CDM Smith
1715 North Westshore Blvd. Suite 875
Tampa, Florida 33607
tel: 813 281-2900
fax: 813 288-8787

March 31, 2014

Yousory Attalla
Engineering Specialist II
Mail Station #5505
Department of Environmental Protection
Division of Air Resource Management
Office of Permitting and Compliance
2600 Blair Stone Road
Tallahassee, Florida 32399

Subject: Hillsborough County Resource Recovery Facility (RRF), Facility ID No. 0570261
Application for Air Operation Permit Revision
Incorporation of modifications in Air Construction Permit NO 0570261-016-AC
Removal of "sewage sludge" as a Prohibited Fuel
Minor Edit to PSD-FL-121D Condition B.2.

Dear Mr. Attalla:

On Behalf of the Solid Waste Management Division of the Hillsborough County Public Works Department, CDM Smith is submitting an air operation permit revision application to incorporate the modifications of Air Construction Permit No 0570261-016-AC. To reiterate, Air Construction Permit No 0570261-016-AC was approved in December 2012, and modified the following.

- PSD-FL-121-D Condition B.6.1 (g)
- PSD-FL-369-C Section III, Condition 9.a.vii (Cited as PSD-FL-121, Specific Condition 5 in Title V Operation Permit)

Both permits previously had conditions stating that sewage sludge is a prohibited fuel. Hillsborough County wishes to remove the term "sewage sludge" in order to combust biosolids (dewatered sewage sludge) as defined in FAC 62-640 (200) (6). The Hillsborough County RRF maximum potential emission rates would not change, and the Facility would continue to comply with all other permit requirements, including all of the applicable emissions limits and standards in 40 CFR 60 Subparts Cb and Eb, Emissions Guidelines and Standards of Performance for Large Municipal Waste Combustors. Each of the four combustors has an air pollution control equipment train – spray dryer scrubber, activated carbon injection, baghouse and selective non-catalytic reduction system – that, combined with good combustion practices, can readily remove air pollutants associated with sewage sludge combustion (primarily metals and particulate matter). This application includes the required test results per Specific Conditions 9 and 10 of the December 2012 approved permit, which were previously provided to the FDEP by Covanta Energy of Hillsborough, Inc.

In addition, Hillsborough County wishes to edit the language of PSD-FL-121D Condition B.2 so that the point of compliance is based upon 102,000 pound of steam per hour.

Application Attachments

Long Form Sections I and II

Attachment 1 – Special Report on Biosolids Combustion dated August 23, 2013

Attachment 2 – Compliance Test Results July 2013.

We greatly appreciate your review of this application. Please feel free to contact me if you have questions, at 813-281-2900 or 813-262-8875 (direct).

Sincerely,

Wei Liu

Wei Liu, P.E.
Environmental Engineer CDM Smith Inc.

cc: Nate Johnson (Hillsborough County)
Kim Byer (Hillsborough County)
Thomas Rawls (Hillsborough County)
Dan Strobridge (CDM Smith)
Paul Hauck (CDM Smith)
Jason Gorrie (Covanta)
Glenn Hoag (Covanta)
Tyler Huffman (Covanta)
FDEP Southwest District, Compliance.

Department of
Environmental Protection

Division of Air Resource Management

APPLICATION FOR AIR PERMIT - LONG FORM

I. APPLICATION INFORMATION

Air Construction Permit – Use this form to apply for an air construction permit:

- For any required purpose at a facility operating under a federally enforceable state air operation permit (FESOP) or Title V air operation permit;
- For a proposed project subject to prevention of significant deterioration (PSD) review, nonattainment new source review, or maximum achievable control technology (MACT);
- To assume a restriction on the potential emissions of one or more pollutants to escape a requirement such as PSD review, nonattainment new source review, MACT, or Title V; or
- To establish, revise, or renew a plantwide applicability limit (PAL).

Air Operation Permit – Use this form to apply for:

- An initial federally enforceable state air operation permit (FESOP); or
- An initial, revised, or renewal Title V air operation permit.

To ensure accuracy, please see form instructions.

Identification of Facility

1. Facility Owner/Company Name: Hillsborough County Board of County Commissioners	
2. Site Name: Hillsborough County Resource Recovery Facility	
3. Facility Identification Number: 0570261	
4. Facility Location... Street Address or Other Locator: 350 N. Falkenburg Road City: Tampa County: Hillsborough Zip Code: 33619	
5. Relocatable Facility? ☐ Yes ☒ No	6. Existing Title V Permitted Facility? ☒ Yes ☐ No

Application Contact

1. Application Contact Name: Wei-Ting Liu., P.E.
2. Application Contact Mailing Address... Organization/Firm: CDM Smith Street Address: 1715 N. Westshore Boulevard, Suite 875 City: Tampa State: Florida Zip Code: 33607
3. Application Contact Telephone Numbers... Telephone: (813) 262 – 8875 ext. Fax: (813) 288 - 8787
4. Application Contact E-mail Address: liuwt@cdmsmith.com

Application Processing Information (DEP Use)

1. Date of Receipt of Application:	3. PSD Number (if applicable):
2. Project Number(s):	4. Siting Number (if applicable):

APPLICATION INFORMATION

Purpose of Application

This application for air permit is being submitted to obtain: (Check one)

Air Construction Permit

- [ ] Air construction permit.
- [ ] Air construction permit to establish, revise, or renew a plantwide applicability limit (PAL).
- [ ] Air construction permit to establish, revise, or renew a plantwide applicability limit (PAL), and separate air construction permit to authorize construction or modification of one or more emissions units covered by the PAL.

Air Operation Permit

- [ ] Initial Title V air operation permit.
- [X] Title V air operation permit revision.
- [ ] Title V air operation permit renewal.
- [ ] Initial federally enforceable state air operation permit (FESOP) where professional engineer (PE) certification is required.
- [ ] Initial federally enforceable state air operation permit (FESOP) where professional engineer (PE) certification is not required.

Air Construction Permit and Revised/Renewal Title V Air Operation Permit (Concurrent Processing)

- [ ] Air construction permit and Title V permit revision, incorporating the proposed project.
- [ ] Air construction permit and Title V permit renewal, incorporating the proposed project.

Note: By checking one of the above two boxes, you, the applicant, are requesting concurrent processing pursuant to Rule 62-213.405, F.A.C. In such case, you must also check the following box:

- [ ] I hereby request that the department waive the processing time requirements of the air construction permit to accommodate the processing time frames of the Title V air operation permit.

Application Comment

This application is to incorporate the provisions of 0570261-016-AC into the current Title V air operation permit.

APPLICATION INFORMATION

Scope of Application

Emissions Unit ID Number	Description of Emissions Unit	Air Permit Type	Air Permit Processing Fee
001	Municipal Waste Combustor Unit 1	ACM1	N/A
002	Municipal Waste Combustor Unit 2	ACM1	N/A
003	Municipal Waste Combustor Unit 3	ACM1	N/A
107	Municipal Waste Combustor Unit 4	ACM1	N/A

Application Processing Fee

Check one: ☐ Attached - Amount: $______________ ☒ Not Applicable

APPLICATION INFORMATION

Owner/Authorized Representative Statement

Complete if applying for an air construction permit or an initial FESOP.

1. Owner/Authorized Representative Name : Kimberly A Byer., P.G. Division Manager, Solid Waste Management Division, Public Works Department	
2. Owner/Authorized Representative Mailing Address... Kimberly A. Byer., P.G. Organization/Firm: Hillsborough County Public Works Department Street Address: 332 N Falkenburg Rd, 2nd Floor City: Tampa State: Florida Zip Code: 33619	
3. Owner/Authorized Representative Telephone Numbers... Telephone: (813) 272 - 5977 ext. 43131 Fax: (813) 272 - 6224	
4. Owner/Authorized Representative E-mail Address: byerk@hillsboroughcounty.org	
5. Owner/Authorized Representative Statement: *I, the undersigned, am the owner or authorized representative of the corporation, partnership, or other legal entity submitting this air permit application. To the best of my knowledge, the statements made in this application are true, accurate and complete, and any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. I understand that a permit, if granted by the department, cannot be transferred without authorization from the department.* [signature] 3/31/2014 Signature Date	

APPLICATION INFORMATION

Application Responsible Official Certification

Complete if applying for an initial, revised, or renewal Title V air operation permit or concurrent processing of an air construction permit and revised or renewal Title V air operation permit. If there are multiple responsible officials, the "application responsible official" need not be the "primary responsible official."

1. Application Responsible Official Name: Kimberly A. Byer., P.G. Division Manager
2. Application Responsible Official Qualification (Check one or more of the following options, as applicable): ☐ For a corporation, the president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or a duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit under Chapter 62-213, F.A.C. ☐ For a partnership or sole proprietorship, a general partner or the proprietor, respectively. ☒ For a municipality, county, state, federal, or other public agency, either a principal executive officer or ranking elected official. ☐ The designated representative at an Acid Rain source or CAIR source.
3. Application Responsible Official Mailing Address... Organization/Firm: Hillsborough County Public Works Department Street Address: 332 N Falkenburg Rd, 2nd Floor City: Tampa State: Florida Zip Code: 33619
4. Application Responsible Official Telephone Numbers... Telephone: (813) 272 - 5977 ext. 43131 Fax: (813) 272 - 6224
5. Application Responsible Official E-mail Address: byerk@hillsboroughcounty.org

6. Application Responsible Official Certification:

I, the undersigned, am a responsible official of the Title V source addressed in this air permit application. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof and all other applicable requirements identified in this application to which the Title V source is subject. I understand that a permit, if granted by the department, cannot be transferred without authorization from the department, and I will promptly notify the department upon sale or legal transfer of the facility or any permitted emissions unit. Finally, I certify that the facility and each emissions unit are in compliance with all applicable requirements to which they are subject, except as identified in compliance plan(s) submitted with this application.

