North Carolina Department of Environment and Natural Resources
Division of Air Quality

Pat McCrory
Governor

Sheila C. Holman
Director

John E. Skvarla, III
Secretary

March 13, 2013

Mr. John Prestage
Senior Vice President
Prestage AgEnergy of NC, LLC
P.O. Box 438
Clinton, NC 28328

SUBJECT: Applicability Determination No. 2181 – Secondary Material Determination
Prestage AgEnergy of NC, LLC
Facility ID No. 0900090
Tar Heel, Bladen County

Dear Mr. Prestage:

The North Carolina Division of Air Quality (NC DAQ) received your letter dated January 28, 2013 summarizing your analysis of used poultry bedding from local poultry houses. Prestage AgEnergy of NC, LLC. (Prestage) is proposing to burn used poultry bedding as a fuel in a new gasification/combustion (boiler) system at an existing pork processing plant (Smithfield Packing Company, Inc.) located in Tar Heel, Bladen County, North Carolina. The boiler will be used to generate steam for the pork processing plant and to produce electricity for distribution.

Used poultry bedding is a non-hazardous secondary material (NHSM) within the meaning of Title 40, Part 241 of the Code of Federal Regulations (40 CFR Part 241). The used poultry bedding described in the letters referenced above is processed and meets the legitimacy criteria provided in 40 CFR 241.3(d)(1). The NC DAQ has determined, therefore, that the material is not a solid waste when used as fuel in a combustion unit. This determination relies on the language of the current Federal rule defining NHSM, discussions NC DAQ has had with representatives of the EPA, and on the proposed changes to the NHSM rule.

Processing of Discarded NHSM – 40 CFR 241.3(b)(4)

Pursuant to 40 CFR 241.2, "processing" means any operations that transform discarded NHSM into a non-waste fuel. "Processing" includes, but is not limited to, operations necessary to: remove or destroy contaminants; significantly improve fuel characteristics of the material, *e.g.* sizing or drying the material in combination with other operations; or chemically improve the as-fired energy content. Minimal operations that result only in modifying the size of the material by shredding do not constitute processing for purposes of this definition. "Secondary material" means any material that is not the primary product of a manufacturing or commercial process, and can include post-consumer material, off-specification commercial chemical products or manufacturing chemical intermediates, post-industrial material, and scrap.

The used poultry bedding that Prestage proposes to burn is generated from poultry houses owned by poultry growers in region. Prestage proposes to significantly improve the fuel combustion properties of the used poultry bedding in order to produce an engineered fuel prior to use in the gasification/boiler system. Prestage

will improve the fuel characteristics of the material through sampling/testing, screening (removal of materials), sizing, grinding and blending. Each load of used poultry bedding will be sampled and tested for moisture content and approximate heat value. Large physical materials will be removed manually and by mechanical screening. Ferrous metal substances will be removed by passing the material through a magnetic separation system. Quality assurance testing on representative samples on a batch basis will ensure that contaminant levels are comparable to or less than those found in traditional fuels which the system is designed to burn. Then the used poultry bedding will be separated by moisture content and stored in an appropriate enclosed building for less than 90 days. Finally, the stored used poultry bedding fuel will blended to ensure adequate consistency in moisture and energy content, and limit emissions from combustion.

The NC DAQ has determined that the processing steps described above meet the regulatory definition of "processing" in 40 CFR 241.2 with further support from a recent EPA determination of proposed NHSM fuels. [1]

Managed as a Valuable Commodity – 40 CFR 241.3(d)(1)(i)

Prestage will store the used poultry bedding in an enclosed building prior to using it as a fuel to prevent moisture uptake in the material and to control potential odors from the used poultry bedding. Use of enclosed storage areas, particularly to limit moisture intake, is consistent with typical management of wood chips and other biomass fuels. In addition, Prestage has indicated that it will store the used poultry bedding for less than 90 days prior to burning the material as a fuel. The NC DAQ concludes that these management practices satisfy the requirement that the NHSM be managed as a valuable commodity, and if so managed, the used poultry bedding meets the legitimacy criterion pursuant to 40 CFR 241.3(d)(1)(i).

