

1641 Sigman Road
PO Box 919
Conyers, GA 30012
1-770-922-8000 ext 164
www.biomassenergylab.com



Report of Analysis

McHale & Associates Inc.
18378 Redmond Way
Redmond WA 98052

Company Contact: James Hollibaugh
james.hollibaugh@mchale.org

| | | | |
|----------------------------|---------------|----------------------------|-------------|
| BEL ID Number(s): | BEL123930 | Sample Weight (kg): | 3.84/4.01 |
| Product/Commodity: | Woody Biomass | Sample Received: | 11/24/2013 |
| Sample Designation: | Time 17:00 | Report Date: | 12/3/2013 |
| Packaging: | Plastic Bag | Report ID: | BEL123930-1 |
| Date Sampled: | 11/21/2013 | Purchase Order # | N/A |

Compositional Analysis: Proximate/Ulimate Analysis

| Parameter | As-Received | Oven Dry | Analytical Method |
|------------------------------------|-------------|----------|-------------------|
| Total Moisture (%) | 38.11 | | CEN/EN 14774-1 |
| Ash (%) | 1.99 | 3.21 | CEN/EN 14775 |
| Volatiles (%) | | | CEN/EN 15148 |
| Fixed Carbon (%) | | | By Difference |
| Gross Calorific Value (GJ/Tonne) | 12.23 | 19.76 | CEN/EN 14918 |
| Net Calorific Value (cV)(GJ/Tonne) | 10.61 | 18.56 | CEN/EN 14918 |
| Net Calorific Value (cP)(GJ/Tonne) | 10.51 | 18.49 | CEN/EN 14918 |
| Carbon (%) | 30.55 | 49.36 | CEN/EN 15104 |
| Hydrogen (%) | 3.60 | 5.81 | CEN/EN 15104 |
| Nitrogen (%) | 0.24 | 0.39 | CEN/EN 15104 |
| Sulfur (%) | 0.01 | 0.01 | CEN/EN 15289 |
| Oxygen (%) | 25.51 | 41.21 | By Difference |

Prepared By: Chris Wiberg

Results shown on this certificate represent only the quantity of sample which was submitted for analysis. BEL does not assume responsibility for selection, representation, and/or sample identifications. Analyses are carried out within the scope of Principal's instructions and with due care and skill in conformity with BEL Terms and Conditions of Business. Claims in respect of services provided will be considered only if based upon failure to take due care proven by the Principal. Liability shall in no circumstances whatsoever exceed a total aggregate sum equal to 10 (ten) times the amount of the fee paid for the service.

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Major and Minor Elements:

| Analyte | Dry Basis | Units | CEN/EN 15297 |
|----------------|-----------|-------|--------------|
| Aluminum (Al) | 136.1 | mg/kg | |
| Calcium (Ca) | 4880 | mg/kg | |
| Chromium (Cr) | <5.0 | mg/kg | |
| Iron (Fe) | 82 | mg/kg | |
| Lead (Pb) | 0.31 | mg/kg | |
| Magnesium (Mg) | 541.9 | mg/kg | |
| Manganese (Mn) | 72.8 | mg/kg | |
| Mercury (Hg) | <0.020 | mg/kg | |
| Phosphorus (P) | 481 | mg/kg | |
| Potassium (K) | 1568 | mg/kg | |
| Silica (Si) | 5139 | mg/kg | |
| Sodium (Na) | <100 | mg/kg | |
| Titanium (Ti) | 5.2 | mg/kg | |

Analysis of Ash: Ash Fusion Temperatures/Mineral Ash Analysis

| Ash Fusion Property | Oxidizing (°C) | ISO 540 |
|--------------------------------------|----------------|---------|
| Shrinkage Starting Temperature (SST) | 1240 | |
| Deformation Temperature (DT) | 1250 | |
| Hemispherical Temperature (HT) | 1260 | |
| Flow Temperature (FT) | 1270 | |

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