*Covanta Hennepin*
*A Covanta Energy Company*
505 Sixth Avenue North
Minneapolis, MN 55405
Tel 612 333 7303
Fax 612 333 7347

December 19, 2012

**UPS TRACKING NUMBER: 1Z5659X00297722603**

Permit Document Coordinator
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

**RE: Solid Waste Composition Study Report**
**Facility Identification Number: 05300400-003**

Dear Permit Document Coordinator:

Per our current Title V Air Emissions Permit (05300400-003) we are required to complete and submit a Solid Waste Composition Study. Covanta Hennepin ERC completed the Solid Waste Composition Study on November 12, 2012 through November 17, 2012. The following components are included in the Solid Waste Composition Study:

1. Fractional Analysis;
2. Proximate Analysis;
3. Ultimate Analysis; and,
4. Heat Value.

If you have any questions regarding the information enclosed, please do not hesitate to contact me at (612) 332-9428.

Sincerely,

**COVANTA HENNEPIN ENERGY RESOURCE COMPANY**

Daniel Fish
Environmental Engineer

cc: Brent Rohne, MPCA
Andy Leith, Hennepin County
Tom Frame, City of Minneapolis
Paul Kantola, Covanta Energy

December 17, 2012

Mr. Dan Fish
Environmental Engineer
Covanta Hennepin Energy Resource Company
505 6th Avenue North
Minneapolis, MN 55405

Subject: **Hennepin Energy Resource Company Waste Characterization Study**

Dear Mr. Fish:

## Overview

Per the agreement between SAIC and Covanta Hennepin Energy Resource Company (HERC), enclosed are the results of the solid waste fractional, proximate, ultimate, and heating value analyses. We have provided a letter report outlining the study objective, applicable methodology, the detailed results for the HERC Facility analysis, statistical interpretation of these results, and the conclusions.

## Objective

The objective of the study is to gather data consistent with Minnesota Rule 7007.0501 Subp. 2(A) requiring a fractional, proximate, ultimate, and heating value analysis of the solid waste for the operating permit for the HERC Facility.

## Fractional Analysis

### Methodology

The proposed methodology for the fractional analysis represents a defensible means to complete the analysis based on the use of proven field and testing methodologies. The methodology developed is consistent with American Society for Testing and Materials (ASTM) Designation: D5231-92 (2003); Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste (ASTM Standard).

#### Review of Facility Transaction Data

The first step included forwarding a written request for information to HERC staff to gather and analyze facility transaction records. The data was reviewed to assess the historical quantities of solid waste received, number and frequency of vehicles depositing solid waste at HERC, and types of



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solid waste received at the HERC Facility. HERC staff provided three, non-consecutive weeks of daily transaction data including but not limited to waste quantities, waste type, vehicle number, time of day for individual transactions, and other related information. In addition, HERC staff provided weekly summaries for each of the three weeks of data and monthly solid waste quantity data for the last 12 months. This data was analyzed to develop the sampling methodology that provides both representative and statistically sound results.

## Materials Sampling

The ASTM Standard identified above provides the foundation for developing the materials sampling methodology. The materials sampling methodology included a series of steps beginning with the selection of the vehicles for the sampling of materials for sorting. The methodology hinges upon eliminating any bias that may enter the process of selecting the materials to sample. SAIC randomly chose selected the vehicles to select samples upon gathering a comprehensive understanding of the traffic and materials flow to the HERC Facility. Then, the individual samples were selected to ensure a representative sample was taken from the selected vehicle load. Based on our review of the HERC facility transaction data, we summarized the data and implemented the sampling plan depicted in Table 1 below.

**Table 1**
**Sampling Plan**
**Covanta Energy – HERC Facility**

| Day of the Week | Daily Percentage of Total Solid Waste Quantities Received (average) | Number of Vehicles Depositing Materials (average) | Representative Number of Samples | Adjusted Number of Samples | "Nth" Truck |
|---|---|---|---|---|---|
| Sunday | 1.9% | 22 | 1 | 0 | NA |
| Monday | 21.2% | 267 | 11 | 11 | 22nd |
| Tuesday | 19.4% | 256 | 10 | 10 | 24th |
| Wednesday | 18.0% | 240 | 9 | 9 | 25th |
| Thursday | 16.8% | 225 | 8 | 9 | 23rd |
| Friday | 18.2% | 245 | 9 | 9 | 26th |
| Saturday | 4.5% | 57 | 2 | 2 | 20th |

The above reflects a similar quantity of materials received Monday through Friday with Saturday and Sunday representing days when smaller quantities of materials are received. SAIC also calculated the average number of vehicles for each day of the week to assist in developing the sampling plan. The proposed number of samples selected was proportional to the average quantities of materials received each day of the week to be representative of the overall materials received in a



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"normal" week. The "Nth truck" was identified using the estimated total number of vehicles and the total number of samples for each day. For example, on Monday approximately every 22nd truck was selected for sampling, for a total of 11 samples.

