Control Laboratories

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Account No:
7386
Batch:
Aug 2016 C
CODE:
BioChar IBI

John Borden
Proton Power Inc.
487 Sam Rayburn Parkway
Lenoir City, TN 37771

Date Received: 8/16/2016
Sample ID: PPI Biochar White Pine
Lab ID. Number: 6080571-01

International BioChar Initiative (IBI) Laboratory Tests for Certification Program

Dry Basis Unless Stated:		Range	Units	Method
Moisture (time of analysis)	8.7		% wet wt.	ASTM D1762-84 (105c)
Bulk Density	3.5		lb/cu ft	
Organic Carbon	88.4		% of total mass	Dry Combust-ASTM D 4373
Hydrogen/Carbon (H:C)	0.25	0.7 Max	Molar Ratio	H dry combustion/C(above)
Total Ash	2.2		% of total mass	ASTM D-1762-84
Total Nitrogen	0.79		% of total mass	Dry Combustion
pH value	10.22		units	4.11USCC:dil. Rajkovich
Electrical Conductivity (EC20 w/w)	0.832		dS/m	4.10USCC:dil. Rajkovich
Liming (neut. Value as-CaCO3)	8.7		%CaCO3	AOAC 955.01
Carbonates (as-CaCO3)	2.8		%CaCO3	ASTM D 4373
Butane Act.	11.0		g/100g dry	ASTM D 5742-95
Surface Area Correlation	483		m2/g dry	G

All units mg/kg dry unless stated:		Results	Range of Max. Levels	Reporting Limit (ppm)	Method
Arsenic	(As)	**ND**	13 to 100	0.60	J
Cadmium	(Cd)	**ND**	1.4 to 39	0.24	J
Chromium	(Cr)	9.0	93 to 1200	0.60	J
Cobalt	(Co)	0.8	34 to 100	0.60	J
Copper	(Cu)	12.7	143 to 6000	0.60	J
Lead	(Pb)	**ND**	121 to 300	0.24	J
Molybdenum	(Mo)	2.9	5 to 75	0.60	J
Mercury	(Hg)	**ND**	1 to 17	0.002	EPA 7471
Nickel	(Ni)	44.5	47 to 420	0.60	J
Selenium	(Se)	**ND**	2 to 200	1.20	J
Zinc	(Zn)	37.2	416 to 7400	1.20	J
Boron	(B)	31.0	Declaration	6.02	TMECC
Chlorine	(Cl)	40.0	Declaration	20.0	TMECC
Sodium	(Na)	**ND**	Declaration	601.9	E
Iron	(Fe)	710	Declaration	30.1	E
Manganese	(Mn)	767	Declaration	0.60	J

Particle Size Distribution	Results	Units	Method
< 0.5mm	36.3	percent	F
0.5-1mm	9.4	percent	F
1-2mm	21.2	percent	F
2-4mm	28.1	percent	F
4-8mm	5.1	percent	F
8-16mm	0.0	percent	F
16-25mm	0.0	percent	F
25-50mm	0.0	percent	F
>50mm	0.0	percent	F

Basic Soil Enhancement Properties			
Total (K)	6574	mg/kg	E
Total (P)	825	mg/kg	E
Ammonia (NH4-N)	3.3	mg/kg	A
Nitrate (NO3-N)	0.9	mg/kg	A
Organic (Org-N)	7851	mg/kg	Calc.
Volatile Matter	15.9	percent dw	D

* "ND" stands for "not detected" which means the result is below the reporting limit.

Method A Rayment & Higginson
B Enders & Lehmann
C Wang after Rajan
D ASTM D1762-84
E EPA3050B/EPA 6010
F ASTM D 2862 Granular
G Butane Activity Surface Area Correlation Based on McLaughlin, Shields, Jagiello, & Thiele's 2012 paper: Analytical Options for Biochar Adsorption and Surface Area
J EPA3050B/EPA 6020

Analyst: Nik Zumberge

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487 Sam Rayburn Parkway
Lenoir City, TN 37771

Date Received: 8/16/2016
Sample ID: PPI Biochar Yellow Poplar
Lab ID. Number: 6080571-02

International BioChar Initiative (IBI) Laboratory Tests for Certification Program

Dry Basis Unless Stated:		Range	Units	Method
Moisture (time of analysis)	5.8		% wet wt.	ASTM D1762-84 (105c)
Bulk Density	4.4		lb/cu ft	
Organic Carbon	88.1		% of total mass	Dry Combust-ASTM D 4373
Hydrogen/Carbon (H:C)	0.21	0.7 Max	Molar Ratio	H dry combustion/C(above)
Total Ash	3.1		% of total mass	ASTM D-1762-84
Total Nitrogen	0.79		% of total mass	Dry Combustion
pH value	10.71		units	4.11USCC:dil. Rajkovich
Electrical Conductivity (EC20 w/w)	0.979		dS/m	4.10USCC:dil. Rajkovich
Liming (neut. Value as-CaCO3)	10.2		%CaCO3	AOAC 955.01
Carbonates (as-CaCO3)	4.5		%CaCO3	ASTM D 4373
Butane Act.	10.5		g/100g dry	ASTM D 5742-95
Surface Area Correlation	467		m2/g dry	G

