2023 Fall Conference at Ashore Resort & Beach Club
Ocean City, Maryland

RAPID INFILTRATION BAISNS FOR WASTEWATER EFFLUENT

Ralph B. Downard, Jr., CPSS

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BIOGRAPHY

Ralph Downard, Jr., CPSS

Ralph Downard has over 34 years of experience in soil science, wetland science, forest resources, and water resources projects. Project tasks include wetland delineation, permitting, and mitigation; soil mapping, interpretation, and classification; forest resource valuation and delineation; and riparian buffer area assessments. Mr. Downard has also used his knowledge of soils to identify and quantify the suitability of areas for stormwater management facilities and on-site wastewater and disposal systems. Projects required the integration of local, state, and federal regulations with accepted scientific principles. Project responsibilities have ranged from project management of various open-ended contracts with simultaneous task orders, coordination with diverse teams of subcontractors, collaboration with stakeholders, expediting time-sensitive permits and expert testimony.

Professional Affiliations

- Soil Science Society of America
- Mid-Atlantic Association of Professional Soil Scientist
- Pennsylvania Association of Professional Soil Scientist
- Delaware Onsite Wastewater Recycling Association
- Delaware Onsite Wastewater Recycling Association

ABSTRACT

Rapid Infiltration Basins for Treated Wastewater Effluent

- Get an understand of what Rapid Infiltration Basins are.
- Soil properties for Rapid Infiltration Basins
- Phase approach helps reduce costs
- Maximization of wastewater disposal potential

- 1.0 PDH

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Millsboro Facts

- Elisha Dickerson built a dam on the Indian River in the 1792, which was considered the official town establishment. At the time it was called "Rock Hole". The official incorporation of the town was in 1893.
- Millsboro is one of only three cities in the United States to record both its state's highest and lowest temperatures, the others being Chester, Massachusetts, and Warsaw, Missouri.
- In 2020, Millsboro was ranked 2nd out of the 57 Delaware cities and ranks 1st out of the 25 Sussex County cities for number of residential building permits issued. In 2020, the population was 6,863. Anticipate a 5% annual growth over the next 30 years.
- Millsboro is located in the Inland Bays Watershed

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Project Scope

- Identify additional areas on the 438-acre White Farm to dispose of treated wastewater.
- The Delaware, Department of Natural Resources and Environmental Control require the soils evaluation include:
  - A combination of test pits and soil borings be excavated on 75-ft. grid pattern.
  - One double-ring infiltration test be performed per acre of project site.
  - Soil chemistry data must be collected from each map unit.
- Sufficient area must be identified for an initial and replacement disposal system.
- Due to the intensity of soil testing required for the formal evaluation and the size of the White Farm, a preliminary evaluation was initiated. The preliminary evaluation included the review of the data collected during previous testing and an evaluation of selected areas on a 225-ft. grid pattern.

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Millsboro Wastewater Facts

- Existing wastewater treatment plant became operational in 2008. Current capacity is 1.15 MGD, with a maximum capacity of 3.0 MGD. The wastewater treatment plant was designed to discharge directly into Indian River a tributary of the Inland Bays
- In October 2008, the Secretary for the Delaware, Department of Natural Resources and Environmental Control issued an order to improve the water quality of the Inland Bays that resulted in the Town being prohibited from direct discharge into Indian River.
- Currently a majority of the treated is disposed of via spray irrigation and rapid infiltration basins (RIBS) at the White Farm. Currently, the total capacity at the White Farm is 1.2 MGD.
- A new wastewater treatment plant is designed on the White Farm, which is projected to have maximum capacity of 2.6 MGD.

