٧	0.626	v	0.716	;	100%
Organics, Semi-volatile	N-Nitrosopiperidine	SW 8270	ug/L	٧	0.907	V	0.943	v	0.615	V	0.571	v	0.822	;	100%
Organics, Semi-volatile	Naphthatene	SW 8270	√J/gn	٧	0.701	v	0.729	v	0.493	٧	0.457	•	0.641	:	100%
Organics, Semi-volatile	Nitrobenzene	SW 8270	ug/L	v	0,508	v	0.528	v	0.868	٧	0.806	٧	0.635	:	100%
Organics, Semi-volatifie	Pentachlorobenzene	SW 8270	J/gn	v	0.426	v	0.443	•	0.386	٧	0.358	٧	0.418	:	100%
Organics, Semi-volatife	Pentachloronitrobenzene	SW 8270	ug/L	v	8.	v	2.07	v	1.42	v	1.32	v	1.83	:	100%
Organics, Semi-volatife	Pentachlorophenol	SW 8270	ng/L	v	0.831	v	0.864	v	0.916	v	0.851	٧	0.870	:	100%
Organics, Semi-volatile	Phenacetin	SW 8270	J/gu	У	0.519	•	0.54	٧	0.398	v	0.369	٧	0.486	:	100%
Organics, Semi-volatile	Phenanthrene	SW 8270	ug/L	٧	0.598	v	0.622	•	0.482	v	0.448	V	0.567	:	100%
Organics, Semi-volatite	Phenol	SW 8270	ng/L	v	0.384	V	0.399	٧	0.91	V	0.845	v	0.564	:	100%
Organics, Semi-volatile	Pronamide	SW 8270	√bn	٧	0.711	v	0.739	٧	0.248	v	0.231	v	0.566	:	100 %
Organics, Semi-volatile	Pyrene	SW 8270	ug/L	v	0.45	v	0.468		0.501	v	0.39	v	0.468	;	48%
Organics, Semi-volatile	Pyridine	SW 8270	ug/L	٧	1.12	v	1.16	v	909.0	•	0.563	٧	0.962	;	100%
Organics, Semi-volatile	bis(2-Chloroethoxy)methane	SW 8270	rg/L	v	0.54	v	0.562	v	0.625	v	0.58	٧	0.576	:	100%
Organics, Semi-volatile	bis(2-Chloroethyl)ether	SW 8270	ug/L	v	0.704	v	0.732	v	0.395	٧	0.367	٧	0.610	:	100%
Organics, Semi-volatile	bis(2-Chloroisopropyl)ether	SW 8270	ug/L	v	0.698	v	0.726	٧	0.823	v	0.764	٧	0.749	:	100%
Organics, Semi-volatile	bis(2-Ethylhexyl)phthalate	SW 8270	ng/L	v	1.76		1.37	v	0.599		1.03	v	1.76	:	46%
Organics, Semi-volatile	p-Chloroaniline	SW 8270	ng/L	v	0.537	٧	0.559	v	0.768	٧.	0.713	٧	0.621	;	100%
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Bottom Ash Sluice Filtrate - Page 4

Sample Stream: Bottom Ash Sluice Filtrate

Analyte Group	Specie	Analytical Method	Units		Run 1		Run 2		Run 3a		Run 3d	E 70		Average	95% C	PL Ratio
Organics, Serni-volatile	p-Dimethylaminoazobenzene	SW 8270	ng/L	v	0.495	٧	0.515	٧	0.748	٧	0.695	8	٧	0.586	;	4001
Organics, Volatile	1,1,1-Trichloroethane	SW 8240	ug/t	v	r.			٧	2.88	V	2.88	ø	v	ю	;	100%
Organics, Votatile	1,1,2,2-Tetrachloroethane	SW 8240	J/gn	٧	Ŋ			v	1.67	٧	<u>+</u>	71	v	ιΩ	:	100%
Organics, Volatile	1,1,2-Trichloroethane	SW 8240	νg/	v	5			v	0.932	٧	0.9	32	v	ю	;	100%
Organics, Volatile	1,1-Dichloroethane	SW 8240	ηQη	v	c)			v	1.64	٧	÷	.	v	ın	;	100%
Organics, Volatile	1,1-Dichloroethene	SW 8240	ng/L	٧	ω			٧	2.09	٧	2	2 2	v	ıçı	;	100%
Organics, Volatile	1,2-Dichloroethane	SW 8240	ug/L	٧	2			v	1.07	٧	Ξ	11	v	5	:	100%
Organics, Volatile	1,2-Dichloroethene (total)	SW 8240	J/On	v	Ω.			v	¥	٧	Z	~	v	10	;	100%
Organics, Volatile	1,2-Dichloropropane	SW 8240	1/6 n	v	S.			v	0.602	٧	9.0	25	v	ro.	;	100%
Organics, Volatile	2-Butanone (MEK)	SW 8240	ug/L	٧	5			v	6.32	٧	6	2	v	5	;	100%
Organics, Volatile	2-Некапопе	SW 8240	J/Bn	v	9			v	¥	٧	Z	4	v	5	:	100%
Organics, Volatile	4-Methyl-2-pentanone (MIBK)	SW 8240	ng/L	٧	5			v	ΑN	٧	Z	•	v	5	;	100%
Organics, Volatile	Acetone	SW 8240	ug/L	v	5			v	Ϋ́	٧	Ž	*	v	우	:	100%
Organics, Volatile	Benzene	SW 8240	ug/L	v	S.			٧	0.848		16	eú.	v	ro.	:	100%
Organics, Volatile	Bromodichloromethane	SW 8240	ng/L	v	ις			v	ν Α	٧	Ž	4	v	S.	:	100%
Organics, Volatile	Bromoform	SW 8240	ng/L	٧	ĸ			٧	¥.	٧	Ž	4	v	ro.	;	100%
Organics, Volatile	Bromomethane	SW 8240	1/8 n	v	ᅌ			v	2.07	٧	5.0	1	v	우	•	100%
Organics, Volatile	Carbon Disulfide	SW 8240	ης, T	v	ις			v	1.73	v	-	က	v	က	;	100%
Organics, Volatile	Carbon Tetrachloride	SW 8240	ng/L	v	Ŋ			٧	1.22	٧	-	21	v	2	;	100%
Organics, Volatile	Chlorobenzene	SW 8240	ng√L	٧	ın			٧	1,2	٧	-	~	v	S.	;	100%
Organics, Volatile	Chloroethane	SW 8240	ug/L	v	5			٧	1.41	٧	-	=	v	9	;	100%
Organics, Volatile	Chloroform	SW 8240	ng√	v	ιΩ			v	0.995	•	0.9	æ	v	ĸo.	:	100%
Organics, Volatile	Chloromethane	SW 8240	ug/L	v	5			٧	2 8:	٧	5.	ďΩ	v	6	;	100%
Organics, Volatile	Dibromochloromethane	SW 8240	ug/L	v	ıc			v	X X	٧	Ż		٧	2	:	100%
Organics, Volatile	Ethylbenzene	SW 8240	ηď,	٧	ĸ			v	0.893		7,	<u>ლ</u>	v	2	:	100%
Organics, Volatile	Methylene Chloride	SW 8240	√gu T∕gu	v	r.				2.94		7.	<u>.</u>	v	2	;	46%
Organics, Volatile	Styrene	SW 8240	ng/L	v	Ŋ			٧	1.36	v	==	Q	v	2	:	100%
Organics, Volatile	Tetrachloroethene	SW 8240	ug/L	v	ιΩ			v	0.843	•	9.0	1 3	v	co	:	100%
Organics, Volatile	Toluene	SW 8240	ug/L	v	c)				0.352	_	3.0	9	v	S.	:	88 %
Organics, Volatile	Trichloroethene	SW 8240	ug/L	v	S			v	1 .3	٧	-	~	v	S)	;	100%
Organics, Volatile	Vinyl acetate	SW 8240	ug/L	v	6			v	4.01	٧	4.	Ξ.	v	6	;	100%
Organics, Volatile	Vinyl chloride	SW 8240	ng/L	٧	9			v	1.67	٧	7.		v	욘	;	100%
ŧ			•	3	4-6	01	Filtmata		ų							

Bottom Ash Sluice Filtrate - Page 5

Bottom Ash Sluice Filtrate - Page 6

Liquid Stream Data Summary

Filtrate
Sluice
n Ash
Botton
Stream:
mple

DL. Ratio	100% 100% 100%
95%	: : :
Average	ນເນເ
	v v v
Run 3d	5.78 0.459 1.35
	v v
Run 3a	2.06 0.459 1.35
	v v v
Run 2	
Run 1	വവവ
	v v v
Unit	ug/L ug/L ug/L
Analytical Method Units	SW 8240 SW 8240 SW 8240
Specie	Xylenes cis-1,3-Dichloropropene trans-1,3-Dichloropropene
Analyte Group	Organics, Volatile Organics, Volatile Organics, Volatile

Liquid Stream Data Summary

Sample Stream: ESP Fly Ash Sluice Filtrate

Andread		Analytical		Q	5					S.			2 2		•	% 62%	5
Group	Specie	Method	Units		· -		8			32			P		Average	ច	Ratio
Reduced Species	Cyanide	SW 9012	jw/go	0.0	0.0014		0.000	7		0.0022	-,	v	0.01		0.0015	0.0016	
Reduced Species	Ammonia as N	EPA 350.1	ju.jon	0	0.379		0.419			0.355			0.438		0.3843	0.0803	
Anions	Chloride	EPA 300	ug/ml	=	10.9		10.7			9.71			10.1		10.4	1.6	
Anions	Fluoride	EPA 340.2	lm/gn	ö	0.633		-			0.576			969.0		0.736	0.572	
Anions	Phosphate	EPA 365.2	m/đn	ö	0.015 J		0.0453		٧	0.02		v	0.02		0.023	0.047	4 %
Anions	Sulfate	EPA 300.0	ng/ml	7	238		582			210			236		343	515	
Metals, Soluble	Aluminum	SW 6010	lm/gn	ö	0.381		2.48			0.0307			0.204		0.964	3.291	
Metals, Soluble	Antimony	SW 6010	lm/6n	0.0	0.0118	•	0.0241		٧	0.0241		v	0.0241	٧	0.024	:	87%
Metals, Soluble	Arsenic	SW 7060	Jw/6n	0.0	0.0108		0.0387			0.0004	-		0.0127		0.017	0.049	
Metals, Soluble	Barium	SW 6010	im/6n	o	0.198		0.314			0.213			0.226		0.242	0.157	
Metals, Soluble	Beryllium	SW 6010	lm/6n	v 0.00	0.000554	•	0.000554		v	0.000554		٧	0.000554	٧	0.000554	:	,
Metals, Soluble	Boron	SW 6010	ug/ml	7	7.03		17			5.73			6.16		9.92	15.32	
Metals, Soluble	Cadmium	SW 7131	im/gu	0.0	0.00275		0.00108			0.00426		Ŭ	0.00269		0.0027	0.0040	
Metals, Soluble	Calcium	SW 6010	ng/ml	-	\$		219			93.6			99.2		136.9	172.9	
Metals, Soluble	Chromium	SW 6010	lm/6n	0.0	0.0582		0.0619			0.0244			0.0329		0.0482	0.0513	
Metals, Soluble	Cobalt	SW 6010	ug/mi	۸ 0.0	0.0034	v	0.0034			0.00008	-	Ĭ	0.00042 J	٧	0.0034	:	% %
Metals, Soluble	Copper	SW 6010	ug/ml	0.0	0.00332 J		0.00236	7		0.00226	-	Ŭ	0.00209		0.0026	0.0015	
Metals, Soluble	lron	SW 6010	ng/ml	0.0	0.0131		0.00277	-		0.00289	~	_	0.00444		0.0063	0.0147	
Metals, Soluble	Lead	SW 7421	ng/mi	0.0	0.0065		0.004			0.00			0.004		0.0048	0.0036	
Metals, Soluble	Magnesium	SW 6010	JIII/đn	60	3.9		5.39			4.08			3.85		4.46	2.02	
Metals, Soluble	Manganese	SW 6010	lm/go	0.0	0.00372		0.0394			0.0173		Ŭ	0.00213		0.0201	0.0447	
Metals, Solubie	Mercury	SW 7470	lm/gu	۸ 0.0	0.00005		0.00008		v	0.00005		v	0.00005	v	0.00005	:	38%
Metals, Soluble	Molybdenum	SW 6010	lm/gn	ö	0.513		1.06			0.29			0.425		0.62	0.98	
Metals, Soluble	Nickel	SW 6010	ug/ml	0.0	0.0272		0.0122			0.032			0.0273		0.0238	0.0257	
Metals, Soluble	Phosphorus	SW 6010	ug/ml	٥ د	0.061		0.243			0.149			0.13		0.14	0.26	8
Metals, Soluble	Potassium	SW 6010	lm/gn	αÓ	8.73		19.4			6.98			8.27		11.70	16.70	
Metals, Soluble	Selenium	SW 7740	lm/gn	0.0	0.0331		0.0518			0.0198			0.0259		0.0349	0.0399	
Metals, Soluble	Silicon	SW 6010	lm/gn	4	4.64		2.78			4.74			4.67		4.05	2.74	
Metals, Soluble	Sodium	SW 6010	lm/gn	-	17.7		32.8			1 .			16.2		21.5	24.6	
Metals, Soluble	Strontium	SW 6010	m/dn	ò	0.488		0.926			0.45			0.514		0.621	0.657	
Metals, Soluble	ᄩ	SW 6010	lm/6n	0.0	0.0111 J		0.00125	7		0.00021	7	v	0.0144		0.0042	0.0149	
Metals, Soluble	Titanium	SW 6010	lm/6n	0.0	0.00095		0.00058	7		0.0475		_	0.00055		0.0163	0.0670	
Metals, Soluble	Vanadium	SW 6010	ug/ml	0.0	0.0634		0.12			0.0224			0.0681		0.0686	0.1218	

ESP Fly Ash Sluice Filtrate - Page 1

Liquid Stream Data Summary

H 86 Sample Stream: ESP Fly Ash Sluice Filtrate

Analyte		Analytical			Run		Run		_	Run		Run		6	95%	ಕ
Group	Specie	Method	Units		-		2			3a		3d	Average		5	Ratio
Metals, Soluble	Zinc	SW 6010	lm/gu		0.00659		9E-05	~	0	0,204		0.00605	0.0702	_	0.2879	
Aldehydes	Acetaldehyde	SW 8315	lm/an		0.014		0.088		0	0.012		0.086	0.0		8	
Aldehydes	Formaldehyde	SW 8315	lm/gu		0.016		0.052		0	0.022		0.034	0.030		0.048	
Organics, Semi-volatile	1,2,4,5-Tetrachlorobenzene	SW 8270	ug /L	v	0.55	v	0.578	·	0	0.375	v	0.375	< 0.501	, E	_	% 00
Organics, Semi-volatite	1,2,4-Trichlorobenzene	SW 8270	7/Bn	v	0.563	٧	0.591	Ī		0.565	v	0.565	< 0.57	ر. د		%
Organics, Semi-volatile	1,2-Dichlorobenzene	SW 8270	√gn	v	0.742	•	0.779	·		0.611	•	0.611	c 0.711	· •	•	% 00
Organics, Semi-volatile	1,2-Diphenylhydrazine	SW 8270	rg/L	٧	6	v	<u>6</u>	·		90	v	9	, 5	· ~	-	%00
Organics, Semi-volatile	1,3-Dichlorobenzene	SW 8270	Wg/L	٧	0.377	v	0.396	·		689	v	689.0	c 0.487		-	%
Organics, Semi-volatile	1,4-Dichlorobenzene	SW 8270	μgγ	v	0.77	v	0.808			0.565	٧	0.585	× 0.714	4	-	80
Organics, Semi-volatile	1-Chloronaphthalene	SW 8270	Lg/	٧	0.613	v	0.644	•		0.516	v	0.516	> 0.5	_	-	%
Organics, Semi-volatile	1-Naphthylamine	SW 8270	ug/L	v	1.49	٧	1.56	·		36.	v	1.95	9.1		-	% 00
Organics, Semi-volatile	2,3,4,6-Tetrachtorophenol	SW 8270	ug/L	٧	0.479	v	0.503	-	0	0.447	v	0.447	A.0.	φ,		%
Organics, Semi-volatile	2,4,5-Trichlorophenol	SW 8270	ug/L	v	0.314	v	0.33	•		0.489	v	0.489	< 0.378			100 %
Organics, Semi-volatile	2,4,6-Trichlorophenol	SW 8270	√gn	v	0.332	٧	0.349		0	0.487	v	0.487	× 0.3	· •	•	80
Organics, Semi-volatile	2,4-Dichlorophenol	SW 8270	ug/L	٧	0.422	v	0.443	-		0.547	v	0.547	× 0.4	E	_	% %
Organics, Semi-volatile	2,4-Dimethylphenol	SW 8270	ug/L	v	1.05	v	Ξ	-	v	1.25	v	1.25	1.1		_	% 00
Organics, Semi-volatile	2,4-Dinitrophenol	SW 8270	ug/L	٧	6.67	٧	7			4.02	v	4.02	6.5	•	- ,	%
Organics, Semi-votatile	2,4-Dinitrotoluene	SW 8270	ng/L	٧	0.524	v	0.55	-		0.568	v	0.568	v 0.5	. 4		%
Organics, Semi-volatile	2,6-Dichlorophenol	SW 8270	rg/	v	0.689	v	0.723	·		0.492	v	0.492		Ω.	-	%
Organics, Semi-volatile	2,6-Dinitrotoluene	SW 8270	Lg/	٧	0.33	v	0.346	·		828	٧	0.828	0.50	' =	-	%
Organics, Semi-volatife	2-Chioronaphthalene	SW 8270	ug/L	٧	0.308	v	0.324	•		377	v	0.377	× 0.3	-	-	%
Organics, Semi-volatile	2-Chlorophenol	SW 8270	ug/L	v	0.728	•	0.764			.611	٧	0.611	× 0.70	-	_	%
Organics, Semi-volatile	2-Methyinaphthalene	SW 8270	Lg/	٧	0.629	v	99.0	•	<u> </u>	0.35	•	0.35	c 0.55	,		8
Organics, Semi-volatile	2-Methylphenol(o-cresol)	SW 8270	√g/L	v	0.509	v	0.534	•		298	v	0.298	4.0 4.	-	-	80
Organics, Semi-volatile	2-Naphthyłamine	SW 8270	ug/L	٧	1.86	٧	1.95	·	`	1.54	v	<u>7.</u>	7.1		_	100 %
Organics, Semi-volatite	2-Nitroaniline	SW 8270	Lgn Lgv	٧	0.383	v	0.402	•		637	v	0.637	0.47	<u>,</u>	-	%
Organics, Semi-volatile	2-Nitrophenol	SW 8270	ug/L	٧	0.419	v	0.44		0	0.502	v	0.502	A.0.	· •	-	8
Organics, Semi-volatile	2-Picolina	SW 8270	7/gn	٧	40.1	٧	1.09	•		795	v	0.795	.6.0 ×	ζ. '	•	8
Organics, Semi-volatile	3,3'-Dichlorobenzidine	SW 8270	ng/L	٧	0.467	v	0.49	·	Ü	3.32	v	0.32	× 0.4	E	-	80
Organics, Semi-volatife	3-Methylcholanthrene	SW 8270	ug/L	٧	0.746	•	0.783	•		0.481	v	0.481	9.0	o	-	80
Organics, Semi-volatile	3-Nitroanitine	SW 8270	Z/gn	v	0.485	v	0.509	•		378	٧	0.378	^ 0.4		•	%
Organics, Semi-votatile	4,6-Dinitro-2-methylphenol	SW 8270	ng/L	v	0.754	v	0.792	·		0.413	v	0.413	. 0.6		•	%
Organics, Semi-volatile	4-Aminobiphenyl	SW 8270	Jg,	٧	0.712	٧	0.748	·		1.14	٧	1.14	98.0		_	%
					ESP Fly Ash Shile	() S	ا مانانا	Hrate	Q.	Page 2						

ESP Fly Ash Sluice Filtrate - Page 2

Liquid Stream Data Summary

Sample Stream: ESP Fly Ash Sluice Filtrate

	,,,,	Method		1			•		50		000		Average	ច	Ratio
4-Bromochenyl ohenyl affer	envi ether	SW 8270	Jon.	v	0.434	•	0.456	\	0.465	*	0.465	٧	0.452	:	8
4-Chloro-3-methylphenol	ylphenol	SW 8270	\$	v	0.689	٧	0.723	٧	0.495	٧	0.495	٧	0.636	:	<u>0</u>
4-Chlorophenyl phenyl ether	nenyl ether	SW 8270	rg.	٧	0.503	٧	0.528	٧	0.405	٧	0.405	v	0.479	:	<u>\$</u>
4-Methylphenol(p-cresol)	p-cresol)	SW 8270	Ϋ́	v	0.548	٧	0.575	٧	0.441	٧	0.441	٧	0.521	;	100 X
4-Nitroaniline	-E	SW 8270	JON.	٧	0.461	•	0.484	٧	0.583	V	0.583	v	0.509	:	00 X
4-Nitrophenol	nof	SW 8270	Lg/L	٧	0.658	٧	0.691	v	0.901	٧	0.901	v	0.750	;	00
7,12-Dimethylbenz(a)anthracene	a)anthracene	SW 8270	Š	v	1.83	٧	1.92	٧	1.28	٧	1.28	٧	1.68	:	100%
Acenaphthene	епе	SW 8270	Ą	٧	0.455	٧	0.478	٧	0.262	٧	0.262	•	0.398	:	100 X
Acenaphthylene	lene	SW 8270	Ϋ́	٧	0.215	v	0.226	v	0.402	٧	0.402	v	0.281	:	00 X
Acetophenone	one	SW 8270	Ϋ́	v	0.437	٧	0.459	٧	0.537	V	0.537	٧	0.478	:	100 %
Aniline		SW 8270	1/6 n	٧	0.889	٧	0.933	٧	0.592	٧	0.592	٧	0.805	;	100%
Anthracene	9	SW 8270	Ą	v	0.553	v	0.581	٧	0.354	٧	0.354	٧	0.496	;	100%
Benzidine	•	SW 8270	7	٧	20	v	20	v	2	٧	8	v	20	:	100%
Benzo(a)anthracene	acene	SW 8270	성	٧	0.49	•	0.515	٧	0.432	٧	0.432	٧	0.479	:	100%
Benzo(a)pyrene	rene	SW 8270	L L	٧	0.365	٧	0.383	٧	0.498	٧	0.498	v	0.415	:	100 %
Benzo(b)fluoranthene	nthene	SW 8270	γď	v	0.542	٧	0.569	٧	0.873	٧	0.873	٧	0.661	:	100 36
Benzo(g,h,i)perylene	nylene	SW 8270	LIGAT.	٧	0.464	٧	0.487	V	0.981	٧	0.981	V	0.644	;	<u>\$</u>
Benzo(k)fluoranthene	nthene	SW 8270	rgy.	٧	0.922	v	0.968	٧	0.961	V	0.961	v	0.950	;	00
Benzoic acid	Dio.	SW 8270	Z,	v	3.77	٧	3.96	٧	37.1	v	37.1	v	14.9	:	<u>6</u>
Benzyl alcohol	loho	SW 8270	ሚ	v	1.03	v	1.08	٧	0.587	٧	0.587	٧	0.899	:	100%
Butyfbenzylphthalate	thalate	SW 8270	Lgv.	v	0.374	v	0.393	٧	0.601	•	0.601	v	0.456	:	200 %
Chrysene	80	SW 8270	Ng/L	٧	0.637	٧	0.669	V	0.516	V	0.516	v	0.607	:	100
Di-n-octylphthalate	halate	SW 8270	1 07	v	0.868	v	0.911	٧	0.338	٧	0.338	٧	0.706	:	20 %
Dibenz(a,h)anthracene	hracene	SW 8270	셤	v	0.451	v	0.474	٧	0.78	٧	0.78	v	0.568	;	00 X
Dibenz(a_j)acridine	ridine	SW 8270	γď	v	0.553	٧	0.581	V	0.81	٧	0.81	•	0.648	:	100 30
Dibenzofuran	Tan	SW 8270	Ą	v	0.389	v	0.408	V	0.516	٧	0.516	٧	0.438	:	100
Dibutytphthalate	alate	SW 8270	Ą	٧	0.47	v	0.493	٧	0.312	٧	0.312	٧	0.425	\$ }	400 30
Diethylphthalate	alate	SW 8270	Ą	v	0.32	v	0.336	٧	0.495	•	0.495	•	0.384	:	100 %
Dimethylphenethylamine	ylamine	SW 8270	ρğ	v	120	٧	120	٧	120	•	52	v	120	;	100 %
Dimethylphthalate	nafate	SW 8270	LG/L	v	0.267	v	0.28	v	0.323	V	0.323	v	0.290	:	± 00
Diphenyfamine	aine Aine	SW 6270	Ą	v	0.503	٧	0.528	v	0.266	٧	0.266	•	0.432	:	100 %
Ethyl methanesulfonate	ulfonate	SW 8270	₽gn	v	0.479	•	0.503	¥	0.653	٧	0.653	v	0.545	:	100%
Fluoranthene	90	SW 8270	Υgn	v	0.608	٧	0.638	v	0.453	٧	0.453	v	0.566	:	100%
Fluorene	•	SW 8270	4	٧	0.32	•	0.336	٧	0.365	٧	0.365	v	0.340	:	100 %
Hexachlorobenzene	nzene	SW 8270	Ř	v	0.223	•	0.234	٧	0.302	٧	0.302	٧	0.253	:	2