SAIC relied on both driver interviews and the sampling randomization inherent in the "Nth truck" approach to select vehicles to sample materials. The Nth truck approach is based on the number of samples required for the study to yield statistically sound results and the number of vehicles expected at the facility each day that will be delivering solid waste. A member of SAIC's waste sort crew interviewed the driver of the Nth truck to determine the origin of the materials being hauled for disposal and confirm that the vehicles were delivering municipal solid waste.

In addition, based on discussions with staff, a small number of transfer trailers are directed to the HERC facility by the County to meet waste throughput objectives. SAIC reviewed the facility transaction data and concluded that transfer trailers are not directed to the facility every week, but in some select weeks the County has directed a small number of transfer trailers with solid waste to the HERC facility for disposal. To our knowledge, no transfer trailers were directed to HERC during the week of the filed sort, thus no samples were taken from transfer trailers.

## Materials Sorting Methodology

Prior to conducting the actual waste sampling and sorting, SAIC and HERC staff discussed and agreed upon the materials' categories and definitions to be sorted (see Appendix A).

SAIC conducted the field event at the HERC Facility from Monday, November 12th through Saturday, November 17th. The SAIC project team sampled and sorted 50 samples totaling more than 10,000 pounds of solid waste materials during the sorting event. Each sample represented a minimum of 200 pounds and was taken from randomly selected vehicle loads to ensure a representative sampling process.

The sampling and sorting included the following:

- Selected a random sample of MSW of at least 200 pounds from the identified loads by coordinating with facility operational staff using a sampling process consistent with the ASTM Designation: D5231-92 (2003), Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste (ASTM Standard).
- Once each sample had been selected, the materials were pre-sorted for any hazardous or infectious wastes.
- SAIC sampled and sorted the materials into the agreed upon categories.
- Upon sorting the MSW materials into the designated containers by material category, the sorting crew weighed these materials for each of the samples and recorded the materials' weights per sample on designated data forms.



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- The recorded weights were input into SAIC's specially-designed statistical computer model for analyzing the waste composition data.
- Before discarding the materials, the sorting crew took grab samples of materials from each of the combustible fractions to create combustible composite samples.
- The composite samples were transported to the laboratory for proximate, ultimate, and heating value analyses.

## Results

As specified in Minnesota Rule 7007.0501 Subpart 2, the results of the solid waste fractional analysis have been characterized as percentages by weight of combustible and noncombustible materials and, at minimum, the material categories include paper, cardboard, plastic, ferrous and nonferrous metals, glass, organic, inorganic, recyclable, problem materials and household hazardous wastes, including mercury-containing materials. The overall results of the analysis are depicted in Figure 1 below as percentages by weight for the primary material categories for the fractional analysis completed.



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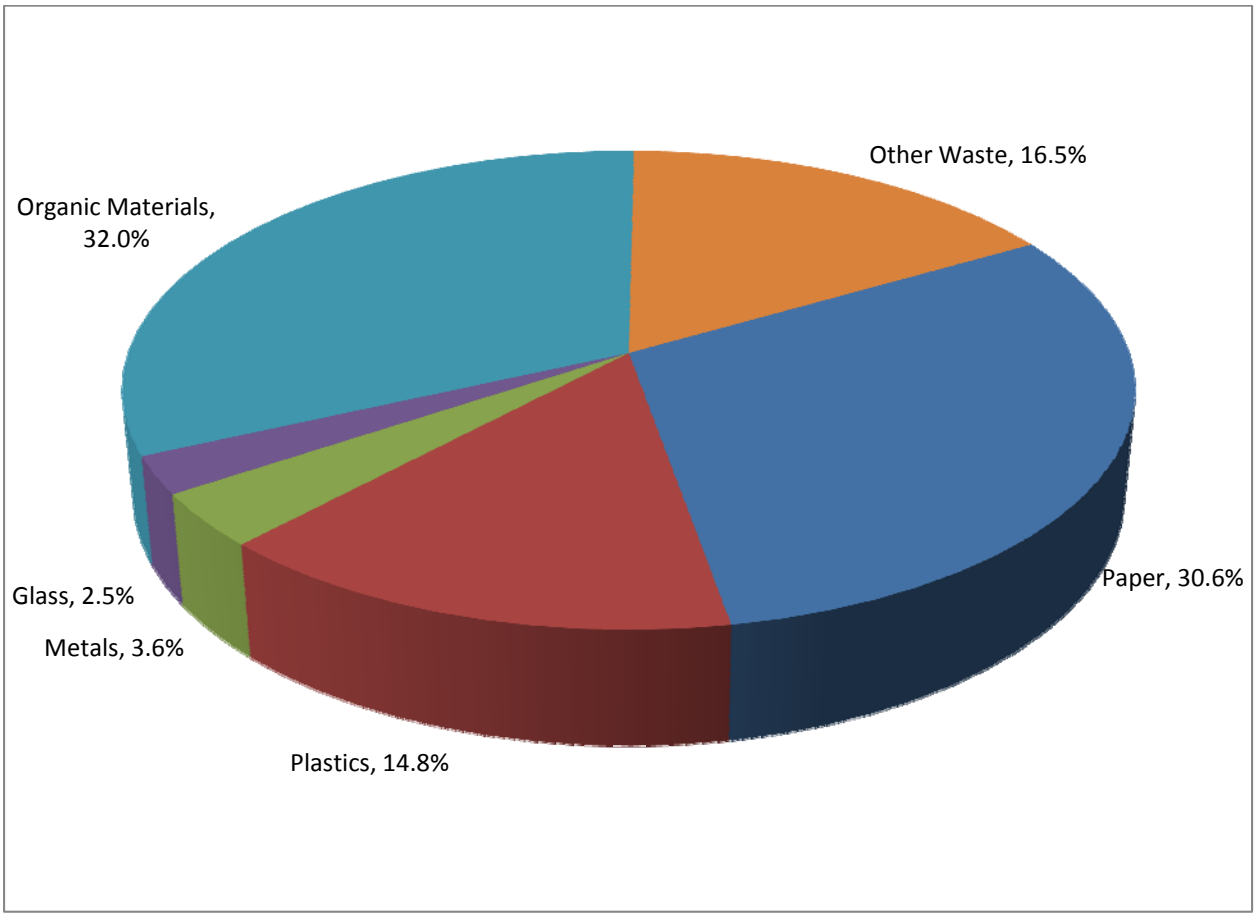
**Figure 1**
**HERC Facility**
**Solid Waste Composition Analysis Results (By Weight)**