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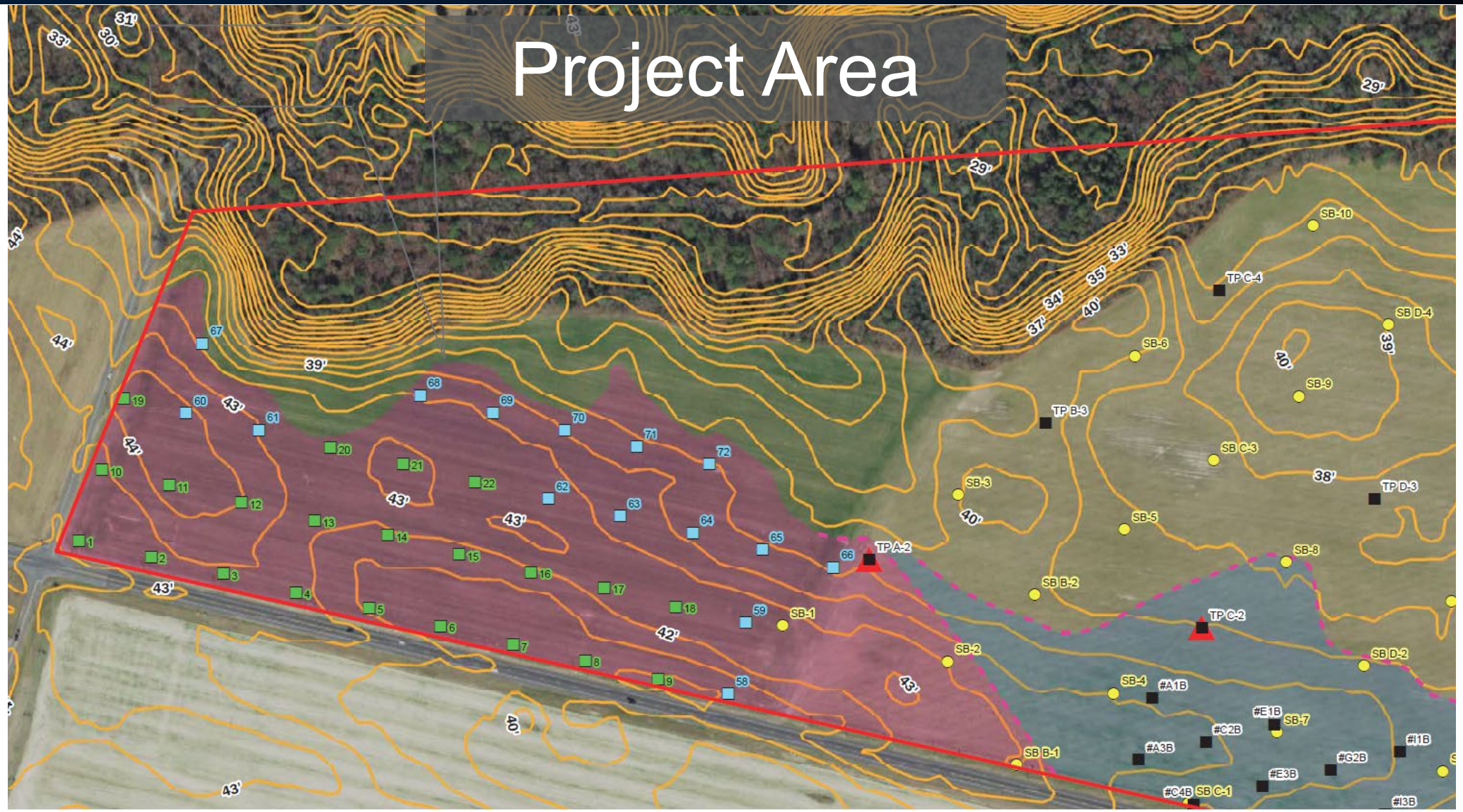

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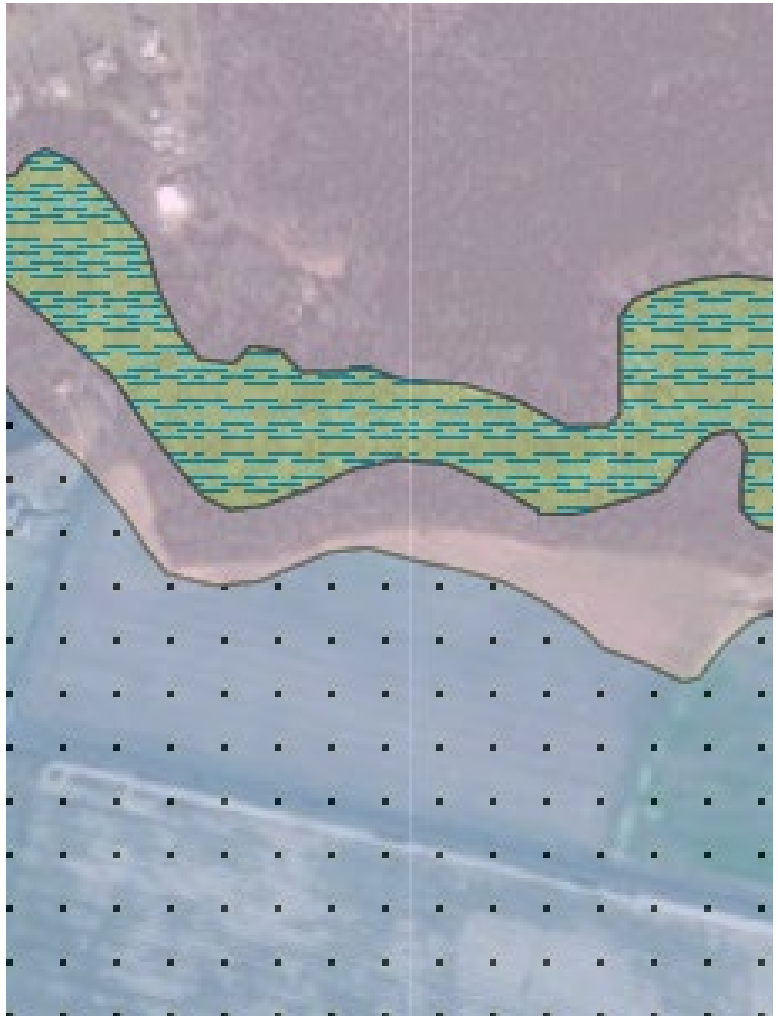

