



**Turf & Soil Diagnostics**

October 28, 2016

Paul Hagy  
Texas Sports Sands  
702 Easy Street  
Garland, TX 75042

TSD File #16100081

Enclosed are the results of the Pro Blend 50-50 Bunker Sand sample received by our laboratory on 10-26-2016. This sample was tested for potential use as bunker sand. These results are being compared to published bunker sand guidelines.

The penetrometer value of the sample indicates a very low tendency to bury the ball. The crusting and setup values suggest that bunkers with this sand in place may not require significant raking after rainfall or irrigation events. The infiltration rate of this sample meets the recommended minimum of 20 in/hr for well-drained bunker sand.

It is desirable for bunker sand used in green side bunkers to be compatible with the greens mix to reduce the risk of layering on the greens. The particle size results for this sample meet bunker sand guidelines. The sand is finer than the USGA particle size recommendations for greens. The gradation suggests there may be a layering risk if this sand is splashed from bunkers onto coarser graded putting greens.

Despite this testing, bunker sand selection is highly subjective. Aside from playability, factors such as color and aesthetics are often weighed in the decision process. We recommend that golf course superintendents, pros, greens committee chairs, and any other interested parties visit a club with the sand in use. Play into and out of it to see how they like it.

If you have any questions or are in need of further assistance, please contact us. Samples are generally kept on the premises for 45 days after report date. Thank you for using Turf & Soil Diagnostics, Inc.

Sincerely,

Sam Ferro  
President

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Date received Oct-26-2016  
 Date Reported Oct-28-2016  
 Facility Product Development

### Bunker Sand Evaluation

| Lab ID#    | Sample Name                 | Dry Color      | Wet Color           | Penetrometer Value<br>kg/cm <sup>2</sup> |
|------------|-----------------------------|----------------|---------------------|--|
| 16100081-2 | Pro Blend 50-50 Bunker Sand | 10YR 8/1 White | 10YR 7/1 Light Gray | 2.9                                      |
|            |                             |                |                     |  |

| Lab ID#    | Sample Name                 | Shape<br>Angularity        | Shape<br>Sphericity | Crusting | Set-Up |
|------------|-----------------------------|----------------------------|---------------------|----------|--------|
| 16100081-2 | Pro Blend 50-50 Bunker Sand | Sub-Angular to Sub-Rounded | Medium              | None     | Slight |
|            |                             |                            |                     |          |        |

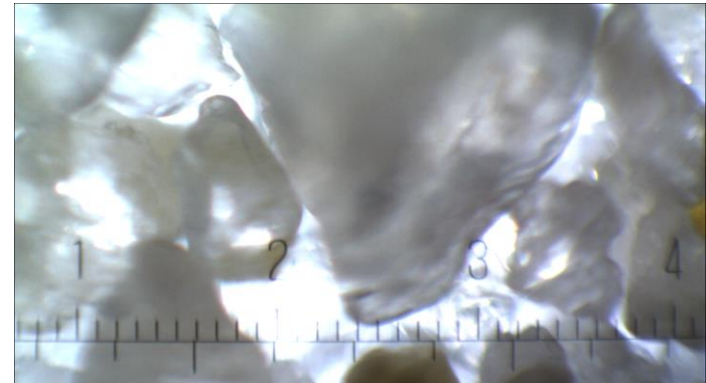
#### Bunker SOP

Samples were tested as received and comments pertain only to the samples shown.

This report may not be reproduced in part, but only in full.

Sample condition upon receipt was normal.

Samples were received without a transmittal letter.



Photomicrograph of Lab ID 16100081-2 Pro Blend 50-50 Bunker Sand.

Reviewed by Sam Feno



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**Facility** Product Development

### 30 cm USGA Physical Evaluation\*

| Lab ID#    | Sample Name                 | Infiltration Rate*<br>in/hr | Infiltration Rate*<br>cm/hr | Bulk Density<br>g/cc |
|------------|-----------------------------|-----------------------------|-----------------------------|----------------------|
| 16100081-2 | Pro Blend 50-50 Bunker Sand | 29.4                        | 74.6                        | 1.62                 |

\*ASTM F1815 Saturated Hydraulic Conductivity (K-SAT)

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### Particle Size Evaluation\*

| Lab ID#                             | Sample Name                 | % Retained mm (US sieve) |                        |                     |                               |                    |                       |                    |                     |                    |                    |                       |
|-------------------------------------|-----------------------------|--------------------------|------------------------|---------------------|-------------------------------|--------------------|-----------------------|--------------------|---------------------|--------------------|--------------------|-----------------------|
|                                     |                             | % Sand<br>2.0 - 0.05 mm  | % Silt<br>0.05-0.002mm | % Clay<br>< 0.002mm | Gravel<br>4.0 (5)             | Gravel<br>2.0 (10) | V. Coarse<br>1.0 (18) | Coarse<br>0.5 (35) | Medium<br>0.25 (60) | Fine<br>0.15 (100) | Fine<br>0.10 (140) | V. Fine<br>0.05 (270) |
| 16100081-2                          | Pro Blend 50-50 Bunker Sand | 98.2                     | 1.1                    | < 1.0               | 0.0                           | 0.5                | 6.7                   | 37.9               | 34.0                | 11.1               | 4.9                | 3.6                   |
| USGA Recommendations for Greens     |                             | ≥ 92%                    | ≤ 5% Silt              | ≤ 3% Clay           | ≤ 3% Gravel<br>≤ 10% Combined |                    | ≥ 60% Combined        |                    | ≤ 20%               | ≤ 5%***            |                    |                       |
| Bunker Sand Guidelines <sup>1</sup> |                             |                          | ≤ 3%                   |                     | ≤ 2%                          | ≤ 15%              | 78 - 100%             |                    |                     |                    | ≤ 5%               |                       |

<sup>1</sup> From Golf Course Management 54:64-70, 1986

| Lab ID#    | Sample Name                 | Uniformity<br>Coefficient<br>Cu | D15<br>mm | D50<br>mm | D85<br>mm | Shape<br>Angularity        | Shape<br>Sphericity | USDA<br>Textural<br>Classification | Acid<br>Reaction | pH <sup>‡</sup><br>1:1 | Combined<br>Fractions<br>< 0.10 mm |
|------------|-----------------------------|---------------------------------|-----------|-----------|-----------|----------------------------|---------------------|------------------------------------|------------------|------------------------|------------------------------------|
| 16100081-2 | Pro Blend 50-50 Bunker Sand | 3.6                             | 0.19      | 0.45      | 0.87      | Sub-Angular to Sub-Rounded | Medium              | Sand                               | Moderate         |                        | 4.8                                |

\*ASTM F1632 Method A & Determination of Size Factors SOP

<sup>‡</sup>ASTM D4972 w/ CaCl<sub>2</sub>

\*\*\*Maximum of 10% combined on Very Fine Sand, Silt, and Clay fractions.

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Reviewed by Sam Fero