Meaningful Heating Value – 40 CFR 241.3(d)(1)(ii)

In the preamble to the final NHSM definitional rule, US EPA indicated that materials with a heat content of at least 5,000 Btu/lb presumptively satisfy this criterion.[2] However, materials with lower heat contents may also satisfy the criterion on a case-by-case basis by showing that "the energy recovery unit can cost-effectively recover meaningful energy from the non-hazardous secondary materials used as fuels."[3] Factors that may be considered in this case-by-case analysis include "whether the facility encounters a cost savings due to not having to purchase significant amounts of traditional fuels they otherwise would need, whether they are purchasing the non-hazardous secondary materials to use as a fuel, whether the non-hazardous secondary materials they are burning can self-sustain combustion, and whether their operation produces energy that is sold for a profit…."[4]

Prestage analyzed composite samples of used poultry bedding collected from poultry houses at multiple farms in North Carolina and also collected a composite sample from South Carolina farms. Because Prestage is not intending to dry the material prior to burning it as a fuel it is appropriate to look at the lower heating value (LHV) of the material. The LHV of the sampled material varies between 2,970 and 4,613 British thermal units per pound (Btu/lb). The average heating value is 3,759 Btu/lb and the median heating value is 3,685 Btu/lb. As

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[1] See Letter dated April 3, 2012 from Becky Weber, Director, Air and Waste Management Division , US EPA Region 7, to Mr. Gregory Haug, PE of Resource Enterprises, LLC. http://www.epa.gov/osw//nonhaz/define/pdfs/Lhoist-engineered-fuels.pdf

[2] 76 Fed. Reg. 15,523 (Mar. 11, 2011).

[3] *Id.*

[4] *Id.*

a basis of comparison, the heat content of green wood chips on a wet basis is 4,300 Btu/lb. A summary of the data received on the heat content of the used poultry bedding is provided in Attachment 1 to this letter.

Because the used poultry bedding has an average heat content below 5,000 Btu/hr (approximately 3700 Btu/lb), the proposed boiler must be able to cost-effectively recover meaningful energy from the material to satisfy this legitimacy criterion. In your letter and subsequent correspondence, Prestage indicated that the proposed boiler would be self-sustaining and able to fire the used poultry bedding without the addition of supplemental fuels. Further, Prestage indicated that the used poultry bedding will cost less than wood chips, and that electricity generated from its combustion will be eligible under North Carolina's Renewable Energy Standard for sale with incentives. The NC DAQ has determined that, because the used poultry bedding can be used in a self-sustaining combustion system to recover energy at a cost that is comparable to the cost of generating energy using a traditional fuel, the material has meaningful heating value and meets the legitimacy criterion under 40 CFR 241.3(d)(1)(ii).

Comparable Contaminant Concentrations – 40 CFR 241.3(d)(1)(iii)

In order for a NHSM to be classified as a non-solid waste fuel, it must "contain contaminants or groups of contaminants *at levels comparable in concentration to or lower than* those in traditional fuels which the combustion unit is designed to burn."[5]

Contaminants

Contaminants are defined as "all pollutants identified in the Clean Air Act sections 112(b) or 129(a)(4) *including the elements chlorine, fluorine, nitrogen, and sulfur in cases where non-hazardous secondary material are burned as fuel and combustion will result in the formation of hydrogen chloride, hydrogen fluoride, and nitrogen oxides or sulfur dioxide.*"[6] In addition to a specific list of pollutants and precursors that fall within the definition of "contaminants," the listing also excludes pollutants that are unlikely to be found in non-hazardous secondary materials as well as individual cresol and xylene isomers.[7]

The NC DAQ reviewed the concentrations of the following contaminants in the used poultry bedding:

- **Metals:** Antimony, Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Lead, Manganese, Mercury, Nickel, Selenium, Silver, and Zinc
- **Halogens:** Chlorine, Fluorine
- **Additional Precursors:** Nitrogen, Sulfur

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[5] 40 CFR 241.3(d)(1)(iii) (February 7, 2013) (*emphasis added*). Note effective April 8, 2013; however, this rule revision does not affect the outcome of this determination.