[signature] 3/31/2014

Signature Date

APPLICATION INFORMATION

Professional Engineer Certification

1. Professional Engineer Name: Wei-Ting Liu., P.E.
   Registration Number: 50892
2. Professional Engineer Mailing Address...
   Organization/Firm: CDM Smith
   Street Address: 1715 N. Westshore Boulevard, Suite 875
   City: Tampa State: Florida Zip Code: 33607
3. Professional Engineer Telephone Numbers...
   Telephone: (813) 262 - 8875 ext. Fax: (813) 288 - 8787
4. Professional Engineer E-mail Address: liuwt@cdmsmith.com
5. Professional Engineer Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this application for air permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.

(3) If the purpose of this application is to obtain a Title V air operation permit (check here [X]*, if so), I further certify that each emissions unit described in this application for air permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance plan and schedule is submitted with this application.*

(4) If the purpose of this application is to obtain an air construction permit (check here [ ]*, if so) or concurrently process and obtain an air construction permit and a Title V air operation permit revision or renewal for one or more proposed new or modified emissions units (check here* [ ]*, if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.*

(5) If the purpose of this application is to obtain an initial air operation permit or operation permit revision or renewal for one or more newly constructed or modified emissions units (check here , if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.

Wei Ting Liu 3/31/14

Signature Date

(seal)

* Attach any exception to certification statement.

DEP Form No. 62-210.900(1) – Form
Effective: 03/11/2010

II. FACILITY INFORMATION

A. GENERAL FACILITY INFORMATION

Facility Location and Type

1. Facility UTM Coordinates... Zone East (km) 268.2 North (km) 3092.7		2. Facility Latitude/Longitude... Latitude (DD/MM/SS) 27/57/14 Longitude (DD/MM/SS) 82/20/22	
3. Governmental Facility Code: 3	4. Facility Status Code: C	5. Facility Major Group SIC Code: 49	6. Facility SIC(s): 4953
7. Facility Comment :			

Facility Contact

1. Facility Contact Name: Glenn Hoag
2. Facility Contact Mailing Address... Organization/Firm: Covanta Hillsborough Inc. Street Address: 350 N. Falkenburg Road City: Tampa State: Florida Zip Code: 33619-0903
3. Facility Contact Telephone Numbers: Telephone: (813) 684 - 5688 ext. 3013 Fax: (813) 684 - 7964
4. Facility Contact E-mail Address: ghoag@covantaenergy.com

Facility Primary Responsible Official

Complete if an "application responsible official" is identified in Section I that is not the facility "primary responsible official."

1. Facility Primary Responsible Official Name: Glenn Hoag
2. Facility Primary Responsible Official Mailing Address... Organization/Firm: Covanta Hillsborough Inc. Street Address: 350 N. Falkenburg Road City: Tampa State: Florida Zip Code: 33619-0903
3. Facility Primary Responsible Official Telephone Numbers... Telephone: (813) 684 - 5688 ext.3013 Fax: (813) 684 - 7964
4. Facility Primary Responsible Official E-mail Address: ghoag@covantaenergy.com

Attachment 1

Biosolids Special Report

COVANTA™
ENERGY
for a cleaner world

Covanta Hillsborough
A Covanta Energy Corporation
350 North Falkenburg Road
Tampa, FL 33619
Tel: 813.684.5688
Fax: 813.684.7964

August 23, 2013

Ms. Erin DiBacco
Florida Department of Environmental Protection
Division of Compliance and Enforcement
13051 North Telecom Parkway
Temple Terrace, FL 33637

Re: Hillsborough County Resource Recovery Facility
Special Report on Biosolids Combustion

Dear Ms. DiBacco,

In accordance with Specific Condition 9 of the Air Construction Permit No. 0570261-016-AC (MWC Units #1, #2, #3, and #4), please find the Special Report on Biosolids Combustion for the Hillsborough County Resource Recovery Facility.

Based upon information and observations formed after reasonable inquiry, the statements and information in the attached document are believed to be true, accurate, and complete.

If you have any questions regarding this matter, please feel free to contact me. I can be reached during the day at (813) 684-5688 ext. 3013.

Sincerely,

Glenn M. Hoag
Facility Manager

cc: C. Defoe (FDEP)
S. Pelz (FDEP)
J. Waters (HC-EPC)
P. Berry (HC-SWMG)
G. Cassady (HC-PUD)
N. Johnson (HC-SWMG)
D. DeArmond (HC-SWMG)
D. Strobridge (CDM Smith)
P. Hauck (CDM Smith)
File (Covanta Hillsborough)

Introduction

The Hillsborough County Resource Recovery Facility (RRF) consists of: four municipal waste combustors (MWC's) (Units 1, 2, 3 and 4) with auxiliary burners; lime storage and processing facilities; ash storage and processing facilities; cooling towers; a wastewater treatment plant and, ancillary support equipment. The facility is owned by Hillsborough County and is currently operated by Covanta Hillsborough, Inc., a subsidiary of Covanta Energy Corporation.

The total capacity of the Hillsborough County RRF is approximately 1,800 tons/day of municipal solid waste (MSW). The gross nominal electric generating capacity of the facility is 47 megawatts (MW). Steam production from Units 1, 2 and 3 is limited to 102,000 pounds of per hour per unit (lb/hour/unit) and 200,000 lb/hour from Unit 4.

Through the issuance of air construction permit 0570261-016-AC, the Department has eliminated the prohibition on the combustion of "sewage sludge," which is also referred to as "biosolids". The limitations set forth by the permit include a 5% limit on biosolids combusted with respect to the overall MSW processed and biosolids must be at least 12% solids by weight.

The purpose of this report is to determine the effects of biosolid combustion on criteria pollutants monitored by the Facility's MWC Unit # 1-4 Continuous Emission Monitoring Systems. The list of pollutants monitored by the MWC Unit #1-3 CEMS include CO, SO_2, and NOx; and MWC Unit #4 monitors CO, SO_2, NOx, and Hg.

Biosolids Combustion Procedure

The combustion of the biosolids takes place as a mixture along with other municipal solid waste (MSW) to prevent combustion upsets caused by overfeeding of biosolids. The HCRRF is authorized to combust biosolids in the amount of up to 5% of the municipal solid waste combusted in Unit Nos. 1, 2, 3 and 4 with loading rates on an as received (i.e., wet) basis not to exceed 90 TPD facility-wide, averaged daily.

Each truckload of biosolids weighs in at the facility scale house. The scale house establishes and records the net weight and the source of the biosolids. Generally, all biosolids are delivered to the RRF by the Public Utilities Department's contractor's trucks. During the 30 day observation period (5/7/2013-6/5/2013), the facility received between 2-4 truckloads per week containing approximately 20 tons of biosolids each.

Each truck proceeds to the RRF tipping floor and positions itself near an unloading bay, but at a safe distance from the storage pit, as directed by the tipping floor loader operator. The driver prepares the truck for unloading, that is, retracts cover tarp as necessary, release manual safety latches, etc. The driver then backs the truck up to the storage pit curb so that all the biosolids will be dumped directly into the storage pit.

The tipping floor loader operator inspects the area where the biosolids truck was unloaded. If there is any residual biosolid material on the tipping floor, the loader operator pushes the residuals to the waste storage pit using the loader bucket with other MSW which has been stored on the tipping floor. This action ensures that any biosolids residuals are removed from the tipping floor and placed into the pit.

After the biosolids have been deposited into the waste storage pit, the crane operator covers the biosolids with a layer of yard waste or other MSW previously placed in the waste storage pit. The crane operator uses the crane grapple to mix the top layer of MSW with the biosolids. The crane operator then spreads the biosolids-MSW mixture over the top of other MSW stored in the back-stack area of the waste storage bunker. Other MSW may be spread over the top of this mixture. All mixing takes place in the waste storage bunker. The mixing process is the primary measure to ensure that a homogenous mixture is fed into the hopper and minimizes environmental concerns related to co-combustion of biosolids.

Results

In order to analyze the effect of biosolid combustion, the average of each pollutant for the first 30 days post biosolid introduction (beginning May 7, 2013) was compared to the 12 month average for each pollutant prior to biosolid combustion on each MWC unit (Tables 1-4).

Table 1

Unit 1

Parameter	Annual Stack Concentrations Measured by the CEMS(1)	May-June 2013 CEMS Data w/ Biosolids(2)
CO	16 ppm @ 7% O2	17 ppm @ 7% O2
SO_2	3 ppm @ 7% O2	1 ppm @ 7% O2
NOx	176 ppm @ 7% O2	176 ppm @ 7% O2

(1) Data collected by averaging all 1-hr periods from 5/7/2012 to 5/6/2013.

(2) Data collected from averaging all 1-hr periods for 30 days beginning on 5/7/2013 and ending on 6/5/2013.

Table 2

Unit 2

Parameter	Annual Stack Concentrations Measured by the CEMS(1)	May-June 2013 CEMS Data w/ Biosolids(2)
CO	13 ppm @ 7% O2	13 ppm @ 7% O2
SO_2	2 ppm @ 7% O2	0 ppm @ 7% O2
NOx	172 ppm @ 7% O2	168 ppm @ 7% O2

(3) Data collected by averaging all 1-hr periods from 5/7/2012 to 5/6/2013.

(4) Data collected from averaging all 1-hr periods for 30 days beginning on 5/7/2013 and ending on 6/5/2013.

Table 3

Unit 3

Parameter	Annual Stack Concentrations Measured by the CEMS[(1)]	May-June 2013 CEMS Data w/ Biosolids[(2)]
CO	18 ppm @ 7% O2	13 ppm @ 7% O2
SO_2	3 ppm @ 7% O2	5 ppm @ 7% O2
NOx	179 ppm @ 7% O2	176 ppm @ 7% O2

(5) Data collected by averaging all 1-hr periods from 5/7/2012 to 5/6/2013.

(6) Data collected from averaging all 1-hr periods for 30 days beginning on 5/7/2013 and ending on 6/5/2013.