All units mg/kg dry unless stated:		Results	Range of Max. Levels	Reporting Limit (ppm)	Method
Arsenic	(As)	**ND**	13 to 100	0.54	J
Cadmium	(Cd)	**ND**	1.4 to 39	0.22	J
Chromium	(Cr)	3.9	93 to 1200	0.54	J
Cobalt	(Co)	**ND**	34 to 100	0.54	J
Copper	(Cu)	15.5	143 to 6000	0.54	J
Lead	(Pb)	**ND**	121 to 300	0.22	J
Molybdenum	(Mo)	1.1	5 to 75	0.54	J
Mercury	(Hg)	**ND**	1 to 17	0.002	EPA 7471
Nickel	(Ni)	12.2	47 to 420	0.54	J
Selenium	(Se)	**ND**	2 to 200	1.08	J
Zinc	(Zn)	15.8	416 to 7400	1.08	J
Boron	(B)	27.0	Declaration	5.41	TMECC
Chlorine	(Cl)	39	Declaration	20.0	TMECC
Sodium	(Na)	**ND**	Declaration	540.6	E
Iron	(Fe)	484	Declaration	27.0	E
Manganese	(Mn)	571	Declaration	0.54	J

Particle Size Distribution	Results	Units	Method
< 0.5mm	4.5	percent	F
0.5-1mm	14.5	percent	F
1-2mm	42.0	percent	F
2-4mm	36.5	percent	F
4-8mm	2.5	percent	F
8-16mm	0.0	percent	F
16-25mm	0.0	percent	F
25-50mm	0.0	percent	F
>50mm	0.0	percent	F

Basic Soil Enhancement Properties			
Total (K)	6769	mg/kg	E
Total (P)	536	mg/kg	E
Ammonia (NH4-N)	2.5	mg/kg	A
Nitrate (NO3-N)	3.5	mg/kg	A
Organic (Org-N)	7852	mg/kg	Calc.
Volatile Matter	13.0	percent dw	D

* "ND" stands for "not detected" which means the result is below the reporting limit.

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Date Received: 8/16/2016
Sample ID: PP Biochar Chestnut Oak
Lab ID. Number: 6080571-03

International BioChar Initiative (IBI) Laboratory Tests for Certification Program

Dry Basis Unless Stated:		Range	Units	Method
Moisture (time of analysis)	7.3		% wet wt.	ASTM D1762-84 (105c)
Bulk Density	7.5		lb/cu ft	
Organic Carbon	85.6		% of total mass	Dry Combust-ASTM D 4373
Hydrogen/Carbon (H:C)	0.19	0.7 Max	Molar Ratio	H dry combustion/C(above)
Total Ash	6.8		% of total mass	ASTM D-1762-84
Total Nitrogen	0.71		% of total mass	Dry Combustion
pH value	11.40		units	4.11USCC:dil. Rajkovich
Electrical Conductivity (EC20 w/w)	1.266		dS/m	4.10USCC:dil. Rajkovich
Liming (neut. Value as-CaCO3)	14.5		%CaCO3	AOAC 955.01
Carbonates (as-CaCO3)	6.5		%CaCO3	ASTM D 4373
Butane Act.	10.3		g/100g dry	ASTM D 5742-95
Surface Area Correlation	462		m2/g dry	G

All units mg/kg dry unless stated:		Results	Range of Max. Levels	Reporting Limit (ppm)	Method
Arsenic	(As)	**ND**	13 to 100	0.61	J
Cadmium	(Cd)	**ND**	1.4 to 39	0.25	J
Chromium	(Cr)	3.5	93 to 1200	0.61	J
Cobalt	(Co)	**ND**	34 to 100	0.61	J
Copper	(Cu)	8.3	143 to 6000	0.61	J
Lead	(Pb)	**ND**	121 to 300	0.25	J
Molybdenum	(Mo)	1.1	5 to 75	0.61	J
Mercury	(Hg)	**ND**	1 to 17	0.001	EPA 7471
Nickel	(Ni)	14.1	47 to 420	0.61	J
Selenium	(Se)	**ND**	2 to 200	1.23	J
Zinc	(Zn)	8.5	416 to 7400	1.23	J
Boron	(B)	37.7	Declaration	6.14	TMECC
Chlorine	(Cl)	**ND**	Declaration	20.0	TMECC
Sodium	(Na)	**ND**	Declaration	614.1	E
Iron	(Fe)	436	Declaration	30.7	E
Manganese	(Mn)	863	Declaration	0.61	J

Particle Size Distribution	Results	Units	Method
< 0.5mm	9.1	percent	F
0.5-1mm	20.2	percent	F
1-2mm	34.3	percent	F
2-4mm	33.3	percent	F
4-8mm	3.1	percent	F
8-16mm	0.0	percent	F
16-25mm	0.0	percent	F
25-50mm	0.0	percent	F
>50mm	0.0	percent	F

Basic Soil Enhancement Properties			
Total (K)	7805	mg/kg	E
Total (P)	521	mg/kg	E
Ammonia (NH4-N)	2.4	mg/kg	A
Nitrate (NO3-N)	1.0	mg/kg	A
Organic (Org-N)	7112	mg/kg	Calc.
Volatile Matter	12.7	percent dw	D

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