Resource Mapping

- The Project Area is located within the Coastal Plain Physiographic Province, which is characterized by flat to gently sloping land surfaces underlain by sedimentary deposits.
- The NRCS Online Soil Survey indicates the White Farm is underlain by the Fort Mott-Henlopen complex, with differing slope ratings. Both Soil Series reportedly have a water table that is more than 80 inches below ground surface.
- Mapping by the Delaware Geological Survey (DGS) indicates that the project area is underlain by a thin unit (<10 feet) of the Lynch Heights Formation
    - The DGS describes the sediments as heterogeneous deposits with colors ranging from reddish-brown to light-gray, and particle size ranging from silty, clayey, sands to gravelly sand and sandy gravel. This formation results of reworking and redeposition of the underlying Beaverdam Fm sediments in shallow water along the margins of a tidal system

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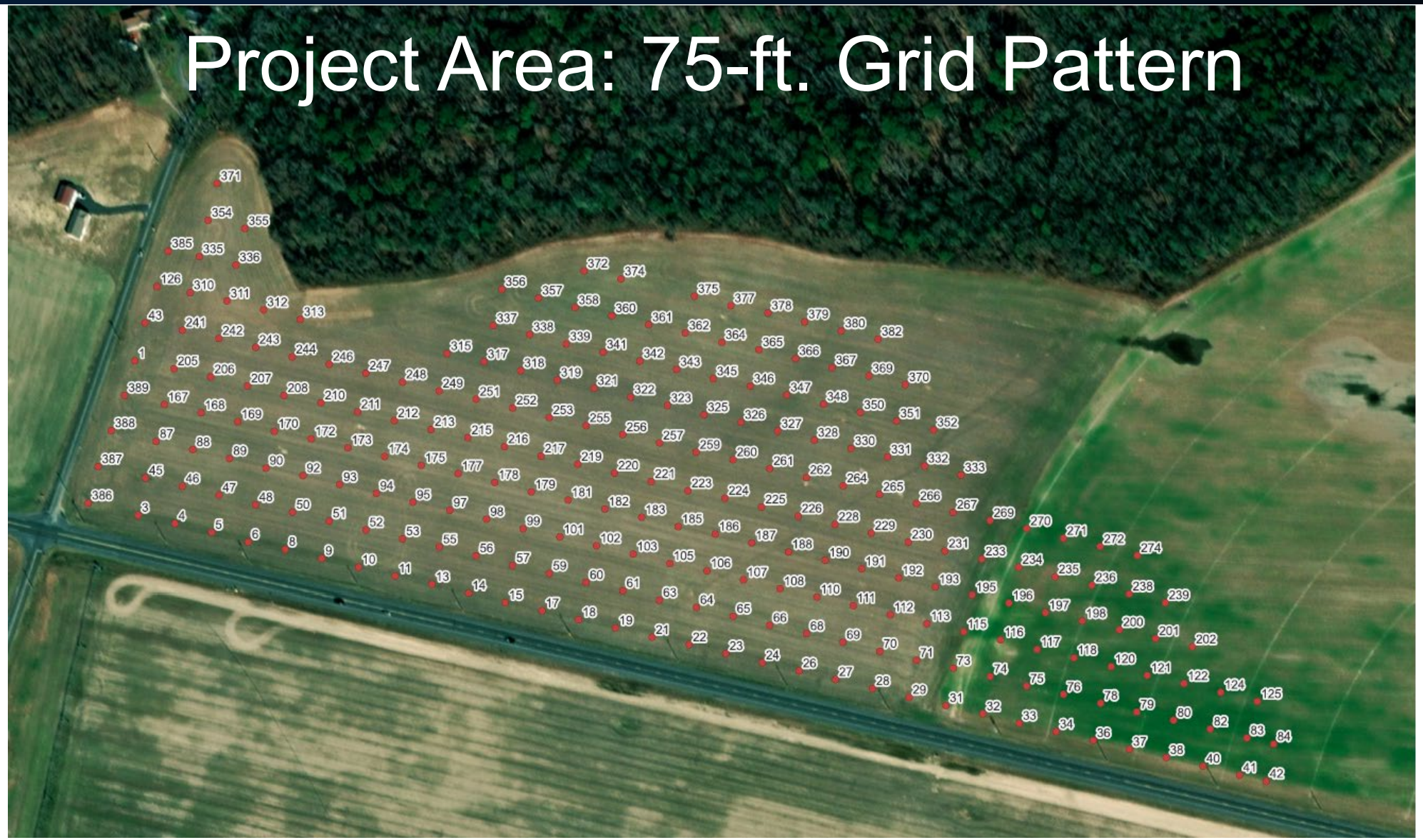

