

# Louisiana DOTD Geotechnical Database Efforts - Part II

Xin Peng, PhD, PE

Geosyntec Consultants

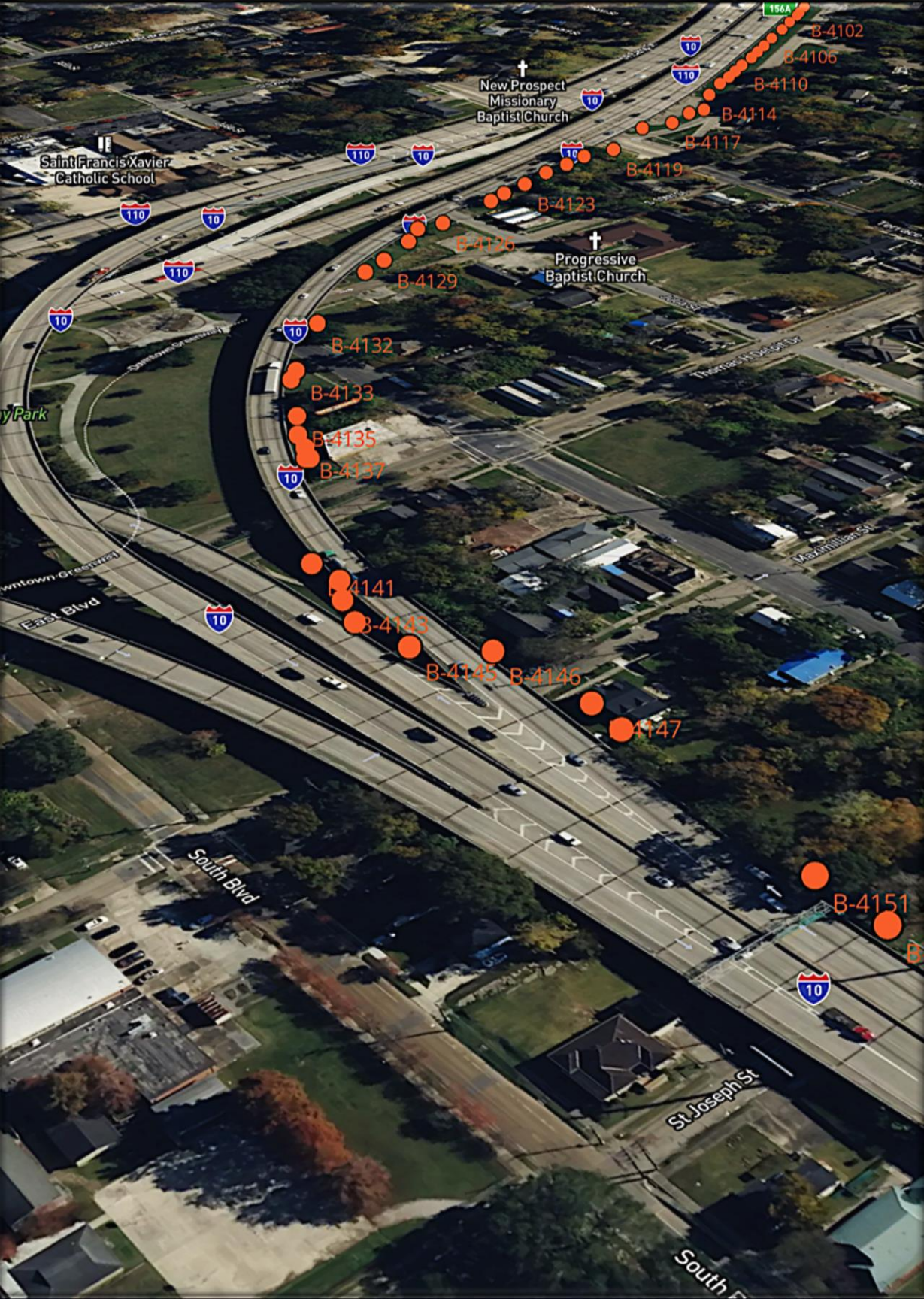
STGEC 2024



# Questions to be addressed



- 1 **LADOTD already uses OpenGround. Why is there still a need to address geotechnical data management challenges?**
- 2 **What strategic steps can LADOTD take in the next decade to fully harness geotechnical data, transforming design and construction practices for more consistent reliability and greater efficiency?**



# An Innovative Digital Solution for LADOTD

## Custom-Designed Web-Based Platform

Specifically built to meet LADOTD's evolving geotechnical needs.

## Collaborative Development

Worked hand-in-hand with LADOTD's geotechnical team to tailor every aspect of the system.

## Streamlined Data Workflows

**Software-Agnostic Collaboration:** Enables effective interaction between LADOTD and consultants, regardless of the software they use.

## Automated Compliance and Efficient Design

**Automatic Standards Adherence:** Ensures designs comply with LRFD and national/state regulations effortlessly.

**Optimized Design Process:** Streamlines workflows through automation, boosting efficiency and consistency.

# Current Data Delivery and Management Workflow at LADOTD

## LADOTD Requests Data

- Static boring logs in PDF format
- Digital data in **gINT** format
- Both should be in LADOTD's standardized template formats.

## Data Submission

Consultants submit both PDF boring logs and **gINT** files aligned with LADOTD's **standardized** requirements.