[6] 40 CFR 241.2 (February 7, 2013) (*emphasis added*).

[7] The definition is as follows: "*Contaminants* means all pollutants listed in Clean Air Act sections 112(b) and 129(a)(4), with the following three modification. This definition includes the elements chlorine, fluorine, nitrogen, and sulfur in cases where non-hazardous secondary materials are burned as a fuel and combustion will result in the formation of hydrogen chloride (HCl), hydrogen fluoride (HF), nitrogen oxides (NO_x), or sulfur dioxide (SO_2). The definition does not include the following pollutants that are either unlikely to be found in non-hazardous secondary materials and products made from such materials or are adequately measured by other parts of this definition: hydrogen chloride (HCl), chlorine gas (Cl_2), hydrogen fluoride (HF), nitrogen oxides (NO_x), sulfur dioxide (SO_2), fine mineral fibers, particulate matter, coke oven emissions, diazomethane, white phosphorus, and titanium tetrachloride. The definition does not include m-cresol, o-cresol, p-cresol, m-xylene, o-xylene, and p-xylene as individual contaminants distinct from the grouped pollutants total cresols and total xylenes." See 78 Fed. Reg. 9212 (Feb. 7, 2013).

Designed, not Permitted to Burn

To determine whether a NHSM satisfies the legitimacy criteria, the current rule requires that the contaminant levels in the NHSM be compared against the levels in "traditional fuels which the combustion unit is designed to burn."[8]

Further, the US EPA issued a Guidance Concept Paper indicating its intent to "address questions raised by industry, assist them in making determinations under the rule, and ensure their use of the flexibility embodied in the rule."[9] The Agency forecasted that the guidance would include a compilation of data it had collected on contaminant levels in traditional fuels which could be used by industry and other interested parties in the contaminant level comparison.

The guidance was provided by US EPA on November 29, 2011. It consists of three tables that provide a range of compiled contaminant concentrations for coal, untreated wood and biomass materials, and fuel oils.[10] The table does not distinguish between concentration levels of different coal ranks (i.e., anthracite, bituminous, sub-bituminous, and lignite) or different types of biomass (i.e., wood, bark, biogas, hogged fuel, and agricultural plant residues).[11] This approach is consistent with the NHSM rule revisions that US EPA finalized on February 7, 2013.

The US EPA codified the meaning of "designed to burn" to include "a traditional fuel that can be or is burned in the particular type of boiler, whether or not the combustion unit is permitted to burn that traditional fuel."[12] Also, in the preamble of final rule US EPA clarified the language regarding potential fuel category groups that any grade/rank (e.g. anthracite, lignite, bituminous and sub-bituminous coal) could be used in the traditional fuel contaminant levels of "designed to burn" fuel for comparison purposes.[13]

Prestage is proposing to burn the used poultry bedding in a new boiler system. Prestage has indicated that the boiler system will be designed to burn solid fuels, including coal and wood. In accordance with US EPA's interpretation of "designed to burn," the NC DAQ compared the concentrations of contaminants in the used poultry bedding to the contaminant levels in coal and wood and biomass materials as provided in the November 29, 2011 guidance document and literature values.

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[8] 40 CFR 241.3(d)(1)(iii) (February 7, 2013).

[9] US EPA, "Non-Hazardous Secondary Materials (NHSM) Rule: Comparable Contaminant Guidance Concept Paper" (July 11, 2011. http://www.epa.gov/osw/nonhaz/define/pdfs/nhsm-concept.pdf

[10] US EPA, "Contaminant concentrations in Traditional Fuels: Tables for Comparison" (November 29, 2011). http://www.epa.gov/osw/nonhaz/define/pdfs/nhsm_cont_tf.pdf

[11] This, despite the fact that a coal fired boiler is designed differently based on the rank of coal it will burn.

[12] 78 Fed. Reg. 9213 (Feb. 7, 2013).

[13] 78 Fed. Reg. 9148 (Feb. 7, 2013).