ESP Fly Ash Sluice Filtrate - Page 3

Liquid Stream Data Summary

H-100 Sample Stream: ESP Fly Ash Stuice Filtrate

Analyte		Anatytical			Run		Run		Run		Run			%96	占
Group	Specie	Method	Units		-		2		3a		PE		Average	ច	Ratio
Organics Semi-volatile	Hexachlorobutadiene	SW 8270	P	v	0.665	v	869.0	v	0.492	•	0.492	٧	0.618	:	100 %
Organics, Semi-volatile	Hexachlorocyclopentadiene	SW 8270	, Jon	v	8,5	v	8.92	٧	5.66	٧	5.66	v	7.69	;	100%
Organics, Semi-volatile	Hexachtoroethane	SW 8270	ug/L	v	0.566	v	0.594	v	0.611	•	0.611	٧	0.590	;	100%
Organics, Semi-volatile	Indeno(1,2,3-cd)pyrene	SW 8270	ug/L	v	0.5	v	0.525	•	1.28	v	1.28	٧	0.768	;	100%
Organics, Semi-votatile	Isophorone	SW 8270	ug/L	v	0.273	v	0.287	v	0.592	•	0.592	٧	0.384	;	100%
Organics, Semi-volatile	Methyt methanesulfonate	SW 8270	ug/L	v	8	v	8	•	ន	•	8	٧	ŝ	:	100%
Organics, Semi-volatile	N-Nitroso-di-n-butylamine	SW 8270	ug/L	v	1.25	v	1.31	•	0.605	•	909.0	v	1.055	;	100% %
Organics, Semi-volatile	N-Nitrosodimethylamine	SW 8270	ug/L	v	1.27	v	1.33	v	0.756	•	0.756	~	1.119	:	100 %
Organics, Semi-volatile	N-Nitrosodiphenylamine	SW 8270	ug/L	v	0.539	v	0.566	v	0.259	•	0.259	•	0.455	;	100 %
Organics, Semi-volatile	N-Nitrosodipropy/amine	SW 8270	ug/L	v	0.715	٧	0.751	v	0.629	•	0.629	•	969'0	:	100%
Organics, Semi-volatile	N-Nitrosopiperidine	SW 8270	цg,	v	0.898	v	0.943	v	0.574	v	0.574	V	0.805	;	†00 %
Organics, Semi-volatile	Naphthalene	SW 8270	√gn	v	0.694	v	0.729	٧	0.46	v	0.46	v	0.628	;	100 %
Organics, Semi-volatile	Nitrobenzene	SW 8270	υg/L	v	0.503	v	0.528	v	0.81	~	0.81	v	0.614	:	100%
Organics, Semi-volatile	Pentachlorobenzene	SW 8270	Lgn L	٧	0.422	٧	0.443	v	9.36	v	0.36	v	0.408	;	100 %
Organics, Semi-volatile	Pentachloronitrobenzene	SW 8270	Ϋ́	v	1.97	v	2.07	v	1.33	•	1.33	•	1.79	;	100%
Organics, Semi-volatile	Pentachlorophenol	SW 8270	Ą	v	0.823	٧	0.864	v	0.855	v	0.855	٧	0.847	:	100%
Organics, Semi-volatile	Phenacetin	SW 8270	Ą	v	0.514	v	0.54	v	0.371	•	0.371	v	0.475	:	100%
Organics, Semi-volatile	Phenanthrene	SW 8270	Ng/	v	0.592	v	0.622	v	0.45	•	0.45	v	0.555	:	100 %
Organics, Semi-volatife	Phenol	SW 8270	ug/L	٧	0.38	v	0.399	•	0.849	•	0.849	٧	0.543	;	100%
Organics, Semi-volatile	Pronamide	SW 8270	√gn	v	0.704	v	0.739	•	0.232	•	0.232	٧	0.558	:	100%
Organics, Semi-volatile	Pyrene	SW 8270	ηgη	v	0.446	v	0.468	v	0.392	•	0.392	v	0.435	:	100 %
Organics, Semi-volatile	Pyridine	SW 8270	Λgη	٧	:	v	1.16	v	0.565	•	0.565	~	0.942	:	100%
Organics, Semi-volatile	bis(2-Chloroethoxy)methane	SW 8270	μgη	v	0.535	v	0.562	•	0.583	•	0.583	٧	0.560	:	<u> </u>
Organics, Semi-volatile	bis(2-Chloroethyl)ether	SW 8270	ηgη	•	0.697	v	0.732	•	0.368	v	0.368	٧	0.599	:	100 %
Organics, Semi-volatile	bis(2-Chloroisopropyl)ether	SW 8270	ug/L	٧	0.691	v	0.726	•	0.767	•	0.767	~	0.728	;	100 %
Organics, Semi-volatile	bis(2-Ethylhexyl)phthalate	SW 8270	Æ	v	1.74		2.35	v	0.559	v	0.559	٧	1.740	;	33%
Organics, Semi-volatile	p-Chloroaniline	SW 8270	Ngn	v	0.532	v	0.559	v	0.716	•	0.716	•	0.602	;	100 %
Organics, Semi-volatife	p-Dimethylaminoazobenzene	SW 8270	₽gv1	v	0.49	v	0.515	v	869.0	•	969.0	v	0.568	;	¥001
Organics, Volatile	1,1,1-Trichloroethane	SW 8240	Lg/L	v	S	v	ĸ	v	2	٧	5	٧	ĸ	:	100%
Organics, Volatile	1,1,2,2-Tetrachloroethane	SW 8240	ug/L	v	S)	v	រក	v	S.	v	ហ	٧	ĸ	;	100%
Organics, Volatile	1,1,2-Trichloroethane	SW 8240	ug/L	v	S	v	5	v	v	•	S	•	'n	:	100 %
Organics, Volatile	1,1-Dichloroethane	SW 8240	ug/L	v	S.	v	2	•	ĸ	٧	ĸ	٧	'n	;	100 %
Organics, Volatile	1,1-Dichloroethene	SW 8240	√gn	v	5	v	2	v	ĸ	•	S.	•	S.	:	100%
Organics, Volatile	1,2-Dichloroethane	SW 8240	ug/L	٧	ro.	٧	S.	v	ហ	v	ъ	٧	LC.	:	100%
				ш	SO ELV AS	2	nico Eiltrat	9	A dage						

ESP Fly Ash Sluice Filtrate - Page 4

Sample Stream: ESP Fly Ash Sluice Filtrate

	Analytical			æ.		Re		Ę		Run			% 96	늄
Specie	Method	Chits		-		2		3a		DE DE		Average	5	Ratio
1,2-Dichloroethene (total)	SW 8240	γ	v	ĸ	٧	ĸ	٧	ιΩ	v	ĸ	v	ĸ	:	400
1,2-Dichtoropropane	SW 8240	γgη	v	တ	٧	ın	v	ß	٧	ĸ	v	10	;	¥001
2-Butanone (MEK)	SW 8240	ug/L	v	9	V	5	v	9	v	5	v	£	:	100%
2-Hexanone	SW 8240	Ng.	٧	5	٧	5	٧	9	v	5	v	9	:	100%
4-Methyl-2-pentanone (MIBK)	SW 8240	SQ.	v	우	٧	9	v	10	v	₽	v	2	:	400%
Acetone	SW 8240	Ng/L	v	0	٧	ð		13	v	5	v	e	:	43%
Benzene	SW 8240	νgη	v	ro.	V	ιn	v	ις	v	ις.	٧	ĸ	:	100%
Bromodichloromethans	SW 8240	ug/	v	£	٧	ស	v	5	v	NO.	v	ĸ	;	100%
Bromoform	SW 8240	ng/L	v	ı,	V	S	v	2	v	ហ	v	ĸ	;	100%
Bromomethane	SW 8240	J⁄gn	v	5	V	9	٧	10	v	£	v	\$:	100%
Carbon Disulfide	SW 8240	√gn	v	s,	٧	ĸ	٧	ນ	٧	ĸ	٧	w	:	400%
Carbon Tetrachloride	SW 8240	√g/L	v	ທ	v	ស	٧	5	v	2	v	ın	:	100%
Chlorobenzene	SW 6240	Ź	v	Ŋ	٧	ĸ	٧	S	٧	K)	٧	K)	;	100%
Chloroethane	SW 8240	μgη	•	9	٧	9	v	t	v	2	v	9	:	100%
Chloroform	SW 8240	μgη	v	ιΩ	V	١Ç	v	SO.	v	LO.	v	ιΩ	:	100%
Chloromethane	SW 8240	1/gn	v	£	v	5	٧	5	v	5	v	5	;	100%
Dibromochloromethane	SW 8240	LgJ	v	ហ	٧	ĸ	v	S.	v	S)	v	ĸ	:	100%
Ethylbenzene	SW 8240	Ϋ́	v	ın	٧	ιρ	v	S	v	ស	v	IO.	;	100%
Methylene Chloride	SW 8240	γđη		5.5		3.6		5.7		6.5		6.4	2.9	
Styrene	SW 8240	rg/	•	ı,	V	ιņ	v	2	v	2	v	Ŋ	:	100%
Tetrachloroethene	SW 8240	ugd.	v	ro.	v	ស	v	2	v	S	v	S.	:	100%
Toluene	SW 8240	Lg/L	v	ເຄ	٧	ហ	v	22	v	S.	v	S	;	100%
Trichloroethene	SW 8240	μgγ	v	Ŋ	v	ស	v	52	v	ıç,	٧	ß	:	100%
Vinyf acetate	SW 8240	rgy.	v	0	٧	\$0 0	٧	01	•	5	v	후	:	100%
Vinyi chloride	SW 8240	Lgh L	v	₽	v	0	٧	0	v	9	v	6	:	100%
Xylenes	SW 8240	ug/L	v	2	٧	ĸ	v	S.	v	Ç,	v	2	;	±00%
cis-1,3-Dichloropropene	SW 8240	γgη.	v	9	٧	ß	٧	z,	v	ĸ	v	S	:	100%
trans-13-Dichloronropana	SW 8740	1/2/1	,											

Sample Stream: Gypsum Pond Water

Analyte		Analytical			Run	Ru		Run		Run		95%	占
Group	Specie	Method	Units		1	2		38		34	Average	ਠ	Ratio
	abines	SIM 0012	lm/pri		0.0477	0.0507		0.0473		0.043	0.0486	0.0046	
Reduced Species	Ammonia as N	EPA 350.1	m/ga	,	16.7	14.4		14.9		15.3	15.3	3.0	
· · · · · · · · · · · · · · · · · · ·	Chloride	EPA 300	ua/mi	·	8300	15200		15700		17300	16,400	4,135	
Anions	Fluoride	EPA 340.2	ım/σn		15.2	13.5		15.9		16.2	14.9	3.1	
Anions	Phosphate	EPA 365.2	lm/gu		.0264	0.0424		0.0292		0.0292	0.0327	0.0212	
Anions	Sulfate	EPA 300.0	m/gn		914	1010		1010		402	878	138	
Addition of the state of the st	Aliminim	SW 6010	lm/on		0.497	0.73		20.		1.15	0.76	0.68	
Metals, Counce	Antimony	SW 6010	m/os	٧	0.241	< 0.241		< 0.241	v	0.241	< 0.24	;	100%
Marinos, eletan	Arsenic	SW 7060	m/dn		0.132	0.114		0.134		0.132	0.13	0.03	
Metale Soluble	Barium	SW 6010	m/da		1.2	1.16		1.2		1.26	1.19	90.0	
Metals, Soluble	Beryllium	SW 6010	ng/m/	۷	0.00554	0.0004	۳,	0.0009	۷ ح	0.00554	< 0.0055	;	68%
Metals, Soluble	Boron	SW 6010	ng/ml		533	497		200		268	533	88	
Metals, Soluble	Cadmium	SW 7131	ım/an		0.16	0.133		0.153		0.15	0,15	0.03	
Metals, Soluble	Calcium	SW 6010	lm/gu		9800	7160		8390		20100	8,117	2,120	
Metals. Soluble	Chromium	SW 6010	lm/gu	_	0.0877	0.106		0.11		0.112	0.101	0.030	
Metals, Soluble	Cobalt	SW 6010	m/gn		0.152	0.0472		0.118		0.106	0.105	0.132	
Metals, Soluble	Copper	SW 6010	m/gn	Ī	0.0431	0.0489		0.0789		0.0738	0.0570	0.0477	
Metals, Soluble	lron	SW 6010	im/gu	v	0.0596	> 0.0596		> 0.0596	٧	0.0596	> 0.0596	;	100%
Metals, Soluble	Lead	SW 7421	m/gn	v	0.0011	o.0011		0.0056		0.0052	0.0022	0.0072	16%
Metals Soluble	Magnesium	SW 6010	m/dn		708	632		723		722	889	121	
Metals, Soluble	Manganese	SW 6010	m/ga		121	111		127		127	120	8	
Metals, Soluble	Mercury	SW 7470	m/gn	0	.00019	0.00019	•	0.00034		0.00023	0.00024	0.00022	
Metals, Soluble	Molybdenum	SW 6010	lm/gu		0.103	0.0552		0.102		0.0886	0.0967	0.0679	
Metals, Soluble	Nickel	SW 6010	m/đn		0.679	0.57		0.62		0.687	0.623	0.136	
Metals Soluble	Phosphorus	SW 6010	m/gn		0.39	0.288		0.355		0.265	0.344	0.129	
Metals Soluble	Potassium	SW 6010	m/dn		54.4	45.9		54.4		55.2	51.6	12.2	
Metals, Soluble	Selenium	SW 7740	lm/gu		0.405	0.253		0.424		0.33	0.361	0.233	
Metals Soluble	Silicon	SW 6010	m/dn		15.7	14.8		17		16.9	15.8	2.7	
Metals Soluble	Sodium	SW 6010	m/gn		7:66	90.5		102		102	97.3	15.5	
Metals Soluble	Strontium	SW 6010	m/dn		13.3	12.3		4		13.9	13.2	2.1	
Metals, Soluble	Tin	SW 6010	lm/gu	v	0.144	0.457	7	0.0083	v ¬	0.144	0.1791	0.6031	13%
Н					Gypsum Pond Water - Page	ond Wa	ter - Pa	ge 1					

H-103

Liquid Stream Data Summary

H-104 Sample Stream: Gypsum Pond Water

Analyte		Analytical		Run	Run	Run	Run		ö	95%	占
Group	Specie	Method	Units	-	2	3a	PE	Average			atio
Metala Soluble	Titanium	SW 6010	la/on	2.39	2.14	2.04	2.04	2.19		448	
Metals Soluble	Vanadium	SW 6010	Im/gn	0.348	0.296	0.323	0.342	0.32		965	
Metals, Soluble	Zinc	SW 6010	m/gn	0.81	0.739	0.868	0.865	0.806		0.161	
Metals, Total	Aluminum	SW 6010	ng/ml	1.91	1.85	2.36	2.83	2.0		69	
Metals, Total	Antimony	SW 6010	lm/gn	< 0.0964	< 0.0964	< 0.241	< 0.241	× 0.14		•	%00I
Metals, Total	Arsenic	SW 7060	lm/go	0.121	0.118	0.141	0.127	0.12		031	
Metals, Total	Barium	SW 6010	m/gn	1.28	1.08	1.21	90:1	Ť		S,	
Metals, Total	Beryllium	SW 6010	ug/ml	0.00396	0.00116	< 0.00554	0.0012	0000 × r			35%
Metals, Total	Boron	SW 6010	lm/gu	283	472	266	512	547		54	
Metals, Total	Calcium	SW 6010	Im/Bn	12200	7720	8470	8340	9,46		961	
Metals, Total	Cadmium	SW 7131	lm/gn	0.174	0.185	0.171	0.168	0.17		918	
Metals, Total	Chromium	SW 6010	lm/gn	0.0586	0.0476	0.118	0.0646	0.0		094	
Metals, Total	Cobalt	SW 6010	lm/gu	0.163	0.113	0.152	0.143	0.14		965	
Metals, Total	Copper	SW 6010	Im/gn	0.0633	0.0403	0.0563	0.0824	0.05		293	
Metals, Totał	Iron	SW 6010	m/6n	0.557	1.01	0.462	0.451	0.67		728	
Metals, Total	Lead	SW 7421	E/go	0.0022	0.0027	0.0058	0.0043	0.00		048	
Metals, Total	Magnesium	SW 6010	ng/mJ	784	620	744	999	710		12	
Metals, Total	Manganese	SW 6010	m/dn	135	105	129	116	42:		œ	
Metals, Total	Mercury	SW 7470	im/gn	0.00028	0.00031	0.0003	0.00036	0.00		9004	
Metals, Total	Molybdenum	SW 6010	m/gn	0.0816	0.0749	0.0718	0.0565	0.07		124	
Metals, Total	Nickel	SW 6010	lm/gn	0.668	0.545	0.678	0.638	0.63		184	
Metals, Total	Phosphorus	SW 6010	lm/gu	0.227	0.235	0.246	0.322	0.236		0.024	
Metals, Total	Potassium	SW 6010	m/gn	53.2	45.9	18	52.2	51.		3.0	
Metals, Total	Selenium	SW 7740	lm/gn	0.242	0.343	0.212	0.0462	0.26		202	
Metals, Total	Silicon	SW 6010	j⊞/gn	19.2	16.9	19	17.1	18,		12	
Metals, Total	Sodium	SW 6010	m/gn	109	91	107	95.5	102		4.5	
Metals. Total	Strontium	SW 6010	lm/gs	15.3	11.7	14.1	12.6	13.		9.	
Metals, Total	돈	SW 6010	lm/gu	> 0.0576	> 0.0576	< 0.144	< 0.144	> 0.0			100%
Metals, Total	Titanium	SW 6010	m/gn	0.351	0.566	2.38	0.855	1.06		769	
Metals, Total	Vanadium	SW 6010	m/gn	0.158	0.145	0.346	0.163	0.21		279	
Metals, Total	Zinc	SW 6010	ug/mi	0.841	0.715	0.884	0.81	0.81		218	