1

2

3

4

## Consultants Prepare Data

Consultants use their preferred geotechnical database software systems to prepare the requested data. They can be gINT, OpenGround, RSLog, BoreDM, TabLogs, or any other.

## LADOTD Manages Data

LADOTD manages the submitted data using OpenGround.

# Transitioning to a Software-Agnostic Approach with DIGGS

## LADOTD Requests Data

- Static boring logs in PDF format
- Digital data in **DIGGS** format
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## Data Submission

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LADOTD manages the submitted data using OpenGround.

# Why DIGGS?

## Future-Proofing

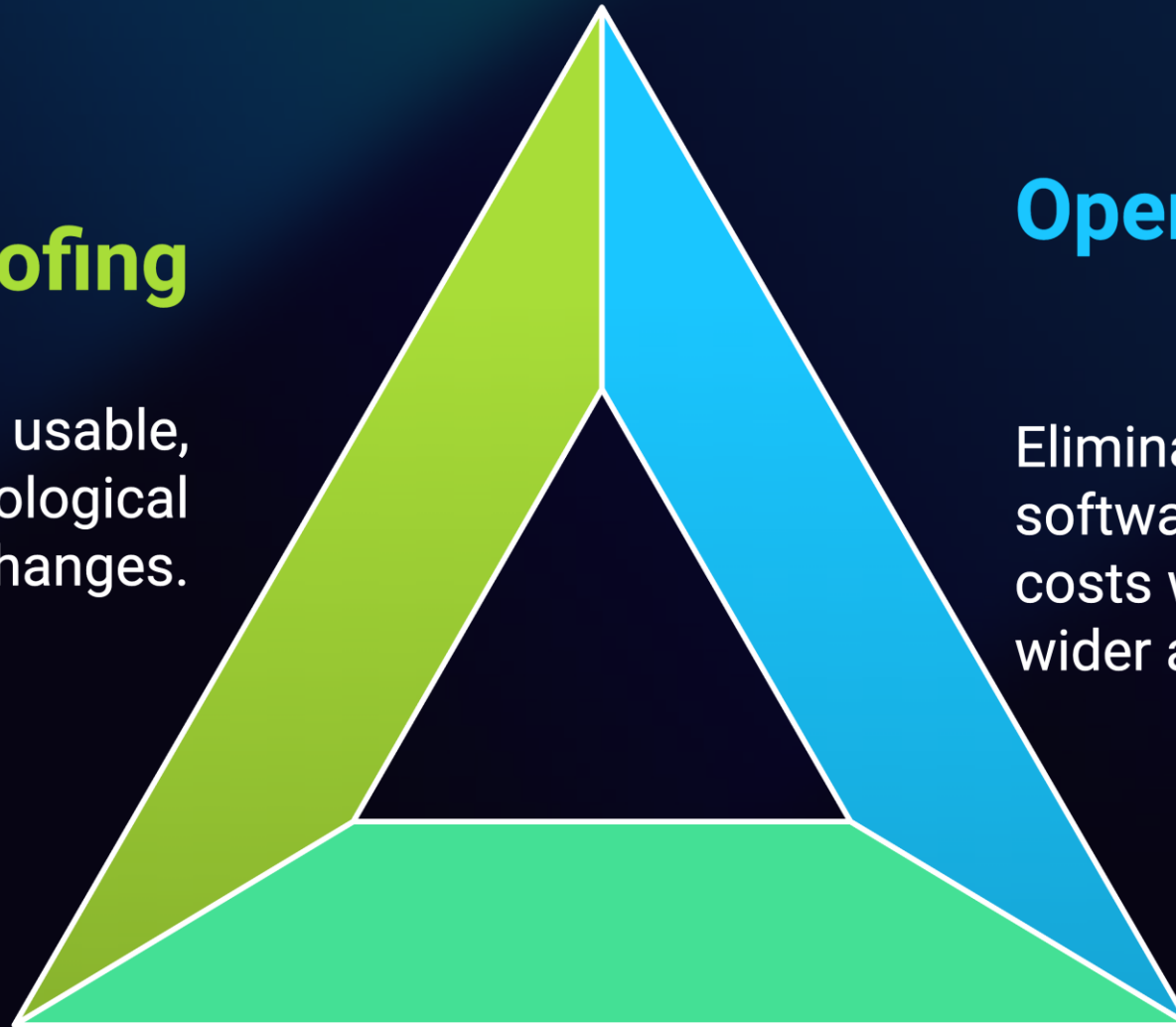
Ensures data remains accessible, usable, and scalable despite technological advancements or software changes.

## Open-Source Format

Eliminates dependency on specific software vendors and reduces licensing costs while promoting transparency and wider adoption within the industry.





## Consultant Flexibility

Allows use of various tools, respecting existing workflows and enhancing collaboration.