Results of the Contaminant Comparison

There are long established statistical tests to determine whether two materials are statistically different based on samples from both material populations. However, the US EPA is simply interested in not designating a candidate NHSM as solid waste if doing so based on its contaminant level would *ever* also define the traditional fuel as a solid waste as well.[14] To this end, the US EPA has indicated that a variety of comparisons could be made. For example, the highest contaminant levels in the NHSM could be compared against the highest contaminant levels in the relevant traditional fuels. Alternatively, the average values of the NHSM could be compared with the average values of the traditional fuels. "Anything less could result in 'traditional fuel' samples being considered solid waste if burned in the very combustion units designed to burn them – not the Agency's intent in either the 2011 NHSM final rule or February 7, 2013 NHSM final rule."[15] However, using different bases for comparison could lead to different results. The US EPA warned that "[i]t would not be appropriate to compare an average NHSM contaminant value to the high end of a traditional fuel range, as the existence of an average implies multiple data points from which a more suitable statistic (*e.g.*, range or standard deviation) could have been calculated." Finally, the US EPA warned that "in the context of an inspection or enforcement action, the Agency will evaluate the appropriateness of alternative methodologies and data sources on a case-by-case basis when determining whether the legitimacy criteria have been met."[16] The NC DAQ chose to use both maximum values and averages in this comparison. The vast number of samples available for coal obviated the need for the NC DAQ to estimate its distribution. (See Attachment 2 for the contaminant chlorine).

Prestage analyzed the contaminant levels in composite samples of used poultry bedding collected from different locations identified as PFGO, PFS, and PFN. A summary of the measured contaminant levels and the contaminant levels in coal and wood and biomass materials is provided in Attachment 3 to this letter. For many contaminants the results show that the measured contaminant levels in the used poultry bedding are within the range of contaminant concentrations in the traditional fuels that the new boiler system will be designed to burn (both using maximum values and averages). In the case of manganese, the average manganese content of used poultry bedding is 488 ppm which is higher than the average manganese content of either wood or coal. However, the highest measured manganese content in the used poultry bedding was 580 ppmd, which is lower than the upper range of manganese content in wood (15,800 ppmd). The relatively few number of samples of used poultry bedding would indicate that the highest measured value is undoubtedly not the maximum value for all used poultry bedding. However, the disparity between the average manganese contents indicate that there is little doubt that the maximum manganese content of used poultry bedding would be considerably below 15,800 ppmd.

The highest measured chlorine content in the used poultry bedding was 8,647 ppmd, which is lower than the upper range of chlorine content in coal (9,080 ppmd), but the average used poultry bedding chlorine content (8,278 ppm) was higher than the average chlorine content in coal (992). In this case only two used poultry bedding samples were available. For the particular case of chlorine, the NC DAQ estimated the maximum value assuming the Cl content in used poultry bedding was normally distributed. See the graph below.