Gypsum Pond Water - Page 2

Sample Stream: Gypsum Pond Water

Group Specie Method Units 1 Aldehydes Acetaldehyde SW 8315 ug/ml 0.002 Aldehydes Formaldehyde SW 8315 ug/ml 0.012 Organics, Semi-volatile 1,2.4.Tichlorobenzene SW 8270 ug/L 0.55 Organics, Semi-volatile 1,2.Dichlorobenzene SW 8270 ug/L 0.742 Organics, Semi-volatile 1,2.Dichlorobenzene SW 8270 ug/L 0.742 Organics, Semi-volatile 1,2.Dichlorobenzene SW 8270 ug/L 0.742 Organics, Semi-volatile 1,2.Dichlorophenzene SW 8270 ug/L 0.773 Organics, Semi-volatile 1,4.Dichlorophenol SW 8270 ug/L 0.773 Organics, Semi-volatile 2,4.5.Tichlorophenol SW 8270 ug/L 0.479 Organics, Semi-volatile 2,4.5.Tichlorophenol SW 8270 ug/L 0.672 Organics, Semi-volatile 2,4.Dinitrophenol SW 8270 ug/L 0.672 Organics, Semi-volatile 2,4.Dinitrophenol SW 8270	0.0242	33 0.072 0.034 0.382 0.576 0.623 0.703 0.703 0.576 0.456 0.456 0.456 0.456 0.456	V V V V V V V V V V V V V V V V V V V	3d 0.074 0.032 0.373 0.563 0.608 0.563 0.514 1.94 0.445 0.487	× × × × × × × × × × × × × × × × × × ×	•	5 0.00 : : : : : : : : : : : : : : : : :	Ratio 100% 100% 100% 100% 100% 100% 100% 100
Acetaldehyde SW 8315 ug/ml Formaldehyde SW 8315 ug/ml 1,2,4,5-Tetrachlorobenzene SW 8270 ug/L 1,2-Diphenylthydrazine SW 8270 ug/L 1,2-Diphenylthydrazine SW 8270 ug/L 1,4-Dichlorobenzene SW 8270 ug/L 1,-Chloronaphthalene SW 8270 ug/L 1,-Chloronaphthalene SW 8270 ug/L 2,4,6-Tetrachlorophenol SW 8270 ug/L 2,4,5-Trichlorophenol SW 8270 ug/L 2,4,5-Trichlorophenol SW 8270 ug/L 2,4,5-Trichlorophenol SW 8270 ug/L 2,4-Dinitrophenol SW 8270 ug/L 2,4-Dinitrophenol SW 8270 ug/L 2,4-Dinitrotoluene SW 8270 ug/L 2,6-Dichlorophenol SW 8270 ug/L 2,6-Dinitrotoluene SW 8270 ug/L 2,6-Dinitrotoluene SW 8270 ug/L 2,6-Dinitrotoluene SW 8270 ug/L 2,6-Dinitrotoluene SW 8270 ug/L 2,6-Dinitrotoluene SW 8270 ug/L 2,6-Dinitrotoluene SW 8270 ug/L 2,8-Dinitrotoluene SW 8270 ug/L 2-Methylinaphthalene SW 8270 ug/L	V V V V V V V V V V V V V V V V V V V	1,072 1,034 1,382 1,576 1,576 1,576 1,576 1,526 1,99 1,526 1,99 1,456 1,496 1,27 1,27	v v v v v v v v v v v v v v v v v v v	0.074 0.032 0.373 0.563 0.608 0.608 0.563 0.563 0.514 1.94 0.445	* * * * * * * * * * * * * * * * * * *			\$000 \$000 \$000 \$000 \$000 \$000 \$000 \$00
Acetaldehyde SW 8315 ug/ml Formaldehyde SW 8315 ug/ml 1,2,4,5-Tetrachlorobenzene SW 8270 ug/L 1,2-Dichlorobenzene SW 8270 ug/L 1,2-Diphenylthydrazine SW 8270 ug/L 1,3-Dichlorobenzene SW 8270 ug/L 1,4-Dichlorobenzene SW 8270 ug/L 1,4-Dichlorophenol SW 8270 ug/L 2,4,5-Trichlorophenol SW 8270 ug/L 2,4,5-Trichlorophenol SW 8270 ug/L 2,4-Dimethylphenol SW 8270 ug/L 2,4-Dimitrophenol SW 8270 ug/L 2,4-Dimitrophenol SW 8270 ug/L 2,4-Dimitrophenol SW 8270 ug/L 2,4-Dimitrophenol SW 8270 ug/L 2,5-Dichlorophenol SW 8270 ug/L 2,6-Dichlorophenol SW 8	V V V V V V V V V V V V V V V V V V V	1,382 1,576 1,703 1,703 1,703 1,576 1,99 1,456 1	· · · · · · · · · · · · · · · · · · ·	0.032 0.373 0.608 0.608 0.686 0.514 1.94 0.445	, , , , , , , , , , , , , , , , , , ,			\$000 \$000 \$000 \$000 \$000 \$000 \$000 \$00
Formaldehyde SW 8315 ug/ml 1,2,4,5-Tetrachlorobenzene SW 8270 ug/L < 1,2,-Dichlorobenzene SW 8270 ug/L < 1,2-Dichlorobenzene SW 8270 ug/L < 1,3-Dichlorobenzene SW 8270 ug/L < 1,4-Dichlorobenzene SW 8270 ug/L < 1,4-Dichlorophenol SW 8270 ug/L < 2,3,4,6-Tetrachlorophenol SW 8270 ug/L < 2,4,5-Trichlorophenol SW 8270 ug/L < 2,4,5-Trichlorophenol SW 8270 ug/L < 2,4-Dichlorophenol SW 8270 ug/L < 2,4-Dichlorophenol SW 8270 ug/L < 2,4-Dichlorophenol SW 8270 ug/L < 2,4-Dinitrotoluene SW 8270 ug/L < 2,4-Dinitrotoluene SW 8270 ug/L < 2,6-Dinitrotoluene SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Methylinaphthalene SW 8270 ug/L < 2-Methylinaphthalene SW 8270 ug/L < 2-Methylinaphthalene SW 8270 ug/L < 2-Methylinaphthalene SW 8270 ug/L < 2-Methylinaphthalene SW 8270 ug/L < 2-Methylinaphthalene SW 8270 ug/L < 3-Methylinaphthalene SW 8270 ug/L <	V V V V V V V V V V V V V V V V V V V	1,382 1,576 1,623 1,703 1,703 1,576 1,99 1,456 1,496 1,496 1,27 1,27	· · · · · · · · · · · · · · · · · · ·	0.032 0.373 0.608 0.608 0.686 0.514 1.94 1.94 0.445	v v v v v v v v v v v v			**************************************
1,2,4,5-Tetrachlorobenzene SW 8270 ug/L 1,2-Dichlorobenzene SW 8270 ug/L 1,2-Diphenyfhydrazine SW 8270 ug/L 1,4-Dichlorobenzene SW 8270 ug/L 1-Choronaphthalene SW 8270 ug/L 1-Choronaphthalene SW 8270 ug/L 2,4,6-Tetrachlorophenol SW 8270 ug/L 2,4,5-Trichlorophenol SW 8270 ug/L 2,4-Dirntrophenol SW 8270 ug/L 2,4-Dirntrophenol SW 8270 ug/L 2,4-Dirntrophenol SW 8270 ug/L 2,4-Dirntrophenol SW 8270 ug/L 2,2-Dirntrophenol SW 8270 ug/L 2,2-Dirntrophenol SW 8270 ug/L 2,2-Dirntrophenol SW 8270 ug/L 2,6-Dichlorophenol SW 8270 ug/L 2,6-Dirntrophenol SW 8270 ug/L 2,6-Dirntrophenol SW 8270 ug/L 2,6-Dirntrophenol SW 8270 ug/L 2,6-Dirntrophenol SW 8270 ug/L 2,6-Dirntrophenol SW 8270 ug/L 2,6-Dirntrophenol SW 8270 ug/L 2,6-Dirntrophenol SW 8270 ug/L 2,6-Dirntrophenol SW 8270 ug/L 2,8-Dirntrophenol SW 8270 ug/L 2-Methylphenol(o-cresol) SW 8270 ug/L 2-Naphthylamine SW 8270 ug/L 2-Naphthylamine SW 8270 ug/L 2-Naphthylamine SW 8270 ug/L 2-Nitroaniline SW 8270 ug/L	V V V V V V V V V V V V V V V V V V V	1,382 1,576 1,00 1,703 1,526 1,526 1,526 1,526 1,526 1,526 1,526 1,456 1	· · · · · · · · · · · · · · · · · · ·	0.373 0.563 0.608 100 0.568 0.514 1.94 0.445 0.487	* * * * * * * * * * * * * * * * * * *	.570 .570 .540 .540 .570 .570 .468 .468 .407	: : : : : : : : : : : : : : : : : : : :	\$000 \$000 \$000 \$000 \$000 \$000 \$000 \$00
1,2,4-Trichlorobenzene SW 8270 ug/L 1,2-Dichlorobenzene SW 8270 ug/L 1,3-Dichlorobenzene SW 8270 ug/L 1,4-Dichlorobenzene SW 8270 ug/L 1-Chloronaphthalene SW 8270 ug/L 2,3,4,6-Tetrachlorophenol SW 8270 ug/L 2,4,5-Trichlorophenol SW 8270 ug/L 2,4-Dichlorophenol SW 8270 ug/L 2,4-Dichlorophenol SW 8270 ug/L 2,4-Dinitrophenol SW 8270 ug/L 2,4-Dinitrophenol SW 8270 ug/L 2,6-Dinitrophenol SW 8270 ug/L 2,6-Dinitrotoluene SW 8270 ug/L 2,6-Dinitrotoluene SW 8270 ug/L 2,6-Dinitrotoluene SW 8270 ug/L 2,6-Dinitrophenol SW 8270 ug/L 2,6-Dinitrophenol SW 8270 ug/L 2,6-Dinitrophenol SW 8270 ug/L 2-Chlorophenol SW 8270 ug/L 2-Chlorophenol SW 8270 ug/L 2-Methylnaphthalene SW 8270 ug/L 2-Methylnaphthalene SW 8270 ug/L 2-Naphthylamine SW 8270 ug/L 2-Naphthylamine SW 8270 ug/L 2-Nitroaniline SW 8270 ug/L 3-Nitroanili	V V V V V V V V V V V V V V V V V V V	1,576 1,703 1,703 1,576 1,99 1,456 1,498 1,498 1,498 1,498 1,498 1,498	· · · · · · · · · · · · · · · · · · ·	0.563 0.608 100 0.686 0.514 1.94 0.445 0.487	* * * * * * * * * * * * * * * * * * *	.6570 100 100 .540 .673 .570 .1.74 .468 .407 .414		\$000 \$000 \$000 \$000 \$000 \$000 \$000 \$00
1,2-Dichlorobenzene SW 8270 ug/L 1,2-Diphenythydrazine SW 8270 ug/L 1,4-Dichlorobenzene SW 8270 ug/L 1,4-Dichlorobenzene SW 8270 ug/L 1-Chkororaphthalene SW 8270 ug/L 2,3,4,6-Tetrachlorophenol SW 8270 ug/L 2,4,5-Trichlorophenol SW 8270 ug/L 2,4-Dimethylphenol SW 8270 ug/L 2,4-Dimitrophenol SW 8270 ug/L 2,4-Dimitrophenol SW 8270 ug/L 2,6-Dichlorophenol SW 8270 ug/L 2,6-Dichlorophenol SW 8270 ug/L 2,6-Dichlorophenol SW 8270 ug/L 2,6-Dichlorophenol SW 8270 ug/L 2,6-Dichlorophenol SW 8270 ug/L 2,6-Dichlorophenol SW 8270 ug/L 2,6-Dichlorophenol SW 8270 ug/L 2,6-Dichlorophenol SW 8270 ug/L 2,7-Motrylnaphthalene SW 8270 ug/L 2-Chlorophenol SW 8270 ug/L 2-Chlorophenol SW 8270 ug/L 2-Methylphenol(o-cresol) SW 8270 ug/L 2-Methylphenol(o-cresol) SW 8270 ug/L 2-Naphthylamine SW 8270 ug/L 2-Nitroaniline SW 8270 ug/L	V V V V V V V V V V V V V V V V V V V	1,703 1,703 1,576 1,576 1,456 1,459 1,459 1,459 1,459 1,459 1,459	· · · · · · · · · · · · · · · · · · ·	0.608 100 0.686 0.514 1.94 0.445 0.487	· · · · · · · · · · · · · · · · · · ·	.683 100 .540 .573 .570 .174 .468 .407 .414		100% 100% 100% 100%
1,2-Diphenylhydrazine SW 8270 ug/L < 1,3-Dichlorobenzene SW 8270 ug/L < 1,4-Dichlorobenzene SW 8270 ug/L < 1-Chloronaphthalene SW 8270 ug/L < 2,4,5-Trichlorophenol SW 8270 ug/L < 2,4,6-Trichlorophenol SW 8270 ug/L < 2,4-Dimethylphenol SW 8270 ug/L < 2,4-Dimethylphenol SW 8270 ug/L < 2,4-Dimitrophenol SW 8270 ug/L < 2,4-Dimitrophenol SW 8270 ug/L < 2,4-Dimitrophenol SW 8270 ug/L < 2,4-Dimitrophenol SW 8270 ug/L < 2,4-Dimitrophenol SW 8270 ug/L < 2,4-Dimitrophenol SW 8270 ug/L < 2,6-Dichlorophenol SW 8270 ug/L < 2,6-Dichlorophenol SW 8270 ug/L < 2,6-Dichlorophenol SW 8270 ug/L < 2,6-Dichlorophenol SW 8270 ug/L < 2,6-Dichlorophenol SW 8270 ug/L < 2,6-Dichlorophenol SW 8270 ug/L < 2,6-Dichlorophenol SW 8270 ug/L < 2,6-Mothylphenol(o-cresol) SW 8270 ug/L < 2,6-Mothylphenol(o-cresol) SW 8270 ug/L < 2,7-Naphthylamine SW 8270 ug/L < 2,7-Nitroaniline SW 8270 ug/L < 2,8-Naphthylamine SW 8270 ug/L < 2,8-Naphthylamine SW 8270 ug/L < 2,8-Naphthylamine SW 8270 ug/L < 2,8-Naphthylamine SW 8270 ug/L < 3,8-Naphthylamine SW 8	V V V V V V V V V V V V V V V V V V V	100 1,576 1,526 1,99 1,456 1,489 1,489 1,558 1,496 1,558	v v v v v v v v	100 0.686 0.514 1.94 0.445 0.487	· · · · · · · · · · · · · · · · · · ·	100 540 570 570 1.74 468 407 414	1111111111	\$000 \$000 \$000 \$000 \$000 \$000 \$000 \$00
1,3-Dichlorobenzene SW 8270 ug/L < 1,4-Dichlorobenzene SW 8270 ug/L < 1-Chloronaphthalene SW 8270 ug/L < 2,3,4,6-Tetrachlorophenol SW 8270 ug/L < 2,4,6-Trichlorophenol SW 8270 ug/L < 2,4-Dirntrophenol SW 8270 ug/L < 2,4-Dirntrophenol SW 8270 ug/L < 2,4-Dirntrophenol SW 8270 ug/L < 2,4-Dirntrophenol SW 8270 ug/L < 2,4-Dirntrophenol SW 8270 ug/L < 2,4-Dirntrophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhorophenol SW 8270 ug/L < 2,6-Dirhoroniline SW 8270 ug/L < 2,6-Dirhoroniline SW 8270 ug/L < 2,6-Dirhoroniline SW 8270 ug/L < 3,6-Dirhoroniline v v v v v v v v v	1,703 1,576 1,526 1,99 1,456 1,496 1,558 1,27 1,27	· · · · · · · · ·	0.568 0.514 1.94 0.445 0.487	· · · · · · · · · · · ·	.540 .570 1.74 .468 .407 .414		\$000 \$ \$0	
1,4-Dichlorobenzene SW 8270 ug/L 1-Chloronaphthalene SW 8270 ug/L 2,3,4,6-Tetrachlorophenol SW 8270 ug/L 2,4-Diratrophenol SW 8270 ug/L 2,4-Diratrophenol SW 8270 ug/L 2,4-Diratrophenol SW 8270 ug/L 2,4-Diratrophenol SW 8270 ug/L 2,4-Diratrophenol SW 8270 ug/L 2,6-Dichlorophenol SW 8270 ug/L 2,6-Diratrotoluene SW 8270 ug/L 2,6-Diratrotoluene SW 8270 ug/L 2,Chlorophenol SW 8270 ug/L 2,Chlorophenol SW 8270 ug/L 2,Chlorophenol SW 8270 ug/L 2,Chlorophenol SW 8270 ug/L 2,Chlorophenol SW 8270 ug/L 2,Chlorophenol SW 8270 ug/L 2,Chlorophenol SW 8270 ug/L 2,Chlorophenol SW 8270 ug/L 2,Chlorophenol SW 8270 ug/L 2,Chlorophenol SW 8270 ug/L 2,Chlorophenol SW 8270 ug/L 2,Naphthylamine SW 8270 ug/L 3,Naphthylamine SW 8270 ug/L 3,Naphthylamine SW 8270 u	V V V V V V V V V	1,576 1,526 1,99 1,456 1,499 1,496 1,558 1,27 1,27		0.563 0.514 1.94 0.445 0.487	· · · · · · · · · · · ·	.673 .570 .174 .468 .407 .414 .490		# # # # # # # # # # # # # # # # # # #
1-Chkoronaphthalene SW 8270 ug/L < 2,3,4,6-Tetrachlorophenol SW 8270 ug/L < 2,4,5-Trichlorophenol SW 8270 ug/L < 2,4,5-Trichlorophenol SW 8270 ug/L < 2,4-Dirntrophenol SW 8270 ug/L < 2,4-Dirntrophenol SW 8270 ug/L < 2,4-Dirntrophenol SW 8270 ug/L < 2,4-Dirntrophenol SW 8270 ug/L < 2,4-Dirntrophenol SW 8270 ug/L < 2,6-Dirntrotoluene SW 8270 ug/L < 2,6-Dirntrotoluene SW 8270 ug/L < 2,5-Dirntrotoluene SW 8270 ug/L < 2,5-Morthylnaphthalene SW 8270 ug/L < 2,5-Methylnaphthalene SW 8270 ug/L < 2,5-Methylnaphthalene SW 8270 ug/L < 2,5-Methylnaphthalene SW 8270 ug/L < 2,5-Naphthylamine SW 8270 ug/L < 2,5-Naphthylamine SW 8270 ug/L < 2,5-Naphthylamine SW 8270 ug/L < 2,5-Naphthylamine SW 8270 ug/L < 2,5-Naphthylamine SW 8270 ug/L < 3,5-Naphthylamine SW 827	V V V V V V V V	1,526 1,99 1,456 1,496 1,496 1,558 1,27 1,27	· · · · · ·	0.514 1.94 0.445 0.487 0.484	· · · · · · · · · · · · · · · · · · ·	.570 1.74 1.468 1.407 1.414 1.16	:::::::	\$000 \$000 \$000 \$000 \$000 \$000 \$000 \$00
1-Naphthylamine SW 8270 ug/L < 2,3,4,6-Tetrachlorophenol SW 8270 ug/L < 2,4,5-Trichlorophenol SW 8270 ug/L < 2,4,5-Trichlorophenol SW 8270 ug/L < 2,4-Dirntrophenol SW 8270 ug/L < 2,4-Dirntrophenol SW 8270 ug/L < 2,4-Dirntrophenol SW 8270 ug/L < 2,5-Dirntrophenol SW 8270 ug/L < 2,6-Dirntrotohenol SW 8270 ug/L < 2,6-Dirntrotohenol SW 8270 ug/L < 2,6-Dirntrotohenol SW 8270 ug/L < 2,5-Dirntrotohenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Naphthylamine SW 8270 ug/L < 2-Nitroaniline SW 8270 ug/L < 2-Nitroaniline SW 8270 ug/L <	V V V V V V	1,99 1,456 1,496 1,558 1,27 1,27	v v v v	1.94 0.445 0.487 0.484	· · · · · · ·	1,74 .468 .407 .414 .490	::::::	* * * * * * * * * * * * * * * * * * *
2,3,4,6-Tetrachlorophenol SW 8270 ug/L < 2,4,5-Trichlorophenol SW 8270 ug/L < 2,4,5-Trichlorophenol SW 8270 ug/L < 2,4-Dichlorophenol SW 8270 ug/L < 2,4-Dinitrophenol SW 8270 ug/L < 2,4-Dinitrophenol SW 8270 ug/L < 2,4-Dinitrotoluene SW 8270 ug/L < 2,6-Dichlorophenol SW 8270 ug/L < 2,6-Dinitrotoluene SW 8270 ug/L < 2,5-Dichlorophenol SW 8270 ug/L < 2-Chloronaphthalene SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Naphthylamine SW 8270 ug/L < 2-Nitroaniline SW 8270 ug/L <	v v v v v ·	1,456 1,496 1,558 1,27 4,1	v v v v	0.445 0.487 0.484	v v v v v	.468 .407 .414 .116	:::::	200 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
2,4,5-Trichlorophenol SW 8270 ug/L < 2,4,6-Trichlorophenol SW 8270 ug/L < 2,4-Dichlorophenol SW 8270 ug/L < 2,4-Dinitrophenol SW 8270 ug/L < 2,4-Dinitrophenol SW 8270 ug/L < 2,6-Dinitrotoluene SW 8270 ug/L < 2,6-Dinitrotoluene SW 8270 ug/L < 2,6-Dinitrotoluene SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Methylnaphthalene SW 8270 ug/L < 2-Methylnaphthalene SW 8270 ug/L < 2-Methylnaphthalene SW 8270 ug/L < 2-Methylnamine SW 8270 ug/L < 2-Methylnamine SW 8270 ug/L < 2-Naphthylamine SW 8270 ug/L < 2-Nitroaniline SW 8270 ug/L <	v v v v ·	1,496 1,496 1,558 1,27 4,1	v v v	0.487 0.484	, , , ,	.407 .414 .490	1 1 1 1	* * * * * * * * * * * * * * * * * * *
2,4-Dichlorophenol SW 8270 ug/L < 2,4-Dichlorophenol SW 8270 ug/L < 2,4-Dimethylphenol SW 8270 ug/L < 2,4-Dimitrophenol SW 8270 ug/L < 2,4-Dinitrotohene SW 8270 ug/L < 2,6-Dichlorophenol SW 8270 ug/L < 2-Chloronaphthalene SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Naphthylamine SW 8270 ug/L < 2-Nitroaniline SW 8270 ug/L <	v v v v),496),558 1.27 4.1	v v	0.484	v v v	.414 .490 1.16	1 1 1	* * * * * * * * * * * * * * * * * * *
2,4-Dichlorophenol SW 8270 ug/L < 2,4-Dimethylphenol SW 8270 ug/L < 2,4-Dinitrophenol SW 8270 ug/L < 2,6-Dichlorophenol SW 8270 ug/L < 2,6-Dichlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Naphthylamine SW 8270 ug/L < 2-Nitroaniline SW 8270 ug/L <	v v v	1,558 1,27 4.1	v		v v	.490 I.16	; ;	% % % % % % % % % % % % % % % % % % %
2,4-Dimethylphenol SW 8270 ug/L < 2,4-Dinitrophenol SW 8270 ug/L < 2,6-Dinitrotoluene SW 8270 ug/L < 2,6-Dichtorophenol SW 8270 ug/L < 2,6-Dinitrotoluene SW 8270 ug/L < 2,6-Dinitrotoluene SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Naphthylamine SW 8270 ug/L < 2-Nitroaniline SW 8270 ug/L <	v v	4.1		0.544	٧	16	:	% % % % 8 8 8 8 8
2,4-Dinitrophenol SW 8270 ug/L < 2,4-Dinitrotoluene SW 8270 ug/L < 2,6-Dichlorophenol SW 8270 ug/L < 2,6-Dinitrotoluene SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Methylnaphthalene SW 8270 ug/L < 2-Methylnaphthalene SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Naphthylamine SW 8270 ug/L < 2-Nitroaniline SW 8270 ug/L <	•	4.1	v	1.24			•	% % & &
2,6-Diritrotoluene SW 8270 ug/L 2,6-Diritrotoluene SW 8270 ug/L 2,6-Diritrotoluene SW 8270 ug/L 2-Chloronaphthalene SW 8270 ug/L 2-Chlorophenol SW 8270 ug/L 2-Methylnaphthalene SW 8270 ug/L 2-Methylphenol(o-cresol) SW 8270 ug/L 2-Naphthylamine SW 8270 ug/L 2-Nitroaniline SW 8270 ug/L 3-Nitroaniline		073	v	4	۷	5.39		808
2,6-Dichlorophenol SW 8270 ug/L < 2-Chloronaphthalene SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Methylnaphthalene SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Naphthylamine SW 8270 ug/L < 2-Nitroaniline SW 8270 ug/L <	·).D/W	v	0.566	v	0.552	:	3
2,6-Dinitrotoluene SW 8270 ug/L 2,6-Dinitrotoluene SW 8270 ug/L 2,2-Chloropheriol SW 8270 ug/L 2,2-Chloropheriol SW 8270 ug/L 2,2-Methylnaphthalene SW 8270 ug/L 2,2-Methylphenol(o-cresol) SW 8270 ug/L 2,2-Naphthylamine SW 8270 ug/L 2,2-Nitroaniline SW 8270 ug/L 4,2-Nitroaniline SW 8270 ug/L	v	0.502	v	0.49	v	0.596	;	8 3
2-Chlorophthalene SW 8270 ug/L < 2-Chlorophenol SW 8270 ug/L < 2-Methylnaphthalene SW 8270 ug/L < 2-Nathylphenol(o-cresol) SW 8270 ug/L < 2-Nathylphamine SW 8270 ug/L < 2-Nitroaniline SW 8270 ug/L <	v	0.844	v	0.824	v	0.587	;	%
2-Chlorophenol SW 8270 ug/L < 2-Methylnaphthalene SW 8270 ug/L < 2-Methylphenol(o-creaol) SW 8270 ug/L < 2-Naphthylamine SW 8270 ug/L < 2-Nitroaniline SW 8270 ug/L <	v	0.384	~	0.375	o v	0.347	:	100 %
2-Methylnaphthatene SW 8270 ug/L < 2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Naphthylamine SW 8270 ug/L < 2-Nitroaniline SW 8270 ug/L <	v	0.623	v	909.0	v	0.676	:	100
2-Methylphenol(o-cresol) SW 8270 ug/L < 2-Naphthylamine SW 8270 ug/L < 2-Nitroaniline SW 8270 ug/L <	v	0.357	v	0.348	v	493	:	80
2-Naphthylamine SW 8270 ug/L < 2-Nitroaniline SW 8270 ug/L <	v	0.304	v	0.297	o v	0.407	:	%001
2-Nitroaniline SW 8270 ug/L <	v	1.57	v	1.53	·	1.72	:	200
	V	0.65	v	0.634	v	0.517	;	200%
Organics, Semi-volatile 2-Nitrophenol SW 8270 ug/L < 0.419	v	0.512	v	0,5	o v	0.466	:	80
2-Picoline SW 8270 ug/L <	v	0.811	v	0.791	o v	0.926	:	₹00 %
3,3'-Dichlorobenzidine SW 8270 ug/L < (v	0.326	v	0.319	v	0.397	+	8
Organics, Serni-volatile 3-Methylcholanthrene SW 8270 ug/L < 0.746	٧	0.49	v	0.478	o v	0.618	;	8
	v	0.385	v	0.376	o v	0.435	:	80
Organics, Semi-volatile 4,6-Dinitro-2-methylphenol SW 8270 ug/L < 0.754	v	0.422	v	0.411	v	0.588	:	80
Organics, Semi-volatile 4-Aminobiphenyl SW 8270 ug/L < 0.712	•	1.17	v	1.14	o v	0.941	:	%00
Gypsum Por	Gypsum Pond Water - Page 3							

Liquid Stream Data Summary

H-109 Sample Stream: Gypsum Pond Water

Analyte		Analytical			Run	Run		Run		Run			%96	7
Group	Specie	Method	Units		-	2		3a		3d		Average	5	Ratio
	Lanced and Lanced and Lanced	0700 7010	101	,	767 0		,	77.75	٧	0.483	٧	0.455	;	400F
Organics, Serin-Volatific		0140040	j :	′ 、	1000		٠,		•	0.403	•	7050		80
Organics, Sermi-volatile		C147 0270	֓֞֝֝֟֝֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓	, ,	0.003		, v	0.000		0.403	v	0.458		100
Organica, Semi-volume	4 Mathigh Angles	C14/ 6170	J	, ,	0.00			0.4E		0.439	•	900	;	į į
Organica, Semi-volatile	4-weinyphenol(p-cread)	SW 8270	9 9		0.461		v	0.594	٧	0.58	v	0.528	:	100 %
Organica Semi-votatile		SW 8270	1/0/1	٧	0.658		v	0.919	٧	0.897	٧	0.789	:	00 %
Organics Semi-volatile	7 12-Dim	SW 8270	ua/L	v	1.83		v	1.3	٧	1.27	v	1.57	:	100%
Organics, Semi-volatile		SW 8270	rg/L	v	0.455		v	0.267	v	0.26	٧	0.361	;	100%
Organics, Semi-volatile	Acenaphthylene	SW 8270	ng/L	v	0.215		v	0.41	v	0.4	v	0.313	:	100%
Organics, Semi-volatile	Acetophenone	SW 8270	. 7/65n	٧	0.437		v	0.548	v	0.535	٧	0.493	:	100%
Organics, Semi-volatile	Aniline	SW 8270	ug/L	٧	0.889		v	0.604	v	0.589	٧	0.747	:	100%
Organics, Semi-volatile	Anthracene	SW 8270	ng/L	٧	0.553		v	0.361	٧	0.352	٧	0.457	:	100 %
Organics, Semi-volatile	Benzidine	SW 8270	J/gn	v	29		v	20	v	8	v	8	;	100%
Organics, Semi-volatile	Benzo(a)anthracene	SW 8270	ng/L	٧	0.49		v	0.44	v	0.43	v	0.47	;	100%
Organics, Semi-volatile	Benzo(a)pyrene	SW 8270	ug/L	v	0.365		v	905.0	v	0.496	v	0.437	;	100%
Organics, Semi-volatile	Benzo(b)fluoranthene	SW 8270	ug/L	v	0.542		v	0.89	v	0.869	v	0.716	:	100%
Organics, Semi-volatile	Benzo(g,h,i)perylene	SW 8270	ug/L	٧	0.464		v	-	v	0.976	v	0.732	:	100%
Organics, Semi-volatile	Benzo(k)fluoranthene	SW 8270	ug/L	٧	0.922		v	0.979	v	0.956	v	0.951	:	100%
Organics, Semi-volatile	Benzoic acid	SW 8270	ug/L	¥	3.77		v	37.8	٧	36.9	٧	20.79	;	100 %
Organics, Semi-volatile	Benzył alcohoł	SW 8270	ug/L	v	1.03		v	0.598	v	0.584	v	0.814	:	100%
Organics, Semi-volatile	Butylbenzylphthalate	SW 8270	ug/L		0.296		v	0.613	v	0.598	v	0.613	;	51%
Organics, Semi-volatile	Chrysene	SW 8270	ug/L	٧	0.637		v	0.526	v	0.514	v	0.582	:	100%
Organics, Semi-volatile	Di-n-octylphthalate	SW 8270	ug/L	٧	0.868		v	0.345	v	0.337	v	0.607	:	100%
Organics, Semi-votatile	Dibenz(a,h)anthracene	SW 8270	ng/L	٧	0.451		v	0.795	v	0.776	v	0.623	:	700%
Organics, Semi-volatile	Dibenz(a.j)acridine	SW 8270	ng/L	٧	0.553		v	0.825	v	908.0	v	0.689	;	100%
Organics, Semi-volatile	Dibenzofuran	SW 8270	ng/L	٧	0.389		v	0.526	v	0.514	v	0.458	;	100%
Organics, Semi-volatile	Dibutyfphthalate	SW 8270	ug/L	v	0.47		v	0.318	v	0.31	v	0.394	;	100%
Organics, Seml-volatile	Diethyfphthalate	SW 8270	ng/L	v	0.32		v	0.505	v	0.493	v	0.413	:	100%
Organics, Semi-volatile	Ö	SW 8270	ng/L	v	120		v	120	v	120	v	120	;	100%
Organics, Semi-volatile	Dimethylphthalate	SW 8270	ug/L		1.44			1.09		1.02		1.27	2.22	
Organics, Semi-volatile		SW 8270	ug/L	v	0.503		v	0.272	٧	0.265	v	0.388	;	100%
Organics Semi-volatile	Ethyl methanesulfonate	SW 8270	ug/L	v	0.479		v	999.0	v	0.65	v	0.573	:	100%
Organics, Semi-volatife	Fluoranthene	SW 8270	√g/	v	0.608		v	0.462	٧	0.451	v	0.535	:	100%
					Gvosum Po	Gvosum Pond Water - Page	_	4						
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Sample Stream: Gypsum Pond Water

Analyte		Analytical			Run	··	Run		Run		Run			85%	占
Group	Specie	Method	Units	1	-		2		38		39		Average	ਹ	Ratio
Organics, Semi-volatile	Fluorene	SW 8270	ug/L	٧	0.32			v	3.373	٧	0.364	v	0.347	:	100%
Organics, Semi-volatile	Hexachlorobenzene	SW 8270	1/6 0	٧	0.223			v	308	٧	0.3	v	0.266	:	100%
Organics, Semi-volatile	Hexachlorobutadiene	SW 8270	/ g n	v	0.665			v	502	v	0.49	v	0.584	:	100%
Organics, Semi-volatile	Hexachlorocyclopentadiene	SW 8270	ug/L	v	8.5			v	5.77	v	5.64	٧	7.14	:	100%
Organics, Semi-volatile	Hexachloroethane	SW 8270	ug/L	•	0.566			v	.623	٧	0.608	٧	0.595	:	100%
Organics, Semi-votatile	Indeno(1,2,3-cd)pyrene	SW 8270	ug/L	v	0.5			v	1,3	٧	1.27	v	0.90	;	100%
Organics, Semi-volatile	Isophorone	SW 8270	√gu	v	0.273			v	0.604	٧	0.589	v	0.439	:	100%
Organics, Semi-volatile	Methyl methanesulfonate	SW 8270	ug/l	v	20			٧	SS SS	v	8	٧	ß	:	100%
Organics, Semi-volatile	N-Nitroso-di-n-butylamine	SW 8270	ug/L	v	1.25			v	.617	٧	0.602	٧	0.934	;	100%
Organics, Semi-volatile	N-Nitrosodimethylamine	SW 8270	ug/L	٧	1.27			_ v	0.777	v	0.752	٧	1.021	;	100%
Organics, Semi-volatile	N-Nitrosodiphenylamine	SW 8270	ug/L	v	0.539			v	7.264	v	0.257	v	0.402	;	100%
Organics, Semi-volatile	N-Nitrosodipropylamine	SW 8270	7/gn	٧	0.715			v	.641	٧	0.626	v	0.678	;	100%
Organics, Semi-volatile	N-Nitrosopiperidine	SW 8270	ng/L	v	0.898			v	.585	٧	0.571	v	0.742	;	100%
Organics, Semi-volatile	Naphthalene	SW 8270	7	v	0.694			v	.469	v	0.457	v	0.582	;	100%
Organics, Semi-votatile	Nitrobenzene	SW 8270	ug/L	٧	0.503			v	.825	v	0.806	v	0.664	;	100%
Organics, Semi-volatile	Pentachlorobenzene	SW 8270	ug/L	v	0.422			v	.367	v	0.358	٧	0.395	;	100%
Organics, Semi-volatile	Pentachloronitrobenzene	SW 8270	1/gn	v	1.97			v	1.35	٧	1.32	٧	1.66	:	100%
Organics, Semi-volatile	Pentachlorophenol	SW 8270	ng/L	v	0.823			v	.872	v	0.851	v	0.848	:	100%
Organics, Semi-volatile	Phenacetin	SW 8270	ug/L	v	0.514			v	378	٧	0.369	v	0.446	;	100%
Organics, Semi-volatile	Phenanthrene	SW 8270	ug/L	v	0.592			v	.459	v	0.448	v	0.526	:	100%
Organics, Semi-volatile	Phenol	SW 8270	ug/L	v	0.38			v	998:	٧	0.845	٧	0.623	;	100%
Organics, Semi-volatife	Pronamide	SW 8270	ug/L	٧	0.704			v	236	v	0.231	٧	0,470	:	100%
Organics, Semi-volatile	Pyrene	SW 8270	ug/L	v	0.446			v	0.4	v	0.39	v	0.423	;	100%
Organics, Semi-volatile	Pyridine	SW 8270	ng/L	٧	1.1			v	0.576	v	0.563	٧	0.838	:	100%
Organics, Semi-volatile	bis(2-Chloroethoxy)methane	SW 8270	ug/L	٧	0.535			v	.594	v	0.58	v	0.565	;	100%
Organics, Semi-volatile	bis(2-Chloroethyl)ether	SW 8270	ng/L	v	0.697			v	0.375	v	0.367	٧	0.536	;	100%
Organics, Semi-volatile	bis(2-Chtoroisopropyt)ether	SW 8270	ug/L	v	0.691			·	0.782	v	0.764	v	0.737	:	100%
Organics, Semi-volatile	bis(2-Ethythexyt)phthalate	SW 8270	ug/L		14.7				2.03	v	0.556		8.365	80.52	
Organics, Seml-volatile	p-Chtoroaniline	SW 8270	ug/L	٧	0.532			v	0.73	v	0.713	v	0.631	;	100%
Organics, Semi-volatile	p-Dimethylaminoazobenzene	SW 8270	ug/L	٧	0.49			v	0.712	v	0.695	٧	0.601	;	100%
Organics, Volatile	1,1,1-Trichloroethane	SW 8240	ug/t	¥	ស	٧	ı,	v	ιΩ	v	Ŋ	v	Ŋ	:	100%
Organics, Volatile	1,1,2,2-Tetrachloroethane	SW 8240	√gu	v	ıc	v	ις.	v	2	v	ຜ	٧	S	:	100%
					Gypsun	n Pond N	3ypsum Pond Water - Page	age 5							

Liquid Stream Data Summary

H-108 Sample Stream: Gypsum Pond Water

Specie
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Gypsum Pond Water - Page 6

Sample Stream: JBR Underflow Slurry Filtrate

Analyte		Analytical		Run		Run		Ruh		Run			%96 %	占
Group	Specie	Method	Units	-		2		3a		PE		Average	ਠ	Ratio
Reduced Species	Cyanide	SW 9012	ng/ml	0.114		0.0372		0.0959		0.0205		0.0824	0.0997	
Reduced Species	Ammonia as N	EPA 350.1	lm/gu	43.9		£	v	40.2		41.6	v	40.2	;	19%
Anions	Chloride	EPA 300	Jw/gn	27,200		24,100		26,900		25,600		26,067	4,248	
Anions	Fluoride	EPA 340.2	lm/gn	23.8		35.1		34.1		34.1		31.0	15.5	
Anions	Phosphate	EPA 365.2	og/m/	0.02		0.118		0.0122	v	0.02		0.047	0.153	7%
Anions	Sulfate	EPA 300.0	ng/mj	740		989		209		709		712	83	
Anions	Sulfite	EPRI-FGD-M2	jw/bn	4		9.1		2.4		1.6		2.67	3.04	
Metals, Soluble	Aluminum	SW 6010	lm/gu	10.7		14.4		11.9		12.4		12.3	4.7	
Metals, Soluble	Antimony	SW 6010	> lm/gn	0.241	٧	0.241	v	0.0964	v	0.241	٧	0.1928	:	100%
Metals, Soluble	Arsenic	SW 7060	ng/m/	0.315		0.157		0.121		0.352		0.198	0.256	
Metals, Soluble	Barium	SW 6010	lm/gu	3.33		3.52		3.31		3.99		3.39	0.29	
Metals, Soluble	Beryllium	SW 6010	ng/mi	0.0085		0.0048		0.00728		0.0042		0.0069	0.0047	
Metals, Soluble	Boron	SW 6010	ng/ml	1450		1430		1310		1480		1,397	188	
Metals, Soluble	Cadmium	SW 7131	Juu/Bn	0.473		0.47		0.426		0.467		0.456	0.065	
Metals, Soluble	Calcium	SW 6010	ng/mi	20,100		19,300		12,600		19,000		17,333	10,232	
Metals, Soluble	Chromium	SW 6010	ng/mj	960'0		0.0851		0.0277		0.0791		9690'0	0.0912	
Metals, Soluble	Cobatt	SW 6010	lm/gu	0.303		0.303		0.305		0.316		0.304	0.003	
Metals, Soluble	Copper	SW 6010	ug/ml	0.242		0.272		0.203		0.234		0.239	0.086	
Metals, Soluble	Iron	SW 6010	> lm/gn	0.0596	v	0.0596	v	0.0238	v	0.0596	٧	0.0477	;	100%
Metals, Soluble	Lead	SW 7421	lm/gu	0.0139		0.016		6000		0.012		0.013	600.0	
Metals, Soluble	Magnesium	SW 6010	lm/gu	1830		1810		1750		1870		1,797	103	
Metals, Soluble	Manganese	SW 6010	lm/gu	318		315		288		326		307	4	
Metals, Soluble	Mercury	SW 7470	ng/ml	0.00056		0.0014		0.00111		0.00125		0.00102	0.00106	
Metals, Soluble	Molybdenum	SW 6010	im/gu	0.0571		0.0659		0.0695		0.0619		0.0642	0.0158	
Metals, Soluble	Nickel	SW 6010	m/6n	1.57		1.61		1.37		1.61		1.52	0.32	
Metals, Soluble	Phosphorus	SW 6010	ng/ml	0.675		0.777		0.703		0.916		0.718	0.131	
Metals, Soluble	Potassium	SW 6010	lw/6n	125		<u>₹</u>		119		126		123	S	
Metals, Soluble	Selenium	SW 7740	lm/gu	< 0.00288		0.734		0.728		0.814		0.488	1.046	0.1%
Metals, Soluble	Silicon	SW 6010	lm/gn	39.7		44.3		43.3		45.4		42.4	6.0	
				nderflow S	7	Filtrate	Dad.	1 9						