Table 4

Unit 4

Parameter	Annual Stack Concentrations Measured by the CEMS[(1)]	May-June 2013 CEMS Data w/ Biosolids[(2)]
CO	32 ppm @ 7% O2	31 ppm @ 7% O2
SO_2	2 ppm @ 7% O2	9 ppm @ 7% O2
NOx	85 ppm @ 7% O2	86 ppm @ 7% O2
Hg	1.37 µg/dscm[(3)]	0.37 µg/dscm

(7) Data collected by averaging all 1-hr periods from 5/7/2012 to 5/6/2013.

(8) Data collected from averaging all 1-hr periods for 30 days beginning on 5/7/2013 and ending on 6/5/2013.

(9) Due to limited amount of data available this number reflects the average of all data points taken from 7/1/2012 – 5/6/2013.

Conclusion

Based on the data observed, there was no significant impact to the RRF emissions due to the co-combustion of biosolids during the course of this analysis. The CEMS data recorded no identifiable emissions increase across all 4 combustion units, and all four units continued to operate within normal operating parameters while the biosolids were being combusted. We will continue to closely monitor the CEMS system during the limited times that biosolids are being combusted and will notify the Department if the practice jeopardizes compliance with RRF's emissions limits.

Attachment 2

July 2013 Annual Compliance Test Report Summary

The July 2013 Annual Compliance Test was performed with approximately 40 tons daily input of biosolids during the testing period.

EMISSIONS TESTING REPORT 13025
Text and Appendices

PERFORMED FOR:

COVANTA ENERGY GROUP, INC.

Morristown, New Jersey

at the

Hillsborough County Solid Waste Energy Recovery Facility

Tampa, Florida

Units 1, 2, 3, and 4 SDA Inlets and Fabric Filter Outlets

July 2013

by

TESTAR Engineering, P.C.

7424-108 ACC Boulevard

Raleigh, North Carolina 27617

License Number C-3896

919/957-9500

PE CERTIFICATION
REPORT 13025

I hereby certify that I have personally examined and am familiar with the information submitted herein. Based upon my own knowledge and my inquiry of those individuals responsible for obtaining the information presented, the foregoing information is true, accurate and complete. I am aware that this information is being requested for the purpose of determining compliance with local, state, and federal laws and may be submitted to appropriate governmental regulatory agencies for those purposes. I am aware that there are significant penalties for submitting false information to such agencies, including the possibility of fine and imprisonment.

Signature ____________________ Date: 8/27/13
Gary L. Williams, PE, QSTI
Director

Professional Engineer, State of Florida

Seal Number 59213

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1.0 INTRODUCTION

1.1 General

Covanta Energy Group, Inc. (Covanta) operates the Hillsborough County Solid Waste Energy Recovery Facility in Tampa, Florida. Covanta contracted TESTAR Engineering, P.C. to conduct an air emissions testing program to quantify specific emissions from Units 1, 2, 3, and 4 for compliance purposes. The testing program was conducted between July 16 and 24, 2013 by TESTAR Engineering under the supervision of Mr. G.J. Aldina of Covanta Energy Group, Inc

1.2 Test Personnel

Table 1-1 presents the personnel that were involved in the testing program.

Table 1-1
Test Personnel

Affiliation	Personnel Responsibility
Covanta Energy Group, Inc.	G. J. Aldina Test Coordinator
TESTAR Engineering, P.C.	Herbert T. Dixon, Jr., PE Project Director
	Blake Cone Field Laboratory Manager
	Jeff Aims Field Laboratory Manager
	Charles Nahrebecki Test Engineer
	Will Snipes Test Engineer
	Sean Daley Test Engineer
	Dan Belton Test Engineer
	Chris Wrenn CEM Test Engineer

1.3 Test Parameters and Run Numbers

Tables 1-2, 1-3, 1-4, and 1-5 present the test dates, sampling locations, flue gas parameters, sampling methods, and run numbers for reference for Unit 1, 2, 3, and 4, respectively.

Table 1-2
Unit 1 and Ash System Test Sequence

Test Location	Sampling Method	Flue Gas Parameter	Run Date	Run Time	Run Number
Unit 1 SDA Inlet	EPA MM26	Hydrogen Chloride	07/19/13	0827-0927	1-I-MM26-1
			07/19/13	0943-1043	1-I-MM26-2
			07/19/13	1103-1203	1-I-MM26-3
	EPA 29	Mercury	07/19/13	0826-1039	1-I-M29-1
			07/19/13	1102-1356	1-I-M29-2
			07/19/13	1414-1727	1-I-M29-3
Unit 1 FF Outlet	EPA 23	Dioxins/Furans	07/16/13	0845-1308	1-O-M23-1
			07/16/13	1404-1825	1-O-M23-2
			07/17/13	0809-1231	1-O-M23-3
			07/19/13	0826-1248	1-O-M23-4
	EPA MM26	Hydrogen Chloride	07/19/13	0827-0927	1-O-MM26-1
			07/19/13	0943-1043	1-O-MM26-2
			07/19/13	1103-1203	1-O-MM26-3
	EPA 5/29	Particulate and Metals	07/19/13	0826-1039	1-O-M5/29-1
			07/19/13	1102-1356	1-O-M5/29-2
			07/19/13	1414-1727	1-O-M5/29-3
	EPA 9	Opacity	07/19/13	1015-1115	1-S-M9-1
Ash Building Baghouse Vent	EPA 9	Opacity	07/17/13	1608-1658	ABBV-M9-1
Carbon Silo 1 Vent	EPA 9	Opacity	07/16/13	1530-1600	CS1-M9-1
Carbon Silo 2 Vent	EPA 9	Opacity	07/19/13	0930-1000	CS2-M9-1
Pebble Lime Silo Vent 1	EPA 9	Opacity	07/17/13	1530-1600	PLS1-M9-1
Pebble Lime Silo Vent 2	EPA 9	Opacity	07/19/13	1615-1645	PLS2-M9-1
Whirl-Wet Vent	EPA 9	Opacity	07/18/13	0830-0900	WW-M9-1
Ash Handling System	EPA 22	Fugitive Emissions	07/16/13	1020-1130	M22-1
			07/17/13	1005-1115	M22-2
			07/18/13	1250-1400	M22-3

Table 1-3
Unit 2 Test Sequence

Test Location	Sampling Method	Flue Gas Parameter	Run Date	Run Time	Run Number
Unit 2 SDA Inlet	EPA MM26	Hydrogen Chloride	07/17/13	0826-0939	2-I-MM26-1
			07/17/13	1006-1106	2-I-MM26-2
			07/17/13	1140-1240	2-I-MM26-3
	EPA 29	Mercury	07/17/13	0825-1058	2-I-M29-1
			07/17/13	1129-1352	2-I-M29-2
			07/17/13	1421-1657	2-I-M29-3
Unit 2 FF Outlet	EPA MM26	Hydrogen Chloride	07/17/13	0826-0939	2-O-MM26-1
			07/17/13	1006-1106	2-O-MM26-2
			07/17/13	1140-1240	2-O-MM26-3
	EPA 5/29	Particulate and Metals	07/17/13	0825-1058	2-O-M5/29-1
			07/17/13	1129-1352	2-O-M5/29-2
			07/17/13	1421-1657	2-O-M5/29-3
	EPA 9	Opacity	07/17/13	0840-0955	2-S-M9-1

Table 1-4
Unit 3 Test Sequence

Test Location	Sampling Method	Flue Gas Parameter	Run Date	Run Time	Run Number
Unit 3 SDA Inlet	EPA MM26	Hydrogen Chloride	07/18/13	0850-0950	3-I-MM26-1
			07/18/13	1016-1116	3-I-MM26-2
			07/18/13	1124-1224	3-I-MM26-3
	EPA 29	Mercury	07/18/13	0820-1034	3-I-M29-1
			07/18/13	1103-1315	3-I-M29-2
			07/18/13	1345-1602	3-I-M29-3
Unit 3 FF Outlet	EPA MM26	Hydrogen Chloride	07/18/13	0850-0950	3-O-MM26-1
			07/18/13	1016-1116	3-O-MM26-2
			07/18/13	1124-1224	3-O-MM26-3
	EPA 5/29	Particulate and Metals	07/18/13	0820-1034	3-O-M5/29-1
			07/18/13	1103-1315	3-O-M5/29-2
			07/18/13	1345-1602	3-O-M5/29-3
	EPA 9	Opacity	07/18/13	0915-1015	3-S-M9-1

Table 1-5
Unit 4 Test Sequence

Test Location	Sampling Method	Flue Gas Parameter	Run Date	Run Time	Run Number
Unit 4 SDA Inlet	EPA MM26	Hydrogen Chloride	07/16/13	0849-0949	4-I-MM26-1
			07/16/13	1019-1119	4-I-MM26-2
			07/16/13	1158-1258	4-I-MM26-3
	EPA 29	Mercury	07/16/13	0848-1112	4-I-M29-1
			07/16/13	1154-1413	4-I-M29-2
			07/16/13	1438-1655	4-I-M29-3
Unit 4 FF Outlet	CTM027	Ammonia	07/19/13	0917-1028	4-O-M027-1
			07/19/13	1055-1207	4-O-M027-2
			07/19/13	1234-1345	4-O-M027-3
	EPA 23	Dioxins/Furans	07/17/13	1201-1637	4-O-M23-1
			07/18/13	0750-1209	4-O-M23-2
			07/18/13	1223-1643	4-O-M23-3
	EPA MM26	Hydrogen Chloride	07/16/13	0849-0949	4-O-MM26-1
			07/16/13	1019-1119	4-O-MM26-2
			07/16/13	1158-1258	4-O-MM26-3
	EPA 5/29	Particulate and Metals	07/16/13	0848-1112	4-O-M5/29-1
			07/16/13	1154-1413	4-O-M5/29-2
			07/16/13	1438-1655	4-O-M5/29-3
	EPA 9	Opacity	07/16/13	0910-1010	4-S-M9-1
	EPA 3A, 6C, 7E, 10	Sulfur Dioxide, Nitrogen Oxides, & Carbon Monoxide	07/24/13	0836-1017	4-O-CEM-1
			07/24/13	1035-1214	4-O-CEM-2
			07/24/13	1231-1406	4-O-CEM-3