# Video Demo 1

The Power of Standardized Digital Format —An glNT Example

-  Upload Data
-  Design Analysis
-  Export Project
-  Load Project

 Cloud Data

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Data Profiles

Resistance Curve

Cross Section

Map Selected Data

[GENERATE FIGURE](#)

Stratigraphy Table

Stratigraphy

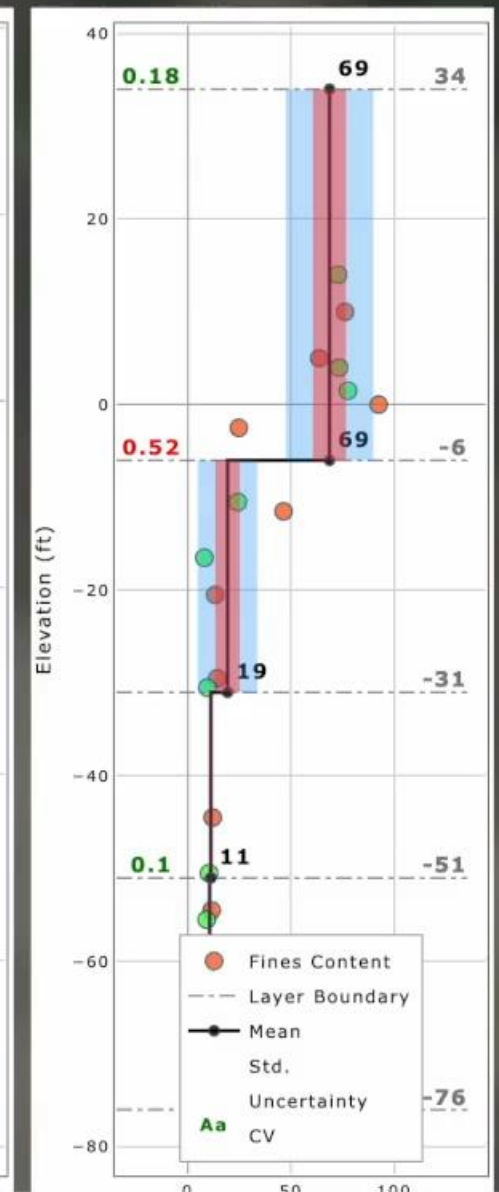
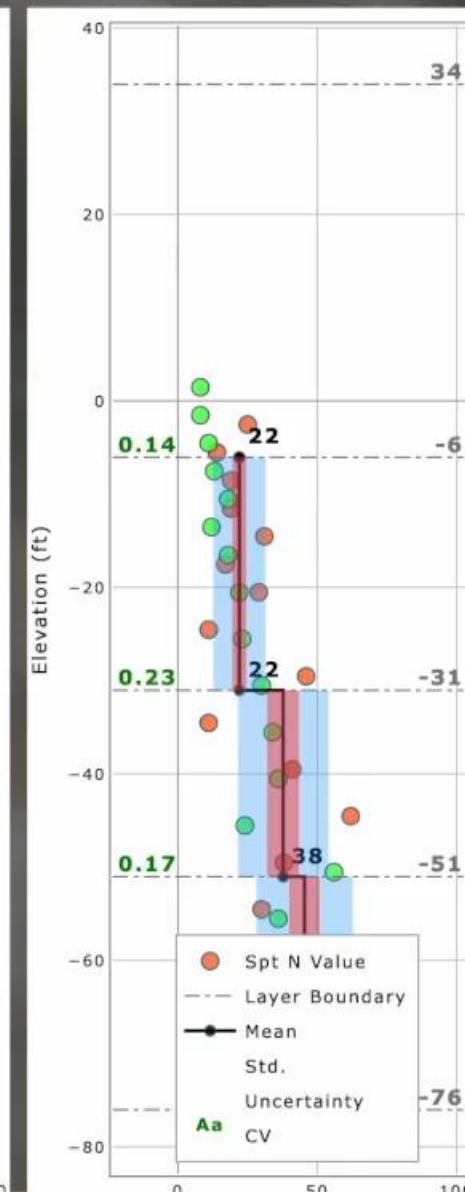
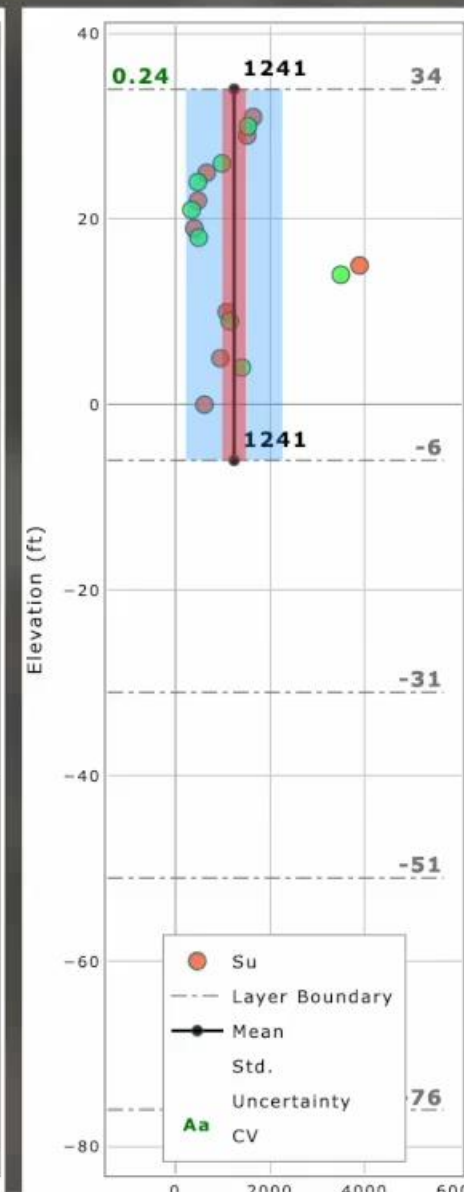
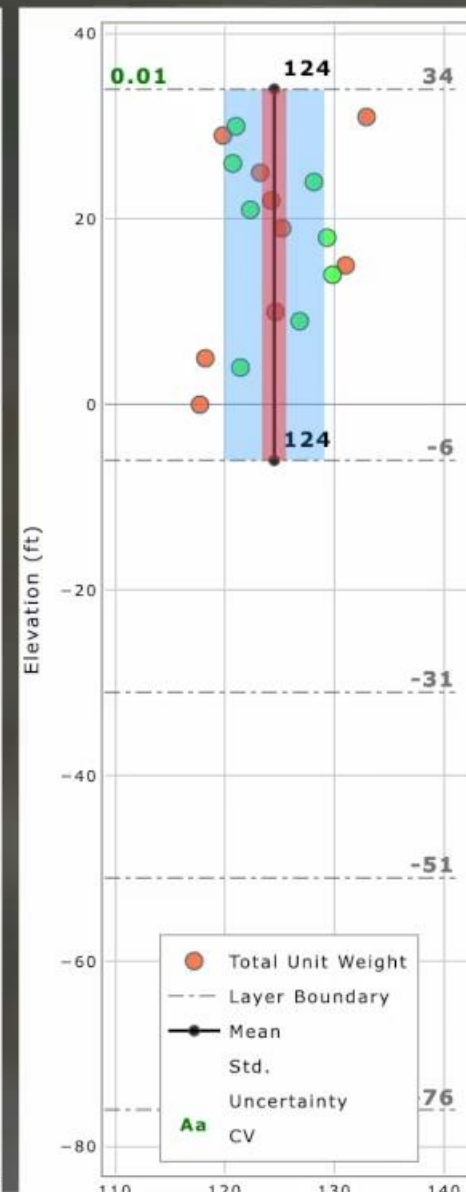
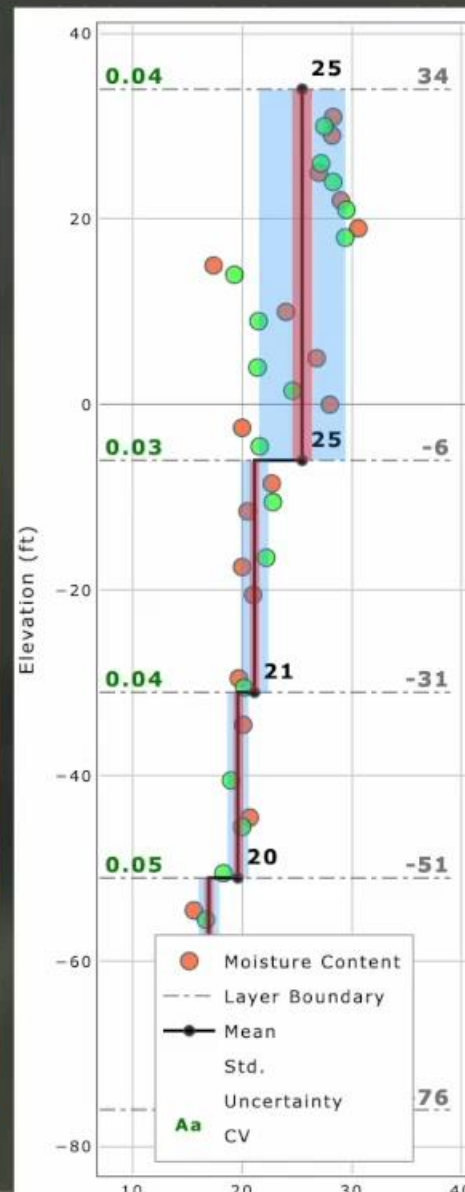
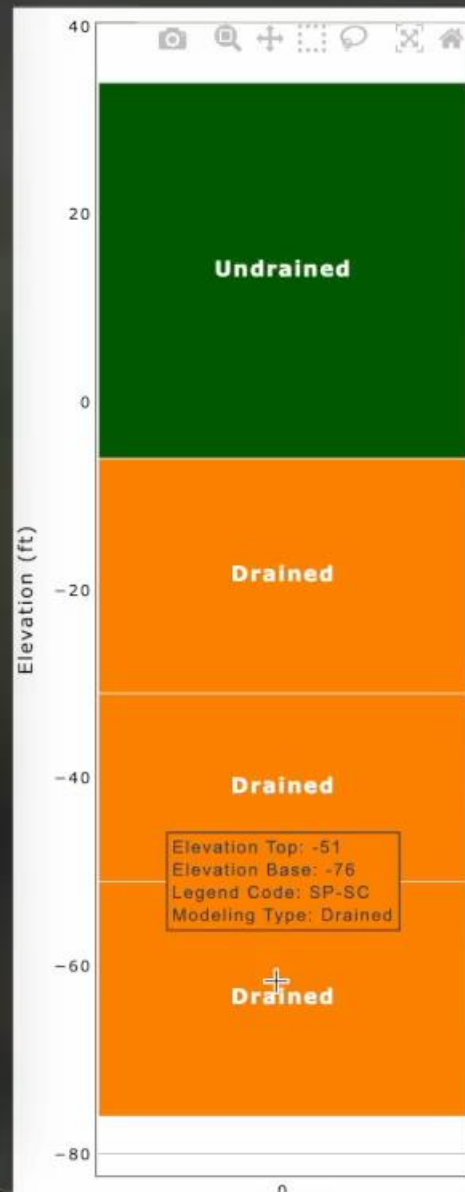
Moisture Content