JBR Underflow Slurry Filtrate - Page 1

H-110 Sample Stream: JBR Underflow Slurry Filtrate

Analyte		Analytical		Run		Run		Run		Run			95%	占
Group	Specie	Method	Units	-	İ	2		38		PE		Average	5	Ratio
Motals Solution	Sodium	SW 6010	jw/bit	244		242		246		256		244	'n	
Metals, Soluble	Strontium	SW 6010	im/gn	<u>¥</u>		33.6		90.9		35		32.9	4.3	
Metals, Soluble	Ti	SW 6010	v ju/bn	0.14		0.0007 J	v	0.14	v	0.144	v	0.144	;	100%
Metals, Soluble	Titanium	SW 6010	lm/gn	0.762		0.817		0.868		0.739		0.816	0.132	
Metals, Soluble	Vanadium	SW 6010	lm/gn	0.296		0.29		0.138		0.288		0.241	0.222	
Metals, Soluble	Zinc	SW 6010	lm/gn	2.34		2.43		2.18		2.52		2.32	0.31	
Aldehydes	Acetaldehyde	SW 8315	lm/gn	0.008		0.078		960'0		0.072		0.061	0.115	
Aldehydes	Formaldehyde	SW 8315	lm/gn	0.004		0.048		0.2		0.152		0.084	0,255	
Organics, Semi-volatife	1,2,4,5-Tetrachlorobenzene	SW 8270	vg/L <	0.625	v	0.567	٧	0.561	v	0.456	v	0.584	;	100%
Organics, Semi-volatile	1,2,4-Trichlorobenzene	SW 8270	vg/L <	0.639	v	0.579	v	0.846	v	0.688	٧	0.688	:	100%
Organics, Semi-volatile	1,2-Dichlorobenzene	SW 8270	> 1/6n	0.842	v	0.764	٧	0.914	v	0.743	v	0.840	;	100%
Organics, Semi-volatile	1,2-Diphenylhydrazine	SW 8270	vg/L <	6	٧	6	٧	8	v	<u>8</u>	٧	100	;	100%
Organics, Semi-volatile	1,3-Dichlorobenzene	SW 8270	vg/L <	0.428	v	0.388	v	1.03	v	0.839	v	0.615	:	100%
Organics, Semi-volatile	1,4-Dichtorobenzene	SW 8270	v 7/6n	0.874	v	0.792	v	0.846	v	0.688	v	0.837	:	100%
Organics, Semi-volatile	1-Chloronaphthalene	SW 8270	v 7/6n	969:0	v	0.631	v	0.773	v	0.628	v	0.700	;	100%
Organics, Semi-volatile	1-Naphthylamine	SW 8270	v J/Bn	1.69	v	1.53	v	2.92	v	2.37	٧	2.05	:	100%
Organics, Semi-volatile	2,3,4,6-Tetrachiorophenol	SW 8270	ug/L <	0.544	v	0.493	٧	0.669	v	0.544	v	0.569	:	100%
Organics, Semi-volatile	2,4,5-Trichlorophenol	SW 8270	v √1)6in	0.357	v	0.324	v	0.732	v	0.595	٧	0.471	:	100%
Organics, Semi-volatile	2,4,6-Trichlorophenol	SW 8270	> √ 00/	0.377	٧	0.342	v	0.728	v	0.592	٧	0.482	:	100%
Organics, Semi-volatile	2,4-Dichtorophenol	SW 8270	v 7/6n	0.479	٧	0.434	•	0.819	v	0.665	v	0.577	:	100%
Organics, Semi-volatile	2,4-Dimethylphenol	SW 8270	v VBn	1.19	٧	1.08	v	1.87	v	1.52	٧	1.38	:	100%
Organics, Semi-volatile	2,4-Dinitrophenol	SW 8270	v ngv	7.57	v	6.86	v	6.01	v	4.89	v	6.81	;	100%
Organics, Semi-volatife	2,4-Dinitrotoluene	SW 8270	og/L <	0.595	v	0.539	v	0.85	v	0.691	٧	0.661	:	100%
Organics, Semi-volatile	2,6-Dichlorophenol	SW 8270	v VBn	0.782	٧	0.709	v	0.737	v	0.599	v	0.743	:	100%
Organics, Semi-volatile	2,6-Dinitrotoluene	SW 8270	v Vôn	0.374	٧	0.339	v	1.24	v	1.01	v	0.651	;	100%
Organics, Semi-volatile	2-Chloronaphthalene	SW 8270	v J/Sn	0.35	v	0.318	v	0.564	v	0.458	v	0.411	:	100%
Organics, Semi-volatile	2-Chlorophenol	SW 8270	> 1/ôn	0.826	v	0.749	v	0.914	v	0.743	v	0.830	:	100%
Organics, Semi-volatile	2-Methylnaphthalene	SW 8270	> 7/60	0.714	v	0.647	v	0.524	v	0.426	٧	0.628	;	100%
Organics, Semi-volatile	2-Methylphenol(o-cresol)	SW 8270	vg/L <	0.577	v	0.524	٧	0.446	v	0.363	v	0.516	:	100%
			JBR Und	nderflow Slurry	Slurry	Filtrate - Page 2	- Pa	3e 2						

Sample Stream: JBR Underflow Sturry Filtrate

Analyte		Analytical			Run		Run		Run		Run			85%	占
Group	Specie	Method	Units		-		2		3.8		P		Average	5	Ratio
Organics, Semi-volatile	2-Naphthylamine	SW 8270	μğ	v	2.11	v	1.9	v	2.3	v	1.87	٧	2.11	;	100%
Organics, Semi-volatile	2-Nitroaniline	SW 8270	ng/L	v	0.435	v	0.394	v	0.954	v	0.775	v	0.594	:	100%
Organics, Semi-volatile	2-Nitrophenol	SW 8270	ug/L	v	0.476	v	0.431	٧	0.751	v	0.611	٧	0.553	:	100%
Organics, Semi-volatile	2-Picoline	SW 8270	ng/L	v	1.18	v	1.07	٧	1.19	v	296.0	٧	1.15	:	100%
Organics, Semi-volatile	3,3'-Dichlorobenzidine	SW 8270	1	v	0.53	v	0.48	٧	0.479	v	0.389	٧	0.496	:	100%
Organics, Semi-volatile	3-Methylcholanthrene	SW 8270	ug/L	v	0.846	V	0.768	٧	0.719	•	0.585	v	0.778	:	100%
Organics, Semi-volatile	3-Nitroanitine	SW 8270	√g/L	٧	0.55	٧	0.499	٧	0.565	٧	0.46	٧	0.538	:	100%
Organics, Semi-volatile	4,6-Dinitro-2-methylphenol	SW 8270	ug/L	٧	0.856	v	0.776	٧	0.619	•	0.503	٧	0.750	:	100%
Organics, Semi-volatile	4-Aminobiphenyl	SW 8270	₽¢/L	٧	0.809	v	0.733	٧	1.71	٧	1.39	٧	1.084	;	100%
Organics, Semi-volatile	4-Bromophenyl phenyl	SW 8270	ug/L	v	0.493	v	0.447	v	969.0	v	0.566	٧	0.545	:	4004
Organics, Semi-volatife	4-Chloro-3-methylphenol	SW 8270	√g√	v	0.782	v	0.709	v	0.741	•	0.602	٧	0.744	:	100%
Organics, Semi-volatile	4-Chlorophenyl phenyl ether	SW 8270	ug/L	v	0.571	v	0.518	٧	909.0	•	0.492	٧	0.565	:	100%
Organics, Semi-volatife	4-Methylphenol(p-cresot)	SW 8270	ng/L	v	0.622	v	0.564	•	99.0	v	0.537	٧	0.615	;	100%
Organics, Semi-volatile	4-Nitroaniline	SW 8270	J/6n	v	0.523	v	0.475	v	0.872	v	0.709	v	0.623	:	400%
Organics, Semi-votatile	4-Nitrophenol	SW 8270	√gn	v	0.747	v	0.677	•	1 .35	v	1.	v	0.925	;	100%
Organics, Semi-volatile	7,12-Dimethyfbenz(a)anthracene	SW 8270	√gv T	٧	2.08	v	1.88	•	1.91	v	1.56	v	36.	;	100%
Organics, Semi-volatife	Acenaphthene	SW 8270	Ng/L	v	0.517	v	0.469	v	0.391	•	0.318	v	0.459	:	100%
Organics, Semi-volatifie	Acenaphthylene	SW 8270	ug/L	v	0.244	v	0.222	•	0.601	•	0.489	v	0.356	;	100%
Organics, Semi-volatile	Acetophenone	SW 8270	ng/L	v	0.496	v	0.45	v	0.804	•	0.654	v	0.583	;	100%
Organics, Semi-volatile	Aniline	SW 8270	√L	٧	101	v	0.915		1.57	•	0.72	v	1.010	:	38%
Organics, Semi-volatile	Anthracene	SW 8270	γgη	٧	0.628	٧	0.57	v	0.529	٧	0.43	٧	0.576	;	100%
Organics, Semi-volatile	Benzidine	SW 8270	ng/L	v	8	v	8	٧	ឧ	v	R	٧	8	:	100%
Organics, Semi-volatile	Benzo(a)anthracene	SW 8270	√g/L	v	0.557	v	0.505	٧	0.646	v	0.525	٧	0.569	;	100%
Organics, Semi-volatite	Benzo(a)pyrene	SW 8270	ug/L	٧	0.414	v	0.375	•	0.745	v	909:0	v	0.511	;	100%
Organics, Semi-volatile	Benzo(b)fluoranthene	SW 8270	√g/L	v	0.615	v	0.558	•	1.31	v	1.06	٧	0.828	:	100%
Organics, Semi-volatile	Benzo(g,h,i)perylene	SW 8270	ug/L	v	0.526	v	0.477	v	1.47	٧	1.19	٧	0.824	:	100%
Organics, Semi-volatile	Benzo(k)fluoranthene	SW 8270	ug/L	v	. 8	v	0.949	٧	4.	•	1.17	v	1.146	:	100%
Organics, Seml-volatile	Benzoic acid	SW 8270	J/Gn	٧	4.28		4.73	•	55.5	v	45.1	v	55.50	;	96 %
Organics, Semi-volatife	Benzył atcohoł	SW 8270	√g'n	٧	1.17	v	97.	v	0.878	٧	0.713	v	1.036	:	400%
Organics, Semi-volatile	Butylbenzylphthalate	SW 8270	ng/L	v	0.425	v	0.385	v	0.899	v	0.731	v	0.570	:	100%
Organics, Semi-volatile	Chrysene	SW 8270	ug/L	v	0.723	v	0.656	٧	0.773	v	0.628	٧	0.717	;	100%
			000	2	arffow (, Filtrat	D .	2, 90,						

JBR Underflow Slurry Filtrate - Page 3

Liquid Stream Data Summary

H-112 Sample Stream: JBR Underflow Sturry Filtrate

占	Ratio	100%	100%	100%	100%	100%	100%	100%	2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
95%	ਠ	:	:	;	1	;	;	;	4.18	;	;	;	:	;	;	:	:	:	:	:	;	;	;	:	:	:	:	:	1	:	;	:	
	Average	0.795	0.716	0.803	0.538	0.494	0.478	52	2.094	0.496	0.671	0.664	0.413	0.311	0.725	8.95	0.713	0.998	0.492	ଜ	1.20	1.29	0.518	0.830	0.935	0.730	0.766	0.484	2.09	1.020	0.556	0.652	
		٧	٧	V	٧	٧	v	٧		٧	V	v	٧	v	v	v	•	v	v	V	v	v	٧	٧	٧	v	٧	٧	v	v	v	v	
Run	34	0.412	0.949	0.985	0.628	0.379	0.602	23	2.65	0.324	0.794	0.551	0.444	0.367	0.599	6.89	0.743	1.56	0.72	ß	0.736	0.919	0.315	0.765	0.698	0.559	0.985	0.437	<u>16.</u>	8	0.451	0.547	
		٧	٧	٧	٧	v	v	v		٧	٧	v	٧	v	v	v	v	٧	V	٧	v	٧	v	٧	v	v	٧	v	٧	v	V	v	
Run	33	0.506	1.17	1.21	0.773	0.466	0.741	120	3.04	0.399	7.20	0.678	0.547	0.452	0.737	8.47	0.914	1.91	0.886	8	0.905	1.13	0.387	0.941	0.859	0.688	1.21	0.538	1.99	1.28	0.555	0.673	Page 4
		V	v	v	V	v	٧	v		v	v	v	v	v	•	v	٧	v	٧	v	v	٧	v	٧	v	v	٧	v	v	v	v	v	-
Run	2	0.893	0.465	0.57	4.0	0.483	0.329	52	3.09	0.518	0.493	0.625	0.329	0.229	0.684	8.75	0.582	0.515	0.281	ଝ	1.28	1.3	0.555	0.736	0.925	0.715	0.518	0.434	2.03	0.847	0.529	0.61	/ Filtrate
		٧	٧	V	٧	V	v	V		v	v	v	v	v	٧	v	v	v	v	v	٧	٧	v	٧	v	v	v	٧	v	v	v	٧	Slurn
Run	-	0.985	0.512	0.628	0.44	0.533	0.363	120	0.303	0.571	0.544	69.0	0.363	0.253	0.755	9.64	0.642	0.568	0.31	ß	1.42	1 .	0.612	0.812	1.02	0.788	0.571	0.479	2.24	0.934	0.584	0.672	inderflow Slurry
		٧	v	v	٧	v	٧	٧	v	v	٧	v	٧	٧	٧	٧	٧	v	v	v	v	v	٧	٧	v	v	٧	v	v	v	٧	٧	Š D
	Units	ua/L	, Pa	ug/L	ug/L	Mg/L	ug/L	ng/L	ng/L	ug/L	ng/L	ug/L	ug/L	ng/L	ng/L	₩g/L	ug/L	Mg/L	ug/L	ng/L	ug/L	Jgs T	ng/L	₩ J	μg.	₩	Mg/L	γg,	J/Gn	ng/L	√gn	ug/L	JBR
Analytical	Method	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	
	Specie	Di-n-octylohthalate	Dibenz(a h)anthracene	Dibenz(a.j)acridine	Dibenzofuran	Dibutylphthalate	Diethylphthalate	Dimethylphenethylamine	Dimethylphthalate	Diphenylamine	Ethyl methanesulfonate	Fluoranthene	Fluorene	Hexachlorobenzene	Hexachlorobutadiene	Hexachlorocyclopentadiene	Hexachloroethane	Indeno(1,2,3-cd)pyrene	Isophorone	Methyl methanesulfonate	N-Nitroso-di-n-butylamine	N-Nitrosodimethylamine	N-Nitrosodiphenylamine	N-Nitrosodipropylamine	N-Nitrosopiperidine	Naphthalene	Nitrobenzene	Pentachlorobenzene	Pentachloronitrobenzene	Pentachlorophenol	Phenacetin	Phenanthrene	
Analyte	Group	Organics Semi-volatile	Organics Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	

Sample Stream: JBR Underflow Slurry Filtrate

Analyte		Analytical			Run		Run		Ru		Run			95%	占
Group	Specie	Method	Units		-		2		38		39		Average	ಶ	Ratio
Organics, Semi-votatile	Phenol	SW 8270	ng/	_ v	1431	v	0.391	v	1.27	V	1.03	v	0.697	:	100%
Organics, Semi-volatile	Pronamide	SW 8270	ng/	v	.799	v	0.725	v	0.347	v	0.282	v	0.624	:	100%
Organics, Semi-volatile	Pyrene	SW 8270	ug/L	v	902:0	v	0.459	v	0.587	v	0.477	v	0.517	;	100%
Organics, Semi-volatile	Pyridine	SW 8270	ug/L	v	1.25	v	1.14	V	0.846	v	0.688	v	1.079	;	100%
Organics, Semi-volatile	bis(2-Chloroethoxy)methane	SW 8270	ug/L	v	909.	v	0.551	v	0.872	v	0.709	v	0.677	:	100%
Organics, Semi-volatile	bis(2-Chloroethyl)ether	SW 8270	rg/	v	0.791	v	0.718	v	0.551	v	0.448	v	0.687	;	100%
Organics, Semi-volatile	bis(2-Chlorolsopropyl)ether	SW 8270	ug/L	v	3.785	v	0.712	٧	1.15	v	0.933	v	0.882	:	100%
Organics, Semi-volatile	bis(2-Ethylhexyl)phthalate	SW 8270	Ę		4		5.11		4.16		2.98		4.42	1.49	
Organics, Semi-volatile	p-Chloroaniline	SW 8270	ng/L	v	0.604	v	0.548	٧	1.07	v	0.871	v	0.741	;	100%
Organics, Semi-volatile	p-Dimethylaminoazobenzene	SW 8270	ug/L	_	0.557	v	0.505	v	<u>5</u>	v	0.849	v	0.701	;	100%
	4 1 1 Trickloroethere	CIM BOAD	<i> </i>	v	ư	٧	ď	٧	ιc	٧	LC.	v	¥.		100 8
Organics, Volatile	1 1 2 2 Totrachlomethane	SW 8240	9 2) נכ	٠ ٧	o uc	v	, ru	v	o un	v	, ru	:	100%
Organics, Volatile	1.1.2-Trichloroethane	SW 8240	l de	v	ı ru	٧	· w	٧	ະດ	٧	ı,	٧	ro.	;	100%
Organics, Volatile	1,1-Dichloroethane	SW 8240	ug/L	v	S.	v	ß	٧	ß	v	ហ	٧	Ŋ	;	100%
Organics, Volatile	1,1-Dichloroethene	SW 8240	ug/L	v	ro	٧	ស	V	ιΩ	٧	ιΩ	٧	ω	;	100%
Organics, Volatile	1,2-Dichloroethane	SW 8240	ug/L	v	ιΩ	٧	£	•	ဏ	v	ιΩ	٧	гo	:	100%
Organics, Volatile	1,2-Dichloroethene (total)	SW 8240	ng/L	v	rs.	v	ß	•	က	٧	Ŋ	v	S	:	100%
Organics, Volatile	1,2-Dichloropropane	SW 8240	ng/L	v	5	v	ß	v	ហ	v	ഗ	v	ស	:	100%
Organics, Volatile	2-Butanone (MEK)	SW 8240	J _G n	v	0	v	9	v	5	٧	₽	v	10	;	100%
Organics, Volatile	2-Hexanone	SW 8240	ug/L	v	0	v	£	v	5	v	₽	v	1	;	100%
Organics, Volatite	4-Methyl-2-pentanone (MIBK)	SW 8240	ug/L	v	5	v	0	v	5	v	0	٧	0	:	100%
Organics, Volatile	Acetone	SW 8240	ug/L	v	5		6.8	~	₽	v	5	٧	10	:	% 09
Organics, Volatile	Benzene	SW 8240	rg/	v	S	v	ιΩ	•	S.	v	S	v	ဟ	:	100%
Organics, Volatile	Bromodichloromethane	SW 8240	ug/L	v	വ	v	20	V	2	٧	Ŋ	v	'n	:	100%
Organics, Volatile	Bromoform	SW 8240	J⁄6n	v	S	v	ιΩ	•	ß	V	ς.	v	ហ	:	100 %
Organics, Volatile	Bromomethane	SW 8240	ng/L	v	10	v	9	٧	₽	٧	ē	٧	9	:	100%
Organics, Volatile	Carbon Disulfide	SW 8240	ug/L	v	S	v	S	٧	S	٧	រហ	v	ιΩ	:	100%
Organics, Volatile	Carbon Tetrachloride	SW 8240	ng/L	v	c)	v	ιn	V	တ	٧	ιΩ	v	υ	:	100%
Organics, Volatile	Chlorobenzene	SW 8240	ng/L	v	2	v	ις.	~	32	v	un.	v	ဌ	:	100%
Organics, Volatile	Chloroethane	SW 8240	ug/L	v	우	v	6	v	9	٧	9	v	9	;	100%
ŀ			JBR (Jnde	Inderflow Slurry Filtrate	urry	Filtrat	•	Page 5						

Liquid Stream Data Summary

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		٧	v	V	٧		٧	٧	v		v	v v	v v v	v v v	v v v v
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Run	2	v.	5	ĸ	ĸ	4 .	ß	ĸ	7	ß		01	5 5	5 5	0 0 0 0 0 0
		v	v	v	٧		v	v		٧		v	v v	v v v	v v v v
Run	-	တ	5	ស	ιΩ	ιΩ	ហ	ιΩ	ιΩ	ស		2	6 6	0 0 5	ე ე ა ა
		v	v	v	٧	v	٧	v	v	v		v	v v	v v v	v v v
	Units	ug/L	ug/L	Jøn	ng/L	ng/L	7ôn	√g,	ug/L	ng/L		J D	1 g	de de de	
Analytical	Method	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240		SW 8240	SW 8240 SW 8240	SW 8240 SW 8240 SW 8240
	Specie	Chloroform	Chloromethane	Dibromochloromethane	Ethylbenzene	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichtoroethene	Vinyl acetate	•	Vinyl chloride	Vinyl chloride Xylenes	Vinyl chloride Xylenes cis-1,3-Dichloropropene
Analyte	Group	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile		Organics, Volatile	Organics, Volatile Organics, Volatile	Organics, Volatile Organics, Volatile Organics, Volatile

Sample Stream: Limestone Slurry Filtrate

Anaivte		Analytical			Run	T.	Run	•	Rgn		Run				36%	占
Group	Specie	Method	Units		1		2		3a		30			Average	5	Ratio
				,		,		•								
Reduced Species	Cyanide	SW 9012	E (B)	õ	0.0593	ö	0.0834	0	0.003		0.0786			0.0486	0.1025	
Reduced Species	Ammonia as N	EPA 350.1	lm/gu	-	13.9	•	15.2	V	13.3		13.8			14.1	2.4	
accide	Chloride	EPA 300	m/en	4	8	12	06	72	12,300		13,700			13,067	2,142	
Scions	Fluoride	EPA 340.2	E/bn		- 7	7	05		4.		1.46			28.	96.0	
Anions	Phosphate	EPA 365.2	ng/ml	v	0.02	v	0.02	v	0.02	٧	0.02		v	20.0	:	100%
Anions	Sulfate	EPA 300.0	ng/m	~	727	_	18	•	8		709			785	豆	
Motote Soluble	Aluminum	SW 6010	na/mf	0	r 680'0	õ	0.0418	0	5 54		0.0725	7		0.2616	0.8463	
Metals Soluble	Antimony	SW 6010	m/bn	v	0.241	o v	241	o v	0.241	•	0.241		v	0.241	:	100%
Metals, Soluble	Arsenic	SW 7060	m/bn	Ó	0.105	Ö	0.089	Ö	0.0068		0.09			0.067	0.131	
Metals, Soluble	Barium	SW 6010	ug/ml	_	1.08	-	13	•	8.48		1.09			3.56	10.58	
Metals, Soluble	Beryllium	SW 6010	lm/gn	ŏ	0.0005	o.0 ×	0.00554	Ö	0.0017	•	< 0.00554		v	0.0055	:	26%
Metals, Soluble	Boron	SW 6010	m/gn	•	£	•	449	6	3330		432			1,407	4,137	
Metals, Soluble	Cadmium	SW 7131	m/gn	00	9670	0.0	0713	0	0.00546		0.0053			0.0067	0.0026	
Metals, Soluble	Calcium	SW 6010	E/Gn	~	7,160	'	030	7	030		6,470			7,073	8	
Metals, Soluble	Chromium	SW 6010	m/gn	õ	3515	9	523	0	0848		0.0361			0.0629	0.0472	
Metals, Soluble	Cobalt	SW 6010	im/bn	õ	0.0347	0.	0.0108 J	Ü	0.23		0.0207	7		0.0918	0.2987	
Metals, Soluble	Copper	SW 6010	lm/gn	ö	0.0255	ŏ	132 J	Ö	0923		0.0273	-		0.0437	0.1057	
Metals, Soluble	Iron	SW 6010	m/6n	ŏ	0.0596); v	969	ō v	9690	V			v	0.0596	:	100%
Metals, Soluble	Fead	SW 7421	m/gn	õ	0.0011	Ö	0.002	0	0.002		0.005			0.0017	0.0013	
Metals, Soluble	Magnesium	SW 6010	m/gn	4,	583	.,	292	•	4470		208			1,882	5,569	
Metals, Soluble	Manganese	SW 6010	lm/gn	_	17.2	_	15.5	υ,	9.06		12.5			1.1	106.5	
Metals, Soluble	Mercury	SW 7470	m/gn	0.0	900000	0.0	900000	ö	0.00005		0.00006			9,0000	0.00001	
Metals, Soluble	Molybdenum	SW 6010	lm/gn	õ	0.0671	ŏ	0.0698	•	905.0		0.102			0.214	0.628	
Metais. Soluble	Nickel	SW 6010	m/gn	0	0.303	0	0.32	•	19.		0.302			0.844	2.293	
Metals, Soluble	Phosphorus	SW 6010	ng/m/	0	104	Ö	0.246	٥	0.118		0.711			0.156	0.194	
Metals, Soluble	Potassium	SW 6010	m/gn	4	6.	4	40.9		333		43.7			138.4	418.7	
Metals, Soluble	Selenium	SW 7740	m/gn	o	0.105	Ö	0.141	٥	0.137		0.157			0.128	0.049	
Metals. Soluble	Silicon	SW 6010	m/gn	~	88	••	83	•	16.9		2.38			7.2	50.9	
Metals, Soluble	Sodium	SW 6010	ng/ml	₩	3.3	&	4.7		387		82.9			285.0	864.9	
H-			_	imes	tone	Limestone Slurry Filtrate - Page 1	iltrate	- Pag	7							