The detailed results including the mean percentages and 90 percent confidence intervals by individual material type are provided in Table 2 below. The individual subcategories and primary categories may not sum due to rounding. Please note that the results are based on 47 samples because three samples were excluded as statistical outliers. Each of the samples identified as outliers contained disproportionate quantities of one or two specific material categories.



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## Table 2
## Covanta Energy – HERC Facility
## Solid Waste Composition Results (By Weight)
## November 2012

| Material Group | | Material | Mean (%) | 90 % Confidence Interval Lower Bound | 90 % Confidence Interval Upper Bound |
|---|---|---|---|---|---|
| **Paper** | | | **30.6%** | **27.9%** | **33.3%** |
| | 1 | Corrugated Cardboard | 4.0% | 3.0% | 5.1% |
| | 2 | Newspaper | 1.9% | 1.5% | 2.5% |
| | 3 | Office Paper | 2.0% | 1.5% | 2.5% |
| | 4 | Mixed Paper | 3.9% | 3.3% | 4.6% |
| | 5 | Magazines/Catalogs | 1.0% | 0.8% | 1.3% |
| | 6 | Phone Books | 0.2% | 0.1% | 0.3% |
| | 7 | Boxboard/Paperboard | 1.5% | 1.3% | 1.7% |
| | 8 | Cartons/Aseptic Packaging | 0.2% | 0.2% | 0.3% |
| | 9 | Food-Soiled Paper, Compostable Food Service Ware & Other Compostable Items[1] | 13.6% | 11.9% | 15.4% |
| | 10 | Other Paper | 2.3% | 1.5% | 3.2% |
| **Plastic** | | | **14.8%** | **13.3%** | **16.5%** |
| | 11 | #1 PET Bottles | 1.2% | 1.0% | 1.4% |
| | 12 | #1 PET Injection-Molded Containers | 0.4% | 0.3% | 0.6% |
| | 13 | #2 HDPE Bottles | 0.7% | 0.6% | 0.8% |
| | 14 | #3 PVC | 0.2% | 0.1% | 0.3% |
| | 15 | #2 (non-bottles), #4, and #5 Bottles & Containers | 0.8% | 0.7% | 1.0% |
| | 16 | Bags & Film Plastic | 6.0% | 5.3% | 6.8% |
| | 17 | Other Rigid Plastics | 1.6% | 1.1% | 2.1% |
| | 18 | All Other Plastics | 3.8% | 3.1% | 4.7% |
| **Metal** | | | **3.6%** | **2.8%** | **4.6%** |
| | 19 | Ferrous Metals | 2.0% | 1.4% | 2.7% |
| | 20 | Aluminum Used Beverage Containers | 0.5% | 0.4% | 0.7% |
| | 21 | Aluminum Scrap Metal | 0.3% | 0.2% | 0.3% |
| | 22 | Other Non-Ferrous Metals | 0.8% | 0.4% | 1.4% |
| **Glass** | | | **2.5%** | **2.0%** | **3.2%** |
| | 23 | Food & Beverage Container Glass | 2.1% | 1.6% | 2.7% |
| | 24 | Other Glass | 0.4% | 0.3% | 0.6% |
| **Organics** | | | **32.0%** | **28.0%** | **36.1%** |
| | 25 | Food Waste | 16.5% | 13.7% | 19.4% |
| | 26 | Liquid Waste | 1.0% | 0.7% | 1.4% |
| | 27 | Yard Waste | 3.5% | 2.1% | 5.3% |
| | 28 | Wood Waste | 4.3% | 2.5% | 6.5% |
| | 29 | Other Organics | 6.7% | 4.6% | 9.2% |