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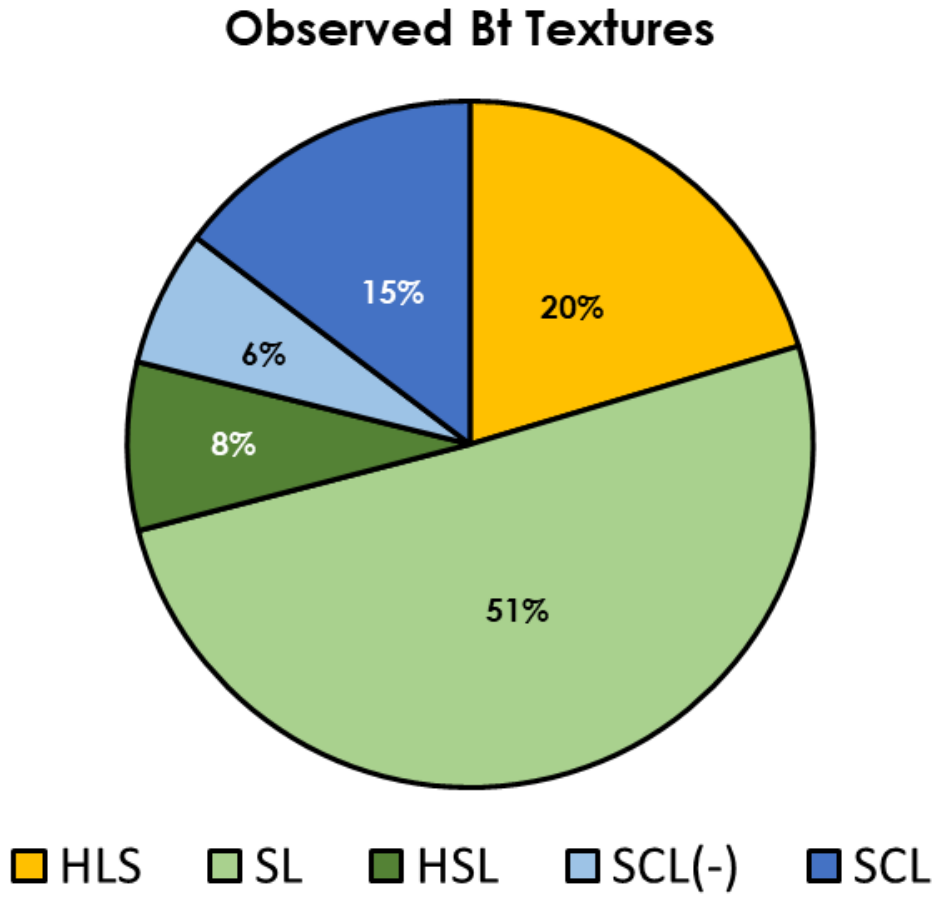

Bt Textures	Total	Percent of Total
HLS	54	20%
SL	134	51%
HSL	21	8%
SCL(-)	17	6%
SCL	39	15%
	265	100%