Total Unit Weight

Undrained Shear Strength

Spt N Value

Fines Content



# LRFD Integration with FHWA GEC-05

“Designs performed using parameters established from mean values with  $COV_{Model} \leq 0.3$  are likely to have reliability that practically equals or exceeds the target reliability for design according to the AASHTO LRFD Bridge Design Specifications.”



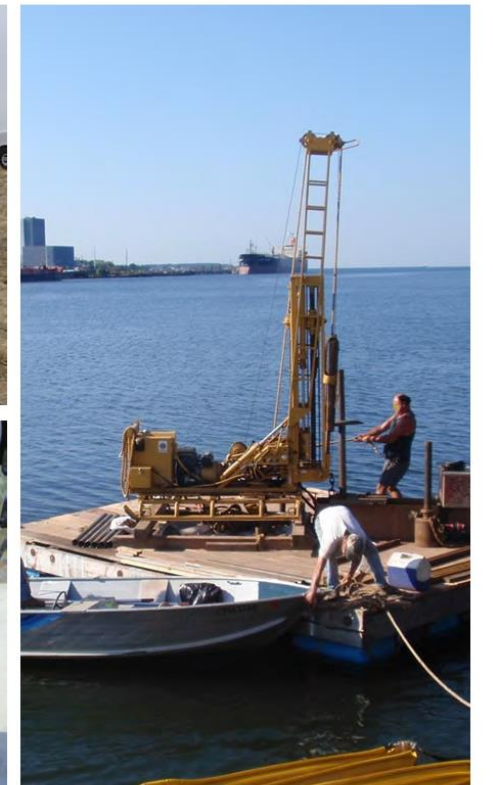
U.S. Department of Transportation

Publication No. FHWA NHI-16-072  
April 2017

**NHI Course No. 132031**

**Geotechnical Engineering Circular No.5**

**Geotechnical Site Characterization**



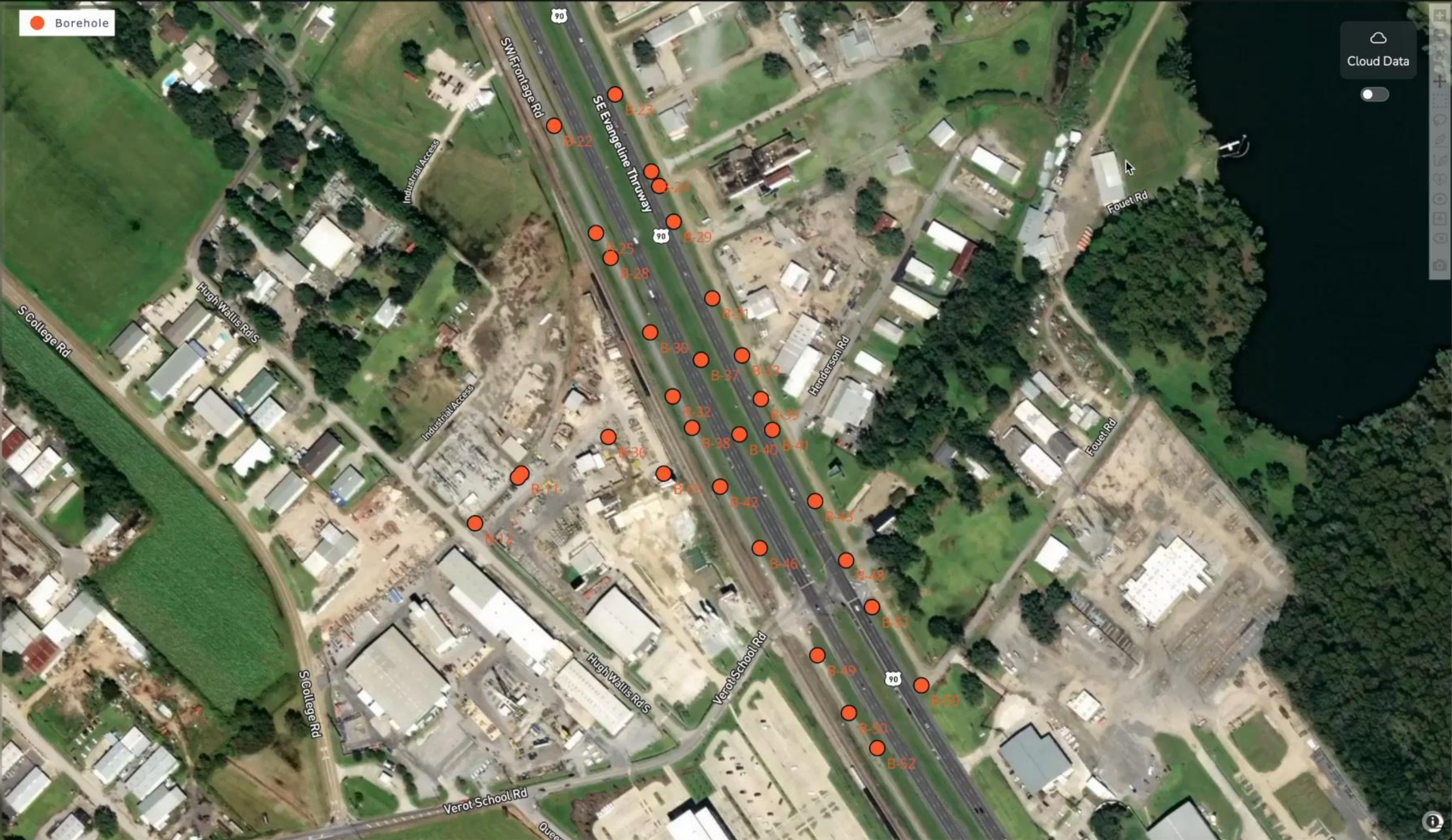
# Video Demo 2

LRFD Integration – FHWA GEC-05

- Upload Data
- Design Analysis
- Export Project
- Load Project

Cloud Data

☐



# AASHTO LRFD Updates for Bridge Design



**NORTH CAROLINA**  
Department of Transportation

## Upcoming Changes to Section 10 of the AASHTO LRFD Bridge Design Specifications

Scott Hidden, P.E.

NCDOT Geotechnical Support Services Supervisor  
AASHTO COBS Soil Structures Technical Committee  
2023 Southeastern Transportation Geotechnical Engineer

Connecting people, products and places safely and efficiently with customer focus, accountability and environmental sensitivity to enhance the economy and vitality of North Carolina



**NORTH CAROLINA**  
Department of Transportation

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## Upcoming Changes to Section 10 of the AASHTO LRFD Bridge Design Specifications

**Scott Hidden, P.E.**

NCDOT

Geotechnical Support Services Supervisor  
AASHTO COBS Soil Structures Technical Committee Chair

**Jesse G Rauser, P.E.**

LADOTD

Assistant Geotechnical Engineer Administrator



Credit:

