200 White Mountain Drive
New Bremen, OH 45869
Tel: (419) 977-2766
Fax: (419) 977-2767

Date: 5/21/2024
Client Name: Freestone Club
File Number: 91984
Consultant: Soil and Water Consulting

Greensmix : Lab #2 CS&G GREENS-M SAND
Gravel: Lab #1061 CS&G PEA GRAVEL

GREENSMIX/GRAVEL COMPATIBILITY

Rootzone Sieve Analysis	Particle Diameter (%)							
	2.0 mm	1.0 mm	0.5 mm	0.25 mm	0.15 mm	0.106 mm	0.053 mm	Silt/Clay
% Retained	0.2	5.6	21.2	56.3	13.3	2.3	0.3	0.8

Gravel Sieve Analysis	Particle Diameter (%)							
	12.5 mm	9.5 mm	6.35 mm	4.75 mm	2.36 mm	2.0 mm	1.0 mm	< 1.0 mm
% Retained	0.0	1.1	37.0	35.0	26.5	0.3	0.1	0.0

1. **For Bridging to Occur.** D15(gravel) <= 8 x D85(rootzone)

   D15(gravel) = 3.68

   D85(rootzone) = 0.78

   3.68 mm <= 6.24 mm

   These Results show that the D15(gravel) at 3.68mm **IS** less than or equal to (<=) 8 x D85(rootzone), which was 8 x 0.78mm = 6.24mm. Therefore, bridging of the coarsest 15% rootzone particles **SHOULD** occur with the finest 15% of gravel particles. This gravel **IS** compatable with sand.

2. **For Adequate Permeability.** D15(gravel) >= 5 x D15(rootzone)

   D15(gravel) = 3.68

   D15(rootzone) = 0.24

   3.68 mm >= 1.20 mm

   These Results show that the D15(gravel) at 3.68mm **IS** >= 5 x D15(rootzone), which was 5 x 0.24mm = 1.20mm. Therefore, adequate permeability **SHOULD** occur with this gravel and rootzone sand.

3. **Uniformity Coefficient of Gravel** D90(gravel)/D15(gravel) <= 3.0

   D90(gravel) = 8.74

   D15(gravel) = 3.68

   2.38 mm <= 3.00mm

   These Results show that the D90(gravel)/D15(gravel) is 2.38mm which **IS** less than or equal to 3.0. Therefore, the Uniformity Coefficient of gravel **PASSES** this criterion.

Furthermore, the gravel should have 100% particles < 12mm, <= 10% particles < 2mm, and <= 5% particles < 1mm.

Reviewed by: _____

BROOKSIDE LABORATORIES INC. EST. 1951

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Date: 5/21/2024
Client Name: Freestone Club
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Consultant: Soil and Water Consulting

Greensmix : Lab #3 CS&G CAPPING MATERIAL
Gravel: Lab #1061 CS&G PEA GRAVEL

GREENSMIX/GRAVEL COMPATIBILITY

Rootzone Sieve Analysis	Particle Diameter (%)							
	2.0 mm	1.0 mm	0.5 mm	0.25 mm	0.15 mm	0.106 mm	0.053 mm	Silt/Clay
% Retained	0.5	0.2	1.1	16.5	35.1	21.0	9.6	16.0

Gravel Sieve Analysis	Particle Diameter (%)							
	12.5 mm	9.5 mm	6.35 mm	4.75 mm	2.36 mm	2.0 mm	1.0 mm	< 1.0 mm
% Retained	0.0	1.1	37.0	35.0	26.5	0.3	0.1	0.0

1. **For Bridging to Occur.** D15(gravel) <= 8 x D85(rootzone)

   D15(gravel) = 3.68
   D85(rootzone) = 0.30

   3.68 mm <= 2.40 mm

   These Results show that the D15(gravel) at 3.68mm **IS NOT** less than or equal to (<=) 8 x D85(rootzone), which was 8 x 0.30mm = 2.40mm. Therefore, bridging of the coarsest 15% rootzone particles **SHOULD NOT** occur with the finest 15% of gravel particles. This gravel **IS NOT** compatable with sand.

2. **For Adequate Permeability.** D15(gravel) >= 5 x D15(rootzone)

   D15(gravel) = 3.68
   D15(rootzone) = 0.05

   3.68 mm >= 0.25 mm

   These Results show that the D15(gravel) at 3.68mm **IS** >= 5 x D15(rootzone), which was 5 x 0.05mm = 0.25mm. Therefore, adequate permeability **SHOULD** occur with this gravel and rootzone sand.

3. **Uniformity Coefficient of Gravel** D90(gravel)/D15(gravel) <= 3.0

   D90(gravel) = 8.74
   D15(gravel) = 3.68

   2.38 mm <= 3.00mm

   These Results show that the D90(gravel)/D15(gravel) is 2.38mm which **IS** less than or equal to 3.0. Therefore, the Uniformity Coefficient of gravel **PASSES** this criterion.

Furthermore, the gravel should have 100% particles < 12mm, <= 10% particles < 2mm, and <= 5% particles < 1mm.

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Date: 5/21/2024
Client Name: Freestone Club
File Number: 91984
Consultant: Soil and Water Consulting

Greensmix : Lab #4 CS&G CAPPING LOVELADY
Gravel: Lab #1061 CS&G PEA GRAVEL

GREENSMIX/GRAVEL COMPATIBILITY

Rootzone Sieve Analysis	Particle Diameter (%)							
	2.0 mm	1.0 mm	0.5 mm	0.25 mm	0.15 mm	0.106 mm	0.053 mm	Silt/Clay
% Retained	0.1	0.1	2.3	44.3	35.7	7.5	4.1	5.9

Gravel Sieve Analysis	Particle Diameter (%)							
	12.5 mm	9.5 mm	6.35 mm	4.75 mm	2.36 mm	2.0 mm	1.0 mm	< 1.0 mm
% Retained	0.0	1.1	37.0	35.0	26.5	0.3	0.1	0.0

1. **For Bridging to Occur.** D15(gravel) <= 8 x D85(rootzone)

D15(gravel) = 3.68
D85(rootzone) = 0.43

3.68 mm <= 3.44 mm

These Results show that the D15(gravel) at 3.68mm **IS NOT** less than or equal to (<=) 8 x D85(rootzone), which was 8 x 0.43mm = 3.44mm. Therefore, bridging of the coarsest 15% rootzone particles **SHOULD NOT** occur with the finest 15% of gravel particles. This gravel **IS NOT** compatable with sand.

2. **For Adequate Permeability.** D15(gravel) >= 5 x D15(rootzone)

D15(gravel) = 3.68
D15(rootzone) = 0.14

3.68 mm >= 0.70 mm

These Results show that the D15(gravel) at 3.68mm **IS** >= 5 x D15(rootzone), which was 5 x 0.14mm = 0.70mm. Therefore, adequate permeability **SHOULD** occur with this gravel and rootzone sand.

3. **Uniformity Coefficient of Gravel** D90(gravel)/D15(gravel) <= 3.0

D90(gravel) = 8.74
D15(gravel) = 3.68

2.38 mm <= 3.00mm

These Results show that the D90(gravel)/D15(gravel) is 2.38mm which **IS** less than or equal to 3.0. Therefore, the Uniformity Coefficient of gravel **PASSES** this criterion.

Furthermore, the gravel should have 100% particles < 12mm, <= 10% particles < 2mm, and <= 5% particles < 1mm.

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