Liquid Stream Data Summary

H-119 Sample Stream: Limestone Slurry Fittrate

Analyte		Analytical			Run			-Sun		Run		Run			%96	占
Group	Specie	Method	Units		-			7		3a	:	3d		Average	ರ	Ratio
			,		;			•						t 1	į	
Metals, Soluble	Strontium	SW 6010	ğ		5.1			4.		5.				S S	0.00	
Metals, Soluble	Ţ	SW 6010	m/gn		0.007	-	v	144	v	0.144		0.109	v	0.144	:	95%
Metals, Soluble	Titanium	SW 6010	m/gn		0.725		٠	.731	٧	0.0102	Ū).0059 J		0.4870	1.0369	0.3%
Metals, Soluble	Vanadium	SW 6010	m/gn		0.137		Ü	128		0.29		0.063		0.185	0.226	
Metals, Soluble	Zinc	SW 6010	lm/gu		0.0133	_	0	0.0307	_	0.0765	•	0.0195		0.0402	0.0811	
Aldehydes	Acetaldehyde	SW 8315	m/gn		0.0042		J	890:		0.08		9200		0.051	0.101	
Aldehydes	Formaldehyde	SW 8315	lm/gn		0.01		Ü	0.022		0.03		0.026		0.021	0.025	
Organics Semi-volatile	1.2.4.5-Tetrachlorobenzene	SW 8270	ua/L	v	0.578		v	.593	v	0.6	v	0.531	v	0:290	;	100%
Organics, Semi-volatile	1,2,4-Trichlorobenzene	SW 8270	ug/L	٧	0.591		v	9090	v	0.905	v	8.0	v	0.701	:	100%
Organics, Semi-volatile	1,2-Dichlorobenzene	SW 8270	ug/L	v	0.779		v	.799	٧	0.977	٧	0.864	v	0.852	:	100%
Organics, Semi-volatile	1,2-Diphenythydrazine	SW 8270	ng/L	٧	<u>6</u>		v	5	v	001	٧	<u>5</u>	v	001	:	100%
Organics, Semi-volatile	1,3-Dichlorobenzene	SW 8270	ng/L	v	0.396		v	904	v	. .	٧	976.0	v	0.634	;	100%
Organics, Semi-volatife	1,4-Dichlorobenzene	SW 8270	ug/L	v	908.0		v	0.829	v	0.905	v	8.0	v	0.847	:	100%
Organics, Semi-volatile	1-Chloronaphthalene	SW 8270	ng/L	٧	0.644		v	:661	v	0.826	v	0.731	v	0.710	;	100%
Organics, Semi-volatile	1-Naphthylamine	SW 8270	ug/L	v	1.56		v	9.1	v	3.12	v	2.76	v	2.09	;	100%
Organics, Semi-volatile	2,3,4,6-Tetrachlorophenol	SW 8270	ug/L	٧	0.503		v	516	v	0.715	v	0.633	v	0.578	;	100%
Organics, Semi-volatile	2,4,5-Trichlorophenol	SW 8270	ug/L	٧	0.33		v	338	v	0.783	v	0.693	v	0.484	:	100%
Organics, Semi-volatile	2,4,6-Trichlorophenol	SW 8270	ng/L	٧	0.349		v	358	v	0.778	v	0.688	v	0.495	;	100%
Organics, Semi-volatile	2,4-Dichlorophenol	SW 8270	ug/L	v	0.443		v	454	v	0.875	٧	0.774	•	0.591	;	100%
Organics, Semi-volatile	2,4-Dimethylphenol	SW 8270	ug/L	v	1.1		v	1.13	v	2	v	1.71	•	14.	:	100%
Organics, Semi-volatile	2,4-Dinitrophenol	SW 8270	νg/μ	٧	7		v	7.18	v	6.43	v	5.69	v	6.87	;	100%
Organics, Semi-volatile	2,4-Dinitrololuene	SW 8270	ng/L	v	0.55		v	.564	v	0.909	v	0.804	v	0.674	;	100%
Organics, Semi-volatile	2,6-Dichlorophenol	SW 8270	ug/L	v	0.723		v	742	v	0.788	v	0.697	•	0.751	;	100%
Organics, Semi-votatile	2,6-Dinitrotoluene	SW 8270	ng/L	v	0.346		v	355	v	1.32	v	1.17	•	0.674	;	100%
Organics, Semi-volatile	2-Chloronaphthalene	SW 8270	ug/L	v	0.324		v	.332	v	0.603	٧	0.533	v	0.420	;	100%
Organics, Semi-volatile	2-Chlorophenol	SW 8270	ug/L	٧	0.764		v	784	v	726.0	٧	0.864	•	0.842	:	100%
Organics, Semi-volatile	2-Methylnaphthalene	SW 8270	ug/L	٧	99.0		v	229	v	0.56	v	0.495	٧	0.632	;	100%
Organics, Semi-volatile	2-Methylphenol(o-cresol)	SW 8270	ug/L	٧	0.534		v	548	v	0.477	٧	0.422	v	0.520	:	100%
Organics, Semi-volatile	2-Naphthylamine	SW 8270	ug/L	٧	1.95		v	2	v	2.46	v	2.18	v	2.14	:	100%
				Ĕ	mestone	V.	2	Filtrate -	Pag	2 91						

Limestone Slurry Filtrate - Page 2

Sample Stream: Limestone Slurry Filtrate

Analyte		Analytical			Run		Run		Run	E		Run			%96	占
Group	Specie	Method	Units		-		~		3a	6		3d		Average	ច	Ratio
Organics, Semi-volatile	2-Nitroaniline	SW 8270	760	v	0.402	٧	0.412	•		8	v	0.902	v	0.611	:	100%
Organics, Semi-volatile	2-Nitrophenol	SW 8270	ng/L	v	4.0	٧	0.451	•	9.0	03	v	0.71	٧	0.565	:	100%
Organics, Semi-volatile	2-Picoline	SW 8270	ng/L	v	2 .	٧	1.12	•	, .	27	٧	1.13	v	1.16	:	100%
Organics, Semi-volatile	3,3'-Dichlorobenzidine	SW 8270	ng/L	v	0.49	٧	0.503	•	0.5	112	v	0.453	v	0.502	:	100%
Organics, Semi-volatile	3-Methylcholanthrene	SW 8270	ug/L	٧	0.783	٧	0.803	•	. 0.7	0.769	٧	0.68	v	0.785	;	100%
Organics, Semi-volatile	3-Nitroaniline	SW 8270	ng/L	٧	0.509	٧	0.522	•	0.6	55	v	0.535	v	0.545	;	100%
Organics, Semi-volatile	4,6-Dinitro-2-methylphenol	SW 8270	ug/L	٧	0.792	٧	0.812		9.0	62	٧	0.585	v	0.755	:	100%
Organics, Semi-volatile	4-Aminobiphenyl	SW 8270	ng/L	٧	0.748	٧	0.767	•	-	1.83	٧	1.62	v	1.115	:	100%
Organics, Semi-volatile	4-Bromophenyl phenyl	SW 8270	ug/L	v	0.456	٧	0.468	•	. 0.7	45	v	0.659	٧	0.556	:	100%
Organics, Semi-volatile	4-Chloro-3-methylphenol	SW 8270	ug/L	v	0.723	٧	0.742	•	. 0.7	35	v	0.701	٧	0.752	:	100%
Organics, Serni-volatile	4-Chlorophenyl phenyl ether	SW 8270	ug/L	v	0.528	٧	0.542	•	9.0	85	v	0.573	v	0.573	!	100%
Organics, Semi-volatile	4-Methylphenol(p-cresol)	SW 8270	ng/L	٧	0.575	٧	0.59	•	. 0.7	90	٧	0.624	٧	0.624	;	100%
Organics, Semi-votatile	4-Nitroaniline	SW 8270	₩	٧	0.484	٧	0.496	•	50	32	٧	0.824	v	0.637	:	100%
Organics, Semi-volatile	4-Nitrophenol	SW 8270	7 /6n	٧	0.691	٧	0.709	•	÷	2	٧	1.27	٧	0.947	:	100%
Organics, Serni-volatile	7,12-Dimethylbenz(a)anthracene	SW 8270	ng/L	٧	1.92	٧	1.97	•		R	v	1.81	v	1.98	:	100%
Organics, Semi-volatile	Acenaphthene	SW 8270	ng/L	v	0.478	٧	0.49	•	. 0	118	v	0.37	v	0.462	:	100%
Organics, Semi-volatile	Acenaphthylene	SW 8270	ug/L	v	0.226	٧	0.232	•	9.0	2	v	0.569	v	0.367	:	100%
Organics, Semi-volatile	Acetophenone	SW 8270	ug/L	v	0.459	٧	0.471	•	õ	%	٧	0.761	•	0.597	:	100%
Organics, Semi-volatile	Aniline	SW 8270	ng/L	v	0.933	٧	0.957	•	9.0	48		966.0	v	0.946	:	100%
Organics, Semi-volatile	Anthracene	SW 8270	ng/L	v	0.581	٧	0.596	•	.05	99	v	0.501	v	0.581	:	100%
Organics, Semi-volatile	Benzidine	SW 8270	ug/L	v	8	٧	8	•		0	v	8	v	ଯ	:	100%
Organics, Semi-volatile	Benzo(a)anthracene	SW 8270	7/Gn	v	0.515	٧	0.528	•	90	9	v	0.611	v	0.578	:	100%
Organics, Semi-volatile	Benzo(a)pyrene	SW 8270	ug/L	v	0.383	٧	0.393	•	0.7	0.797	٧	0.705	٧	0.524	:	100%
Organics, Semi-volatile	Benzo(b)fluoranthene	SW 8270	ng/L	v	0.569	٧	0.584	•	-	4	v	1.24	v	0.851	:	100%
Organics, Semi-volatile	Benzo(g,h,l)perylens	SW 8270	ug/L	v	0.487	v	0.499	•		27	٧	1.39	v	0.852	;	100%
Organics, Semi-volatile	Benzo(k)fluoranthene	SW 8270	ng/L	v	996.0	٧	0.993	•	-	*	٧	1.36	v	1.167	:	100%
Organics, Semi-volatile	Benzoic acid	SW 8270	7/6n	v	3.96	٧	4.06	•	93 33	4.	٧	52.5	٧	22.473	;	100%
Organics, Semi-volatile	Benzyl alcohol	SW 8270	ng/L	v	1.08	٧	1.1	•	5.0	38	v	0.83	v	1.043	:	100%
Organics, Semi-volatile	Butylbenzylphthalate	SW 8270	ug/L		0.319 J		0.355	_	9.0	62	v	0.85	v	0.962	:	42%
Organics, Semi-volatile	Chrysene	SW 8270	ug/L	ν	0.669	٧	0.686	•	9.6	<u>2</u> 9	v	0.731	٧	0.727	;	100%
Organics, Semi-volatile	Di-n-octylphthalate	SW 8270	ug/L	v	0.911	٧	0.934	•		27	٧	0.479	٧	0.796	;	100%
Н			_	Ĕ	imestone Slurry	TI	y Filtrate	-	Page 3	က						

Liquid Stream Data Summary

H-118 Sample Stream: Limestone Slurry Filtrate

Analyte		Analytical			Run		Run		Æ	-		Res			%96	占
Group	Specie	Method	Units		1		2		3a			3d		Average	C	Ratio
Organics, Seml-volatile	Oibenz(a,h)anthracene	SW 8270	ug/L	v	0.474	٧	0.486		1.25	ıc	v	Ţ	v	0.737	1	100%
Organics, Semi-volatile	Dibenz(a,j)acridine	SW 8270	ug/L	v	0.581	v	0.596	•	 	_	v	1.15	V	0.826	;	100%
Organics, Semi-volatile	Dibenzofuran	SW 8270	ug/L	٧	0.408	٧	0.418	•	. 0.87	g:	٧	0.731	٧	0.551	;	100%
Organics, Semi-volatile	Dibutytphthalate	SW 8270	ug/L	v	0.493	٧	0.506		0.769	9	V	0. 14	v	0.506	1	39%
Organics, Semi-volatife	Diethylphthalate	SW 8270	ng/L	v	0.336	٧	0.345		0.4	ر 23	•	0.701	•	0.345	;	41%
Organics, Semi-volatile	Dimethylphenethylamine	SW 8270	ug/L	v	120	٧	120	•		_	٧	52	٧	52	;	100%
Organics, Semi-volatile	Dimethylphthalate	SW 8270	ug/L	v	0.28	v	0.287	•	. 0.51	7	٧	0.457	٧	0.361	1	4004
Organics, Semi-votatile	Diphenylamine	SW 8270	ng/L	v	0.528	٧	0.542		. 0.42	go.	٧	0.377	v	0.499	;	100%
Organics, Semi-volatile	Ethyl methanesulfonate	SW 8270	,6a	v	0.503	v	0.516	·	0.	₹	v	0.924	v	0.686	;	100%
Organics, Semi-volatile	Fluoranthene	SW 8270	- J/Sn	٧	0.638	٧	0.654		. 0.72	τυ.	v	0.641	v	0.672	:	100%
Organics, Semi-volatile	Fluorene	SW 8270	ug/L	٧	0.336	٧	0.345	Ĭ	. 0.56	ιΩ	٧	0.517	٧	0.422	t	100%
Organics, Semi-volatile	Hexachlorobenzene	SW 8270	ng/L	v	0.234	v	0.24	·	.0.	2	٧	0.427	v	0.319	:	100%
Organics, Semi-volatile	Hexachlorobutadiene	SW 8270	ng/L	v	969.0	٧	0.716	·	0.78	92	٧	0.697	v	0.734	;	100%
Organics, Semi-volatile	Hexachlorocyclopentadiene	SW 8270	ng/L	v	8.92	٧	9.15	•	0.6	c o	V	8.01	•	908	:	100%
Organics, Semi-volatile	Hexachloroethane	SW 8270	ng/L	v	0.594	٧	0.609	٠	0.97	7	٧	0.864	v	0.727	;	100%
Organics, Semi-volatile	Indeno(1,2,3-cd)pyrene	SW 8270	ng/L	٧	0.525	v	0.538	•	2.0	ıo	v	1.81	v	1.038	1	100%
Organics, Semi-volatife	Isophorone	SW 8270	ug/L	v	0.287	v	0.294		9	œ	v	0.838	v	0.510	:	100%
Organics, Semi-volatile	Methyl methanesulfonate	SW 8270	ng/L	v	S	v	ଜ		 		٧	ß	V	ß	;	100%
Organics, Semi-volatite	N-Nitroso-di-n-butylamine	SW 8270	ug/L	v	1.3	v	2 .3		060	92	V	0.856	v	1.21	:	100%
Organics, Semi-volatile	N-Nitrosodimethylamine	SW 8270	ng/L	v	1.33	٧	1.36	•	1.2	_	v	1.07	٧	1.30	:	100%
Organics, Serni-volatife	N-Nitrosodiphenylamine	SW 8270	ng/L	v	0.566	•	0.581	·	0.4	4	٧	0.366	v	0.520	:	100%
Organics, Semi-volatile	N-Nitrosodipropylamine	SW 8270	'ng√	v	0.751	v	0.77		0.	_	٧	0.89	٧	0.84	;	100%
Organics, Semi-volatile	N-Nitrosopiperidine	SW 8270	ug/L	٧	0.943	٧	0.967	·	. 0.9	89	٧	0.812	•	0.943	:	100%
Organics, Semi-volatile	Naphthaiene	SW 8270	ng/L	٧	0.729		0.206	· ¬	. 0.73	īΣ	•	0.65	٧	0.735	:	78%
Organics, Semi-volatile	Nitrobenzene	SW 8270	ng/L	v	0.528	v	0.542	•	÷.		٧	1.15	•	0.790	:	100%
Organics, Semi-volatile	Pentachlorobenzene	SW 8270	ng/L	v	0.443	v	0.454	•	0.57	ξΩ	v	0.509	•	0.491	;	100%
Organics, Semi-volatile	Pentachloronitrobenzene	SW 8270	ug/L	v	2.07	v	2.12	•	2.1	~	٧	1.88	٧	2.10	;	100%
Organics, Semi-volatile	Pentachlorophenoi	SW 8270	ug/L	٧	0.864	•	0.886	·	 E.	7	V	1.21	•	€ 040	:	100%
Organics, Semi-volatile	Phenacetin	SW 8270	ng/L	v	0.54	v	0.554	•	. 0.50	4	٧	0.525	V	0.563	:	100%
Organics, Serni-volatite	Phenanthrene	SW 8270	ng/L	v	0.622	٧	0.638	Ī	: 0.7	8	v	0.637	V	0.660	:	100%
Organics, Semi-volatile	Phenol	SW 8270	ug/L	٧	0.399	٧	0.409		1.36	G	٧	1.2	v	0.723	!	100%
•				3	S auctor	1	Filtra	10.1	A Ane	₩						

Limestone Slurry Filtrate - Page 4

Sample Stream: Limestone Slurry Filtrate

Analyte		Analytical			Run		Run		Run		Run			95%	占
Group	Specie	Method	Units	١	-		2		3a		34		Average	ច	Ratio
Oresolve Comittee	Pronamide	SW R270	[/UI	٧	0 739	٧	0.758	٧	0.371	v	0.328	v	0.623	;	100%
Organics, Semi-volatile	Pyrene	SW 8270	na/L	v	0.468	٧	84.0	٧	0.628	٧	0.555	v	0.525	;	100%
Organics, Semi-volatile	Pyridine	SW 8270	, Ag	٧	1.16	٧	1.19	v	9060	v	8.0	v	1.085	:	100%
Organics, Semi-volatile	bis(2-Chloroethoxy)methane	SW 8270	ug/L	٧	0.562	v	0.576	v	0.932	v	0.824	v	0.690	:	100%
Organics, Semi-volatile	bis(2-Chloroethyl)ether	SW 8270	ng/L	v	0.732	٧	0.751	٧	0.589	٧	0.521	v	0.691	:	100%
Organics, Seml-volatile	bis(2-Chtoroisopropyl)ether	SW 8270	ug/L	٧	0.726	٧	0.745	v	1.23	٧	1.09	٧	0.900	:	100%
Organics, Semi-volatile	bis(2-Ethylhexyl)phthalate	SW 8270	₩,		5.17		6.43		399		0.918		137	564	
Organics, Semi-volatile	p-Chloroaniline	SW 8270	ng/L	٧	0.559	٧	0.573	v	1.15	٧	1.0	•	0.761	:	100%
Organics, Semi-volatile	p-Dimethylaminoazobenzene	SW 8270	ug/L	٧	0.515	٧	0.528	٧	1.12	٧	0.988	v	0.721	:	100%
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Organics, Volatile	1,1,1-1 richioroemane	SW 0240	00, 10,	v	י מ	,	nı	,	י כ	,	י ה	,	י כ	<u>'</u>	8 8
Organics, Volatile	1,1,2,2-Tetrachloroethane	SW 8240	ng/L	v	ın ı	٧	ശ	v	ומ	v	മ	v	ו מו	:	400
Organics, Volatile	1,1,2-Trichloroethane	SW 8240	ug/L	v	ហ	٧	co Co	v	ιn	v	ıc	v	ഹ	:	100%
Organics, Volatile	1,1-Dichloroethane	SW 8240	ug/L	v	ιo	٧	S.	v	တ	٧	'n	v	S	:	100%
Organics, Volatile	1,1-Dichloroethene	SW 8240	ug/L	v	ഹ	٧	S	v	လ	v	က	v	ស	;	100%
Organics, Volatile	1,2-Dichloroethane	SW 8240	ng/L	v	Ŋ	٧	S	v	ស	v	S.	v	ស	:	100%
Organics, Volatile	1,2-Dichloroethene (total)	SW 8240	ug/L	v	2	v	S	v	S.	v	က	v	co Co	:	100%
Organics, Volatile	1,2-Dichloropropane	SW 8240	ug/L	٧	လ	٧	ιΩ	٧	ស	ν	ς,	v	Ω.	:	100%
Organics, Volatile	2-Butanone (MEK)	SW 8240	ug/l.	v	2	v	5		5.1	v	5	v	6	:	99 99
Organics, Volatile	2-Hexanone	SW 8240	ug/t	v	•	٧	£	٧	10	٧	0	v	10	:	100%
Organics, Volatile	4-Methyl-2-pentanone (MIBK)	SW 8240	ng/L	٧	9	٧	£	v	10	٧	₽	v	01	:	100%
Organics, Volatile	Acetone	SW 8240	ug/		0		74		24		8		Ø	7	
Organics, Volatife	Benzene	SW 8240	ng/L	v	ഹ	٧	so.	٧	2	v	ις	•	ß	:	100%
Organics, Volatile	Bromodichloromethane	SW 8240	ug/L	٧	ß	٧	ß	v	ς.	v	s.	v	ស	:	100%
Organics, Volatile	Bromoform	SW 8240	ng/L	v	ιΩ	V	S	٧	ည	٧	ις	v	ιΩ	:	100%
Organics, Volatile	Bromomethane	SW 8240	ug/L	v	6	v	₽	•	10	v	5	•	Q	:	100%
Organics, Volatile	Carbon Disulfide	SW 8240	ug/L	v	Ŋ	٧	ro.	v	വ	v	ις.	•	Ω.	:	100%
Organics, Volatile	Carbon Tetrachloride	SW 8240	ng/L	v	ഹ	v	S)	v	ល	v	w	v	ro	:	100%
Organics, Volatile	Chiorobenzene	SW 8240	ng/L	v	S)	٧	ς.	v	ς.	v	S.	v	r,	:	100%
Organics, Volatile	Chloroethane	SW 8240	ng/L	٧	9	٧	0	v	0	٧	5	٧	Q	:	100%
Organics, Volatite	Chloroform	SW 8240	μĝ	v	တ	V	ro.	٧	S	٧	ß	•	S	:	100%
Н				Ë	imestone Slurry		/ Filtrate -	_	Page 5						

Limestone Slurry Filtrate - Page 6

Liquid Stream Data Summary

Filtrate
Slurry
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Stream: L
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36% DL		100%	100%	100%	%0Z ···	100%		100%	100%	100%	100% 100% 100%	100% 100% 100% 100%	100% 100% 100% 100% 100%	100%
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Analytical	Method	OVCB INC	344 0240	SVV 6240	ON/ 8240	SW 8240	SW 8240		CACR MAS	SW 8240	SW 8240 SW 8240	SW 8240 SW 8240 SW 8240	SW 8240 SW 8240 SW 8240 SW 8240	SW 8240 SW 8240 SW 8240 SW 8240 SW 8240
	Specie	4		Ulbromochioromethane	Ethylbenzene	Memylene Caldade	Totrachlossethene		Tefrican	Toluene	Toluene Trichloroethene	Toluene Trichloroethene Vinyl acetate	Tokuene Trichloroethene Vinyl acetate Vinyl chloride	Toluene Trichloroethene Vinyl acetate Vinyl chloride Xylenes
Analyte	Group		Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, volatile			Organics, Volatile	Organics, Volatile Organics, Volatile	Organics, Votatile Organics, Votatile Organics, Votatile	Organics, Votatile Organics, Votatile Organics, Votatile Organics, Votatile	Organics, Votatile Organics, Votatile Organics, Votatile Organics, Votatile Organics, Votatile

Liquid Stream Data Summary

Sample Stream: Cooling Water

DL Ratio									65%	100%		100%					82%									21%		100%				68 %				
% 56 5	100000	2000	0.014	1.80	0.018	0.070	1.36	0.047	;	:	0.0081	;	3.44	0.00697	52.65	0.0027	;	0.131	0.131	0.097	4.01	0.250	0.00002	0.00069	0.00484	;	0.49	;	4.25	11.57	0.080	;	0.00120	090000	0.050	
Average	0000	200	0.047	5.71	0.134	0.094	6.34	0.031	0.024	0.001	0.013	0.001	0.93	0.00198	19.12	0.0020	0.0034	0.035	0.112	0.027	3.09	0.072	0.00005	0.00152	0.00215	0.061	2.42	0.0014	4.55	8.42	0.049	0.014	0.00111	0.00272	0.018	
									٧	v		v					v									v		٧				٧				
	-	7														~								-	_									7		
Run 3d	0000	0.00203	0.0333	5.26	0.146	0.0623	6.02	0.0423	0.0241	0.000657	0.0109	0.000554	0.0807	0.00136	4.97	0.00061	0.0034	0.0103	0.0923	0.0121	1.23	0.0107	0.00005	0.00057	0.0017	0.0941	205	0.00144	3.75	5.29	0.0251	0.0144	0.00125	0.00089	0.00857	
									٧	٧		V					٧						v					v				٧				
	-	•						7	7	<u>,</u>		4		~		_	~	_					¬	~	~			_				~	<u>-</u>	~		
Run 3a	70,00	200.0	0.0421	5.25	0.128	0.0614	5.73	0.0151	0.0127	0.000657	0.0113	0.000554	0.196	0.00042	8.72	0.00291	0.00062	0.0959	0.173	0.0072	3.95	0.0188	0.00004	0.00137	0.00012	0.0929	2.38	ø	6.53	13.8	0.0335	0.00666	0.00055	0.00256	0.0413	
										٧		٧																٧								
	-	•								~		4		Δ.		-							"	- -	-			_					_		.	•
Run 2	250	2	0.0455	5.34	0.132	0.114	6.51	0.052	0.0241	0.000657	0.0169	0.000554	2.52	0.00522	43.5	0.00081	0.0034	0.00447	0.0844	0.0722	4.	0.188	0.0000	0.00184	0.00231	0.061	7.04	0.00144	3.55	5.62	0.0856	0.0144	0.00136	0.0026	0.00616	1
									٧	٧		٧					٧									٧		٧				٧				
	-	7						7		_						7								7	7	7										
Run T	250	3	0.0532	6.55	0.142	0.106	6.79	0.0265	0.0241	0.000657	0.0112	0.000554	0.0601	0.00031	5.13	0.00239	0.0034	0.00429	0.079	0.0023	1.23	0.00932	0.00005	0.00135	0.00401	0.021	2.25	0.00144	3.58	5.85	0.0265	0.0144	0.00141	0.003	0.00684	
									v	٧		٧					٧											٧				٧				
Units	1		lm/gn	m/gn	m/on	lm/gu	lm/gu	m/gn	E/Bn	m/dn	m/Bn	m/gu	m/gn	μ/gn	m/go	m/bn	lm/go	ĮΨ/đη	lm/gu	lm/gu	lm/gu	μ/gn	m/gn	lm/gu	m/gn	lm/gu	jw/gn	m/gn	m/on	μ/bn	m/sn	Įω/ď	m/gn	lm/6n	m/gn	
Analytical Method	C FOO 7913	2108 440	EPA 350.1	EPA 300	EPA 340.2	EPA 365.2	EPA 300.0	SW 6010	SW 6010	SW 7060	SW 6010	SW 6010	SW 6010	SW 7131	SW 6010	SW 6010	SW 6010	SW 6010	SW 6010	SW 7421	SW 6010	SW 6010	SW 7470	SW 6010	SW 6010	SW 6010	SW 6010	SW 7740	SW 6010	SW 6010	SW 6010	SW 6010	SW 6010	SW 6010	SW 6010	
			z																		•	en		E		40										
Specie		Cyalline	Ammonta as N	Chloride	Fluoride	Phosphate	Sulfate	Aluminum	Antimony	Arsenic	Bartum	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Potassium	Selenium	Silicon	Sodium	Strontium	투	Titanium	Vanadium	Zinc	
Analyte		Reduced Species	Reduced Species	Anions	Anions	Anions	Anions	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	Metals, Soluble	