Scott Hidden, PE of NCDOT

Jesse Rauser, LADOTD

SWGEC 2024

# Video Demo 3

LRFD Integration —AASHTO LRFD Updates

Split Layer Delete Layer

Stratigraphy

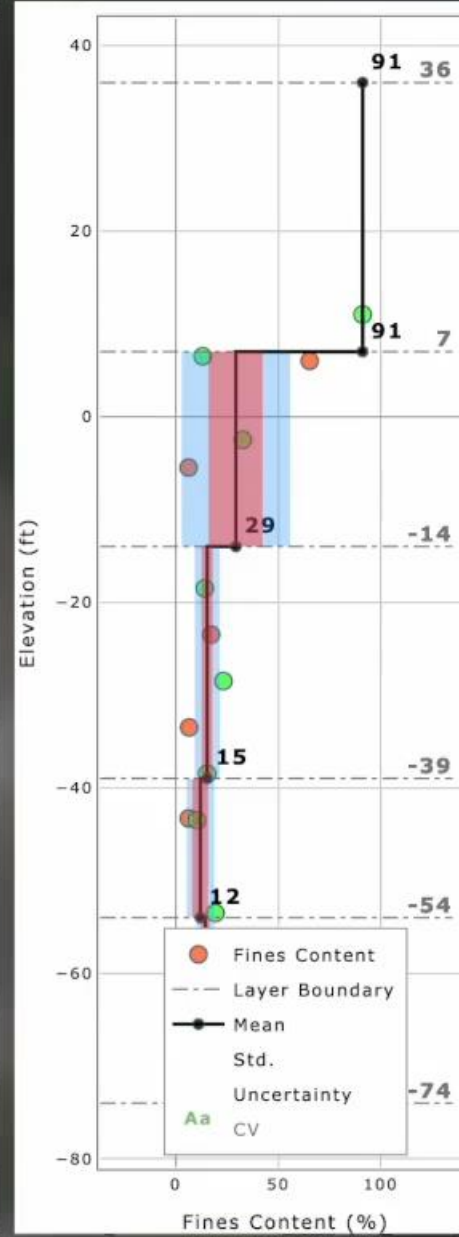