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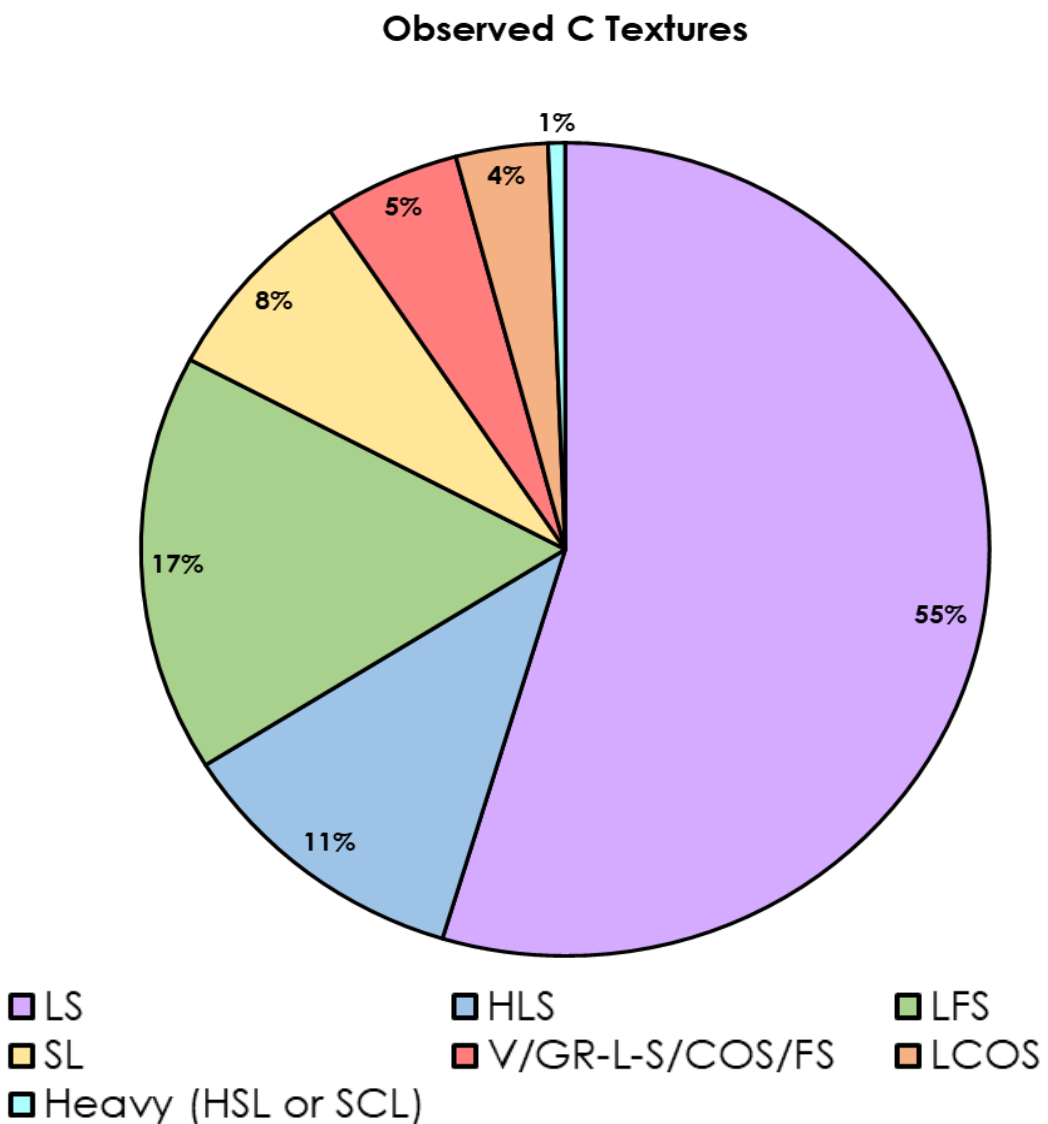

C Textures	Total	Percent of Total
LS	421	55%
HLS	88	11%
LFS	128	17%
SL	61	8%
V/GR-L-S/COS/FS	40	5%
LCOS	27	4%
Heavy (HSL or SCL)	5	1%
	770	100%

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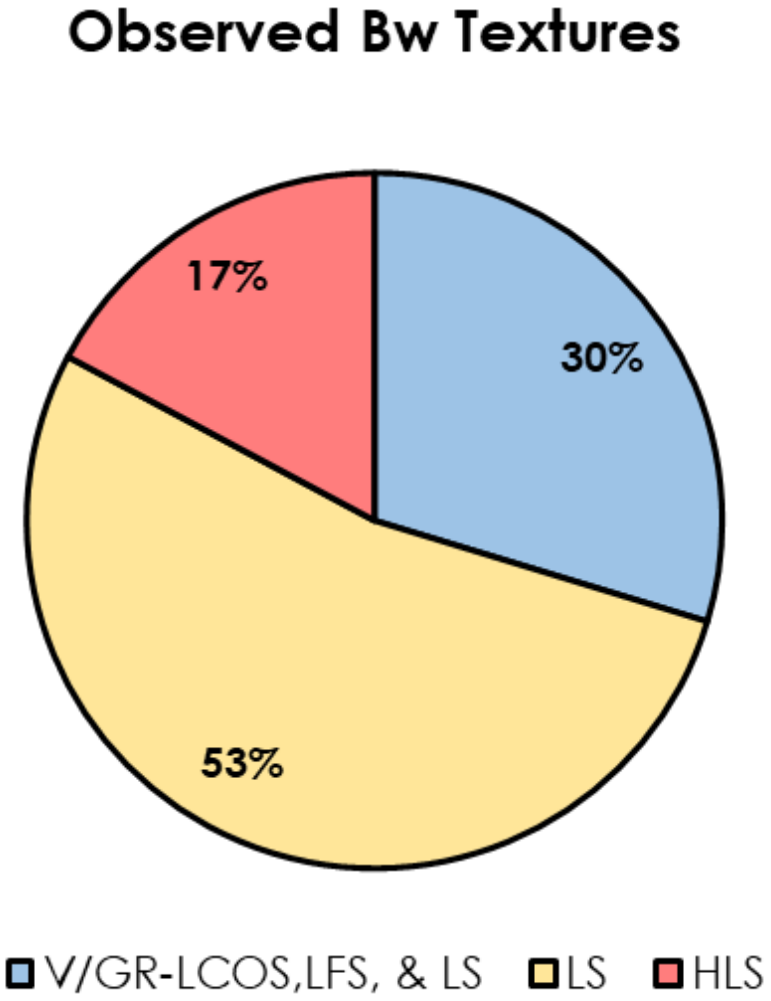