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**Table 2**
**Covanta Energy – HERC Facility**
**Solid Waste Composition Results (By Weight)**
**November 2012**

| Material Group | Material | Mean (%) | 90 % Confidence Interval Lower Bound | 90 % Confidence Interval Upper Bound |
|---|---|---|---|---|
| **Other Waste** | | **16.5%** | **13.8%** | **19.3%** |
| 30 | Electronics with CRTs | 0.8% | 0.4% | 1.3% |
| 31 | Electronics w/o CRTs | 0.7% | 0.4% | 1.2% |
| 32 | Small Household Appliances | 0.7% | 0.3% | 1.1% |
| 33 | Major Appliances | 0.5% | 0.2% | 0.8% |
| 34 | HHW | 0.0% | 0.0% | 0.1% |
| 37 | Textiles and Leather | 3.5% | 2.5% | 4.6% |
| 38 | Bulky Waste | 3.4% | 1.9% | 5.4% |
| 39 | C&D | 2.8% | 1.6% | 4.2% |
| 40 | Tires/Rubber | 0.5% | 0.3% | 0.7% |
| 41 | Other Inorganics Materials | 0.7% | 0.4% | 1.2% |
| 42 | Fines | 2.9% | 2.7% | 3.2% |
| **GRAND TOTAL** | | **100.0%** [2] | | |

[1] Includes paper and compostable plastics, but placed in paper material category because paper composes majority of the category by weight.
[2] Total not equal 100% due to rounding.

## Statistical Interpretation

In evaluating the results we recommend that both the mean and 90 percent confidence intervals be reviewed for the various categories. The 90 percent confidence interval is consistent with the ASTM standards and is considered the solid waste industry statistically accepted standard for similar type studies. A 90 percent confidence interval represents that there is a 90 percent level of confidence that the true population mean (i.e., if all the materials received at the HERC facility were sorted) falls within the identified upper and lower intervals. The mean percentages, by weight, provide a definitive measure for characterizing the various materials in the solid waste stream.

## Conclusions

In the context of the solid waste fractional analysis for HERC and the mean percentages identified, we conclude the following:

- Household hazardous wastes compose no more than 0.1% of the overall waste stream;
- The Organics category is the largest primary material category by weight composing 32% of the overall waste stream;
- The Food Soiled Paper, Compostable Food Service Ware and other Compostable Items material subcategory is the largest subcategory of the overall Paper category composing 13.6% by weight of the overall waste stream;



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- Glass composes approximately 2.5 percent of the overall waste stream by weight; and
- Plastics are estimated to compose 14.8 percent of the overall waste stream by weight.

The overall confidence intervals by material category are consistent with anticipated statistical variations seen in other studies with no more than a range of 8 percentage points (lower to upper bound confidence intervals) for all primary material categories.

## Proximate, Ultimate, and Heating Value Analyses

### Methodology

Samples were taken from solid waste deposited at the HERC Facility for the completion of proximate, ultimate, and heating value analyses. Stratified samples of solid waste were developed using grab samples taken during the sorting event by SAIC staff and placed in individual containers for transport to the selected laboratory. The appropriate chain of custody measures were taken by SAIC and laboratory staff prior to initiating the analyses. The samples were created by taking estimated fractions of the various combustible material categories as grab samples and combining to create five samples for testing. In some instances, multiple materials were "ground up" and analytical data averaged.

Proximate, ultimate, and heating value analyses were conducted on five stratified material samples taken from the HERC Facility consistent with Minnesota Rule 7007.0501 Subpart 2 (2) and (3). All analyses were conducted per the applicable ASTM methods.

### Results

The specific results of the proximate, ultimate, and heating value analyses are detailed in Appendix B. Overall, the parameters of the results reflect the level of variability usually found in similar solid waste proximate, ultimate, and heating value analyses.



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The samples were not analyzed for statistical patterns or directly compared with databases for other waste streams, but in general the data indicates "typical" municipal solid waste. Moisture content ranged from 12 to 34 percent with an average of approximately 28 percent. The higher heating value (assumed HHV) also reflects the typical range for field collected samples (4,559 to 7,097 Btu/lb). The average heating value was approximately 5,886 Btu/lb as received.

Thank you for the opportunity to provide these services.