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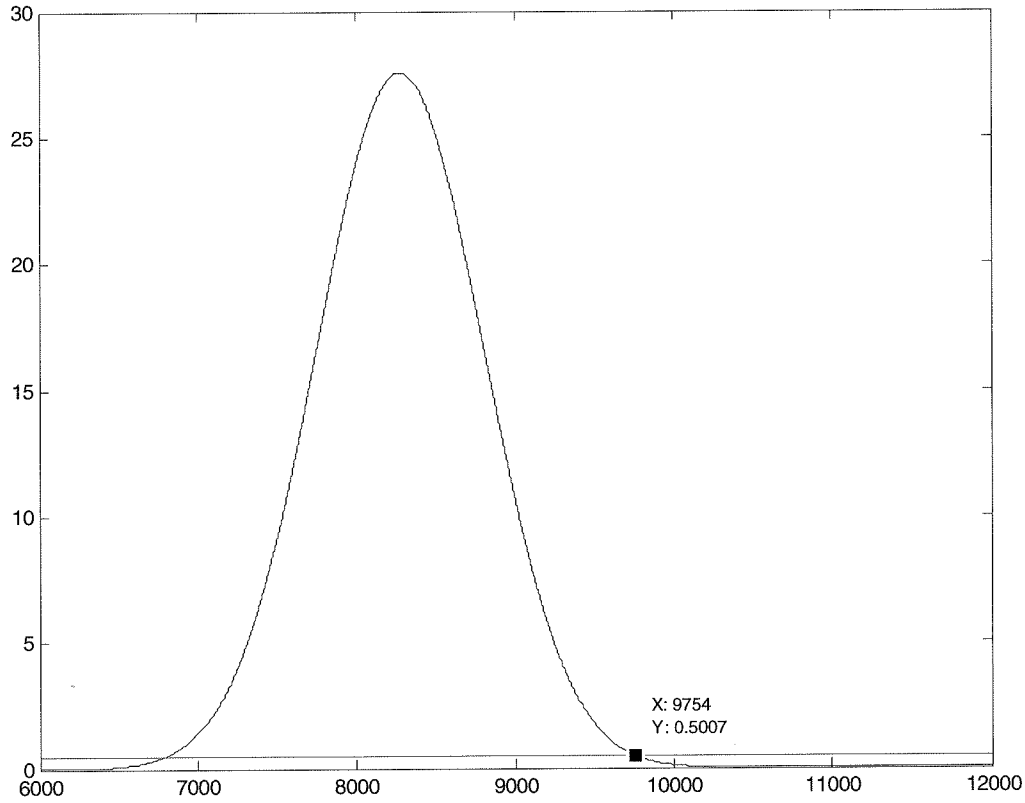
[14] Indeed, the EPA points out in its preamble to final rule that, for example, the coals used in a comparison need not be limited to the coal received from either the current or past suppliers. Of course, in cases where the unit is not permitted to burn coal, but is designed to burn coal, any coal rank can be considered including anthracite, lignite, bituminous, and sub-bituminous. 78 Fed. Reg. 9148 (Feb. 7, 2013).

[15] 78 Fed. Reg. 9151 (Feb. 7, 2013).

[16] 78 Fed. Reg. 9151 (Feb. 7, 2013).



Note that the maximum predicted Cl content (indicated by the highest value for which the sample size is greater than 0.5) is approximately 9,750 ppm. This is slightly more than the maximum value reported by the EPA of 9,080 ppm for coal. Following the EPA's determination of engineered fuel products, the NC DAQ believes the less than 10% difference between these values constitutes comparability.[17]

Given the comparability of all relevant contaminants between coal and used poultry bedding as characterized by your submittal, the NC DAQ has determined that the used poultry bedding does meet the legitimacy criteria under 40 CFR 241.3(d)(1)(iii).

[17] See April 3, 2012 determination from Becky Weber, Director, Air and Waste Management Division , US EPA Region 7, to Mr. Gregory Haug, PE of Resource Enterprises, LLC.

Conclusion

As described in the letters received from Prestage on January 28, 2013, the used poultry bedding is processed and does meet the legitimacy criteria provided in 40 CFR 241.3(d)(1). Therefore, the NC DAQ has determined that it is not a solid waste when used as fuel in a combustion unit. As a result of this determination, the proposed boiler would not be subject to the combustion source emission standards for biomass fuel promulgated pursuant to Section 129 of the Clean Air Act. If you have any questions regarding this NHSM determination, please contact me at (919) 707-8475.