Bw Textures	Total	Percent of Total
V/GR-LCOS,LFS, & LS	19	30%
LS	34	53%
HLS	11	17%
	64	100%

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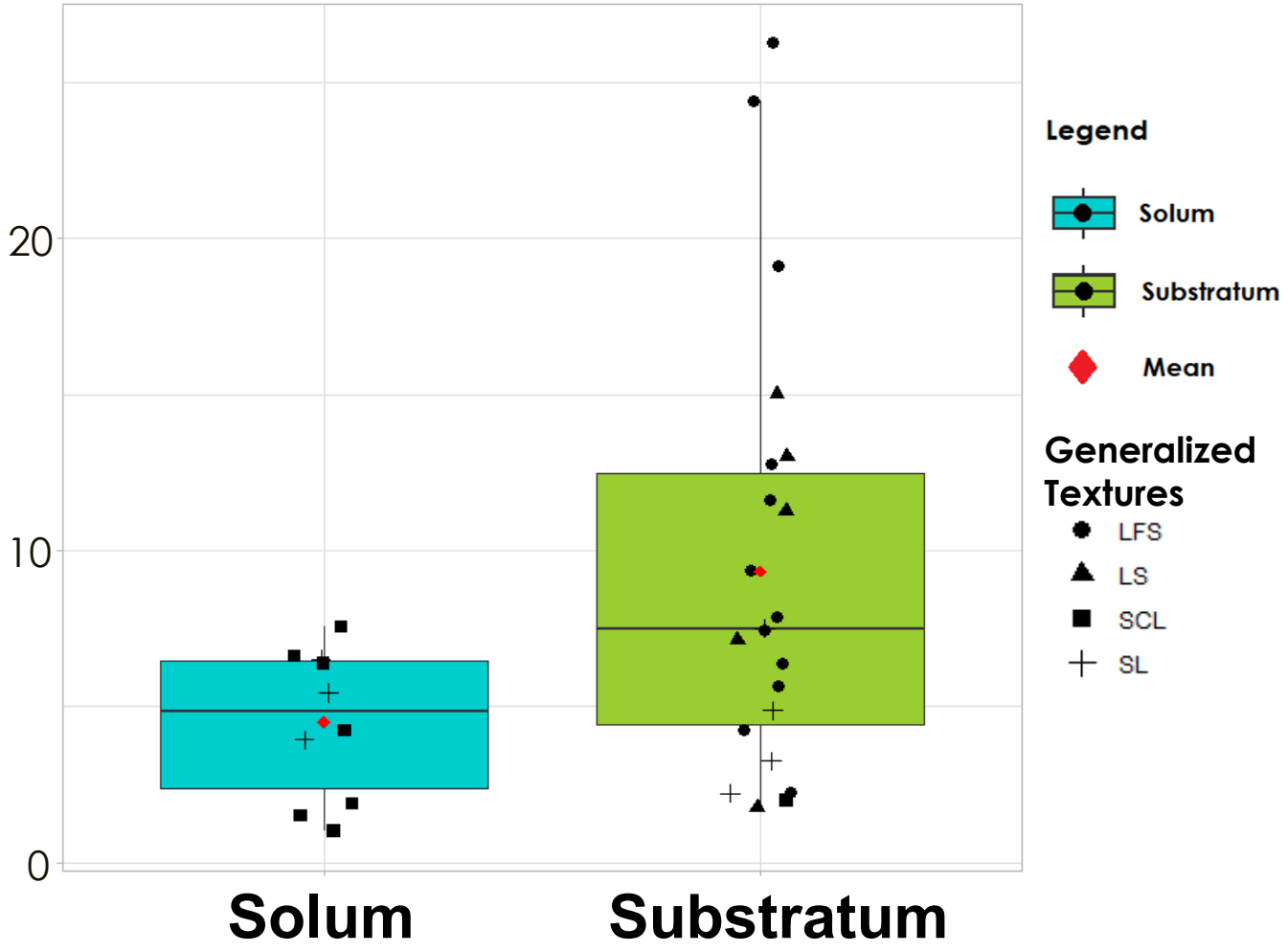
Infiltration Data