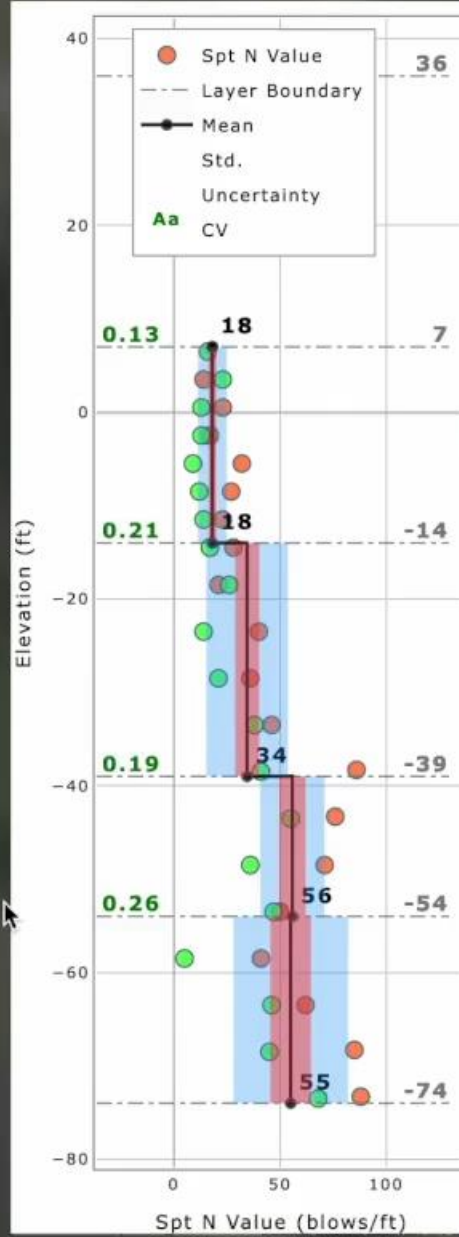
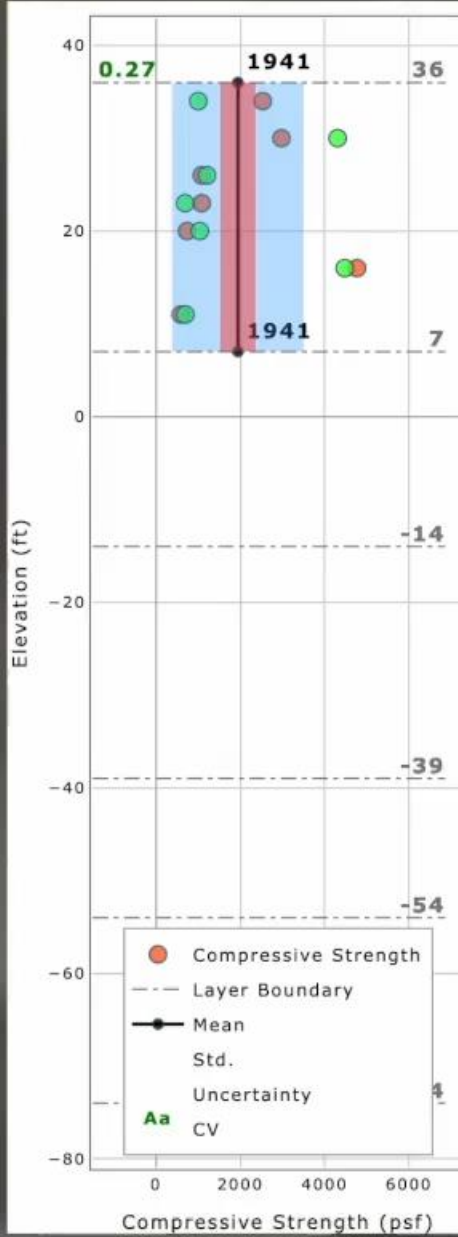
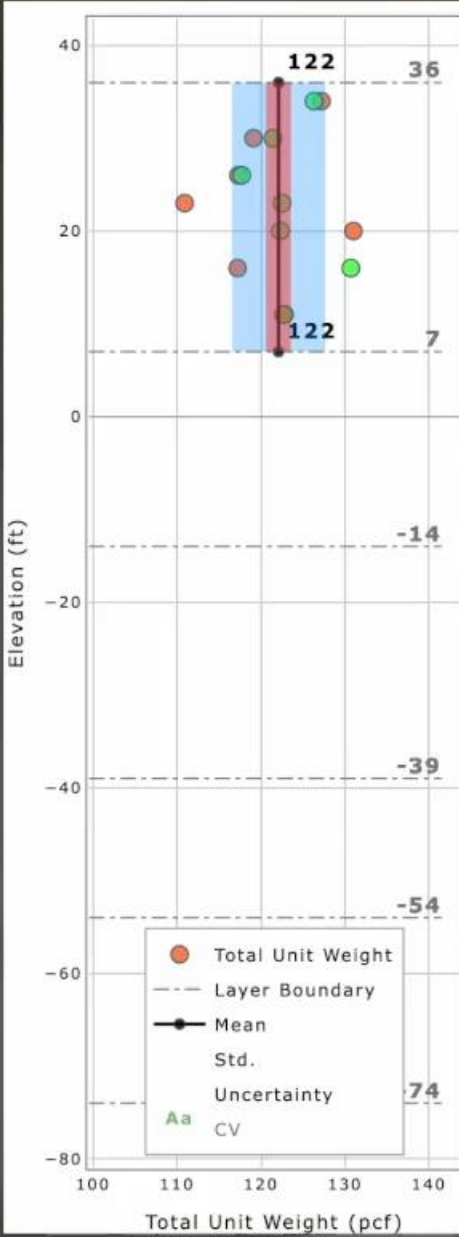
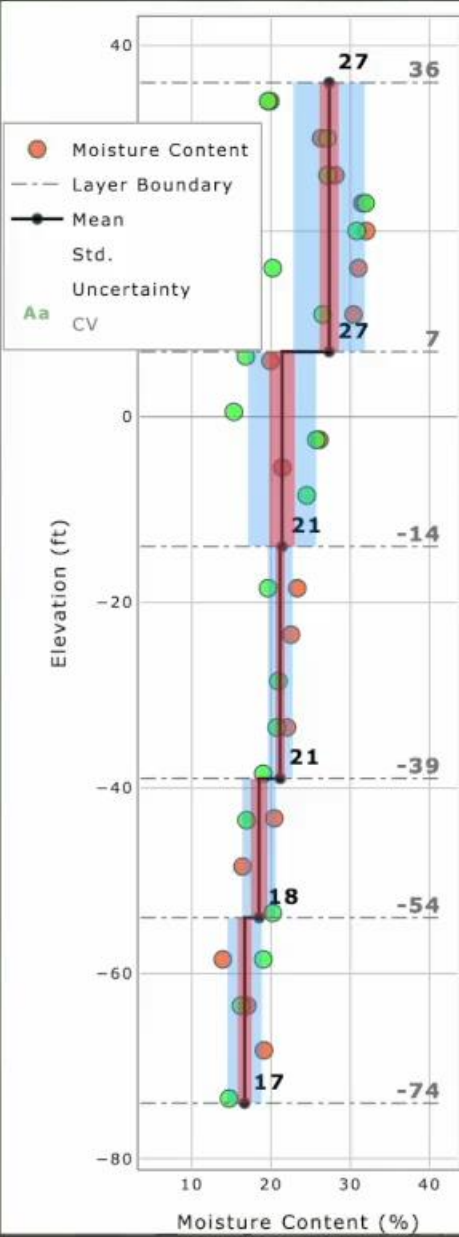
Moisture Content