Table 1-6
Utilization of EPA Method 2 and 3 Data

Runs Requiring Additional Information	Runs Providing Air Flow Rate Data	Runs Providing Flue Gas Composition Data
1-I-MM26-1	1-I-M29-1	1-I-M29-1
1-I-MM26-2	1-I-M29-1	1-I-M29-1
1-I-MM26-3	1-I-M29-2	1-I-M29-2
1-O-MM26-1	1-O-M5/29-1	1-O-M5/29-1
1-O-MM26-2	1-O-M5/29-1	1-O-M5/29-1
1-O-MM26-3	1-O-M5/29-2	1-O-M5/29-2
2-I-MM26-1	2-I-M29-1	2-I-M29-1
2-I-MM26-2	2-I-M29-1	2-I-M29-1
2-I-MM26-3	2-I-M29-2	2-I-M29-2
2-O-MM26-1	2-O-M5/29-1	2-O-M5/29-1
2-O-MM26-2	2-O-M5/29-1	2-O-M5/29-1
2-O-MM26-3	2-O-M5/29-2	2-O-M5/29-2
3-I-MM26-1	3-I-M29-1	3-I-M29-1
3-I-MM26-2	3-I-M29-1,2	3-I-M29-1,2
3-I-MM26-3	3-I-M29-2	3-I-M29-2
3-O-MM26-1	3-O-M5/29-1	3-O-M5/29-1
3-O-MM26-2	3-O-M5/29-1,2	3-O-M5/29-1,2
3-O-MM26-3	3-O-M5/29-2	3-O-M5/29-2
4-I-MM26-1	4-I-M29-1	4-I-M29-1
4-I-MM26-2	4-I-M29-1	4-I-M29-1
4-I-MM26-3	4-I-M29-2	4-I-M29-2
4-O-MM26-1	4-O-M5/29-1	4-O-M5/29-1
4-O-MM26-2	4-O-M5/29-1	4-O-M5/29-1
4-O-MM26-3	4-O-M5/29-2	4-O-M5/29-2
4-O-CEM-1 (Runs 1,2,3)	4-O-M2-1,2,3	4-O-CEM-1 (Runs 1,2,3)
4-O-CEM-2 (Runs 4,5,6)	4-O-M2-4,5,6	4-O-CEM-2 (Runs 4,5,6)
4-O-CEM-3 (Runs 7,8,9)	4-O-M2-7,8,9	4-O-CEM-3 (Runs 7,8,9)

2.0 SUMMARY OF RESULTS

2.1 *Report Organization*

The results of the testing project are summarized in Section 2. The process tested is discussed in Section 3. The sampling and analytical methods utilized are discussed in Section 4 while the Quality Assurance/Quality Control results are presented in Section 5. Appendix A contains detailed results of the testing program. Appendix B contains the field data that was collected and Appendix C contains the analytical results. Appendix D contains all pertinent testing equipment calibration data. Refer to the Table of Contents and the List of Tables and Figures for a complete reference with appropriate page numbers.

2.2 *Presentation of Results*

Table 2-1 presents the results of the emissions testing project for Unit 1. Table 2-2 presents the results of the emissions testing project for Unit 2. Table 2-3 presents the results of the emissions testing project for Unit 3. A more detailed summary of the sampling gas parameters is presented in Appendix A.

2.3 *Opacity and Fugitive Emissions Results*

Opacity measurements were taken during one EPA Method 5/29 test run on Units 1, 2, 3, and 4. One opacity measurement was taken on each of the Ash Building Baghouse Vent, Carbon Silo 1 Vent, Carbon Silo 2 Vent, Pebble Lime Silo Vent 1, Pebble Lime Silo Vent 2, and Whirl-Wet Vent,. Additionally, three EPA Method 22 test runs were performed for fugitive emissions on the ash handling system building and transfer points. No opacity or fugitive emissions results are presented in Appendix A because all values were zero. The field data sheets are located in Appendix B.

2.4 *Test Runs During Soot Blow*

The emissions data for Units 1, 2, 3, and 4 include one (1) test run conducted during a soot blow condition for each unit. The soot blow test runs were 1-O-M5/29-2, 2-O-M5/29-2, 3-O-M5/29-2, and 4-O-M5/29-2.

2.5 *Dioxins/Furans Results and EMPC Values*

In accordance with EPA Method 23, Section 9.9, all dioxins/furans results that were below the minimum detection limit (ND) were treated as zero when averaging or totaling the results. All dioxins/furans results that were an estimated maximum possible concentration (EMPC) are presented using the EMPC value as a positive catch when calculating the results.

Table 2-1
Unit 1 Summary of Emissions

Parameter	Rep. 1 Rep. 4	Rep. 2	Rep. 3	Average	Permit Limit
Unit 1 Process Information [1]					
Heat Input, MMBtu/hr	158	157	162	159	NA
Waste Charging Rate, lbs/hr	35,041	34,861	35,938	35,280	NA
Unit 1 SDA Inlet					
Hydrogen Chloride, ppm @ 7% O_2	521	567	488	526	NA
Mercury, mg/DSCM @ 7% O_2	0.0732	0.0792	0.0448	0.0657	NA
Unit 1 FF Outlet Concentrations					
Carbon Monoxide, ppm @ 7% O_2 [2]	15	24	18	19	100
	16	18	22	---	---
Dioxins/Furans, ng/DSCM @ 7% O_2	11.6	11.9	13.1	12.5	30
	13.4	---	---	---	---
Hydrogen Chloride, ppm @ 7% O_2	10.4	9.82	9.49	9.92	29
Mercury, mg/DSCM @ 7% O_2	0.00247	0.00288	0.00350	0.00295	0.050
Metals					
Beryllium, ug/DSCM @ 7% O_2	< 0.0288	< 0.0288	< 0.0282	< 0.0286	NA
Cadmium, mg/DSCM @ 7% O_2	<0.000115	<0.000118	<0.000135	<0.000123	0.035
Lead, mg/DSCM @ 7% O_2	0.00214	0.00115	0.00262	0.00197	0.400
Nitrogen Oxides, ppm @ 7% O_2 [3]	176	---	---	176	205
Opacity, %	0	---	---	0	10
Particulate, Gr/DSCF @ 7% O_2	0.000603	0.000328	0.000247	0.000393	0.012
Particulate, mg/DSCM @ 7% O_2	1.38	0.750	0.565	0.898	25
Sulfur Dioxide, ppm @ 7% O_2 [4]	1	---	---	1	29
Unit 1 FF Outlet Concentrations, lb/MMBtu (For Informational Purposes Only)					
Dioxins/Furans	1.04E-08	1.07E-08	1.17E-08	1.12E-08	NA
	1.20E-08	---	---	---	---
Hydrogen Chloride	0.0142	0.0134	0.0129	0.0135	NA
Mercury	2.22E-06	2.59E-06	3.14E-06	2.65E-06	NA
Metals					
Beryllium	<2.58E-08	<2.59E-08	<2.54E-08	<2.57E-08	NA
Cadmium	<1.03E-07	1.06E-07	1.22E-07	<1.10E-07	NA
Lead	1.93E-06	1.03E-06	2.36E-06	1.77E-06	NA
Particulate	1.24E-03	6.74E-04	5.07E-04	8.07E-04	NA
Unit 1 FF Outlet Emission Rates, lb/hr (For Informational Purposes Only)					
Dioxins/Furans	1.65E-06	1.65E-06	1.87E-06	1.74E-06	NA
	1.81E-06	---	---	---	---
Hydrogen Chloride	2.24	2.11	2.03	2.13	NA
Mercury	3.50E-04	4.06E-04	5.08E-04	4.21E-04	NA
Metals					
Beryllium	<4.08E-06	<4.06E-06	<4.10E-06	<4.08E-06	NA
Cadmium	<1.63E-05	1.67E-05	1.97E-05	<1.75E-05	NA
Lead	3.04E-04	1.62E-04	3.81E-04	2.82E-04	NA
Particulate	0.196	0.106	0.082	0.128	NA
Unit 1 Removal Efficiency, %					
HCl RE%, ppm @ 7% O_2	98.0	98.3	98.1	98.1	≥95
Mercury RE%, mg/DSCM @ 7% O_2	96.6	96.4	92.2	95.1	≥85
Sulfur Dioxide RE%, ppm @ 7% O_2 [4]	97	---	---	97	≥75

[1] Process information based upon EPA Method 5/29 test data and a heat content of 4500 BTU/lb.
[2] – 4 hr block averages
[3] – 24 hr arithmetic average
[4] – 24 hr geometric mean

