Thomas Turf Services
SOIL ANALYSIS AND TURF MANAGEMENT

October 21, 2016

C. David Mayer
Mayer Materials, LP
1212 Silver Creek Azle Rd.
Azle, TX 76020

Mr. Mayer:

We have completed the fertility and leachate analysis on the 1/4" Comand Compost sample submitted for testing. The fertility data are summarized in the following table. Except for the CEC, pH and EC; all data are in ppm (mg/kg) and most represent the plant available amounts. For reference purposes, the right column is the ideal range of nutrients in soil for healthy turfgrass.

Parameter	1/4" Comand Compost	Ideal Range
CEC (meq/100 g)	129.5	>10
pH	7.0	6.5-7
1:3 EC (micromhos/cm)	3,285	<1000
Major Nutrients		
Nitrate Nitrogen	34.4	11-30
Ammonium Nitrogen	68.7	>5
Available Phosphorus	3480	10-40
Available Potassium	2213	121-175
Cations:		
Available Calcium	3119	460-3,560
Available Magnesium	78.5	60-150
Available Sodium	119.5	N/A
Metals:		
Available Copper	4.0	1-2.4
Available Iron	254.7	7-36
Available Manganese	96.1	4-24
Available Zinc	5.1	2-6

1/4" Comand Compost Fertility

The 1/4" Comand Compost had a very slightly acid to neutral pH of 6.9-7.0 units which is ideal for most soils. The compost had a high electrical conductivity (EC) of 3,285 micromhos per cm indicating a high total salt content. However, a portion of the measured EC may be due to organic acids resulting from the composting process. The compost had a high cation exchange capacity (CEC) of 129.5 meq/100 g which is excellent for a compost product. This indicates that the compost will be able to hold a large amount of nutrients for plant use.

The 1/4" Comand Compost sample contained 34.4 ppm nitrate nitrogen and 68.7 ppm ammonium nitrogen. The phosphorus concentration was 3,480 ppm. The potassium concentration was 2,213 ppm. These values indicate that the compost will help supply plant available N, P, and K to sites where it is applied.

The 1/4" Comand Compost contained 3,119 ppm calcium and 78.5 ppm available magnesium. The sodium concentration of 119.5 ppm is within the safe range. The high amount of calcium relative to sodium indicates little to no sodium hazard from the compost.

The 1/4" Comand Compost micronutrient concentrations consisted of 4.0 ppm available copper, 254.7 ppm iron, 96.1 ppm manganese and 5.1 ppm zinc. Micronutrients are required for plant nutrition, but only in very small amounts. The test results indicate that the compost will likely serve as a slow release form of plant available micronutrients.

1/4" Comand Compost Leachate

A sub-sample of the 1/4" Comand Compost was mixed with water to make a 1 to 3 ratio by weight. This was the smallest amount of water that could be used and still generate enough leachate for analysis. The excess water (leachate) was then drained from the sample and analyzed for the major water soluble cations and anions that contribute to the electrical conductivity. The data are summarized in the following table. Except for SAR, all values are in ppm (mg/L)

Parameter	Concentration
Soluble Cations	
Calcium	227
Magnesium	31
Sodium	116.5
Potassium	54.5
SAR	2.0
Soluble Anions	
Chloride	170.4
Sulfate	1049

The initial leachate from the 1/4" Command Compost contained 227 ppm calcium and 31 ppm magnesium. Calcium and magnesium are beneficial for the soil. They help maintain good soil structure and off-set the harmful effects of high levels of sodium. In addition, the leachate contained 54.5 ppm potassium which is an essential plant nutrient.

The leachate contained 116.5 ppm sodium which is within the safe range. The sodium absorption ratio (SAR) is calculated based on the relative amounts of sodium, calcium and magnesium. SAR values near 1 are safe for most plants and soils, while SAR values over 5 will have harmful effects on plants and soils. The leachate had a SAR of 2.0 which is within the safe range and should not adversely affect the plants or soils at sites where reasonable amounts of compost and good management procedures are used.

The total amount of water soluble cations and anions is sufficient to account for an electrical conductivity of approximately 1,000 micromhos/cm which is approximately one third of the total EC measured in the compost.

The leachate contained 170.4 ppm chloride and 1,049 ppm sulfate.

Lab Blend - 90/10 and 80/20 Mixes - So. TX Golf Sand / 1/4" Comand Compost

A Lab Blend - 90/10 Mix So. TX Golf Sand / 1/4" Command Compost was previously tested and reported as Lab ID: G9958 on 11-Oct-16. The 90/10 Mix had an EC of 268 micromhos/cm which is well within the ideal range of <1,000.

As requested, a Lab Blend - 80/20 Mix So. TX Golf Sand / 1/4" Command Compost was also made and tested for salts. The 80/20 Mix had an EC of 887 micromhos/cm which is also within the ideal range.