Cooling Water - Page 1

Liquid Stream Data Summary

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Analyte		Analytical		u .	Run		Run		2	=		Run			95%	占
Group	Specie	Method	Units		-		2		3a			DE 3d		Average	ਠ	Ratio
Metais, Total	Aluminum	SW 6010	lm/gn	~	86.		4.6		1.03	ø		1.15		2.87	4.44	
Metals, Total	Antimony	SW 6010	ш/бл	0	960		0.0219	7	0.00859	359 J		0.0346		0.022	0.034	
Metals, Total	Arsenic	SW 7060	m/go	ö	0.0216	٧	0.000657		< 0.000657	657	٧	0.000657		0.0074	0.0305	3%
Metals, Total	Barium	SW 6010	m/gn	ö	0.0322		0.0409		0.0188	88		0.0181		0.031	0.028	
Metals, Total	Beryllium	SW 6010	m/gn	ਨ	9E-05		0.00014	-	0000	554	٧	0.000554	٧	0.00055	:	22%
Metals, Total	Boron	SW 6010	m/gn	O	0.247		0.488		0,236	œ		0.0846		0.324	0.354	
Metals, Total	Cadmium	SW 7131	m/gu	0.0	0.00023		0.00209		0.00064	36 4		0.00031		0.00099	0.00243	
Metals, Total	Calcium	SW 6010	m/gu	¥O	5.91		6.54		5.28	80		4.62		5.91	1.57	
Metals, Total	Chromium	SW 6010	m/gu	0.0	0.00566		0.00634		0.00283	283		0.00449		0.00494	0.00462	
Metals, Total	Cobalt	SW 6010	E/ð	0.0	0.00453		0.00682		0.00368	898		0.00622		0.00501	0.00403	
Metals, Total	Copper	SW 6010	⊞/go	ö	0.0112		0.0132		0.00682	382		0.00552		0.010	0.00811	
Metals, Total	Iron	SW 6010	m/gn	4	4.12		6.21		1.87	7		1.94		4.07	5.39	
Metals, Total	Lead	SW 7421	m/gn	ö	0.0163		0.0572		0.0173	73		0.0092		0.030	0.058	
Metals, Total	Magnesium	SW 6010	m/gn	-	1.81		1.89		£.	9		1.28		1.69	0.71	
Metals, Total	Manganese	SW 6010	m/bn	O	193		0.237		ŏ	¥		0.0934		0.178	0.168	
Metals, Total	Mercury	SW 7470	m/gn	0.0	0003		0.00004	7	0.00005	92		900000		0.00004	0.00002	
Metals, Total	Molybdenum	SW 6010	m/gn	0.0	0175 J		0.00246	7	0.00295	7 982	v	0.00463		0.00239	0.00150	
Metals, Total	Nickel	SW 6010	m/gn	0.0	0524		0.00445	-	> 0.00986	986		0.00078	•	0.010	1	34%
Metals, Total	Phosphorus	SW 6010	m/gn	O	138		0.184		> 0.061	<u>~</u>	v	0.061		0.118	0.196	% 6
Metais, Total	Potassium	SW 6010	ug/m	•	Ξ		2.84		2.3	8		2.43		2.76	0.97	
Metals, Total	Selenium	SW 7740	m/6n	ö	214	٧	0.00144		< 0.00144	44	٧	0.00144		0.008	0.030	%9
Metals, Total	Silicon	SW 6010	lm/gu	7	2		8.22		4.47	7		4.56		6.57	4.75	
Metals, Total	Sodium	SW 6010	E/Bn	9	27		5.1		4.81	-		4.7		5.39	1.92	
Metals, Total	Strontium	SW 6010	m/gn	ö	0.0295		0.0293		0.0241	-		0.0224		0.028	0.0076	
Metals, Total	ᆵ	SW 6010	m/gn	ŏ v	14	٧	0.0144		م 0.01	4	٧	0.0144	٧	0.014	:	100%
Metals, Total	Titanium	SW 6010	m/gn	O	0.167		0.235		90.0	77		690.0		0.157	0.209	
Metals, Total	Vanadium	SW 6010	m/gn	0.0	0.00881		0.0119		0.00427	127		0.00629		0.00833	0.010	
Metals, Total	Zinc	SW 6010	m/gn	Ö	0.0275		0.0382		0.01	98		0.0136		0.026	0.031	
Aldebudee	Acetaldebyde	SW 8315	m/m/	o	8		9900		0	æ		60.0		0.055	0.117	
	Extraplement	SW 8315	æ/or.	· -	0.0054		0.044		0 03	. ~		0.026		0.026	0.049	
Aldenydes	rollnanellyus	200	P	ś	5				3	,		200		2707		
Organics, Semi-volatile	1,2,4,5-Tetrachforobenzene	SW 8270	J/gn	۷	0.55	٧	0.556		< 0.371	Ξ.	v	0.375	٧	0.492	;	100%
Organics Semi-volatile	1,2,4-Trichlorobenzene	SW 8270	ug/L	v	0.563	٧	0.568		× 0.5	9	v	0.565	٧	0.564	:	100%
Organics, Semi-volatile	1,2-Dichlorobenzene	SW 8270	ug/L	v	742	٧	0.749		90°0	ξ.	٧	0.611	V	0.699	:	100%

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Liquid Stream Data Summary

Sample Stream: Cooling Water

占	Ratio	3001	3	100 %	100 %	100%	100%	100%	100%	7001	100%	100%	100%	100%	100%	100%	100%	4001	100%	100%	100%	100%	100%	100%	100 %	100%	100%	100%	100%	100%	100%	100 %	100%	100%	100%	100%	100%	100%	
% 98	ਠ	1	1	:	:	;	:	:	:	•	;	:	;	:	:	1	:	:	:	;	1	;	;	:	;	;	:	;	;	;	1	:	;	! !	:	;	:	;	
	Average	Ş	3	0.480	0.702	0.581	1.64	0.469	0.372	0.383	0.463	1,12	5.79	0.539	0.624	0.494	0.331	0.689	0.54	0.439	1.75	0.467	0.446	0.959	0.418	0.658	0.449	0.642	0.854	0.444	0.625	0.471	0.513	0.501	0.738	1.65	0.391	0.277	
	`	•	,	v	v	٧	v	٧	٧	٧	v	v	v	٧	v	٧	٧	v	٧	v	٧	٧	٧	v	v	٧	v	v	٧	٧	v	v	v	v	v	v	v	v	
Run	3d	ξ	3	0.689	0.565	0.516	1.85	0.447	0.489	0.487	0.547	1.25	4.02	0.568	0.492	0.828	0.377	0.611	0.35	0.298	1.54	0.637	0.502	0.795	0.32	0.481	0.378	0.413	1.14	0.465	0.495	0.405	0.441	0.583	0.901	1.28	0.262	0.402	
	ļ	`	,	v	v	٧	v	٧	v	v	٧	v	v	٧	٧	٧	v	v	v	٧	v	٧	٧	v	٧	٧	٧	٧	v	٧	v	٧	v	٧	٧	v	٧	٧	
Run	38	ξ	3 }	0.683	0.56	0.511	1.93	0.443	0.485	0.482	0.542	1.24	3.98	0.563	0.488	0.82	0.373	0.605	0.347	0.295	1.52	0.631	0.497	0.788	0.317	0.476	0.374	0.41	1.13	0.461	0.49	0.401	0.437	0.577	0.892	1.27	0.259	0.398	
		,	,	v	v	٧	٧	v	v	v	٧	v	v	٧	v	٧	v	٧	v	٧	v	٧	v	v	v	v	٧	v	٧	٧	v	٧	٧	٧	٧	v	v	v	
Run	2	ξ	3	0.381	0.777	0.619	2 .	0.484	0.317	0.336	0.426	1.06	6.73	0.529	0.695	0.333	0.312	0.735	0.635	0.513	1.87	0.387	0.423	50.	0.471	0.753	0.489	0.762	0.719	0.438	0.695	0.508	0.553	0.465	0.664	1.85	0.46	0.217	
		,	,	v	٧	v	v	٧	v	v	٧	v	v	v	v	v	v	٧	v	v	v	v	v	v	٧	v	v	v	v	v	v	v	v	v	v	v	v	v	
Run	-	ξ	3	0.377	0.77	0.613	1.49	0.479	0.314	0.332	0.422	1 8	6.67	0.524	0.689	0.33	0.309	0.728	0.629	0.509	2	0.383	0.419	2	0.467	0.746	0.485	0.754	0.712	0.434	0.689	0.503	0.548	0.461	0.658	1.83	0.455	0.215	Ć
		`	,	٧	V	V	٧	٧	V	٧	V	v	V	٧	٧	٧	v	٧	v	٧	v	٧	٧	٧	٧	V	٧	٧	٧	V	V	v	v	٧	٧	V	V	v	
	Chits	,	7	ğ	√gn	ng/L	√gv	√g/	1/ 6 n	ug/L	A VB	ug/L	√gn	ng/L	ng/L	J/Bn	J/gn	Z Z	ηď,	ug/L	ug/L	1/6 0	ug/L	rg/	J/dh	ug/L	ug/L	ng/L	₽ F	γĝη	Ϋ́	γ <mark>ό</mark> ς	√g/	ug/L	ug/L	ug/L	ug/L	충	
Analytical	Method	0200	0170 Mc	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270					
	Specie		1,Z-Upnenymydrazme	1,3-Dichlorobenzene	1,4-Dichlorobenzene	1-Chloronaphthalene	1-Naphthylamine	2,3,4,6-Tetrachlorophenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4-Dichlorophenol	2,4-Dimethylphenol	2,4-Dinttrophenol	2,4-Dinitrotoluene	2,6-Dichlorophenol	2,6-Dinitrotoluene	2-Chloronaphthalene	2-Chlorophenol	2-Methylnaphthalene	2-Methylphenol(o-cresol)	2-Naphthytamine	2-Nitroaniline	2-Nitrophenol	2-Picoline	3,3'-Dichlorobenzidine	3-Methylcholanthrene	3-Nitroanitine	4,6-Dinitro-2-methylphenol	4-Aminobiphenyl	4-Bromophenyl phenyl	4-Chloro-3-methylphenol	4-Chlorophenyl phenyl ether	4-Methylphenol(p-cresol)	4-Nitroaniline	4-Nitrophenol	7,12-Dimethylbenz(a)anthracene	Acenaphthene	Acenaphthylene	
Analyte	Group		Organics, Semi-Volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-votatile	Organics, Semi-votatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatife	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatife	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-votatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-votatile	Organics, Semi-votatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-votatile	Organics Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	•

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Liquid Stream Data Summary

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占	Ratio	400%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	\$	100%	100%	100%	100 %	100 %	100% %	100 %	100%	100%	100%	100%	100%	100%	100%	400%
95%	5	;	;	;	;	;	:	;	;	;	:	•	;	;	;	;	;	;	1	:	;	:	;	;	;	;	:	:	:	;	:	:	;	:	:	;	;
	Average	0.470	0.791	0.487	23	0.471	0.409	0.651	0.634	0.935	14.79	0.884	0.449	0.597	0.693	0.56	0.64	0.431	0.418	0.378	120	0,285	0,425	0.537	0.557	0.335	0.249	9090	7.58	0.581	0.76	0.379	ይ	1.036	1,100	0,446	0,687
		٧	٧	•	٧	v	•	v	v	v	v	v	v	٧	•	v	v	v	v	v	v	•	•	•	•	v	v	•	v	v	•	•	v	•	v	v	v
Run	8	0.537	0.592	0.354	2	0.432	0.498	0.873	0.981	0.961	37.1	0.587	0.601	0.516	0.338	0.78	0.81	0.516	0.312	0.495	120	0.323	0.266	0.653	0.453	0.365	0.302	0.492	5.66	0.611	1.28	0.592	ß	0.605	0.756	0.259	0.629
		v	٧	v	v	٧	v	v	v	v	v	v	v	v	v	•	v	v	v	v	v	v	v	v	v	v	v	v	•	v	v	v	v	•	v	v	v
Run	3a	0.532	0.587	0.35	20	0.428	0.493	0.865	0.971	0.951	36.8	0,581	0.595	0.511	0.335	0.772	0.802	0.511	0,309	0.49	120	0.32	0.264	0.647	0.449	0.362	0.299	0.488	5.61	0.605	1.27	0.587	ଝ	0.599	0,749	0.256	0,623
		v	٧	٧	v	v	v	٧	v	v	v	v	v	v	v	v	٧	v	v	v	v	v	v	v	٧	V	V	v	٧	v	٧	٧	v	٧	v	v	V
Run	2	0.441	0.897	0.559	20	0.495	0.368	0.547	0.468	0.931	3.81	2	0.378	0.643	0.876	0.456	0.559	0.392	0.474	0.323	120	0.269	0.508	0.484	0.613	0.323	0.225	0.671	8.58	0.571	0.505	0.276	8	1.26	1.28	0.544	0.722
		v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	•	v	v	v	v	v	v	v	v	v	v
Run	-	0.437	0.889	0.553	2	0.49	0.365	0.542	0.464	0.922	3.77	1.03	0.374	0.637	0.868	0.451	0.553	0.389	0.47	0.32	120	0.267	0.503	0.479	909.0	0.32	0.223	0.665	8.5	0.566	0.5	0.273	22	1.25	1.27	0.539	0.715
		v	٧	٧	v	v	٧	v	v	٧	٧	v	v	٧	v	٧	٧	v	v	v	٧	٧	•	٧	٧	v	v	v	v	v	v	٧	v	٧	v	v	v
	Units	1/0/1	/001	7	- N	J/6n	1/60	ng/	√gn	/gn	J/Bn	ug/L	J/Bn	ug/L	ug/L	ug/L	₩,	ng/L	√gn	J/Bn	√gv	J/gn	√gu	√g√	J/Bn	√g⁄r	ng/L	ug/L	γď	₽ V	γgn	γgη.	ng/L	√gn	√gu	7	1/ôn
Analyticat	Method	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270
	Specie	Acetonhenone	Aniline	Anthracene	Benzidine	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic acid	Benzył alcohol	Butyfbenzylphthalate	Chrysene	Di-n-octylphthalate	Dibenz(a,h)anthracene	Dibenz(a,))acridine	Dibenzofuran	Dibutyfphthalate	Diethylphthalate	Dimethytphenethylamine	Dimethylphthalate	Diphenylamine	Ethyl methanesulfonate	Fluoranthene	Fiuorene	Hexachiorobenzene	Hexachlorobutadiene	Hexachlorocyclopentadtene	Hexachloroethane	Indeno(1,2,3-cd)pyrene	Isophorone	Methyl methanesulfonate	N-Nitroso-di-n-butylamine	N-Nitrosodimethylamine	N-Nitrosodiphenylamine	N-Nitrosodipropytamine
Analyte	Group	Organica Semi-volatile	Organice Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatifie	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatite	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatifie	Organics, Semi-volatile	Organics, Semi-volatifie	Organics, Semi-votatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatite	Organics, Semi-volatite	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatifie	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatite	Organics, Semi-volatile	Organics, Semi-volatile

Cooling Water - Page 4

Sample Stream: Cooling Water

ᆸ	Ratio	5 8	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	3%	100 %	100% %	100%	100%	100%	100%	100°	100%	100%	100%	100%	100%	100%	45%	100%	100%	100%	100%	100%	
95%	5	:	;	:	;	:	;	;	:	:	:	;	:	:	;	:	7.2	:	:	:	;	;	:	:	;	:	:	:	:	:	:	;	:	:	:	;	
	Average	0.791	0.62	0.604	0.401	1.76	0.834	0.467	0.545	0.535	0.548	0.428	0.93	0.551	0.589	0.716	3.55	0.593	0.559	J.	ĸ	ις.	ro.	ιΩ	ιΩ	ιΩ	ro C	우	5	2	9	ĸ	ĸ	ស	5	2	
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E		74	9	<u>~</u>	92	ಜ	22	71	ਨ	49	32	82	65	83	88	29	SS.	16	86									₽	0	0	-				0		
Run	Ñ	< 0.574	ŏ	٠ 0	< 0.36	¥.	< 0.855	< 0.371	< 0.45	8.0 8.0	< 0.232	× 0.3	s. 0.5	A 0.5	× 0.3	7.0 ×	< 0.559	× 0.7	× 0.698	un V	V.	υ	v.	ιο	UP V	v.	ν	-	-	=	₩.	vo v	v	uc V	∓	v.	
Run	3a	0.569	0.455	0.802	0.356	131	0.847	0.368	0.446	0.841	0.23	0.389	0.56	0.577	0.365	92.0	0.553	0.71	0.691	ĸ	S	ß	വ	S.	ß	വ	ro	2	9	₽	12	S	£	S	우	သ	
		v	٧	v	v	V	٧	٧	v	v	v	٧	٧	٧	٧	V	v	٧	٧	٧	٧	٧	v	v	٧	v	v	v	v	٧		٧	V	v	v	٧	
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Run	2	0.907	0.701	0.508	0.426	.98	0.831	0.51	0.59	0.38	0.711	0	=	0.5	0.70	0.69	5.8	0.53	0.49	iù.	ı,	ro.	10	10	 10	ψ.		2	5		5	ιΩ Ω	ις C	S.	우	S.	
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Run	-	0.898	0.694	0.503	.422	1.97	0.823	514	.592	38	0.704	.446	1.1	.535	7691	.691	4.56	532	0.49	r.	Ç.	D.	ស	ιΩ	လ	ۍ ک	ω	9	5	5	9	ഗ	S	2	욘	2	;
		v	v	v	v	V	v	v	v	v	۷	v	v	v	v	v	•	v	v	v	٧	v	v	٧	v	v	v	v	v	v	v	v	v	v	v	v	
	Units	ug/L	ng/L	ng/L	ug/L	ug/L	1	ug/L	J/gn	ug/L	ug/L	ug/L	ηĝη	ug/L	ng/L	ارو ا	Jgn J	ng/	7	ug/L	ug/L	ng/L	ng/L	ug/L	ug/t	ug/L	ug/L	ng/L	ug/L	ng/L							
Analytical	Method	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8270	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	
	Specie	N-Nitrosopiperidine	Naphthalene	Nitrobenzene	Pentachlorobenzene	Pentachloronitrobenzene	Pentachlorophenol	Phenacetin	Phenanthrene	Phenol	Pronamide	Pyrene	Pyridine	bis(2-Chioroethoxy)methane	bis(2-Chloroethyl)ether	bis(2-Chloroisopropyl)ether	bis(2-Ethythexyl)phthalate	p-Chloroaniline	p-Dimethytaminoazobenzene	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,2-Dichloroethene (total)	1,2-Dichloropropane	2-Butanone (MEK)	2-Hexanone	4-Methyf-2-pentanone (MIBK)	Acetone	Benzene	Bromodichloromethane	Bromoform	Bromomethane	Carbon Disulfide	
Analyte	Group	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-votatile	Organics, Semi-volatile	Organics, Semi-volatife	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-volatile	Organics, Semi-votatile	Organics, Semi-volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatife	Organics, Volatile	Organics, Volatife	Organics, Volatile	Organics, Volatile	Organics, Votatile	Organics, Votatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	

Cooling Water - Page 5

Liquid Stream Data Summary

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Sample Stream: (

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Sample Stream: Coal Pile Run-off

Analyte	•	Analytical	=		Run •	Run .			36%	DF.
Group	Specie	Meriloo	OFFE		-	•		Average	5	Natio
Aldehydes	Acetaldehyde	SW 8315	m/gn		0.07	0.112		0.091	0.267	
Aldehydes	Formaldehyde	SW 8315	lm/gu		0.026	0.088		0.057	0.394	
Organics, Semi-volatile	1,2,4,5-Tetrachlorobenzene	SW 8270	ug/L	v	0.709		٧	0.709	:	100%
Organics, Semi-volatile	1,2,4-Trichlorobenzene	SW 8270	ng/L	٧	0.725		v	0.725	:	100%
Organics, Semi-volatile	1,2-Dichlorobenzene	SW 8270	ľg,	٧	0.956		٧	926.0	:	100%
Organics, Semi-volatile	1,2-Diphenylhydrazine	SW 8270	ug/L	٧	92		٧	5	:	100%
Organics, Semi-volatile	1,3-Dichlorobenzene	SW 8270	ug/L	٧	0.486		v	0.486	:	100%
Organics, Semi-volatile	1,4-Dichlorobenzene	SW 8270	ug/L	٧	0.991		٧	0.991	:	100%
Organics, Semi-volatile	1-Chloronaphthalene	SW 8270	ug/L	٧	0.79		٧	0.79	;	100%
Organics, Semi-volatile	1-Naphthylamine	SW 8270	ug/ L	٧	1.91		٧	1 .	:	100%
Organics, Semi-volatile	2,3,4,6-Tetrachlorophenol	SW 8270	ug/L	v	0.617		٧	0.617	:	100%
Organics, Semi-volatile	2,4,5-Trichlorophenol	SW 8270	ngıl	٧	0.405		V	0.405	:	100%
Organics, Semi-volatile	2,4,6-Trichlorophenol	SW 8270	ug/L	٧	0.428		٧	0.428	:	100%
Organics, Semi-volatile	2,4-Dichlorophenol	SW 8270	ug/L	v	0.544		٧	0.544	;	100%
Organics, Semi-volatile	2,4-Dimethylphenol	SW 8270	P _S	v	1.35		٧	1.35	;	100%
Organics, Semi-volatile	2,4-Dinitrophenol	SW 8270	ug/L	٧	8.59		v	8.59	:	100%
Organics, Semi-volatile	2,4-Dinitrotoluene	SW 8270	rg,	٧	0.675		٧	0.675	:	100%
Organics, Semi-volatile	2,6-Dichlorophenol	SW 8270	rg,	v	0.887		٧	0.887	:	100 %
Organics, Semi-volatile	2,6-Dinitrotoluene	SW 8270	ν Ω	٧	0.425		v	0.425		100%
Organics, Semi-volatile	2-Chloronaphthalene	SW 8270	₽gu T/gu	v	0.396		v	0.398	:	100%
Organics, Semi-volatile	2-Chlorophenol	SW 8270	₽ P	٧	0.937		٧	0.937	:	100%
Organics, Semi-volatile	2-Methylnaphthalene	SW 8270	rgu T	٧	0.81		٧	0.81	:	400%
Organics, Semi-volatile	2-Methylphenol(o-cresol)	SW 8270	ng/L	v	0.655		v	0.655	:	100%
Organics, Semi-volatile	2-Naphthylamine	SW 8270	√J/Gn	٧	2.39		v	2.39	;	100%
Organics, Semi-volatile	2-Nitroaniline	SW 8270	ug/L	٧	0.493		٧	0.493	:	100%
Organics, Semi-volatile	2-Nitrophenol	SW 8270	ng/L	٧	0.54		٧	0.54	;	100%
Organics, Semi-volatile	2-Picoline	SW 8270	ų V	v	<u>4</u> .		V	1.34	:	100%
Organics, Semi-volatile	3,3'-Dichlorobenzidine	SW 8270	ug/L	٧	0.601		v	0.601	:	100%
Organics, Semi-volatile	3-Methylcholanthrene	SW 8270	rg/	٧	0.961		v	0.961	;	100%
Organics, Semi-volatile	3-Nitroaniline	SW 8270	ug/L	v	0.625		٧	0.625	:	100%
		ပိ	al Pile	2	Coal Pile Run-off - Pa	Page 1				
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Sample Stream: Coal Pile Run-off

Group Specie Method Units 1 2 Average CI 100% Organica, Semi-votalite 44-Dirdic-2-methylphenyl SW 8270 ugl. < 0.918 < 0.916 < 0.919 < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00% < 0.00%	Analyte		Analytical			Run	Run			%96	占
4.6-Dintric-Z-methyphenol SW 8270 ug/L < 0.972 < 0.972 4-Aminobpheny SW 8270 ug/L < 0.986 < 0.956	Group	Specie	Method	Units		-	2		Average	ಶ	Ratio
4-Chioro-2-methyphenol SW 8270 ug/L < 0.978 < 0.972											
4-Drinobphenyl SW 8270 ug/L < 0.918 < 0.919 4-Drinophenyl phe	Organics, Semi-volatile	4,6-Dinitro-2-methylphenol	SW 8270	√g ng/F	٧	0.972		V	0.972	;	10% %
## Hormopheny pheny SW 8270 ug/L C 0.56 ## Chitoco-Amethyphenic SW 8270 ug/L C 0.887 C 0.887 ## Chitoco-Amethypheny ether SW 8270 ug/L C 0.648 C 0.768 C 0.768 ## Authrophenic SW 8270 ug/L C 0.594 C 0.768 C 0.768 ## Acenaphthyene SW 8270 ug/L C 0.587 C 0.287 ## Acenaphthyene SW 8270 ug/L C 0.277 C 0.277 ## Acenaphthyene SW 8270 ug/L C 0.277 C 0.277 ## Acenaphthyene SW 8270 ug/L C 0.277 C 0.277 ## Anthracene SW 8270 ug/L C 0.277 C 0.277 ## Anthracene SW 8270 ug/L C 0.277 C 0.277 ## Benzo(a) anthracene SW 8270 ug/L C 0.477 C 0.47 ## Benzo(a) flucianthene SW 8270 ug/L C 0.47 C 0.47 ## Benzo(a) flucianthene SW 8270 ug/L C 0.47 C 0.47 ## Benzo(a) flucianthene SW 8270 ug/L C 0.598 C 0.598 ## Benzo(a) flucianthene SW 8270 ug/L C 0.598 C 0.598 ## Benzo(a) flucianthene SW 8270 ug/L C 0.599 C 0.598 ## Benzo(a) flucianthene SW 8270 ug/L C 0.599 C 0.599 ## Benzo(a) flucianthene SW 8270 ug/L C 0.590 C 0.590 ## Benzo(a) flucianthene SW 8270 ug/L C 0.592 C 0.590 ## Dibenz(a) anthracene SW 8270 ug/L C 0.592 C 0.590 ## Dibenz(a) anthracene SW 8270 ug/L C 0.592 C 0.590 ## Dibenz(a) anthracene SW 8270 ug/L C 0.592 C 0.590 ## Dibenz(a) anthracene SW 8270 ug/L C 0.592 C 0.590 ## Dibenz(a) anthracene SW 8270 ug/L C 0.592 C 0.590 ## Dibenz(a) anthracene SW 8270 ug/L C 0.590 C 0.590 ## Dibenz(a) anthracene SW 8270 ug/L C 0.590 C 0.590 ## Dibenz(a) anthracene SW 8270 ug/L C 0.590 C 0.590 ## Dibenz(a) anthracene SW 8270 ug/L C 0.590 C 0.590 ## Dibenz(a) anthracene SW 8270 ug/L C 0.590 C 0.590 ## Dibenz(a) anthracene SW 8270 ug/L C 0.590 C 0.590 ## Dibenz(a) anthracene SW 8270 ug/L C 0.590 C 0.590 ## Dibenz(a) anthracene SW 8270 ug/L C 0.590 C 0.590 ## Dibenz(a) anthracene SW 8270 ug/L C 0.590 C 0.590 ## Dibenz(a) anthracene SW 8270 ug/L C 0.590 C 0.590 ## Dibenz(a) ant	Organics, Semi-votatile	4-Aminobiphenyl	SW 8270	ug/L	٧	0.918		٧	0.918	:	100%
4-Chloro-3-methylphenol SW 8270 ug/L < 0.887 < 0.848 4-Chloro-3-methylphenol (p-cread) SW 8270 ug/L < 0.648	Organics, Semi-volatile	4-Bromophenyl phenyl	SW 8270	ug/L	٧	0.56		٧	0.56	;	100%
4-Chlorophenyl phenyl ether SW 8270 ug/L < 0.648 < 0.648	Organics, Semi-volatile	4-Chloro-3-methylphenol	SW 8270	ug/L	٧	0.887		٧	0.887	:	100%
4-Methylphenol(p-cresol) SW 8270 ug/L c 0.706 4-Minophenol SW 8270 ug/L c 0.848 c 0.594 7,12-Dimethylbenz(a)anthracene SW 8270 ug/L c 0.848 c 0.848 Acenaphthylene (a) Minophenol SW 8270 ug/L c 0.587 c 0.587 Acenaphthylene (a) SW 8270 ug/L c 0.277 c 0.277 Antiline (a) SW 8270 ug/L c 0.563 c 0.587 Antiline (a) SW 8270 ug/L c 0.713 c 0.713 Benzo(a)anthracene (a) SW 8270 ug/L c 0.632 c 0.632 0.632 0.677 0.568 0.632 0.632 0.632 0.632 0.632 0.632 0.632 0.632 <	Organics, Semi-volatile	4-Chlorophenyl phenyl ether	SW 8270	ug/L	٧	0.648		v	0.648	:	100%
4-Nitrophenol SW 8270 ug/L < 0.594 < 0.594 4-Nitrophenol SW 8270 ug/L < 0.846	Organics, Semi-volatile	4-Methylphenol(p-cresol)	SW 8270	ng/L	٧	0.706		v	90.70	;	100%
4-Nitrophenol SW 8270 ug/L < 0.848 . 0.848 . 0.848 . 0.848 . 0.848 . 0.848 . 0.848 . 0.848 . 0.848 . 0.848 . 0.848 . 0.848 . 0.847 . 0.848	Organics, Semi-volatile	4-Nitroanitine	SW 8270	ug/L	٧	0.594		٧	0.594	:	100%
7,12-Dimethylbenz(a)anthracene SW 8270 ug/L < 2.36 2.36 Acenaphthene SW 8270 ug/L < 0.587	Organics, Semi-volatile	4-Nitrophenol	SW 8270	ug/L	٧	0.848		V	0.848	:	100%
Acenaphthene SW 8270 ug/L < 0.587	Organics, Semi-volatile	7,12-Dimethylbenz(a)anthracene	SW 8270	ug/L	٧	2.36		٧	2.36	:	100%
Acetophenone SW 8270 ug/L < 0.277 Acetophenone SW 8270 ug/L < 0.563	Organics, Semi-volatile	Acenaphthene	SW 8270	ng/L	٧	0.587		V	0.587	:	100%
Acetophenone SW 8270 ug/L < 0.563 < 0.563 Antiline SW 8270 ug/L < 1.14	Organics, Semi-volatile	Acenaphthylene	SW 8270	ng/L	٧	0.277		٧	0.277	:	100%
Antiline SW 8270 ug/L < 1.14 - 1.14 - 1.14 Anthracene SW 8270 ug/L < 0.713	Organics, Semi-volatile	Acetophenone	SW 8270	ng/L	V	0.563		V	0.563	:	100%
Anthracene SW 8270 ugf. < 0.713 Benzo(a)anthracene SW 8270 ugf. < 20	Organics, Semi-volatile	Aniline	SW 8270	J/Gn	٧	1.14		v	1.14	:	100%
Benzolajne SW 8270 ug/L < 20 < 20 Benzo(a)anthracene SW 8270 ug/L < 0.632	Organics, Semi-volatile	Anthracene	SW 8270	ng/L	٧	0.713		v	0.713	:	100%
Benzo(a)anthracene SW 8270 ug/L < 0.632 Benzo(a)pyrene SW 8270 ug/L < 0.47	Organics, Semi-volatile	Benzidine	SW 8270	rg/L	V	29		v	8	1	100%
Benzo(a)pyrene SW 8270 ug/L < 0.47 < 0.47 Benzo(b)fluoranthene SW 8270 ug/L < 0.596	Organics, Semi-volatile	Benzo(a)anthracene	SW 8270	ng/L	v	0.632		v	0.632	:	100%
Benzo(gh,i)perylene SW 8270 ug/L < 0.598 - 0.598	Organics, Semi-volatile	Benzo(a)pyrene	SW 8270	ng/L	٧	0.47		v	0.47	:	100%
Benzo(g,h,i)perylene SW 8270 ug/L < 0.598 Benzo(k)fluoranthene SW 8270 ug/L < 1.19	Organics, Semi-votatile	Benzo(b)fluoranthene	SW 8270	ng/L	٧	969'0		v	969.0	:	100%
Benzo(k)fluoranthene SW 8270 ug/L < 1.19 Benzolc acid SW 8270 ug/L < 4.86	Organics, Semi-votatile	Benzo(g,h,i)perylene	SW 8270	rgy V	٧	0.598		V	0.598	:	100%
Benzolo acid SW 8270 ug/L < 4.86 < 4.86 Benzyl alcohol SW 8270 ug/L < 1.33	Organics, Semi-volatile	Benzo(k)fluoranthene	SW 8270	ng/L	V	1.19		٧	1.19	:	100%
Benzyl alcohol SW 8270 ug/L < 1.33 Chrysene SW 8270 ug/L < 0.839	Organics, Semi-volatile	Benzoic acid	SW 8270	J/gn	٧	4.86		v	4.86	:	100%
Butylbenzylphthalate SW 8270 ug/L 0.539 Chrysene SW 8270 ug/L < 0.821	Organics, Semi-volatile	Benzył akohol	SW 8270	ng/L	V	1.33		٧	8	:	100%
Chrysene SW 8270 ug/L < 0.821 Di-n-octyfphthalate SW 8270 ug/L < 1.12	Organics, Semi-volatile	Butylbenzylphthalate	SW 8270	√gn		0.539			0.539	:	
Di-n-octyphthalate SW 8270 ug/L < 1.12 Dibenz(a,h)anthracene SW 8270 ug/L < 0.582	Organics, Semi-volatile	Chrysene	SW 8270	ng/L	٧	0.821		٧	0.821	:	100%
Dibenz(a,h)anthracene SW 8270 ug/L < 0.582 Dibenz(a,j)acridine SW 8270 ug/L < 0.713	Organics, Semi-volatile	Di-n-octyfphthalate	SW 8270	ng/L	v	1.12		٧	1.12	:	100%
Dibenz(a,j)acridine SW 8270 ug/L < 0.713 Dibenzofuran SW 8270 ug/L < 0.501	Organics, Semi-volatile	Dibenz(a,h)anthracene	SW 8270	J/Bn	٧	0.582		v	0.582	:	100%
Dibenzofuran SW 8270 ug/L < 0.501 < 0.501 Dibuty/phthalate SW 8270 ug/L < 0.412	Organics, Semi-volatile	Dibenz(a,j)acridine	SW 8270	ng/L	٧	0.713		٧	0.713	;	100%
Dibutyphthalate SW 8270 ug/L < 0.605 Diethylphthalate SW 8270 ug/L < 0.412	Organics, Seml-volatile	Dibenzofuran	SW 8270	ng/L	٧	0.501		٧	0.501	;	100%
Directhylphthalate SW 8270 ug/L < 0.412 Directhylphenettylamine SW 8270 ug/L < 120 < 120 Coal Pile Run-off - Page 2	Organics, Semi-volatile	DibutyIphthalate	SW 8270	ng/L	٧	0.605		٧	0.605	:	100%
Dimethylphenethylamine SW 8270 ug/L < 120 Coal Pile Run-off - Page 2	Organics, Semi-volatile	Diethylphthalate	SW 8270	ng/L	٧	0.412		٧	0.412	;	100%
Page	Organics, Semi-volatile	Dimethylphenethylamine	SW 8270	ng/L	٧	8		v	52	•	100%
			ပိ	al Pile	2		age 2				