Table 2-2
Unit 2 Summary of Emissions

Parameter	Rep. 1	Rep. 2	Rep. 3	Average	Permit Limit
Unit 2 Process Information [1]					
Heat Input, MMBtu/hr	138	145	148	144	NA
Waste Charging Rate, lbs/hr	30,752	32,180	32,933	31,955	NA
Unit 2 SDA Inlet					
Hydrogen Chloride, ppm @ 7% O_2	524	626	576	575	NA
Mercury, mg/DSCM @ 7% O_2	0.0889	0.0772	0.0774	0.0812	NA
Unit 2 FF Outlet Concentrations					
Carbon Monoxide, ppm @ 7% O_2 [2]	9	12	10	10	100
	11	9	11	---	---
Hydrogen Chloride, ppm @ 7% O_2	7.96	8.82	9.32	8.70	29
Mercury, mg/DSCM @ 7% O_2	0.00167	0.00184	0.00173	0.00175	0.050
Metals					
Beryllium, ug/DSCM @ 7% O_2	<0.0336	< 0.0319	< 0.0313	< 0.0322	NA
Cadmium, mg/DSCM @ 7% O_2	<0.000134	0.000201	0.000193	<0.000176	0.035
Lead, mg/DSCM @ 7% O_2	0.00386	0.00199	0.00506	0.00364	0.400
Nitrogen Oxides, ppm @ 7% O_2 [3]	177	---	---	177	205
Opacity, %	0	---	---	0	10
Particulate, Gr/DSCF @ 7% O_2	0.000499	0.000307	0.000164	0.000323	0.012
Particulate, mg/DSCM @ 7% O_2	1.14	0.702	0.375	0.739	25
Sulfur Dioxide, ppm @ 7% O_2 [4]	1	---	---	1	29
Unit 2 FF Outlet Concentrations, lb/MMBtu (For Informational Purposes Only)					
Hydrogen Chloride	0.0108	0.0120	0.0127	0.0118	NA
Mercury	1.50E-06	1.65E-06	1.56E-06	1.57E-06	NA
Metals					
Beryllium	<3.01E-08	<2.87E-08	<2.81E-08	<2.90E-08	NA
Cadmium	<1.21E-07	1.80E-07	1.73E-07	<1.58E-07	NA
Lead	3.47E-06	1.79E-06	4.55E-06	3.27E-06	NA
Particulate	1.02E-03	6.30E-04	3.37E-04	6.64E-04	NA
Unit 2 FF Outlet Emission Rates, lb/hr (For Informational Purposes Only)					
Hydrogen Chloride	1.50	1.66	1.84	1.67	NA
Mercury	2.08E-04	2.39E-04	2.31E-04	2.26E-04	NA
Metals					
Beryllium	<4.17E-06	<4.15E-06	<4.16E-06	<4.16E-06	NA
Cadmium	<1.67E-05	2.61E-05	2.56E-05	<2.28E-05	NA
Lead	4.80E-04	2.59E-04	6.74E-04	4.71E-04	NA
Particulate	0.142	0.0913	0.0499	0.0944	NA
Unit 2 Removal Efficiency, %					
HCl RE%, ppm @ 7% O_2	98.5	98.6	98.4	98.5	≥95
Mercury RE%, mg/DSCM @ 7% O_2	98.1	97.6	97.8	97.8	≥85
Sulfur Dioxide RE%, ppm @ 7% O_2 [4]	96	---	---	96	≥75

[1] Process information based upon EPA Method 5/29 test data and a heat content of 4500 BTU/lb.
[2] – 4 hr block averages
[3] – 24 hr arithmetic average
[4] – 24 hr geometric mean

Table 2-3
Unit 3 Summary of Emissions

Parameter	Rep. 1	Rep. 2	Rep. 3	Average	Permit Limit
Unit 3 Process Information [1]					
Heat Input, MMBtu/hr	152	156	153	154	NA
Waste Charging Rate, lbs/hr	33,684	34,730	34,045	34,153	NA
Unit 3 SDA Inlet					
Hydrogen Chloride, ppm @ 7% O_2	523	587	492	534	NA
Mercury, mg/DSCM @ 7% O_2	0.0786	0.0714	0.0237	0.0579	NA
Unit 3 FF Outlet Concentrations					
Carbon Monoxide, ppm @ 7% O_2 [2]	16	16	11	17	100
	16	13	28	---	---
Hydrogen Chloride, ppm @ 7% O_2	8.39	8.59	8.10	8.36	29
Mercury, mg/DSCM @ 7% O_2	0.000880	0.00105	0.00101	0.000978	0.050
Metals					
Beryllium, ug/DSCM @ 7% O_2	<0.0309	<0.0296	<0.0004	<0.0303	NA
Cadmium, mg/DSCM @ 7% O_2	0.000168	0.000198	0.000153	0.000173	0.035
Lead, mg/DSCM @ 7% O_2	0.00201	0.00276	0.00160	0.00212	0.400
Nitrogen Oxides, ppm @ 7% O_2 [3]	175	---	---	175	205
Opacity, %	0	---	---	0	10
Particulate, Gr/DSCF @ 7% O_2	0.000378	0.0000518	0.000345	0.000258	0.012
Particulate, mg/DSCM @ 7% O_2	0.864	0.118	0.790	0.591	25
Sulfur Dioxide, ppm @ 7% O_2 [4]	1	---	---	1	29
Unit 3 FF Outlet Concentrations, lb/MMBtu (For Informational Purposes Only)					
Hydrogen Chloride	0.0114	0.0117	0.0110	0.0114	NA
Mercury	7.91E-07	9.39E-07	9.06E-07	8.79E-07	NA
Metals					
Beryllium	<2.77E-08	<2.66E-08	<2.73E-08	<2.72E-08	NA
Cadmium	1.51E-07	1.78E-07	1.37E-07	1.55E-07	NA
Lead	1.81E-06	2.48E-06	1.43E-06	1.91E-06	NA
Particulate	7.77E-04	1.06E-04	7.10E-04	5.31E-04	NA
Unit 3 FF Outlet Emission Rates, lb/hr (For Informational Purposes Only)					
Hydrogen Chloride	1.73	1.80	1.72	1.75	NA
Mercury	1.20E-04	1.47E-04	1.39E-04	1.35E-04	NA
Metals					
Beryllium	<4.20E-06	<4.16E-06	<4.18E-06	<4.18E-06	NA
Cadmium	2.29E-05	2.77E-05	2.10E-05	2.39E-05	NA
Lead	2.74E-04	3.87E-04	2.20E-04	2.93E-04	NA
Particulate	0.118	0.0166	0.109	0.0810	NA
Unit 3 Removal Efficiency, %					
HCl RE%, ppm @ 7% O_2	98.4	98.5	98.4	98.4	≥95
Mercury RE%, mg/DSCM @ 7% O_2	98.9	98.5	95.7	97.7	≥85
Sulfur Dioxide RE%, ppm @ 7% O_2 [4]	98	---	---	98	≥75

[1] Process information based upon EPA Method 5/29 test data and a heat content of 4500 BTU/lb.
[2] – 4 hr block averages
[3] – 24 hr arithmetic average
[4] – 24 hr geometric mean

Table 2-4
Unit 4 Summary of Emissions

Parameter	Rep. 1	Rep. 2	Rep. 3	Average	Permit Limit
Unit 4 Process Information [1]					
Heat Input, MMBtu/hr	249	253	234	245	NA
Waste Charging Rate, lb/hr	49,844	50,653	46,756	49,084	NA
Unit 4 SDA Inlet					
Hydrogen Chloride, ppm @ 7% O_2	604	564	627	599	NA
Mercury, mg/DSCM @ 7% O_2	0.0671	0.103	0.0853	0.0850	NA
Unit 4 FF Outlet Concentrations					
Ammonia, ppm @ 7% O_2	1.29	1.61	1.27	1.39	10/15 [2]
Carbon Monoxide, ppm @ 7% O_2 [3]	17	20	24	23	100
	26	24	24	---	---
Dioxins/Furans, ng/DSCM @ 7% O_2	0.851	1.45	0.289	0.863	13
Hydrogen Chloride, ppm @ 7% O_2	4.77	6.51	7.23	6.17	25
Mercury, ug/DSCM @ 7% O_2	0.431	0.448	0.508	0.462	28
Metals					
Beryllium, ug/DSCM @ 7% O_2	<0.0308	<0.0314	<0.0328	<0.0317	NA
Cadmium, mg/DSCM @ 7% O_2	0.000344	0.000512	0.000226	0.000361	0.010
Lead, mg/DSCM @ 7% O_2	0.00496	0.00662	0.00270	0.00476	0.140
Nitrogen Oxides, ppm @ 7% O_2 [4]	85	---	---	85	110
Opacity, %	0	---	---	0	10
Particulate, Gr/DSCF @ 7% O_2	0.000404	0.000660	0.000574	0.000546	NA
Particulate, mg/DSCM @ 7% O_2	0.924	1.51	1.31	1.25	12
Sulfur Dioxide, ppm @ 7% O_2 [5]	2	---	---	2	26
Unit 4 FF Outlet Concentrations, lb/MMBtu (For Informational Purposes Only)					
Ammonia	0.00082	0.00102	0.00080	0.00088	NA
Dioxins/Furans	7.65E-10	1.30E-09	2.59E-10	7.75E-10	NA
Hydrogen Chloride	0.00649	0.00886	0.00984	0.00840	NA
Mercury	3.87E-07	4.02E-07	4.56E-07	4.15E-07	NA
Metals					
Beryllium	<2.77E-08	<2.82E-08	<2.95E-08	<2.85E-08	NA
Cadmium	3.09E-07	4.60E-07	2.03E-07	3.24E-07	NA
Lead	4.46E-06	5.95E-06	2.43E-06	4.28E-06	NA
Particulate	8.30E-04	1.36E-03	1.18E-03	1.12E-03	NA

[1] Process information based upon EPA Method 5/29 test data and a heat content of 5000 BTU/lb.
[2] Ammonia slip emission limit:
@ 195 MMBtu/hr = 10 ppmvd
@ 260 MMBtu/hr = 15 ppmvd
[3] – 4 hr block averages
[4] – 24 hr arithmetic average
[5] – 24 hr geometric mean

Table 2-4
Unit 4 Summary of Emissions
(continued)

Parameter	Rep. 1	Rep. 2	Rep. 3	Average	Permit Limit
Unit 4 FF Outlet Emission Rates, lb/hr					
Ammonia	0.196	0.252	0.200	0.216	NA
Carbon Monoxide [1]	3.91	8.98	4.66	5.85	32.4
Dioxins/Furans	1.91E-07	3.17E-07	6.45E-08	1.91E-07	3.61E-06
Hydrogen Chloride	1.62	2.21	2.49	2.11	25.4
Mercury	9.65E-05	1.02E-04	1.07E-04	1.02E-04	0.022
Metals					
Beryllium	<6.90E-06	<7.15E-06	<6.90E-06	<6.98E-06	NA
Cadmium	7.70E-05	1.17E-04	4.75E-05	8.03E-05	NA
Lead	1.11E-03	1.51E-03	5.68E-04	1.06E-03	NA
Nitrogen Oxides [1]	36.8	35.5	38.0	36.8	58.5
Particulate	0.207	0.343	0.276	0.275	3.3
Sulfur Dioxide [1]	0.279	0.209	0.000	0.163	19.2
Unit 4 Removal Efficiency, %					
HCl RE%, ppm @ 7% O_2	99.2	98.8	98.8	99.0	≥95
Mercury RE%, mg/DSCM @ 7% O_2	99.4	99.6	99.4	99.4	≥85

[1] Reference method CEMs were used along with air flow rates measured during concurrent testing to calculate the pounds/hour emissions for SO_2, NO_x, and CO.