	Solum	Substratum
n	10	22
Range	1 - 7.56	1.75 - 26.3
Median	4.84	7.47
Mean	4.50	9.33

- Welch Two Sample t-test returned p-value = 0.003388
- Mean infiltration rate into substratum is significantly faster than into solum

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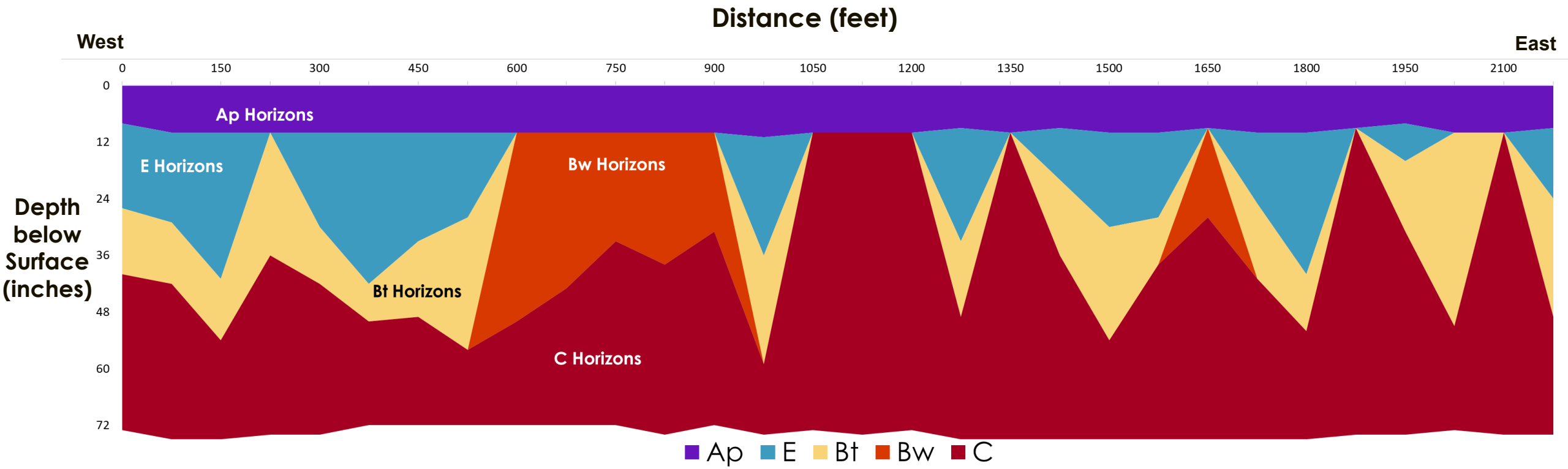
West – East Cross Section of Agricultural Field



Lower Limit of Observation

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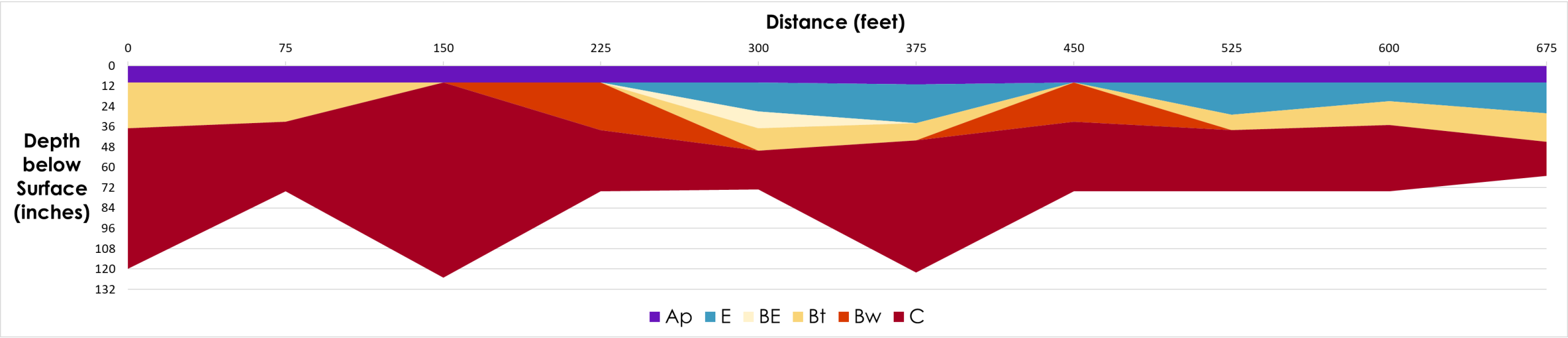
South - North Cross Section of Agricultural Field