Sample Stream: Coal Pile Run-off

Specie Method Units 1 2 Average CI Diphenylamine SW 8270 ug/L < 0.844 < 0.344 Diphenylamine SW 8270 ug/L < 0.617 < 0.617 Fluoranthore SW 8270 ug/L < 0.783 < 0.617 Fluoranthore SW 8270 ug/L < 0.783 < 0.287 Hexachlorobratisene SW 8270 ug/L < 0.729 < 0.287 Hexachlorochtratiene SW 8270 ug/L < 0.729 < 0.287 Hexachlorochtratiene SW 8270 ug/L < 0.729 < 0.729 Hexachlorochtratiene SW 8270 ug/L < 0.854 < 0.729 Inderect (1.23-cd)pyrene SW 8270 ug/L < 5.00 < 0.729 Inderect (1.23-cd)pyrene SW 8270 ug/L < 5.00 < 0.854 N-Mitrosoclimethylene SW 8270 ug/L < 0.854	Group	-lood3									
Dimethylphthalete SW 8270 ugL c 0.344 c 0.344 Dipherylamine SW 8270 ugL c 0.648 c 0.648 Fluoranthene SW 8270 ugL c 0.617 c 0.617 Fluoranthene SW 8270 ugL c 0.643 c 0.641 Hexachloroberzene SW 8270 ugL c 0.647 c 0.648 Hexachloroberzene SW 8270 ugL c 0.656 c 0.648 Hexachloroberzene SW 8270 ugL c 0.729 c 0.643 Hexachloroberzene SW 8270 ugL c 0.729 c 0.644 Hexachlorophymene SW 8270 ugL c 0.644 c 0.644 Makhy methanesulforane SW 8270 ugL c 0.644 c 0.644 N-Nitrosodipropylamine SW 8270 ugL c 0.644 c 0.644 N-A		Specie	Method	Units		-	2		Average	5	Ratio
Dipherylamine SW 8270 ugl. < 0.648 < 0.648 Fluorente SW 8270 ugl. < 0.617	Organics, Semi-volatile	Dimethylphthalate	SW 8270	J/Bn	٧	0.344		٧	0.344	:	100%
Ethyl methanesulinate SW 8270 ugL < 0.817 < 0.617 Fluoranthene SW 8270 ugL < 0.783	broanies Semi-volatile	Dichendamine	SW 8270	הם הם	V	0.648		٧	0.648	;	100%
Fluoranthene SW 8270 ug/L < 0.783 Hexachloroberacene SW 8270 ug/L < 0.412	Organics, Semi-volatile	Ethyl methanesulfonate	SW 8270	M	٧	0.617		٧	0.617	:	100%
Fluorene SW 8270 ug/L < 0.412 < 0.412 < 0.412 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287 < 0.287	organics, Semi-volatile	Fluoranthene	SW 8270	ng/L	٧	0.783		٧	0.783	;	100%
Hexachlorobrazene SW 8270 ug/L c 0.287 c 0.287 Hexachlorobutadlene SW 8270 ug/L c 0.856 c 0.656 Hexachlorocyclopentadrene SW 8270 ug/L c 0.729 c 0.729 Indeno(1,2,3-cd)pyrene SW 8270 ug/L c 0.544 c 0.729 Methyl methanesulforate SW 8270 ug/L c 0.544 c 0.352 N-Nitroso-din-butylamine SW 8270 ug/L c 1.61 c 0.352 N-Nitroso-din-butylamine SW 8270 ug/L c 0.694 c 0.644 N-Nitroso-din-butylamine SW 8270 ug/L c 1.63 c 1.61 c N-Nitroso-din-butylamine SW 8270 ug/L c 1.63 c 1.61 c N-Nitroso-din-putylamine SW 8270 ug/L c 1.63 c 1.63 c Pentachlorobreviere SW 8270 ug/L<	organics, Semi-volatile	Fluorene	SW 8270	ug/	٧	0.412		٧	0.412	;	100%
Hexachlorocyclopentacliene SW 8270 ug/L < 10.9 Hexachlorocyclopentacliene SW 8270 ug/L < 10.9	rganics, Semi-volatile	Hexachlorobenzene	SW 8270	- Joh	v	0.287		V	0.287	;	100%
Hexachlorocyclopentadiene SW 8270 ug/L < 10.9 Hexachlorocyclopentadiene SW 8270 ug/L < 0.729	organics, Semi-volatile	Hexachlorobutadiene	SW 8270	ng/L	v	0.856		٧	0.856	:	100%
Hexachloroethane SW 8270 ug/L < 0.729 < 0.729 Indenc(1,2,3-cd)pyrene SW 8270 ug/L < 0.352	rganics, Semi-volatile	Hexachlorocyclopentadiene	SW 8270	ng/L	٧	10.9		٧	6.01	:	100%
Indenc(1,2,3-cd)pyrene SW 8270 ug/L < 0.844 < 0.844 < 0.844	rganics, Semi-votatile	Hexachloroethane	SW 8270	rg,	٧	0.729		٧	0.729	:	±00±
Septionone SW 8270 Ug/L	rganics, Semi-volatile	Indeno(1,2,3-cd)pyrene	SW 8270	rg/	٧	0.644		v	0.644	;	100%
Methyl methanesulfonate SW 8270 ug/L < 161 N-Nitroso-din-butylamine SW 8270 ug/L < 163	rganics, Semi-volatile	Isophorone	SW 8270	ng/L	v	0.352		v	0.352	;	100%
N. Nitroso-di-n-butylamine SW 8270 ugfL < 1.61 < 1.61 N-Nitrosodimethylamine SW 8270 ugfL < 1.63	rganics, Semi-volatile	Methyl methanesulfonate	SW 8270	ng/L	٧	25		٧	ଜ	:	100%
N-Nitrosodimethylamine SW 8270 ug/L < 163 - 16	rganics, Semi-volatite	N-Nitroso-di-n-butylamine	SW 8270	J/Ĝn	٧	1.61		٧	1.61	:	100%
N-Nitrosodiphenylarnine SW 8270 ug/L < 0.694 N-Nitrosodipropylarnine SW 8270 ug/L < 1.16	rganics, Semi-volatile	N-Nitrosodimethylamine	SW 8270	ď,	٧	1.63		٧	1.63	;	100%
N-Nitrosodipropylamine SW 8270 ug/L < 0.921 N-Nitrosodipropylamine SW 8270 ug/L < 1.16	rganics, Semi-volatile	N-Nitrosodiphenylamine	SW 8270	ug/L	v	0.694		٧	0.694	:	100%
N-Nitrosopiperidine SW 8270 ug/L < 1.16 Naphthalene SW 8270 ug/L < 0.894	rganics, Semi-volatile	N-Nitrosodipropylamine	SW 8270	7/Bn	٧	0.921		٧	0.921	;	100%
Naphthalene SW 8270 ug/L < 0.894 Nitrobenzene SW 8270 ug/L < 0.648	rganics, Semi-volatite	N-Nitrosopiperidine	SW 8270	J/Ĝn	٧	1.16		٧	1.16	;	100%
Niktrobenzene SW 8270 ug/L < 0.648	rganics, Semi-votatile	Naphthalene	SW 8270	'n,	v	0.894		v	0.894	:	±00%
Pentachlorobenzene SW 8270 ug/L < 0.544 < 0.544 < 0.544 Pentachlorophenol SW 8270 ug/L < 1.06	rganics, Semi-volatile	Nitrobenzene	SW 8270	ng/L	٧	0.648		٧	0.648	:	100%
Pentachloronitrobenzene SW 8270 ug/L < 2.54 Pentachlorophenol SW 8270 ug/L < 0.663	rganics, Semi-volatile	Pentachlorobenzene	SW 8270	ug/L	v	0.544		٧	0.544	:	100%
Pentachlorophenol SW 8270 ug/L < 1.06 Phenacetin SW 8270 ug/L < 0.663	rganics, Semi-volatile	Pentachloronitrobenzene	SW 8270	rg/	٧	2.54		٧	2.54	:	100%
Phenacetin SW 8270 ug/L < 0.663 Phenarithrene SW 8270 ug/L < 0.763	rganics, Semi-votatile	Pentachlorophenol	SW 8270	rg/L	٧	1.06		٧	1.06	:	100%
Phenanthrene SW 8270 ug/L < 0.763 Phenol SW 8270 ug/L < 0.49	rganics, Semi-volatile	Phenacetin	SW 8270	ĘŶ	٧	0.663		٧	0.663	;	100%
Phenol SW 8270 ug/L < 0.49 0.49 Pyrene SW 8270 ug/L < 0.574	rganics, Semi-volatile	Phenanthrene	SW 8270	J/Ŝn	v	0.763		٧	0.763	;	100%
Pronamide SW 8270 ug/L < 0.907 Pyrene SW 8270 ug/L < 0.574	rganics, Semi-volatile	Phenol	SW 8270	ng/L	٧	0.49		٧	0.49	ţ	100%
Pyrene SW 8270 ug/L < 0.574 < 0.574 Pyridine SW 8270 ug/L < 1.42	rganics, Seml-volatile	Pronamide	SW 8270	lg.	v	0.907		٧	0.907	:	100%
Pyridine SW 8270 ug/L < 1.42 < 1.42 1.42	rganics, Semi-volatile	Pyrene	SW 8270	√g/L	v	0.574		٧	0.574	:	100%
bis(2-Chloroethoxy)methane SW 8270 ug/L < 0.69	rganics, Semi-volatile	Pyridine	SW 8270	ng/L	٧	1.42		٧	1.42	;	100%
bis(2-Chloroethyl)ether SW 8270 ug/L < 0.898 ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '	rganics, Semi-volatile	bis(2-Chloroethoxy)methane	SW 8270	rgo/L	٧	0.69		v	0.69	1	100%
bis(2-Chloroisopropyl)ether SW 8270 ug/L < 0.891	rganics, Semi-volatile	bis(2-Chloroethyl)ether	SW 8270	ng/L	٧	0.898		٧	0.898	;	100%
	Organics, Semi-volatile	bis(2-Chloroisopropyl)ether	SW 8270	rg,	٧	0.891		٧	0.891	:	100%

Sample Stream: Coal Pile Run-off

Analyte		Analytical			Run	Run			36%	占
Group	Specie	Method	Units	1	-	2		Average	5	Ratio
Organics, Semi-volatile	bis(2-Ethylhexyl)phthalate	SW 8270	ug/L		3.3			3.3	:	
Organics, Semi-volatile	p-Chloroaniline	SW 8270	ng/L	v	0.686		v	989.0	;	100%
Organics, Semi-volatile	p-Dimethylaminoazobenzene	SW 8270	ng/L	v	0.632		٧	0.632	:	100 %
Organics, Volatile	1,1,1-Trichloroethane	SW 8240	ng/L	v	ro.	ە ما	٧	ស	:	100%
Organics, Volatile	1,1,2,2-Tetrachloroethane	SW 8240	η δ η	v	ıs.	A TU	٧	ιo	;	100%
Organics, Volatile	1,1,2-Trichloroethane	SW 8240	ng/	v	w	۸ ص	٧	40	:	100%
Organics, Votatile	1,1-Dichloroethane	SW 8240	ug/L	v	ιΩ	ហ v	٧	က	:	100%
Organics, Volatile	1,1-Dichloroethene	SW 8240	ug/L	٧	2	۸ ان	v	လ	:	100%
Organics, Volatile	1,2-Dichloroethane	SW 8240	ng/L	٧	S	v 2	٧	တ	;	100%
Organics, Volatile	1,2-Dichloroethene (total)	SW 8240	ng/L	٧	2	v 2	٧	ည	;	100%
Organics, Volatile	1,2-Dichloropropane	SW 8240	ng/L	٧	5	۸ ص	٧	£	;	100%
Organics, Volatile	2-Butanone (MEK)	SW 8240	ug/L	v	0	^ 0	٧	9	:	100%
Organics, Volatile	2-Hexanone	SW 8240	ng/L	٧	0	۰ 5	٧	£	:	100%
Organics, Volatile	4-Methyl-2-pentanone (MIBK)	SW 8240	ng/L	٧	9	۰ 5	٧	10	:	100%
Organics, Volatile	Acetone	SW 8240	ug/L		8	20		4	254	
Organics, Volatile	Benzene	SW 8240	ng/L	٧	r.	v v	V	ιΩ	:	100%
Organics, Volatile	Bromodichloromethane	SW 8240	ug/L	٧	သ	۸ دن	v	ĸ	:	100%
Organics, Volatile	Bromoform	SW 8240	ng/L	v	S	v v	٧	ß	:	100%
Organics, Volatile	Bromomethane	SW 8240	ng/L	v	5	۰ 10	V	\$:	100%
Organics, Volatile	Carbon Disulfide	SW 8240	ng/L	٧	S.	۸ ئ	٧	ស	:	100%
Organics, Volatile	Carbon Tetrachloride	SW 8240	ng/L	٧	SO.	v v	v	မာ	:	100%
Organics, Volatile	Chlorobenzene	SW 8240	ng/L	٧	S.	۸ 50	٧	S	:	100%
Organics, Volatile	Chloroethane	SW 8240	ng/L	v	10	, 5	٧	9	:	100%
Organics, Volatile	Chloroform	SW 8240	ng/L	v	S)	v S	٧	ស	:	100%
Organics, Volatile	Chloromethane	SW 8240	ng/L	٧	10	^ 10	٧	9	:	100%
Organics, Volatile	Dibromochloromethane	SW 8240	ng/L	v	ß	۸ دۍ	V	ß	:	100%
Organics, Volatile	Ethylbenzene	SW 8240	ug/L	٧	S.	v v	٧	S	:	100%
Organics, Volatile	Methylene Chloride	SW 8240	ug/L	٧	2	3.5 J	v	2	:	71%
Organics, Volatile	Styrene	SW 8240	ng/L	٧	ro.	v v	v	တ	;	100%
Organics, Volatile	Tetrachloroethene	SW 8240	ng/L	٧	Z.	so v	v	ß	:	100%

Coal Pile Run-off - Page 4

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DL Ratio	%00I	100%	%00%	300	£00	%00%	%00I
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4	v	v	v	v	v	v	v
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₽ ~	ហ	40	6	5	9	လ	ഗ
ľ	v	٧	v	٧	٧	v	٧
Units	ng/L	ng/Ľ	ng/L	J/Ĝn	ųgų.	ng/L	ng/L
Analytical Method Units	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240	SW 8240
Specie	Toluene	Trichloroethene	Vinyl acetate	Vinyl chloride	Xylenes	cis-1,3-Dichloropropene	trans-1,3-Dichloropropene
Analyte Group	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile	Organics, Volatile

APPENDIX I: DEVELOPMENT OF MASS BALANCE EQUATIONS AND EXAMPLE CALCULATIONS

Mass Balances

Mass balances for ash and trace metals around Plant Yates power generation and emission control systems were calculated as a check on data consistency. Mass balances were calculated for the following processes: boiler, ESP, JBR, and total plant. The mathematical expressions used are developed in the paragraphs below.

A general mass balance equation which applies to any system is:

For all species, the generation term in Equation I-1 is equal to zero. Ash is considered to be a component of coal and not to be generated. Mass balance closure is defined by the following expression:

% Closure =
$$100 * \frac{Out}{In-Accumulation}$$
 (I-2)

Uncertainties for mass balance closures (95% confidence intervals) were calculated using an error propagation analysis method based on ANSI/SME PTC 19.1-1985, "Measurement Uncertainty." The development of this method is treated in Appendix F.

The following sections detail the development of mass balances for the boiler, ESP, JBR and total plant (power generation and emission control systems). The equations are developed from Equation I-1 above. The purpose of this development is to present the variables considered in each mass balance. The equations presented below are simplified for clarity. The exact equations, which are more complex, are presented in Table I-1.

Table I-1 Detailed Mass Balance Equations

Mass Balance About Boiler:

$$Closure = 100 * \frac{(F_{coal} (1 - C_{w,coal}) C_{ash,coal} - Q_{espin} C_{ash,espin}) C_{i,bottomash} + Q_{espin} (C_{i,espin,v} + C_{i,espin,s})}{F_{coal} (1 - C_{w,coal}) C_{i,coal}}$$

Mass Balance About ESP:

Closure =
$$100 * \frac{(Q_{\text{capin}} C_{\text{ash,espin}} - Q_{\text{capout}} C_{\text{ash,espout}}) C_{i,\text{collected ash}} + Q_{\text{espout}} (C_{i,\text{espout},v} + C_{i,\text{espout},s})}{Q_{\text{espin}} (C_{i,\text{espin},v} + C_{i,\text{espin},s})}$$

Mass Balance About JBR:

Closure =
$$100 * \frac{O_{JBR}}{I_{JBR}}$$

where,

$$I_{JBR} = -\frac{\Delta M_{i}}{\Delta t} + Q_{espout} \left(C_{i,espout,v} + C_{i,espout,s}\right) + \left(F_{return,FT128} + F_{return,FT142} + F_{return,FT150B}\right)$$

$$* C_{i,return} + F_{makeup,FT150A} C_{i,makeup} + F_{ls} \left[\frac{C_{solids,ls} C_{i,solids,ls} + \hat{V}_{i,ls}(1 - C_{solids,ls}) C_{i,liq,ls}}{C_{solids,ls}\hat{V}_{s,ls} + (1 - C_{solids,ls})\hat{V}_{i,ls}}\right]$$

$$O_{JBR} = F_{bdwn \ FT162A} \left[\frac{C_{solids,bdwn} \ C_{i,solids,bdwn} + \hat{V}_{l,bdwn} \left(1 - C_{solids,bdwn}\right) \ C_{i,liq,bdwn}}{C_{solids,bdwn} \ \hat{V}_{s,bdwn} + \left(1 - C_{solids}\right) \ \hat{V}_{l,bdwn}} \right] + Q_{stackgas} \left(C_{i,stackgas,v} + C_{i,stackgas,s}\right)$$

Table I-1 (Continued)

$$\begin{split} \frac{\Delta M_{i}}{\Delta t} &= \frac{A_{IBR}}{\Delta t} \left[C_{i,solida,IBR} \left(\left[\frac{L_{TBR} C_{solida,IBR}}{C_{solida,IBR} \hat{V}_{s,IBR} + \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}} \right]_{t} - \left[\frac{L_{TBR} C_{solida,IBR}}{C_{solida,IBR} \hat{V}_{s,IBR} + \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}} \right]_{t} - \frac{L_{TBR} C_{solida,IBR}}{C_{solida,IBR} \hat{V}_{s,IBR} + \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}} \right]_{t-\Delta t} \right] \\ &+ \left[C_{i,liq,IBR} \left(\left[\frac{L_{TBR} \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}}{C_{solida,IBR} \hat{V}_{s,IBR} + \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}} \right]_{t} \left[\frac{L_{TBR} \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}}{C_{solida,IBR} \hat{V}_{s,IBR} + \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}} \right]_{t-\Delta t} \right] \\ &+ \left[C_{i,liq,IBR} \left(\left[\frac{L_{TBR} \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}}{C_{solida,IBR} \hat{V}_{s,IBR} + \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}} \right]_{t-\Delta t} \right] \right] \\ &+ \left[C_{i,liq,IBR} \left(\left[\frac{L_{TBR} \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}}{C_{solida,IBR} \hat{V}_{s,IBR} + \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}} \right]_{t-\Delta t} \right] \right] \\ &+ \left[C_{i,liq,IBR} \left(\left[\frac{L_{TBR} \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}}{C_{solida,IBR} \hat{V}_{s,IBR} + \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}} \right]_{t-\Delta t} \right] \right] \\ &+ \left[C_{i,liq,IBR} \left(\left[\frac{L_{TBR} \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}}{C_{solida,IBR} \hat{V}_{s,IBR} + \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}} \right]_{t-\Delta t} \right] \right] \\ &+ \left[C_{i,liq,IBR} \left(\left[\frac{L_{TBR} \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}}{C_{solida,IBR} \hat{V}_{s,IBR} + \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}} \right]_{t-\Delta t} \right] \right] \\ &+ \left[C_{i,liq,IBR} \left(\left[\frac{L_{TBR} \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}}{C_{solida,IBR} \hat{V}_{s,IBR} + \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}} \right]_{t-\Delta t} \right] \right] \\ &+ \left[C_{i,liq,IBR} \left(\frac{L_{TBR} \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}}{C_{solida,IBR} \hat{V}_{s,IBR} + \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}} \right]_{t-\Delta t} \right] \\ &+ \left[C_{i,liq,IBR} \left(\frac{L_{TBR} \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}}{C_{solida,IBR} \hat{V}_{s,IBR} + \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR} \right]_{t-\Delta t} \right] \\ &+ \left[C_{i,liq,IBR} \left(\frac{L_{TBR} \left(1 - C_{solida,IBR} \right) \hat{V}_{i,IBR}}{C_{solida,IBR} \hat{V}_{s,IBR} + \left($$

Mass Balance About Entire Plant

Closure =
$$100 * \frac{O_{plant}}{I_{plant}}$$

where,

$$I_{plant} = -\frac{\Delta M_{i}}{\Delta t} + F_{coal} \left(1 - C_{w,coal}\right) C_{i,coal} + \left(F_{return,FT128} + F_{return,FT142} + F_{return,FT150B}\right) C_{i,return} + F_{makeup,FT150A} C_{i,makeup} + F_{ls} \left[\frac{C_{solids,ls} C_{i,solids,ls} + \hat{V}_{l,ls} \left(1 - C_{solids,ls}\right) C_{i,liq,ls}}{C_{solids,ls} \hat{V}_{s,ls} + \left(1 - C_{solids,ls}\right) \hat{V}_{l,ls}}\right]$$

$$\begin{aligned} O_{plant} &= Q_{stackgas} \left(\overset{\bullet}{C}_{i,stackgas,v} + \overset{\bullet}{C}_{i,stackgas,s} \right) \\ &+ F_{bdwn,FT162A} \left[\frac{\overset{\bullet}{C}_{solids,bdwn} \overset{\bullet}{C}_{i,solids,bdwn} + \mathring{V}_{l,bdwn} \left(1 - \overset{\bullet}{C}_{solids,bdwn} \right) \overset{\bullet}{C}_{i,liq,bdwn}}{\overset{\bullet}{C}_{solids,bdwn} \overset{\bullet}{V}_{s,bdwn} + \left(1 - \overset{\bullet}{C}_{solids,bdwn} \right) \mathring{V}_{l,bdwn}} \right] \\ &+ \left[F_{coal} \left(1 - \overset{\bullet}{C}_{w,coal} \right) \overset{\bullet}{C}_{ash,coal} - \overset{\bullet}{Q}_{espin} \overset{\bullet}{C}_{ash,espin} \right] \overset{\bullet}{C}_{i,bottomash} \\ &+ \left[\overset{\bullet}{Q}_{espin} \overset{\bullet}{C}_{ash,espin} - \overset{\bullet}{Q}_{espout} \overset{\bullet}{C}_{ash,espout} \right] \overset{\bullet}{C}_{i,colloctedash} \end{aligned}$$

Boiler

The following form of Equation I-1 applies to the boiler:

The accumulation term for ash and trace metal species in the boiler is small and was neglected. For ash, Equation I-3 is expressed mathematically as:

$$F_{\text{coal}} C_{\text{ash.coal}} = F_{\text{bottomash}} + Q_{\text{estrin}} C_{\text{ash.estrin}}$$
 (I-4)

Since the bottom ash flow rate could not be measured accurately, Equation I-4 was used to calculate it. The concentrations of trace metal species in combustion air are very low and were neglected. Applied to a trace metal species, Equation I-3 becomes:

$$F_{\text{coal}} C_{i,\text{coal}} = F_{\text{bottomash}} C_{i,\text{bottomash}} + Q_{\text{espin}} C_{i,\text{espin}}$$
 (I-5)

The exact equation used in calculating the data presented in Table 6-2 in Section 6 was obtained by substituting Equation I-4 into Equation I-5 and rewriting in closure format. This equation is located in Table I-1.