2.6 Carbon Monoxide, Sulfur Dioxide, and Nitrogen Oxides

The carbon monoxide, sulfur dioxide, and nitrogen oxides concentration data for units 1, 2, 3, and 4 were provided by the facility CEMs. The carbon monoxide, sulfur dioxide, and nitrogen oxides emission rate data for unit 4 was provided by the reference CEMs and was used along with air flow rates measured during testing to calculate the pounds/hour emissions.

2.7 Metals Reagent Blank Corrections

Lead was detected at low levels in the reagent blank. In accordance with EPA Method 29, Sections 12.6 and 12.7, the test run catch weights were corrected for the blank values.

2.8 Unit 1 Dioxins/Furans Additional Test Run

Test run 1-O-M23-3 was conducted on Wednesday, July 17, 2013. The particulate filter for test run 1-O-M23-3 showed signs of visible particulate indicating a malfunction in the fabric filter baghouse during the test run. The control room operator subsequently inspected the opacity trend logs during the test run and noticed opacity spikes on Unit 1 opacity monitor during test run 1-O-M23-2 verifying a malfunction in the fabric filter baghouse during the test run. The fabric filter baghouse malfunction was repaired and test run 1-O-M23-4 was conducted on Friday, July 19, 2013. All four EPA Method 29 test runs were analyzed and reported for Unit 1.

2.9 Non-detected Values

The results are presented using a worst-case scenario. All non-detected results were used as values for calculation purposes and the result is preceded by a "<" symbol. All non-detected results were used as a zero when calculating total catch weights for samples that had both a positive catch weight for one or more fractions and also non-detected fraction(s). When averaging across a set of three test runs, non-detected results were treated as values. Any average result that includes a non-detected value includes a "<" symbol in front of the result.

2.10 Duplicate Analyses

One run for each unit was analyzed in duplicate for the metals of interest. All runs for mercury were analyzed in duplicate. All runs for HCl were analyzed in duplicate. The average of the duplicate analyses were used for reporting purposes.

3.0 PROCESS DESCRIPTION AND OPERATION

The Hillsborough County Solid Waste Energy Recovery Facility processes a nominal 1800 tons of solid waste each day, generating approximately 45 megawatts of electricity. The facility is operated by Covanta Hillsborough, Inc. There are three (3) Martin GmbH waterwall furnaces processing up to 400 tons of waste per day and one (1) Martin GmbH waterwall furnace processing up to 600 tons of waste per day. Waste is combusted at furnace temperatures exceeding 1,800 degrees Fahrenheit and reduced to an inert ash residue. Before leaving the facility, combustion air is directed through technologically advanced air pollution control equipment consisting of a spray dryer absorbers (SDA), aqueous ammonia injection, powdered carbon injection, and fabric filter baghouses.

4.0 SAMPLING AND ANALYTICAL METHODS

This section briefly describes the sampling and analytical procedures that were used and any deviations from the methods. Figure 4-1 depicts the cross-section of the SDA Inlet test locations and Figure 4-2 depicts the cross-section of the Fabric Filter Outlet test locations.

4.1 EPA Methods 1-4 – Air Flow and Moisture

EPA Methods 1 through 4 were utilized in conjunction with each isokinetic test method. EPA Method 1 was used to determine the location of the sampling points. EPA Method 2 was used to measure the flue gas flow rate. EPA Method 3 was used to determine the flue gas molecular weight. EPA Method 4 was used to determine the flue gas moisture content. The information provided by these methods was used in determining isokinetics, parameter concentrations, and parameter emission rates.

4.2 EPA Method 9 - Opacity

Opacity (visible emissions) readings were taken every 15 seconds by a certified visual emissions reader for the specified length of time during each EPA Method 5 test run.

4.3 EPA Method 23/Alternate Method 052 – Dioxins/Furans

The concentrations and emissions rates of polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDD/PCDF or dioxins/furans) were determined utilizing EPA 23. The EPA Method 23 sampling train consisted of a glass nozzle, a heated glass probe, a heated glassmat filter, a condenser, an XAD resin trap, an empty impinger, two chilled impingers each with 100mL of DI water, an empty impinger, an impinger with 200 grams of silica gel, and a dry gas metering console. The equipment was operated in accordance with EPA Method 23 with no exceptions except that the methylene chloride rinse was not performed with EPA approval.

At the end of each test run, the nozzle, probe, and filter fronthalf were rinsed with acetone into a sample jar. The filter was recovered dry into a glass petri dish. The filter backhalf, and condenser were rinsed with acetone into a sample jar. All of the components listed above up to the XAD resin trap were rinsed again with toluene into a sample jar. The XAD resin trap was sealed and placed into a chilled ice chest. The contents of the first three impingers were poured back into the original reagent jar. The silica gel was poured back into its original container. The moisture catch was then determined gravimetrically.

The samples were analyzed in accordance with EPA Method 23 for dioxins/furans.

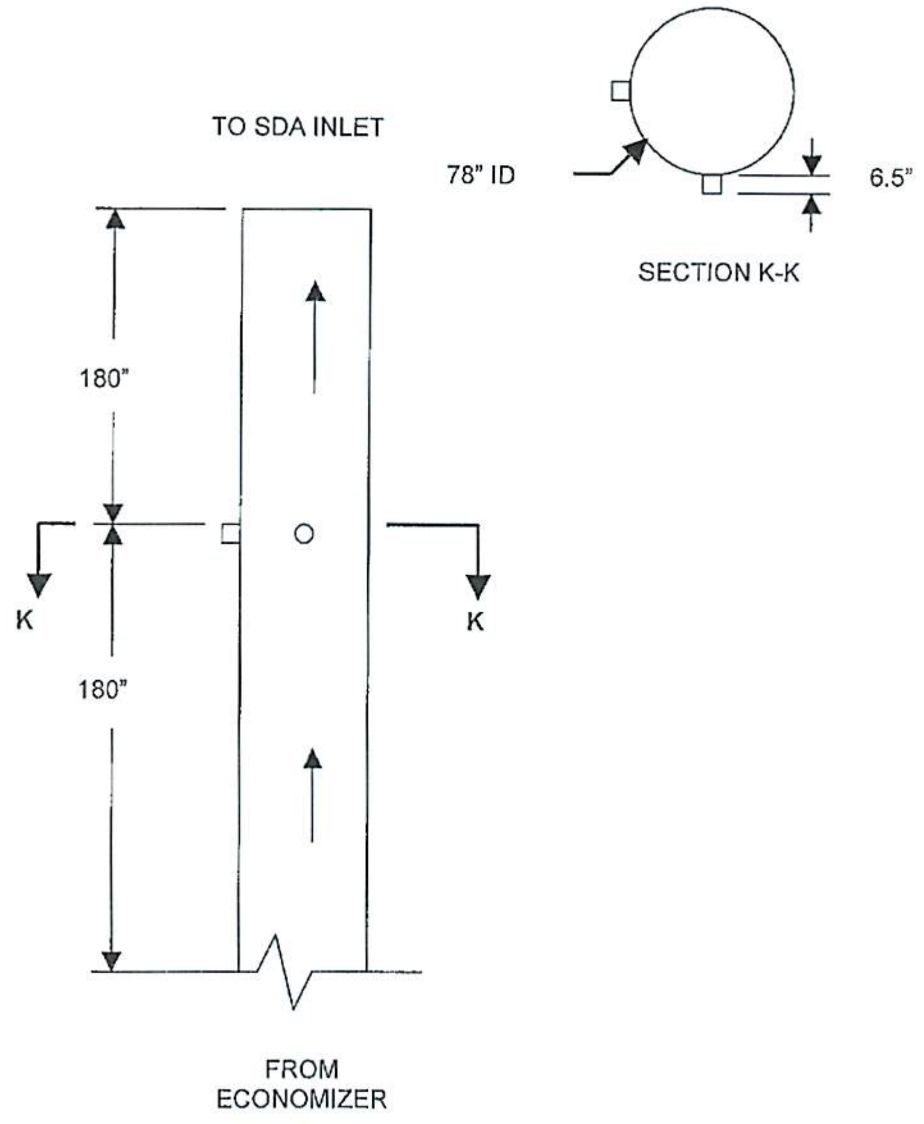

Figure 4-1. SDA Inlet Sampling Location
(Units 1, 2, & 3 are identical)