Sincerely,

**SAIC Energy, Environment & Infrastructure, LLC**

Robert W. Craggs

Robert W. Craggs
Project Manager



*SAIC Energy, Environment & Infrastructure, LLC*
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# Appendix A

# MATERIAL CATEGORY DEFINITIONS – COVANTA HENNEPIN ENERGY RESOURCE COMPANY

# Appendix A
# Material Category Definitions – Covanta Hennepin Energy Resource Company

| | | |
|---|---|---|
| **Paper** | | |
| 1. | Corrugated Cardboard | Old Corrugated Cardboard (OCC) cartons and boxes with corrugated paper medium. |
| 2. | Newspaper | Old newspaper (ONP) including newsprint, glossy paper inserts & advertisements included with the newspaper at the time of distribution. |
| 3. | Office Paper | High-grade, recyclable paper including office and school papers, bond paper, stationery with or without color, ledger paper, photocopy paper, computer printouts, index cards, etc. |
| 4. | Mixed Paper | Low grade recyclable paper. Includes junk mail, all envelopes (with & without windows), glossy-coated paper, text books, brown paper (Kraft) bags, paper towel & toilet paper cores, etc. |
| 5. | Magazines/Catalogs | Magazines, catalogs including any "seasonal circular" catalog clearly recognized as such from direct mail (e.g., LL Bean, Nordstrom's, etc.) |
| 6. | Phone Books | Telephone directories printed for or by telephone directory publishers. |
| 7. | Boxboard/Paperboard | Uncoated box board such as cereal, cracker, and shoe boxes. Does not include coated boxes such as refrigerated and frozen food boxes. |
| 8. | Cartons/Aseptic Packaging | Paper milk & juice cartons and poly-coated packaging lined with an aluminum or plastic layer typically containing soy milk, fruit drinks, soups, broth, wine, etc. Packages often have folded down square corners. Includes pouches. |
| 9. | Other Paper | Paper with metal or plastic coating, cigarette packages, photographs, etc. |
| **Plastics** | | |
| 10. | #1 Polyethlylene Terephthalate (PET) Bottles | Plastic containers coded #1 used for containing soda, water, fruit juice, sports drink, ice tea, liquor, etc. Plastic caps on bottles will remain with the bottles and will not be removed. |
| 11. | #1 PET Injection-Molded Containers | Jars for peanut butter, mayonnaise, etc. plus microwavable food trays and other containers. |
| 12. | #2 HDPE Bottles | Plastic containers such as milk jugs, shampoo bottles, and laundry detergent bottles coded #2. Plastic caps on bottles will remain with the bottles and will not be removed. |
| 13. | #3 PVC | Includes rigid plastic packaging coded #3 (PVC) such as take-out/clamshell containers. Also includes rigid plastic piping, fencing, etc., and flexible PVC such as tubing and wire/cable insulation. |
| 14. | #2 Non-Bottle Food & Beverage Containers, and #4 and #5 Food & Beverage Containers | Plastic containers coded:<br>#2 (HDPE that are not bottles with a neck) such as ice cream pails<br>#4 (LDPE) containers such as squeezable honey & mustard bottles<br>#5 (PP) such as yogurt containers, margarine tubs, medicine bottles, etc.<br>Also includes plastic bottle caps that are loose in the MSW (i.e., have been removed from the bottle). |
| 15. | Bags and Film Plastic | Includes plastic garbage bags, plastic grocery & retail shopping bags and other bags provided at retail (of any color) used for carrying items home, bread bags, and newspaper bags. Also includes any film plastic including sheet plastic, shrink wrap, tarping, and other non-rigid plastic. |
| 16. | Other Rigid Plastics | Other rigid plastics such as toys, plastic casings, clothes hangers, plant pots, etc. |