ESP

The following form of Equation I-1 applies to the ESP:

The accumulation term for solids and trace metals is small and was neglected. For ash, Equation I-6, expressed mathematically, becomes:

$$Q_{esprin} C_{ash,esprin} = Q_{espout} C_{ash,espout} + F_{collectedash}$$
 (I-7)

Since the collected fly ash flow rate could not be measured, Equation I-7 was used to solve for it. Applied for a trace species, Equation I-6 becomes:

$$Q_{espin} C_{i,espin} = Q_{espout} C_{i,espout} + F_{collectedash} C_{i,collectedash}$$
 (I-8)

The exact equation used in calculating the data presented in Table 6-2 of Section 6 was obtained by substituting Equation I-7 into Equation I-8 and rewriting in closure format. This equation is located in Table I-1.

JBR

The following form of Equation 1 applies to the JBR:

In the JBR, because of potential changes in volume or slurry solids concentration, the accumulation of solids and trace metals was not considered to be negligible over the test period. Mass flows of trace metal species in oxidation air are very low and were neglected. For a trace metal species, Equation I-1 becomes:

$$\frac{dM_{i}}{dt} = Q_{espout} C_{i,espout} + F_{makeup} C_{i,makeup} + F_{return} C_{i,return}$$

$$+ [F_{is} C_{solids,is} + F_{is} C_{liq,is} C_{i,liq,is}]$$

$$- [(F_{bdwn} C_{solids} C_{i,solids} + F_{bdwn} C_{liq,bdwn} C_{i,liq,bdwn}) + Q_{stackgas} C_{i,stackgas}]$$
(I-10)

The accumulation term in Equation I-10 was approximated:

$$\frac{dM_i}{dt} \approx \frac{\Delta M_i}{\Delta t} \tag{I-11}$$

 ΔM_i , the change in the mass of a species in the JBR over a test period, was calculated with the following equation:

$$\Delta \mathbf{M}_{i} = \mathbf{A}_{JBR} \Delta \begin{bmatrix} \mathbf{L}_{JBR} & \mathbf{C}_{solids,JBR} & \mathbf{C}_{i,solids} + \mathbf{L}_{JBR} & (1 - \mathbf{C}_{solids,JBR}) & \hat{\mathbf{V}}_{1} & \mathbf{C}_{i,liq} \\ \mathbf{C}_{solids,JBR} & \hat{\mathbf{V}}_{s} + (1 - \mathbf{C}_{solids,JBR}) & \hat{\mathbf{V}}_{1} \end{bmatrix}$$
 (I-12)

The exact equation used in calculating the data presented in Table 6-2 of Section 6 was obtained by substituting Equation I-12 into Equation I-10 and rewriting in closure format. This equation is located in Table I-1. Densities used in making the above calculations are as follows: JBR solids (gypsum), 2.32 g/cc; limestone solids (CaCO₃), 2.72 g/cc; JBR and limestone liquid phase, 1.00 g/cc.

Total Plant

Equation I-1, applied to the combined power generation/emission control system is:

Since most trace metal species will be removed with the bottom and fly ash, the accumulation term in the JBR will be relatively small in the total plant balance. Accumulations in other vessels have been neglected in previous equations and are also neglected in Equation I-13. Trace metals concentrations in the combustion and oxidation air streams are very low and assumed negligible. Expressed mathematically for a trace species, Equation I-13 becomes:

$$\frac{\Delta M_{i,JBR}}{\Delta t} = F_{coal} C_{i,coal} + F_{return} C_{i,return} + F_{makeup} C_{i,makeup} + [F_{LS} C_{solids,LS} C_{i,solids,LS} + F_{LS} C_{liq,LS} C_{i,liq,LS}] - [Q_{stackgas} C_{stackgas} + F_{bdwn} C_{solids,bdwn} C_{i,solids,bdwn}] - [F_{bdwn} C_{liq,bdwn} C_{i,liq,bdwn}] - [F_{collectedash} C_{i,collectedash} + F_{bottomash} C_{i,bottomash}]$$
(I-14)

The exact equation used in calculating the data presented in Table 6-2 of Section 6 was obtained by substituting Equations I-4 and I-7 into Equation I-14 and rewriting in closure format. This equation is located in Table I-1.

Example Calculations

Emission Factor

The unit-energy-based emission factors were determined by dividing the mass flow rate of a substance being emitted by the heat input to the boiler during testing. Mathematically, Equation 6-3 of Section 6 can be expressed as:

Emission Factor for Species
$$i = \frac{Q_{\text{stackgas}} (C_{i,\text{stackgas},s} + C_{i,\text{stackgas},v})}{H_{\text{coal}} F_{\text{coal}} (1 - C_{\text{w,coal}})}$$
 (I-15)

Lead will be used for the following example calculation. The following data were taken from tables in Sections 3 and 5.

 $Q_{\text{stack gas}} = 456,000 \text{ Nm}^3/\text{hr}$

 $C_{i,stackgas,s} = 0.50 \,\mu g/Nm^3$

 $C_{i,stackgas,v} = \langle 0.22 \ \mu g/Nm^3 \rangle$; for calculations, use $0.11 \ \mu g/Nm^3$

 $H_{coal} = 12,700 \text{ Btu/lb}$

 $F_{coal} = 91,000 \text{ lb/hr (coal rejects subtracted)}$

 $C_{w,coal} = 0.117$ lb water/lb coal

The emission factor for lead is calculated directly from Equation I-15.

Emission Factor, Pb = 2202.6 *
$$\frac{456,000 (0.50 + 0.11)}{12,700 * 91,000 (1 - 0.117)} = 0.6 \frac{\text{lb}}{10^{12}\text{Btu}}$$
 (I-16)

Mass Balance

An example calculation for each of the mass balance equations presented in Table I-1 follows:

In this appendix, aluminum mass balance sample calculations are shown using equations and data from the report. The four sample calculations include boiler closure, ESP closure, JBR closure, and total plant closure.

Boiler Closure. The data required and the location of the data found in the report are shown below:

$$C_{i,coal} = 1.45 \times 10^7 \,\mu g/kg$$
 (Table 5-6)

$$F_{coal} = 4.13 \times 10^4 \text{ kg/hr} (9.1 \times 10^4 \text{ lb/hr})$$
 (Table 3-7)

$$C_{w,coal} = 0.117 \text{ kg/kg}$$
 (Table 3-7)

$$C_{ash,coal} = 0.111 \text{ kg/kg}$$
 (Table 3-7)

$$Q_{espin} = 2.84 \times 10^5 \text{ dscfm } (4.5 \times 10^5 \text{ Nm}^3/\text{hr})$$
 (Table 3-7)

$$C_{ash,cspin} = 3.64 \text{ gr/dscf } (0.00896 \text{ kg/Nm}^3)$$
 (Table 3-7)

$$C_{i,bottomash} = 7.61 \times 10^7 \,\mu\text{g/kg} \tag{Table 5-7}$$

$$C_{i,espin,s} = 8.7 \times 10^5 \,\mu g/Nm^3$$
 (Table 5-2)

$$C_{i,espin,v} = 146 \ \mu g/Nm^3$$
 (Table 5-2)

The material balance around the boiler is represented by the following equation:

$$Closure_{boller} = 100 * \frac{(F_{coal} (1 - C_{w,coal}) C_{ash,coal} - Q_{aspin} C_{ash,coal}) C_{i,bottomash} + Q_{aspin} (C_{i,capin,v} + C_{i,aspin,e})}{F_{coal} (1 - C_{w,coal}) C_{i,coal}}$$

Substitution of the values listed above results in the following boiler closure for aluminum:

 $Closure_{boiler} = 74\%$

ESP Closure. The data used in calculating the material balance closure around the ESP are shown as follows:

$$Q_{espin} = 2.84 \times 10^5 \text{ dscfm } (4.5 \times 10^5 \text{ Nm}^3/\text{hr})$$
 (Table 3-7)

$$C_{i,espin,s} = 8.7 \times 10^5 \,\mu g/Nm^3$$
 (Table 5-2)

$$C_{i,espin,v} = 146 \ \mu g/Nm^3$$
 (Table 5-2)

$$Q_{espout} = Q_{espin} (4.5 \times 10^5 \text{ Nm}^3/\text{hr})$$
 (Table 3-7)

$$C_{i,expout,s} = 1.21 \times 10^4 \ \mu g/Nm^3$$
 (Table 5-2)

$$C_{i,espout,v} = 57.5 \ \mu g/Nm^3$$
 (Table 5-2)

$$C_{\text{sub-expin}} = 3.64 \text{ gr/dscf} (8.96 \times 10^{-3} \text{ kg/Nm}^3)$$
 (Table 3-7)

$$C_{ash,espout} = 0.0577 \text{ gr/dscf } (1.42 \times 10^4 \text{ kg/Nm}^3)$$
 (Table 3-7)

$$C_{i,collectedash} = 9.8 \times 10^7 \,\mu\text{g/kg} \tag{Table 5-7}$$

The material balance closure equation for the ESP is represented by the following equation:

Closure_{ESP} =
$$100 * \frac{(Q_{espin} C_{sch,espin} - Q_{espont} C_{sch,espont}) C_{i,collected ash} + Q_{espont} (C_{i,espont,v} + C_{i,espont,v})}{Q_{espin} (C_{i,espin,v} + C_{i,espin,s})}$$

After substitution of the data presented above into this equation, the material balance closure for aluminum around the ESP is calculated to be:

$$Closure_{esp} = 101\%$$

 $L_{IBR,t} = 4.3 \text{ m}$

JBR Closure. Unlike the other unit operations considered at Plant Yates, the accumulation term for the JBR could be important in the material balance calculations. This is because the residence time of the slurry in the JBR is much greater than any of the sampling times. The first step shown is the calculation for one of the runs in Test Period 1. An average accumulation rate was calculated for each test period; the average of these was then used in the mass balance calculations.

Data required to calculate accumulation are as follows:

$$C_{i,liq,JBR} = 10.7 \text{ mg/L } (1.07 \text{ x } 10^7 \,\mu\text{g/m}^3) \qquad \qquad (App. \ H, \ Run-1)$$

$$A_{JBR} = 127 \ m^2 \qquad \qquad (Design \ Drawings)$$

$$\Delta t = 8 \ hr \qquad \qquad (Run \ 1)$$

$$C_{i,solids,JBR} = 1.03 \ x \ 10^6 \,\mu\text{g/kg} \qquad \qquad (App. \ H, \ Run \ 1)$$

$$L_{JBR,l-\Delta t} = 4.29 \ m \qquad \qquad (Average \ in \ Table \ 6-1)$$

$$V_{s,JBR} = 0.000431 \ m^3/\text{kg } (Sp. \ Gr. = 2.32) \qquad \qquad (App. \ I, \ p. \ 6)$$

$$V_{t,JBR} = 0.001 \ m^3/\text{kg } (Sp. \ Gr. = 1.0) \qquad \qquad (App. \ I, \ p. \ 6)$$

$$C_{solids,JBR,t-\Delta t} = 0.222 \ \text{kg/kg} \qquad \qquad (Average \ \% \ solids \ in \ Table \ 6-1)$$

$$C_{solids,JBR,t} = 0.223 \ \text{kg/kg} \qquad \qquad (Average \ \% \ solids \ in \ Table \ 6-1)$$

(Average level in Table 6-1)

The accumulation term $(\Delta m_i/\Delta t)$ is represented by the following equations. The change in mass of aluminum contained in the JBR during the run is calculated:

$$\Delta \mathbf{m}_{i} = \mathbf{A}_{\mathbf{JBR}} \begin{bmatrix} \mathbf{C}_{\mathbf{Lsolids},\mathbf{JBR}} & \frac{\mathbf{L}_{\mathbf{JER},t} \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t}}{\mathbf{C}_{\mathbf{solids},\mathbf{JBR}}(\hat{\mathbf{V}}_{\mathbf{s},\mathbf{JBR}} + (1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t})\hat{\mathbf{V}}_{\mathbf{L},\mathbf{JBR}}} \\ + \mathbf{C}_{\mathbf{L}\mathbf{liq},\mathbf{JBR}} & \frac{\mathbf{L}_{\mathbf{JBR},t}(1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t})\hat{\mathbf{V}}_{\mathbf{L},\mathbf{JBR}}}{\mathbf{C}_{\mathbf{solids},\mathbf{JBR},t}\hat{\mathbf{V}}_{\mathbf{s},\mathbf{JBR}} + (1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t})\hat{\mathbf{V}}_{\mathbf{L},\mathbf{JBR}}} \\ - \frac{\mathbf{L}_{\mathbf{JBR},t}(1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t})\hat{\mathbf{V}}_{\mathbf{L},\mathbf{JBR}}}{\mathbf{C}_{\mathbf{solids},\mathbf{JBR},t}\hat{\mathbf{V}}_{\mathbf{s},\mathbf{JBR}} + (1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t})\hat{\mathbf{V}}_{\mathbf{L},\mathbf{JBR}}} \\ - \frac{\mathbf{L}_{\mathbf{JBR},t - \Delta t}\hat{\mathbf{V}}_{\mathbf{s},\mathbf{JBR}} + (1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t - \Delta t})\hat{\mathbf{V}}_{\mathbf{L},\mathbf{JBR}}}{\mathbf{C}_{\mathbf{solids},\mathbf{JBR},t}\hat{\mathbf{V}}_{\mathbf{s},\mathbf{JBR}} + (1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t - \Delta t})\hat{\mathbf{V}}_{\mathbf{L},\mathbf{JBR}}} \\ - \frac{\mathbf{L}_{\mathbf{JBR},t - \Delta t}(1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t - \Delta t})\hat{\mathbf{V}}_{\mathbf{L},\mathbf{JBR}}}{\mathbf{C}_{\mathbf{solids},\mathbf{JBR},t - \Delta t}\hat{\mathbf{V}}_{\mathbf{s},\mathbf{JBR}} + (1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t - \Delta t})\hat{\mathbf{V}}_{\mathbf{L},\mathbf{JBR}}} \\ - \frac{\mathbf{L}_{\mathbf{JBR},t - \Delta t}\hat{\mathbf{V}}_{\mathbf{s},\mathbf{JBR}} + (1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t - \Delta t})\hat{\mathbf{V}}_{\mathbf{L},\mathbf{JBR}}}{\mathbf{C}_{\mathbf{solids},\mathbf{JBR},t - \Delta t}\hat{\mathbf{V}}_{\mathbf{s},\mathbf{JBR}} + (1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t - \Delta t})\hat{\mathbf{V}}_{\mathbf{L},\mathbf{JBR}}} \\ - \frac{\mathbf{L}_{\mathbf{JBR},t - \Delta t}\hat{\mathbf{V}}_{\mathbf{s},\mathbf{JBR}} + (1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t - \Delta t})\hat{\mathbf{V}}_{\mathbf{L},\mathbf{JBR}}}{\mathbf{C}_{\mathbf{solids},\mathbf{JBR},t - \Delta t}\hat{\mathbf{V}}_{\mathbf{s},\mathbf{JBR}} + (1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t - \Delta t})\hat{\mathbf{V}}_{\mathbf{L},\mathbf{JBR}}} \\ - \frac{\mathbf{L}_{\mathbf{JBR},t - \Delta t}\hat{\mathbf{V}}_{\mathbf{s},\mathbf{JBR}} + (1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t - \Delta t}\hat{\mathbf{V}}_{\mathbf{s},\mathbf{JB}} + (1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t - \Delta t}\hat{\mathbf{V}}_{\mathbf{s},\mathbf{JB}} + (1 - \mathbf{C}_{\mathbf{solids},\mathbf{JBR},t - \Delta t}\hat{\mathbf{V}}_{\mathbf{s},\mathbf{JB}$$

The accumulation of aluminum in the JBR during Run 1 is the change in mass divided by the length of the run and is calculated to be:

$$acc = \Delta m/\Delta t$$
 $acc = 1.37 \times 10^8 \mu g/hr$

In a similar manner, the accumulations in Runs 2 and 3 were calculated and when combined with the accumulation from Run 1, an average accumulation of $1.42 \times 10^8 \,\mu\text{g/hr}$ was calculated. This average accumulation is used with the following data to calculate mass balance closure around the JBR:

$$acc_{xxx} = 1.42 \times 10^8 \, \mu g/hr$$

$$Q_{espout} = 2.84 \times 10^5 \text{ dscfm } (4.5 \times 10^5 \text{ Nm}^3/\text{hr})$$
 (Table 3-7)

$$C_{i,espout,s} = 1.21 \times 10^4 \,\mu g/Nm^3$$
 (Table 5-2)

$$C_{i,cspout,v} = 57.5 \ \mu g/Nm^3$$
 (Table 5-2)

F_{makeup,FT150A} = 26.8 gal/min (6.09 m³/hr) (Mat'l bal. average in Table 6-1 Mist Elim/Deck Wash [Ash Pond Return])

$$C_{i,makeup} = 0.176 \text{ mg/L} (1.76 \text{ x } 10^5 \mu\text{g/m}^3)$$
 (Table 5-10)

$$F_{\text{return},FT128} = 78.9 \text{ gal/min } (17.9 \text{ m}^3/\text{hr})$$
 (Mat'l bal. average in Table 6-1 Transition Duct PW Flow [Gypsum Pond Return])

$$F_{return,FT142} = 39.9 \text{ gal/min } (9.06 \text{ m}^3/\text{hr})$$
 (Mat'l bal. average in Table 6-1)

$$F_{return,FT150B} = 6.39 \text{ gal/min } (1.45 \text{ m}^3/\text{hr})$$
 (Mat'l bal. average in Table 6-1)

$$C_{i,return} = 2.04 \text{ mg/L} (2.04 \text{ x } 10^6 \mu\text{g/m}^3)$$
 (Table 5-10)

$$F_b = 36.5 \text{ gal/min } (8.29 \text{ m}^3/\text{hr})$$
 (Mat'l bal. average in Table 6-1 Reagent Flow)

$$C_{solids,ls} = 0.361 \text{ kg/kg}$$

(Mat'l bal. average in Table 6-1)

$$C_{i,iq,is} = 6.78 \times 10^{-2} \text{ mg/L} (6.78 \times 10^4 \, \mu\text{g/m}^3)$$

(App. H, Run 3d substituted for Run 3)

 $F_{bdwn,FT162A} = 78.4 \text{ gal/min} (17.8 \text{ m}^3/\text{hr})$

(JBR blowdown in Table 6-1)

 $C_{\text{solids,bdwn}} = 0.229 \text{ kg/kg}$

(JBR density, mat'l bal. average in Table 6-1)

$$C_{i,solids,bdwn} = 1.1 \times 10^3 \ \mu g/gm \ (1.1 \times 10^6 \ \mu g/kg)$$

(Table 5-9)

$$V_{s,ls} = 0.000367 \text{ m}^3/\text{kg}$$

(App. I, p. 6)

$$V_{i,ls} = 0.001 \text{ m}^3/\text{kg}$$

(App. I, p. 6)

$$V_{s,bdwn} = 0.00431 \text{ m}^3/\text{kg (Sp. Gr.} = 2.32)$$

(App. I, p. 6)

$$V_{Lbdwn} = 0.001 \text{ m}^3/\text{kg (Sp. Gr.} = 1.0)$$

(App. I, p. 6)

$$C_{i,solids,ls} = 756 \ \mu g/gm \ (7.56 \ x \ 10^5 \ \mu g/kg)$$

(Table 5-9)

$$C_{i,lia,bdwn} = 12.3 \text{ mg/L} (1.23 \text{ x } 10^7 \text{ } \mu\text{g/m}^3)$$

(Table 5-10)

$$Q_{\text{stackgas}} = 2.88 \text{ x } 10^5 \text{ dscfm } (4.56 \text{ x } 10^5 \text{ Nm}^3/\text{hr})$$

(Table 3-7)

$$C_{i,\text{stackgas,s}} = 191 \ \mu\text{g}/\text{Nm}^3$$

(Table 5-2)

$$C_{i,\text{stackgas},v} = 4.35 \, \mu \text{g/Nm}^3$$

With these input values, the terms I_{SBR} and O_{JBR} can be calculated as shown below:

$$I_{IBR} = -\frac{\Delta M_i}{\Delta t} + Q_{espout} \left(C_{i,espout,v} + C_{i,espout,s} \right) + \left(F_{return,FT128} + F_{return,FT142} + F_{return,FT150B} \right)$$

*
$$C_{i,return}$$
 + $F_{makeup,FT150A}$ $C_{i,makeup}$ + F_{ls}
$$\left[\frac{C_{solids,ls} C_{i,solids,ls} + \hat{V}_{l,ls} (1 - C_{solids,ls}) C_{i,liq,ls}}{C_{solids,ls} \hat{V}_{s,ls} + (1 - C_{solids,ls}) \hat{V}_{l,ls}} \right]$$

 $I_{JBR} = 8.32 \times 10^9 \, \mu g/hr$

$$O_{JBR} = F_{bdwn \ FT162A} \left[\frac{C_{solids,bdwn} \ C_{i,solids,bdwn} + \hat{V}_{l,bdwn} \ (1 - C_{solids,bdwn}) \ C_{i,liq,bdwn}}{C_{solids,bdwn} \ \hat{V}_{s,bdwn} + (1 - C_{solids}) \ \hat{V}_{l,bdwn}} \right]$$

$$+ Q_{stackgas} \left(C_{i,stackgas,v} + C_{i,stackgas,s} \right)$$

$$O_{JBR} = 5.44 \times 10^9 \,\mu g/hr$$

Mass balance closure for aluminum around the JBR is calculated to be:

$$Closure_{rbR} = 100 * O_{JbR}/I_{JbR} = 65\%$$

Note that the accumulation of aluminum in the JBR (1.42 x 10^8 µg/hr) is small relative to the throughput (outlet equals 5.5 x 10^9 µg/hr). However, the accumulation calculations are based on a single concentration and only reflect changes in the JBR density and level.

Total Plant Closure. All of the data required for the total plant calculations have been specified in previous calculations. The total flow of aluminum into the plant (minus JBR accumulation) is calculated according to the following equation:

$$\begin{split} I_{plant} &= -\frac{\Delta M_{i}}{\Delta t} + F_{coal} \left(1 - C_{w,coal}\right) C_{i,coal} + \left(F_{return,FT128} + F_{return,FT142} + F_{return,FT150B}\right) C_{i,return} \\ &+ F_{makeup,FT150A} C_{i,makeup} + F_{ls} \left[\frac{C_{solids,ls} C_{i,solids,ls} + \hat{V}_{l,ls} \left(1 - C_{solids,ls}\right) C_{i,liq,ls}}{C_{solids,ls} \hat{V}_{s,ls} + \left(1 - C_{solids,ls}\right) \hat{V}_{l,ls}} \right] \end{split}$$

Substituting values defined above, the mass flow of aluminum into the plant becomes:

$$I_{plant} = 5.32 \times 10^{11} \, \mu g/hr$$

The total flow of aluminum exiting the plant is calculated with the following equation:

$$\begin{aligned} O_{plant} &= Q_{stackgas} \left(C_{i,stackgas,v} + C_{i,stackgas,s} \right) \\ &+ F_{bdwn,FT162A} \left[\frac{C_{solids,bdwn} \ C_{i,solids,bdwn} + \hat{V}_{l,bdwn} \left(1 - C_{solids,bdwn} \right) \ C_{i,liq,bdwn}}{C_{solids,bdwn} \ \hat{V}_{s,bdwn} + \left(1 - C_{solids,bdwn} \right) \ \hat{V}_{l,bdwn}} \right] \\ &+ \left[F_{coal} \left(1 - C_{w,coal} \right) \ C_{ash,coal} - Q_{espin} \ C_{ash,espin} \right] \ C_{i,bottomash} \\ &+ \left[Q_{espin} \ C_{ash,espin} - Q_{espout} \ C_{ash,espout} \right] \ C_{i,collectedash} \end{aligned}$$

Again, values previously given are substituted, which results in the outlet mass flow for aluminum being:

$$O_{plant} = 3.95 \times 10^{11} \, \mu g/hr$$

Using the mass flows inlet and outlet, the overall plant closure for aluminum is calculated:

$$Closure_{plant} = 100 * O_{plant}/I_{plant} = 75\%$$

Removal Efficiencies

An example will be developed for lead removal in the JBR. Equation 6-4 applied to the JBR becomes:

$$\% \text{ Removal} = \left[\frac{1 - Q_{\text{stackgas}} \left(C_{i,\text{stackgas,s}} + C_{i,\text{stackgas,v}} \right)}{Q_{\text{espout}} \left(C_{i,\text{espout,s}} + C_{i,\text{espout,v}} \right)} \right] * 100$$
 (I-17)

The following data were obtained from tables in Sections 3 and 5.

 $Q_{\text{stackyas}} = 456,000 \text{ Nm}^3/\text{hr}$

 $C_{i,stackgas,s} = 0.50 \,\mu g/Nm^3$

 $C_{i,stackgas,v} = < 0.22 \,\mu g/Nm^3$; for calculations use 0.11 $\mu g/Nm^3$

 $Q_{ESPout} = 450,000 \text{ Nm}^3/\text{hr}$

 $C_{i,ESPout,s} = 18 \mu g/Nm^3$

 $C_{i,ESPout,v} = 0.4 \mu g/Nm^3$

The removal efficiency for lead is calculated directly from Equation I-17.

Removal Efficiency of JBR for Pb =
$$\left[1 - \frac{456,000 (0.50 + 0.11)}{450,000 (18 + 0.4)}\right] * 100 = 96.7\%$$
 (I-18)

Nomenclature

A Cross-sectional area, m²

C Concentration $\mu g/Nm^3$ (gas), $\mu g/L$ (liquid), $\mu g/kg$ (solid), or weight fraction (ash or water fraction)

F Coal flow rate, kg/hr or water/slurry flow rate, m³/hr

L Level, m

Appendix I: Development of Mass Balance Equations & Example Calculations

Q Gas flow rate, Nm³/hr

 $\hat{\mathbf{V}}_{\bullet}\mathbf{V}$ Specific volume, m³/kg

Subscripts

bdwn JBR blowdown slurry

bottomash Bottom ash coal Feed coal

collectedash ESP sluiced ash

espin ESP inlet

espout ESP outlet

FTx As indicated by flow transmitter x (flow from data acquisition

system)

i Species, i

JBR JBR l, liq Liquid

ls Limestone slurry

makeup FGD makeup water (ash pond return)

return Gypsum pond return

Solid phase

solids Solids stackgas Stack gas v Vapor phase

w Water