Sincerely,

Donald R. van der Vaart, Ph.D., J.D., P.E.
Chief

Attachments

c: Fayetteville Regional Office
Central Files
Jeff Twisdale

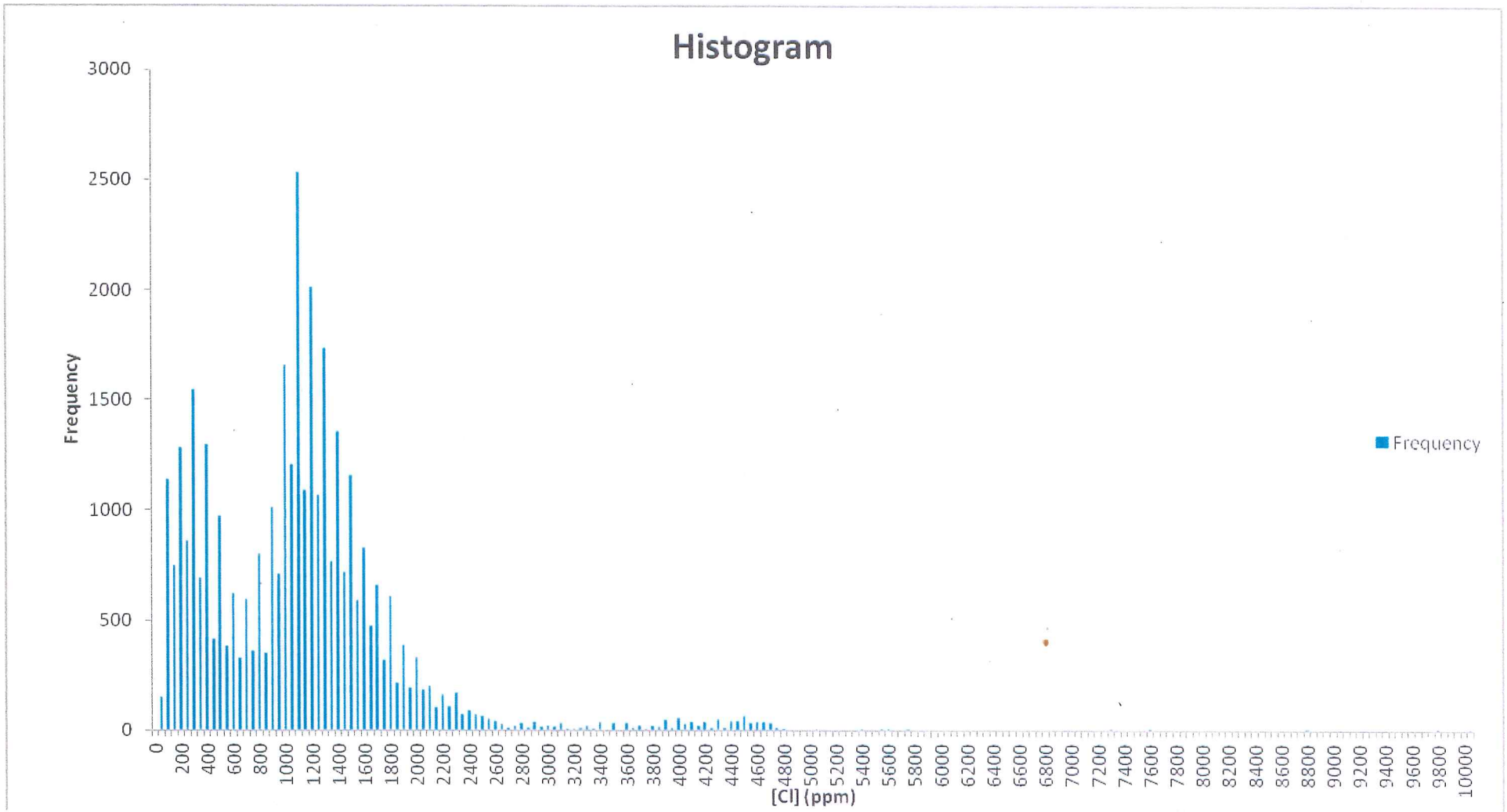
Attachment 1: Heat Contents of Used Poultry Bedding