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| | | |
|---|---|---|
| 17. | All Other Plastics | Plastics coded #6 – Polystyrene (PS), #7 – Other, and any other plastics not defined above. |
| Metals | | |
| 18. | Ferrous Metals | Includes food and beverage containers composed primarily of iron, plus other scrap ferrous including clothes hangers, sheet metal products, pipes, miscellaneous metal scraps, and other magnetic metal items. |
| 19. | Aluminum Used Beverage Containers | Used beverage containers (UBC) made from aluminum used for containing soda, fruit juice, sports drinks, iced tea, beer, etc. |
| 20. | Aluminum Scrap Metal | Scrap aluminum such as door & window frames, siding, softball bats, outdoor furniture, crutches, ladders, pots & pans, etc. |
| 21. | Other Non-Ferrous Metals | Other non-ferrous metal (besides UBC and aluminum scrap). Includes brass, copper, bronze, lead, nickel, gold, silver, platinum, and other non-magnetic metal. Stainless steel may or may not be magnetic. |
| Glass | | |
| 22. | Food & Beverage Container Glass | Clear, brown, green, and blue glass food, beverage, wine, liquor and beer containers. |
| 23. | Other Glass | Non-container glass including window glass, mirrors, drinking glasses, dishes, ceramics, etc. |
| Organic Materials | | |
| 24. | Food Waste[1] | Food preparation wastes, food scraps, and spoiled food including meat and bones. |
| 25. | Liquid Waste[2] | Liquids such as water, soda, juice, etc. that are disposed in a sealed bottle or other type of container. |
| 26. | Food-Soiled Paper, Compostable Food Service Ware, and Other Compostable Items | Paper products including paper napkins, towels, and tissues; paper plates, cups and food containers; paper egg cartons, fast food paper bags and wrappers, including waxed paper and parchment; pizza boxes and boxes from refrigerated & frozen food packaging; coffee filters & grounds, tea bags, paper vacuum bags, dryer lint, human and pet hair, wooden toothpicks, ice cream & corn dog sticks, chop sticks, cotton balls, house plants, etc.<br>Also includes Biodegradable Products Institute (BPI)-certified compostable plastic utensils, cups and containers. |
| 27. | Yard Waste | Grass clippings, leaves, braches, sticks, garden waste, brush, and trees. |
| 28. | Wood Waste | Non-treated lumber, pallets, and crates. |
| 29. | Other Organics | Diapers, adult sanitary products, manure/feces, cat litter, cork, natural fibers, hemp rope, sawdust, etc. |
| Other Waste | | |
| 30. | Electronics containing CRTs | Electronic items with cathode ray tubes (CRTs). Includes older computer monitors and televisions. |
| 31. | Electronics without CRTs | Electronic items without CRTs. Includes flat screen TVs & computer monitors, copiers, scanners, printers, cell phones, telephones, phone answering machines, computer games and other electronic toys, portable CD players, camcorders, digital cameras, and other small consumer electronics. |

| | | |
|---|---|---|
| 32. | Small Household Appliances | Electrically-powered household products fabricated from metals and plastics not easily separable into individual materials. Examples include hair dryers, toasters, coffee makers, etc. |
| 33. | Major Appliances | Washers, dryers, dishwashers, refrigerators, ovens, microwaves, water heaters, etc. |
| 34. | Household Hazardous Waste (HHW) | Includes pesticides, herbicides, fungicides, paints, adhesives, solvents, cleaners, automotive products, batteries, etc. |
| 35. | Mercury-Containing Items | Thermostats, thermometers, light switches, and other items containing mercury. |
| 36. | Sharps | Hypodermic needles (loose or attached to a syringe). |
| 37. | Textiles and Leather | Carpeting, clothing, blankets, rags, curtains, belts, purses, shoes, etc. |
| 38. | Bulky Waste | Furniture, mattresses, box springs, etc. |
| 39. | C&D | Construction & Demolition (C&D) debris including concrete, brick, asphalt, roofing materials, drywall, fiberglass insulation, etc. |
| 40. | Tires/Rubber | Tires, rubber tubing, mats, hoses, etc. |
| 41. | Other Inorganic Materials | Inorganic material not otherwise classified, such as rock, dirt, and sand. |
| 42. | Fines | Remnants left after sorting is complete. Typically consists of dirt, sawdust, small food scraps, etc. |

[1] When feasible, food waste will be removed from containers (e.g., Tupperware, carry-out containers, etc.) and the food waste will be placed in the Food Waste category and the container will be placed in its appropriate category.

[2] Liquids such as water, soda, juice, etc. will be removed from containers (e.g., PET bottles, milk cartons, glass jars) and the liquids will be emptied into a 5-gallon or similar-sized bucket and the bottle or container will be placed in its appropriate category.

# Appendix B

## ANALYTICAL RESULTS
## INTERPOLL LABORATORIES, INC.

Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (763) 786-6020
FAX: (763) 786-7854

# ANALYTICAL RESULTS FOR SAIC ENERGY, ENVIRONMENT & INFRASTRUCTURE, LLC

Submitted to:

**SAIC Energy, Environment & Infrastructure, LLC**
**1380 Corporate Center Curve, Suite 305**
**St. Paul, Minnesota 55121**

Attention: Robert Craggs

Approved By:

Gregg W. Holman, Manager
Chemistry Department

Laboratory Report #31628
December 7, 2012

## PROJECT SUMMARY

The following laboratory report contains the analytical results for five solid waste samples submitted to Interpoll Laboratories, Inc. (ILI) by SAIC Energy, Environment & Infrastructure, LLC. The samples were received on November 19, 2012 according to Interpoll Labs documented sample acceptance procedures. The samples were analyzed for the parameters requested by Robert Craggs via email.

The five sample containers were not labeled with any identification information. After contacting Robert Craggs by phone, Interpoll Labs was instructed to arbitrarily assign the log numbers, 01 through 05.