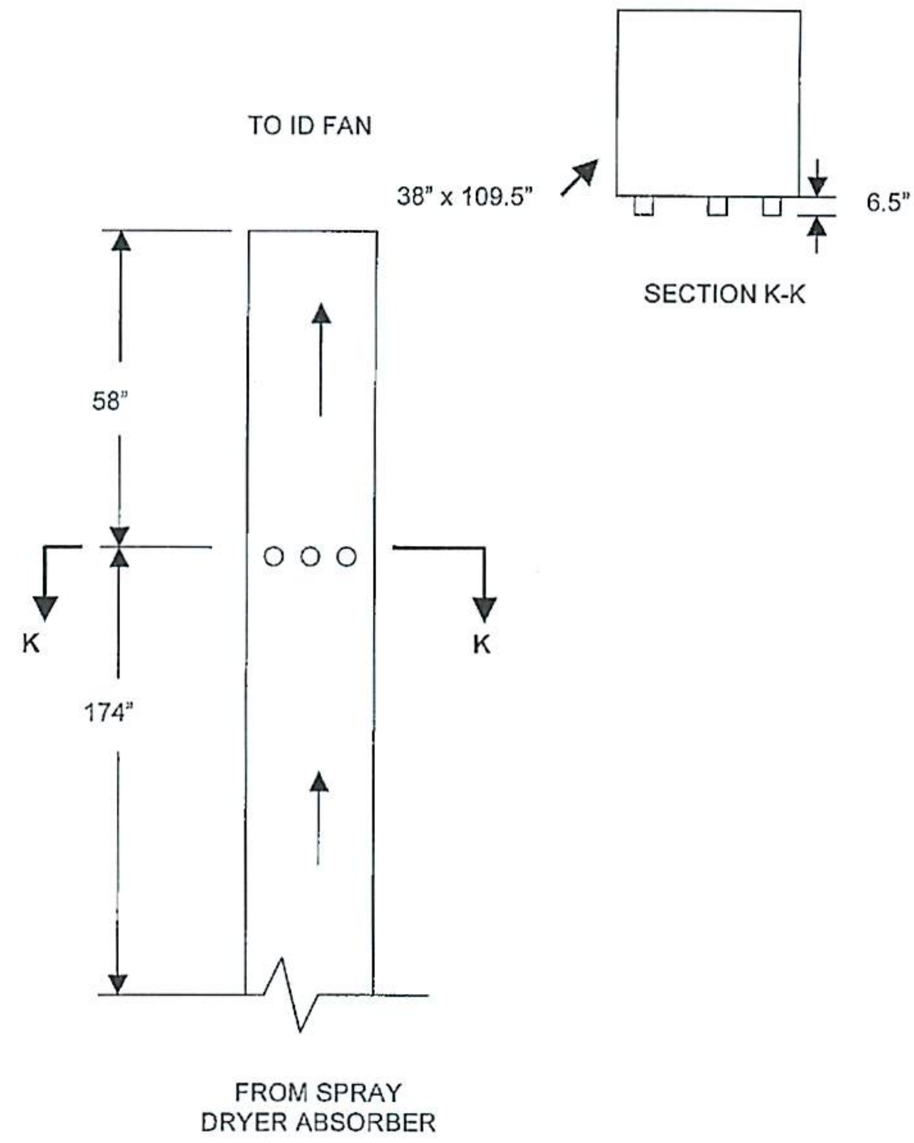

Figure 4-2. FF Outlet Sampling Location
(Units 1, 2, & 3 are identical

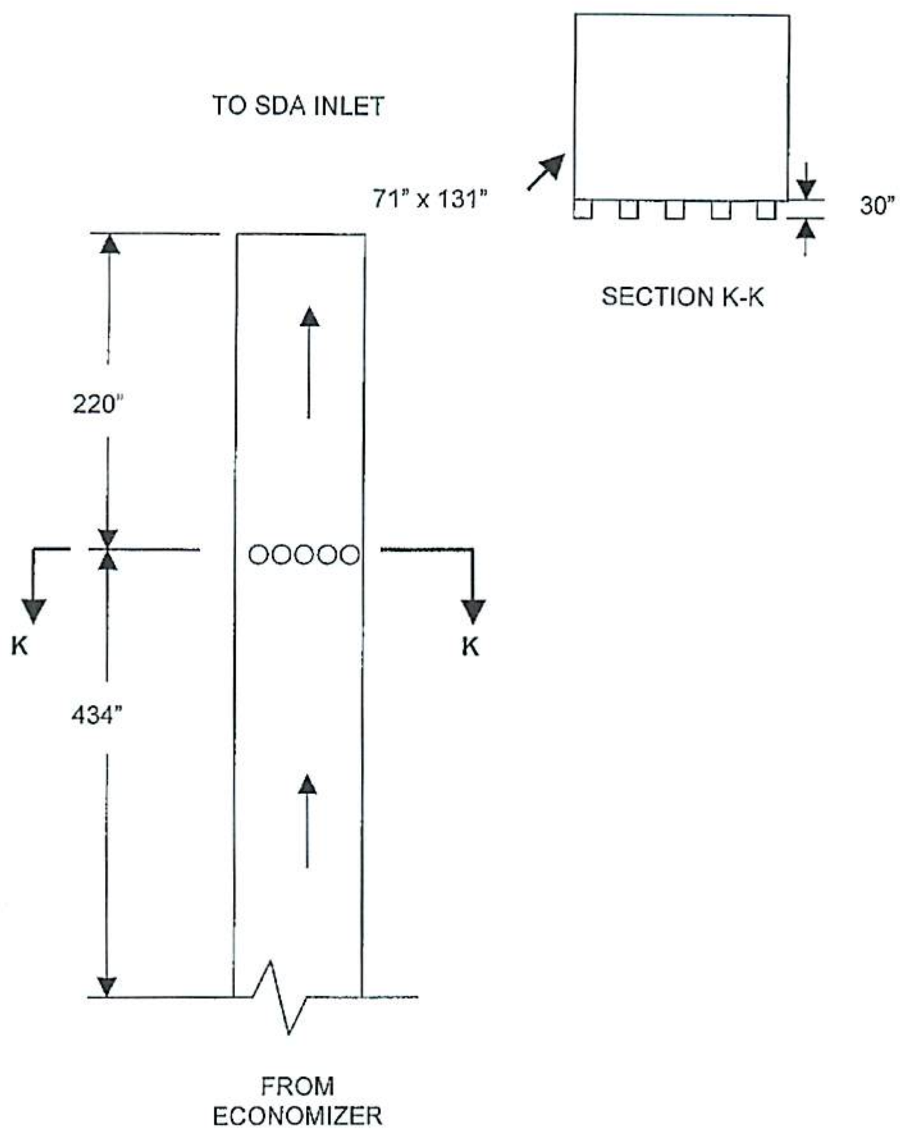

Figure 4-3. SDA Inlet Sampling Location
(Unit 4)

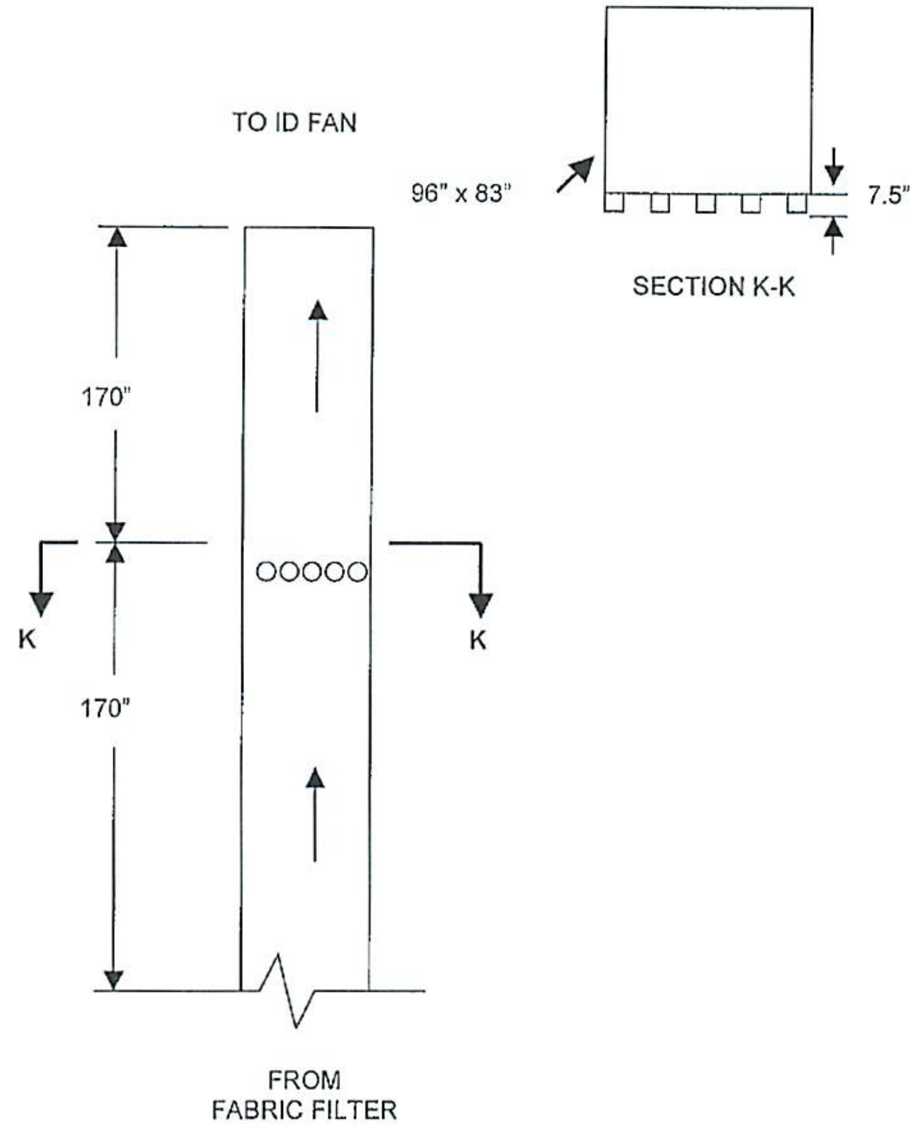

Figure 4-4. FF Outlet Sampling Location
(Unit 4)

4.4 EPA Modified Method 26 – Hydrogen Chloride

Hydrogen chloride concentrations and emission rates were determined utilizing EPA Method 26 modified to use large impingers. The EPA Method 26 sampling train consisted of a heated glass probe, a heated quartz filter, two chilled impingers each with 100mL of 0.1N H_2SO_4, a dry impinger, an impinger with 200 grams of silica gel, and a dry gas metering console. The equipment was operated in accordance with EPA Method 26 except that large impingers were used for sample collection.

At the end of each test run, the contents of the first three impingers were poured back into the original H_2SO_4 reagent jar. The silica gel was returned to its original container. The moisture catch in the components was determined gravimetrically. The filter backhalf and first three impingers were rinsed with DI water into the H_2SO_4 reagent jar.

The H_2SO_4 portion of the samples were analyzed in accordance with EPA Method 26 for hydrogen chloride.