Summary

The fertility analysis results of the 1/4" Comand Compost indicate it to contain substantial amounts of naturally occurring plant nutrients. The compost had a very slightly acid to neutral pH of 6.9 to 7.0 which is ideal. The compost had a high electrical conductivity of 3,285 of which salts compose approximately one third, and organic acids plus other degradation compounds constitute the remaining two thirds.

The 1/4" Comand Compost will serve as a slow release nutrient source for many of the major and micronutrients. Therefore, application of the 1/4" Comand Compost to sand or soil should be beneficial to the growth of most crops including turfgrass. The high CEC of the compost will help retain nutrients against leaching from high sand content root zones.

When the 1/4" Command Compost is blended with South TX Golf Sand for potential use as a sand-based root zone mix, both the 90/10 and 80/20 Mixes had acceptable EC values. Therefore, the 1/4" Command Compost should be suitable for use with clean sands at ratios up to 20% by volume.

If you have questions concerning these analyses or recommendations, please feel free to phone me directly at 979-575-5107. You may also send E-Mail to: <soiltest@thomasturf.com>. Thank you for using Thomas Turf Services, Inc.

Sincerely,

James C. Thomas, C.P.Ag.
President

JCT:rgy

Enclosure: Tables (3)
Invoice

File: 98698, G9965

Thomas Analytical

Environmental & Analytical Testing Services

Company:	Thomas Turf Services, Inc.	Report Date:	10/21/16
Submitted By:	Bob Yzaguirre	Date Collected:	--
Client Code:	001	Date Received:	10/12/16
Report No.:	005276	Matrix:	Compost
Project:	Mayer, LLC - Product Development		
	David Mayer		

Parameter	1/4" Comand Compost G9965-1	1/4" Comand Compost G9965-1, duplicate	Tech	Date	Time
pH	6.9	7.0	RM	10/14/16	1700
1:3 EC, mmhos/cm	3.17	3.40	RM	10/14/16	1700
EDTA Extractable Cations, ppm					
Calcium	3057	3181	JA	10/17/16	0915
Magnesium	74	83	JA	10/18/16	1525
Sodium	123	116	JA	10/20/16	1420
Potassium	2150	2275	JA	10/20/16	1610
DTPA Extractable Micronutrients, ppm					
Copper	4.1	3.9	JA	10/17/16	1010
Iron	260.4	248.9	RM	10/19/16	1000
Manganese	97.5	94.7	JA	10/20/16	1545
Zinc	4.9	5.3	JA	10/17/16	1445
Available P, ppm	3473	3486	RM	10/17/16	1000
NO_3-N, ppm	34.6	34.1	RM	10/21/16	1000
NH_4-N, ppm	69.1	68.2	JA	10/20/16	1030
CEC, meq/100 g	124	135	JA	10/20/16	1500

Jacob Alaniz
Laboratory Director

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---------- Leachate Analysis ----------

Parameter	1/4" Comand Compost G9965-1	1/4" Comand Compost G9965-1, duplicate	Tech	Date	Time
1:3 Soluble Cations, ppm					
Calcium	235	219	JA	10/17/16	0915
Magnesium	29	33	JA	10/18/16	1525
Sodium	115	118	JA	10/20/16	1420
Potassium	52	57	JA	10/20/16	1610
SAR	1.9	2.0	--------- Calculation ---------		
1:3 Soluble Anions, ppm					
Chloride	170.4	170.4	KK	10/19/16	1116
Sulfate	1064	1034	RM/KK	10/21/16	1503

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Testing Certificate Number: 0743.01
Geotechnical Putting Green Materials

Mayer Materials, LP	Facility: Product Development
C. David Mayer	Account No.: 98698
1212 Silver Creek Azle Rd.	Lab ID: G9965
Azle, TX 76020	Date Rec'd: 12-Oct-16
Phone: 817-907-0585	Test Date: 12-Oct-16
E-mail: david@mmrcs.com	Report Date: 21-Oct-16

Chemical Analysis Report

Sample ID	pH*	Electrical Conductivity** micromhos/cm	Extraction Method	Acid Reaction 1N HCl***
Lab Blend - 90/10 Mix†	7.1	527	1 To 1	Very Slight
(G9958, 10/11/16)				
Lab Blend - 80/20 Mix†	-	887	1 To 1	Very Slight
† So. TX Golf Sand / 1/4" Comand Compost				

*pH Tested Using USEPA Method 9045C - 1:1 Ratio (20 g Soil:20 ml Distilled Water)
**EC Tested Using "Methods of Soil Analysis" Published by the American Society of Agronomy (Rhoades, J.D. 1982)
***Thomas Turf Services Method 1992

Reviewed by: _____
James C. Thomas, C.P. Ag.
Pres., Thomas Turf Services, Inc.