GWH/cg

**INTERPOLL LABORATORIES, INC.**
**Fuel Laboratory**
**(763) 786-6020**

Date: 12/07/2012

Client: SAIC ENERGY, ENVIRONMENT & INFRASTRUCTURE, LLC

Laboratory Log Number: 31628-01

Sample Collected: NOT PROVIDED

Sample Received: 11/19/2012

Sample Identification: SOLID WASTE

## Proximate Analysis WT %

| Parameter | ASTM Method | Moisture & Ash Free | Moisture Free | As Received |
|---|---|---|---|---|
| Moisture, Total | E949 | | | 33.0 |
| Ash | E830 | | 19.7 | 13.2 |
| Volatile Matter | E897 | 84.2 | 67.6 | 45.3 |
| Fixed Carbon (calculation) | E870 | 15.8 | 12.7 | 8.52 |
| Sulfur | E775 | 0.11 | 0.090 | 0.060 |
| Heating Value, Btu/LB. | E711 | 11911 | 9566 | 6411 |

## Utimate Analysis WT %

| Parameter | ASTM Method | Moisture & Ash Free | Moisture Free | As Received* |
|---|---|---|---|---|
| Moisture, Total | E949 | | | 33.0 |
| Ash | E830 | | 19.7 | 13.2 |
| Sulfur | E775 | 0.11 | 0.090 | 0.060 |
| Carbon | D5373 | 70.1 | 56.3 | 37.7 |
| Hydrogen | D5373 | 8.90 | 7.15 | 4.79 |
| Nitrogen | D5373 | 0.373 | 0.300 | 0.201 |
| Oxygen (Calculated) | E870 | 18.4 | 14.8 | 9.89 |
| Chlorine, mg/kg | SW-846 5050/9056 | 21659 | 17395 | 11657 |
| Total | | 100.0 | 100.0 | 100.0 |
| F-Factor (DSCF/mmBtu) | | 11021 | 11021 | 11021 |

* As received H and O values do not include water

**INTERPOLL LABORATORIES, INC.**
**Fuel Laboratory**
**(763) 786-6020**

Date: 12/07/2012

Client: SAIC ENERGY, ENVIRONMENT & INFRASTRUCTURE, LLC

Laboratory Log Number: 31628-02

Sample Collected: NOT PROVIDED

Sample Received: 11/19/2012

Sample Identification: SOLID WASTE

## Proximate Analysis WT %

| Parameter | ASTM Method | Moisture & Ash Free | Moisture Free | As Received |
|---|---|---|---|---|
| Moisture, Total | E949 | | | 33.8 |
| Ash | E830 | | 15.0 | 9.93 |
| Volatile Matter | E897 | 92.1 | 78.3 | 51.8 |
| Fixed Carbon (calculation) | E870 | 7.87 | 6.69 | 4.43 |
| Sulfur | E775 | 0.11 | 0.092 | 0.061 |
| Heating Value, Btu/LB. | E711 | 11631 | 9886 | 6541 |

## Utimate Analysis WT %

| Parameter | ASTM Method | Moisture & Ash Free | Moisture Free | As Received* |
|---|---|---|---|---|
| Moisture, Total | E949 | | | 33.8 |
| Ash | E830 | | 15.0 | 9.93 |
| Sulfur | E775 | 0.11 | 0.092 | 0.061 |
| Carbon | D5373 | 65.0 | 55.2 | 36.5 |
| Hydrogen | D5373 | 9.66 | 8.21 | 5.44 |
| Nitrogen | D5373 | 0.464 | 0.395 | 0.261 |
| Oxygen (Calculated) | E870 | 24.5 | 20.8 | 13.8 |
| Chlorine, mg/kg | SW-846 5050/9056 | 3368 | 2863 | 1894 |
| Total | | 100.0 | 100.0 | 100.0 |
| F-Factor (DSCF/mmBtu) | | 10613 | 10613 | 10613 |

* As received H and O values do not include water

**INTERPOLL LABORATORIES, INC.**
**Fuel Laboratory**
**(763) 786-6020**

Date: 12/07/2012

Client: SAIC ENERGY, ENVIRONMENT & INFRASTRUCTURE, LLC

Laboratory Log Number: 31628-03

Sample Collected: NOT PROVIDED

Sample Received: 11/19/2012

Sample Identification: SOLID WASTE

## Proximate Analysis WT %

| Parameter | ASTM Method | Moisture & Ash Free | Moisture Free | As Received |
|---|---|---|---|---|
| Moisture, Total | E949 | | | 30.4 |
| Ash | E830 | | 31.5 | 21.9 |
| Volatile Matter | E897 | 82.3 | 56.4 | 39.3 |
| Fixed Carbon (calculation) | E870 | 17.7 | 12.1 | 8.42 |
| Sulfur | E775 | 0.12 | 0.080 | 0.056 |
| Heating Value, Btu/LB. | E711 | 10114 | 6928 | 4824 |