Sample Source	Sample ID No.	Higher Heating Value (HHV) Btu/lb	Moisture Content[1] % by Weight	Lower Heating Value[2] (LHV) Btu/lb
NC - Breeder Dark Out	120	5,226	23.55%	4,602
	121	5,244	25.62%	4,613
	122	5,712	17.83%	5,117
NC Breeder Laying	130	4,355	18.61%	3,848
	131	4,286	28.39%	3,685
NC Tom Grow Out	142	3,888	42.32%	3,176
NC Tom w/ Brooder	150	3,813	48.31%	3,048
	151	3,726	48.33%	2,970
	152	3,930	41.98%	3,223
NC Light Hen	160	4,127	37.56%	3,442
	161	4,588	30.60%	3,941
	162	4,744	28.72%	4,113
NC Heavy Hen	170	4,882	31.75%	4,221
	171	3,851	42.63%	3,142
	172	4,396	25.58%	3,829
NC Composite	11/16-17	4,283	32.32%	3,655
SC Prestage	11/16	3,890	33.63%	3,274
Range:		3,726 - 5,712		**2,970 - 5,117**
Average:		4,408	32.81%	**3,759**
Median:		4,286	31.75%	**3,685**

1. All moisture contents were measured from the samples are as received.

2. Because Prestage is not proposing to dry the used poultry bedding prior to firing, it is appropriate to use the LHV when determining whether the material has a meaningful heating value within the meaning of 40 CFR 241.3(d)(1)(ii).

Attachment 2: Frequency Distribution of Chlorine in Coal



Attachment 3: Contaminant Level Comparison for Used Poultry Bedding

Unless otherwise provided, all measurements in parts per million on a dry basis (ppmd). Highest contaminant levels are shaded orange.
ND = Non-Detect

	TRADITIONAL FUELS - Tables for Comparison[1]								
	Coal[2]			Wood & Biomass Materials			Prestage Samples		
Contaminant	Range	Average	ND Rate	Range	Average	ND Rate	PFGO[3]	PFS[4]	PFN[5]
Metals									
Antimony	ND - 6.9	1.7	25%	ND - 6.0	0.9	45%	<0.58	<0.60	<0.52
Arsenic	ND - 174	8.2	8%	ND - 298	6.3	57%	1.6	26.4	21.9
Beryllium	ND - 206	1.9	12%	ND - 10	0.3	69%	<0.12	<0.12	<0.1
Cadmium	ND - 19	0.6	38%	ND - 178	0.6	32%	0.15	<0.12	<0.1
Chromium	ND - 168	13.4	1%	ND - 340	5.9	14%	4.9	3.5	10.6
Cobalt	ND - 25.2	6.9	8%	ND - 213	6.5	23%	1.2	0.88	1
Lead	ND - 148	8.7	5%	ND - 229	4.5	28%	<0.58	<0.60	<0.52
Manganese	ND - 512	26.2	<1%	ND - 15800	302	<1%	580	426	458
Mercury	ND - 3.1	0.09	5%	ND - 1.1	0.03	22%	<0.006	<0.0062	<0.20
Nickel	ND - 730	21.5	<1%	ND - 175	2.8	17%	5.4	4.1	6.5
Selinium	ND - 74.3	3.4	22%	ND - 9.0	1.1	69%	3.1	3.6	2.9
Silver							<0.58	<0.60	<0.52
Zinc							658	477	544
Halogens									
Chlorine	ND - 9,080	992	4%	ND - 5,400	259	5%	See Note 6	7,910	8,647
Fluorine	ND - 178	64.0	9%	ND - 128	32.4	43%			
Precursors									
Nitrogen	13,600 - 54,000	15,090	0%	2,200 - 4,600	3460	0%		30,000	34,400
Sulfur	740 - 61,300	13,580	0%	ND - 6,100	704	5%		4,700	4,700

1. U.S. EPA's *Contaminant Concentrations in Traditional Fuels: Tables for Comparision* (Nov. 29, 2011). http://www.epa.gov/wastes/nonhaz/define/pdfs/nhsm_cont_tf.pdf
2. Includes data for anthracite, bituminous, sub-bituminous, and lignite coal.
3. Samples taken from Prestage Grow Out operations. Included in Prestage's Dec. 1, 2011 submittal.
4. Samples taken from Prestage Southern operations. Composites collected from eleven farms in South Carolina and blended. Included in both Prestage's Dec. 1, 2011 and Mar. 16, 2011 submittals.
5. Samples taken from Prestage Northern operations. Composites collected from sixteen farms in NorthCarolina and blended. Included in Prestage's Mar. 16, 2011 submittal.