4.5 EPA Method 5/29 – Particulate and Metals

Particulate and metals concentrations and emission rates were determined utilizing EPA Methods 5 and 29. The EPA Method 5/29 sampling train consisted of a glass nozzle, a heated glass probe, a heated, tared quartz filter, two chilled impingers each with 100mL of 5%HNO_3/10%H_2O_2, an empty impinger, two chilled impingers each with 100mL of 4%$KMnO_4$/10%H_2SO_4, an impinger with 200 grams of silica gel, and a dry gas metering console. The equipment was operated in accordance with EPA Method 29 with no exceptions.

At the end of each test run, the nozzle, probe, and filter fronthalf were rinsed with 100 mL of acetone into a glass sample jar. Then, the nozzle, probe, and filter fronthalf were rinsed with 100 mL of 0.1N nitric acid into a sample jar. The filter was recovered dry into another sample jar. The contents of the 5%HNO_3/10%H_2O_2 impingers were poured back into the original reagent jar. Any condensate in the empty impinger was poured into a sample jar. The 4%$KMnO_4$/10%H_2SO_4 impingers were recovered into another sample jar.

The moisture catch was then determined gravimetrically. The filter backhalf and 5%HNO_3/10%H_2O_2 impingers were rinsed with 100 mL of 0.1N nitric acid into the reagent jar. The empty impinger was rinsed with 100 mL of 0.1N nitric acid into a sample jar. The 4%$KMnO_4$/10%H_2SO_4 impingers were rinsed with 100 mL of 4%$KMnO_4$/10%H_2SO_4 and 100 mL of DI water into the jar containing the 4%$KMnO_4$/10%H_2SO_4 reagent. The 4%$KMnO_4$/10%H_2SO_4 impingers and connecting glassware were rinsed with 25mL of 8N HCl if any brown residue remained. This HCl rinse was added to a jar containing 200mL of DI water.

The filter and acetone rinses were desiccated and analyzed gravimetrically for particulate following EPA Method 5 techniques. Then, the samples were analyzed in accordance with EPA Method 29 for metals.

4.6 EPA Methods 3A, 6C, 7E, and 10 – O2, CO2, SO2, NOx, and CO

Oxygen, carbon dioxide, sulfur dioxide, nitrogen oxides, and carbon monoxide concentrations were determined utilizing a continuous emissions monitoring (CEM) system as per EPA Methods 3A, 6C, 7E, and 10. This section presents the sample system description and operation. No deviations from EPA Methods were performed.

The CEM system consisted of an in stack probe, heated out of stack filter, heated transfer lines, condenser, unheated Teflon sample lines, sample pump, distribution manifold board, analyzers, and calibration gases. All components of the sampling system that are in contact with the sample are constructed of Teflon, glass, or stainless steel (316). Flue gas was extracted from the source through a three-point stainless steel probe. Flue gas was then passed through a heated Teflon sample line to a tee where the sample was split. Part of the sample remained heated to the hydrocarbon analyzer while the remainder of the sample was diverted into a condenser. This filtering system removes interferences such as particulate and moisture. Conditioned flue gas was then transported via Teflon tubing to a Teflon lined sample pump, through a distribution manifold, and on to various analyzers.

The integrity of this sampling system was verified (as per EPA Methods) using EPA Protocol 1 calibration gases. The design of this sampling system allows the operator to introduce calibration gases at the outlet of the probe, prior to the heated out of Fabric Filter Outlet filter (for the system bias check and calibration drift check), and directly into the analyzers (for linearity checks).

4.7 Conditional Test Method 027 - Ammonia

Ammonia concentrations were determined utilizing Conditional Test Method 027 (CTM 027). The sampling train consisted of a glass nozzle, a heated glass probe, a heated glassmat filter, two chilled G-S impingers each with 100mL of 0.1N H_2SO_4, an empty impinger, an impinger with 200 grams of silica gel, and a dry gas metering console. The equipment was operated isokinetically in accordance with CTM 027.

At the end of each test run, the contents of the impingers were poured back into the original reagent jar. The silica gel was returned to its original container. The moisture catch in the components was determined gravimetrically. The probe and filter fronthalf were rinsed with DI water into a reagent jar. The filter was placed into the fronthalf jar. The filter backhalf, impingers, and connecting glassware were rinsed with DI water into the original reagent jar.

The samples, excluding the fronthalf, were analyzed using ion chromatography techniques in accordance with CTM 027 for ammonia.

5.0 QA/QC RESULTS

5.1 QA/QC Policy Procedures

TESTAR Engineering, P.C. is committed to adhering to Quality Assurance/Quality Control (QA/QC) procedures and objectives that meet or exceed the relevant EPA guidance. Our procedures include calibration of equipment as appropriate, proper glassware pre-cleaning to prevent contamination of samples, proper sample recovery, documented sample custody, blank samples, duplicate analyses, matrix spike recovery, and validated computer generated results. We also adhere to other method specific criteria such as maintaining isokinetic conditions during particulate type testing and posttest leak checks.

TESTAR Engineering uses oil manometers to determine velocity differential pressures thus eliminating potential errors from magnehelic gauges. The manometers are leveled and zeroed prior to taking any measurements. All equipment used onsite undergoes a pretest audit and operational check for accuracy. Dry gas meters are checked by using an orifice to determine the meter gamma. The audit gamma must be within 3% of the full test gamma for the meter to be acceptable. Likewise, all thermocouples are checked at ambient temperature versus an ASTM reference thermometer or a thermometer that has been checked against an ASTM reference thermometer. The reading must agree within 2°F. Additionally, the barometer is checked against a reference barometer prior to each project and must agree within 0.1" Hg.

After each testing project, the dry gas meter undergoes a posttest audit following the guidelines of Alternate Method 009. Alternate Method 009 utilizes a mathematical calculation to check the dry gas meter calibration factor (gamma) versus the full test calibration factor. The gamma must agree within ±5% of the full test gamma.

5.2 Sample Custody and Preservation

Proper sample custody and preservation techniques ensure that the samples collected and analyzed are the same, that the sample did not change in concentration prior to analysis, and that the sample was not tampered with prior to analysis. To ensure accurate results, TESTAR Engineering collects and transports samples in clean containers that are inert to the matrix enclosed, that will not contaminate the sample, and that prevent photochemical reactions when appropriate. All samples contain unique identifiers that include the client name, facility name, TESTAR Engineering project number, collection date, unique run number, sample fraction, and matrix. Liquid levels are marked in order to determine if any leakage occurred during transport. Samples are accompanied by sample custody forms identifying the client, facility, project number, sample, fractions, collection date, etc. When custody is relinquished to the laboratory, the receiving sample custodian signs the form.

5.3 Sample Blanks, Duplicates, and Matrix Spikes

Several types of blanks are utilized depending upon the project QA objectives. Typical blanks include field blanks, reagent blanks, and trip blanks. Blanks help to identify the source of contamination if contamination is suspected based upon the result validation procedure. Trip blanks are typically not analyzed unless the field blank shows significant contamination. Field blanks and reagent blanks are analyzed during most testing programs involving metals unless requested not to do so by the client. Field blanks are analyzed during most programs involving organics such as dioxins/furans.

Duplicates and matrix spikes are analyzed for projects involving metals testing. At least 10% of the samples are analyzed in duplicate for metals and at least one matrix spike is performed. All mercury analyses are performed in duplicate.

Breakthrough analyses are performed for projects involving organics utilizing adsorbent tubes. Adsorbent tubes are desorbed and analyzed separately to determine if any breakthrough occurred. Breakthrough is said to have occurred if the organic catch weight on the last fraction (generally the backhalf of the last adsorbent tube) is more than 10% of the total train organic catch.

5.4 Data Validation and Presentation

The field test engineer is responsible for reviewing and validating data as it is obtained. Additionally the onsite project manager reviews data for consistency, completeness, and accuracy prior to leaving the site. This validation procedure is based upon their knowledge of the process being tested and/or similar sources as well as checks built into the software being utilized. This allows for error correction or for the testing to be repeated immediately rather than at a later undetermined date. The data undergoes another review by a Project Director upon return to headquarters. Analytical data is reviewed by the QA Director upon submittal by the analytical laboratory to resolve any conflicts or concerns as soon as possible rather than after the results have been calculated.

Data is collected using computerized spreadsheets in the field and the results are calculated using validated computer programs to prevent erroneous calculations.

5.5 QA/QC Results

This section presents QA/QC results from measures taken during the testing program. The results are summarized in the following tables for easy reference.

Table 5-1
Summary of QA/QC Procedures

Test Method	QA/QC Procedure	QA/QC Objective	QA/QC Results	Status of QA/QC
EPA M23	Internal Standard Recoveries (4-6)	40 – 130 %	74.6 – 114 %	Acceptable
	Internal Standard Recoveries (7-8)	25 – 130 %	77.3 – 120 %	Acceptable
	Surrogate Standard Recoveries	70 – 130 %	91.3 – 128 %	Acceptable
EPA MM26	HCl Reagent Blank	ND	< 0.085 mg	Acceptable
	In-house HCl Audit	± 10 %	2.07 %	Acceptable
	HCl Spike	90 – 110 %	100.3 %	Acceptable
EPA M5/29	Acetone Blank	< 1.0E-5 mg/mg	0.00E-06 mg/mg	Acceptable
EPA M29	Duplicate RPD	≤ 20 %	4.9 %	Acceptable
Beryllium	Reagent Blank	ND	< 0.05 ug	Acceptable
Cadmium	Reagent Blank	ND	< 0.2 ug	Acceptable
Lead	Reagent Blank	ND	0.265 ug	Acceptable, Blank Correction
	Spike Recoveries	75 – 125 %	76 – 118 %	Acceptable
EPA M29 - Hg	Duplicate RPD	≤ 10 %	6.1 %	Acceptable
	Reagent Blank	ND	< 0.5 ug	Acceptable
	Spike Recoveries	75 – 125 %	76 – 113 %	Acceptable
CTM 027	Reagent Blank	ND	< 0.090 mg	Acceptable
	In-house NH3 Audit	± 10 %	3.56 %	Acceptable
	NH3 Spike	90 – 110 %	100.9 %	Acceptable