## Utimate Analysis WT %

| Parameter | ASTM Method | Moisture & Ash Free | Moisture Free | As Received* |
|---|---|---|---|---|
| Moisture, Total | E949 | | | 30.4 |
| Ash | E830 | | 31.5 | 21.9 |
| Sulfur | E775 | 0.12 | 0.080 | 0.056 |
| Carbon | D5373 | 67.7 | 46.4 | 32.3 |
| Hydrogen | D5373 | 9.35 | 6.41 | 4.46 |
| Nitrogen | D5373 | 1.10 | 0.756 | 0.526 |
| Oxygen (Calculated) | E870 | 19.9 | 13.6 | 9.49 |
| Chlorine, mg/kg | SW-846 5050/9056 | 17983 | 12318 | 8578 |
| Total | | 100.0 | 100.0 | 100.0 |
| F-Factor (DSCF/mmBtu) | | 12730 | 12730 | 12730 |

* As received H and O values do not include water

**INTERPOLL LABORATORIES, INC.**
**Fuel Laboratory**
**(763) 786-6020**

Date: 12/07/2012

Client: SAIC ENERGY, ENVIRONMENT & INFRASTRUCTURE, LLC

Laboratory Log Number: 31628-04

Sample Collected: NOT PROVIDED

Sample Received: 11/19/2012

Sample Identification: SOLID WASTE

## Proximate Analysis WT %

| Parameter | ASTM Method | Moisture & Ash Free | Moisture Free | As Received |
|---|---|---|---|---|
| Moisture, Total | E949 | | | 29.2 |
| Ash | E830 | | 11.2 | 7.97 |
| Volatile Matter | E897 | 93.7 | 83.1 | 58.9 |
| Fixed Carbon (calculation | E870 | 6.34 | 5.63 | 3.99 |
| Sulfur | E775 | 0.063 | 0.056 | 0.040 |
| Heating Value, Btu/LB. | E711 | 11291 | 10021 | 7097 |

## Utimate Analysis WT %

| Parameter | ASTM Method | Moisture & Ash Free | Moisture Free | As Received* |
|---|---|---|---|---|
| Moisture, Total | E949 | | | 29.2 |
| Ash | E830 | | 11.2 | 7.97 |
| Sulfur | E775 | 0.063 | 0.056 | 0.040 |
| Carbon | D5373 | 56.2 | 49.9 | 35.3 |
| Hydrogen | D5373 | 7.94 | 7.05 | 4.99 |
| Nitrogen | D5373 | 0.290 | 0.258 | 0.182 |
| Oxygen (Calculated) | E870 | 34.9 | 31.0 | 22.0 |
| Chlorine, mg/kg | SW-846 5050/9056 | 5758 | 5110 | 3619 |
| Total | | 100.0 | 100.0 | 100.0 |
| F-Factor (DSCF/mmBtu) | | 8760 | 8760 | 8760 |

* As received H and O values do not include water

**INTERPOLL LABORATORIES, INC.**
**Fuel Laboratory**
**(763) 786-6020**

Date: 12/07/2012

Client: SAIC ENERGY, ENVIRONMENT & INFRASTRUCTURE, LLC

Laboratory Log Number: 31628-05

Sample Collected: NOT PROVIDED

Sample Received: 11/19/2012

Sample Identification: SOLID WASTE

## Proximate Analysis WT %

| Parameter | ASTM Method | Moisture & Ash Free | Moisture Free | As Received |
|---|---|---|---|---|
| Moisture, Total | E949 | | | 11.7 |
| Ash | E830 | | 50.2 | 44.3 |
| Volatile Matter | E897 | 100 | 49.8 | 44.0 |
| Fixed Carbon (calculation) | E870 | 0.0416 | 0.0207 | 0.0183 |
| Sulfur | E775 | < 0.10 | < 0.051 | < 0.045 |
| Heating Value, Btu/LB. | E711 | 10357 | 5161 | 4559 |

## Utimate Analysis WT %

| Parameter | ASTM Method | Moisture & Ash Free | Moisture Free | As Received* |
|---|---|---|---|---|
| Moisture, Total | E949 | | | 11.7 |
| Ash | E830 | | 50.2 | 44.3 |
| Sulfur | E775 | < 0.10 | < 0.051 | < 0.045 |
| Carbon | D5373 | 78.9 | 39.3 | 34.7 |
| Hydrogen | D5373 | 13.7 | 6.81 | 6.02 |
| Nitrogen | D5373 | 0.459 | 0.229 | 0.202 |
| Oxygen (Calculated) | E870 | 6.66 | 3.32 | 2.93 |
| Chlorine, mg/kg | SW-846 5050/9056 | 2236 | 1114 | 984 |
| Total | | 100.0 | 100.0 | 100.0 |
| F-Factor (DSCF/mmBtu) | | 16175 | 16175 | 16175 |

* As received H and O values do not include water