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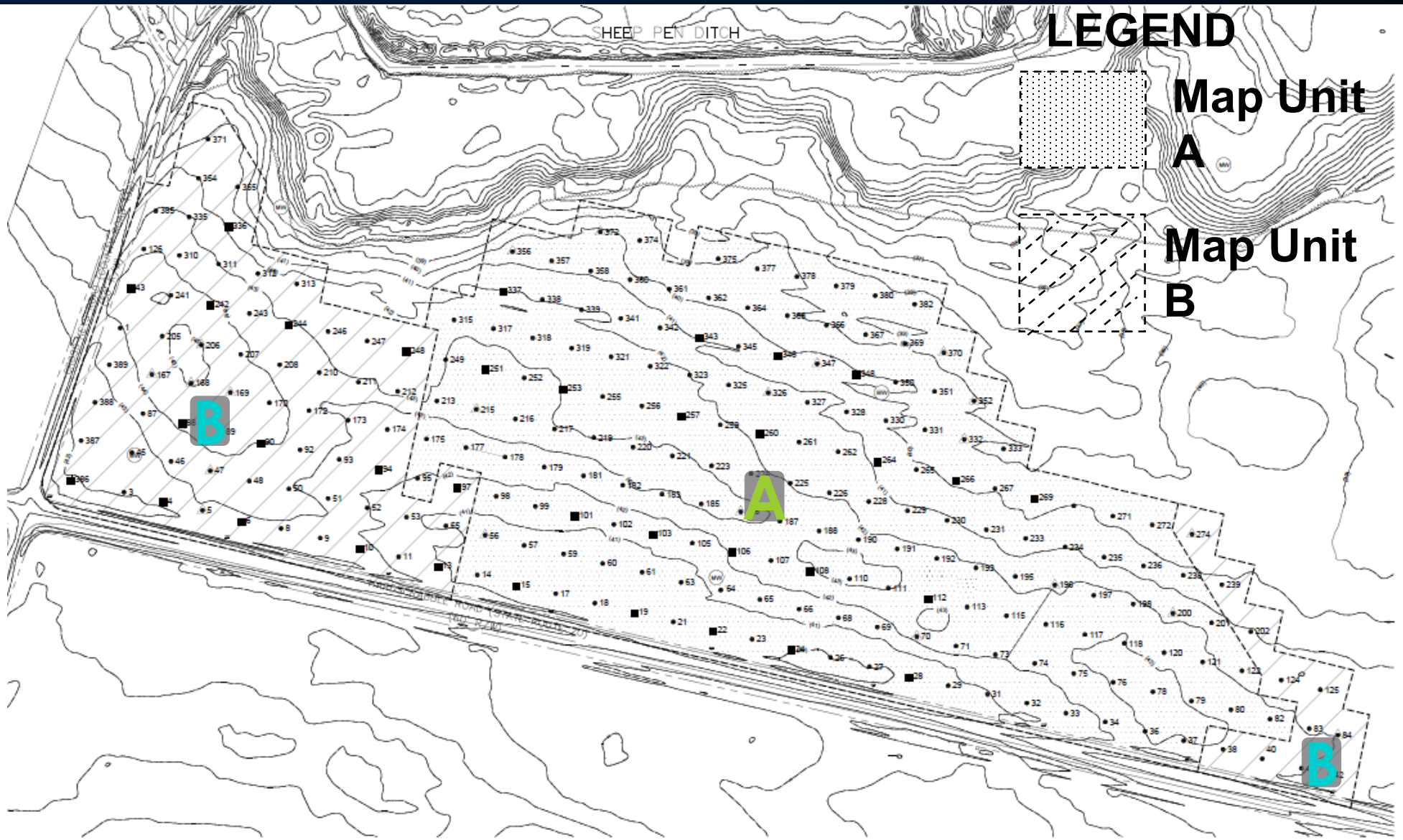

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Conclusions

- Two Soil Map Units, A and B, were identified based on thickness of Bt horizon.
- Soil Map Unit A was characterized by soil with a Bt horizon that terminated < 36 inches from the surface.
- Soil Map Unit B was characterized by soil with a Bt horizon that terminated 36 to > 48 inches from the surface.
- Both Soil Map Units are suitable RIBs with an invert approximately 36-inches below the surface.
- Soil replacement will likely be required in the RIBs located in Soil Map Unit B.

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QUESTIONS?

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