Total Unit Weight

Compressive Strength

Spt N Value

Fines Content



# Video Demo 4

LRFD Integration —Collaboration Capabilities with Enhanced Efficiency and Transparency

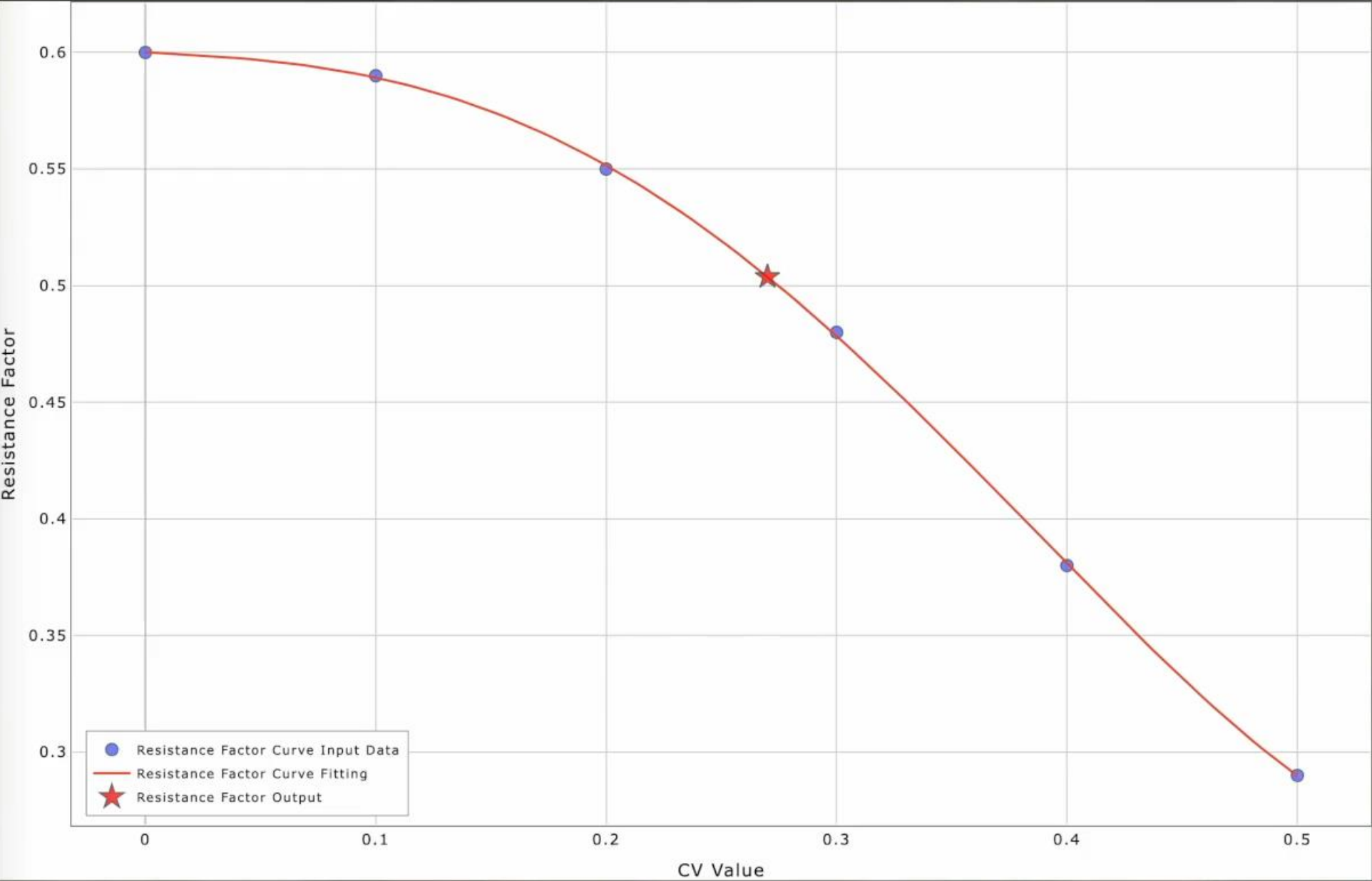
Data Profiles

Resistance Curve

Cross Section

Map Selected Data

Qu Curve For Unit Tip Resistance, 2025 Calibrated



Qu Curve for Unit Tip Resistance, 2025 Calibrated

SAVE

Resistance Curve Input

CV Value	Resistance Factor
0	0.6
0.1	0.59
0.2	0.55
0.3	0.48
0.4	0.38
0.5	0.29

Polynomial Order

4

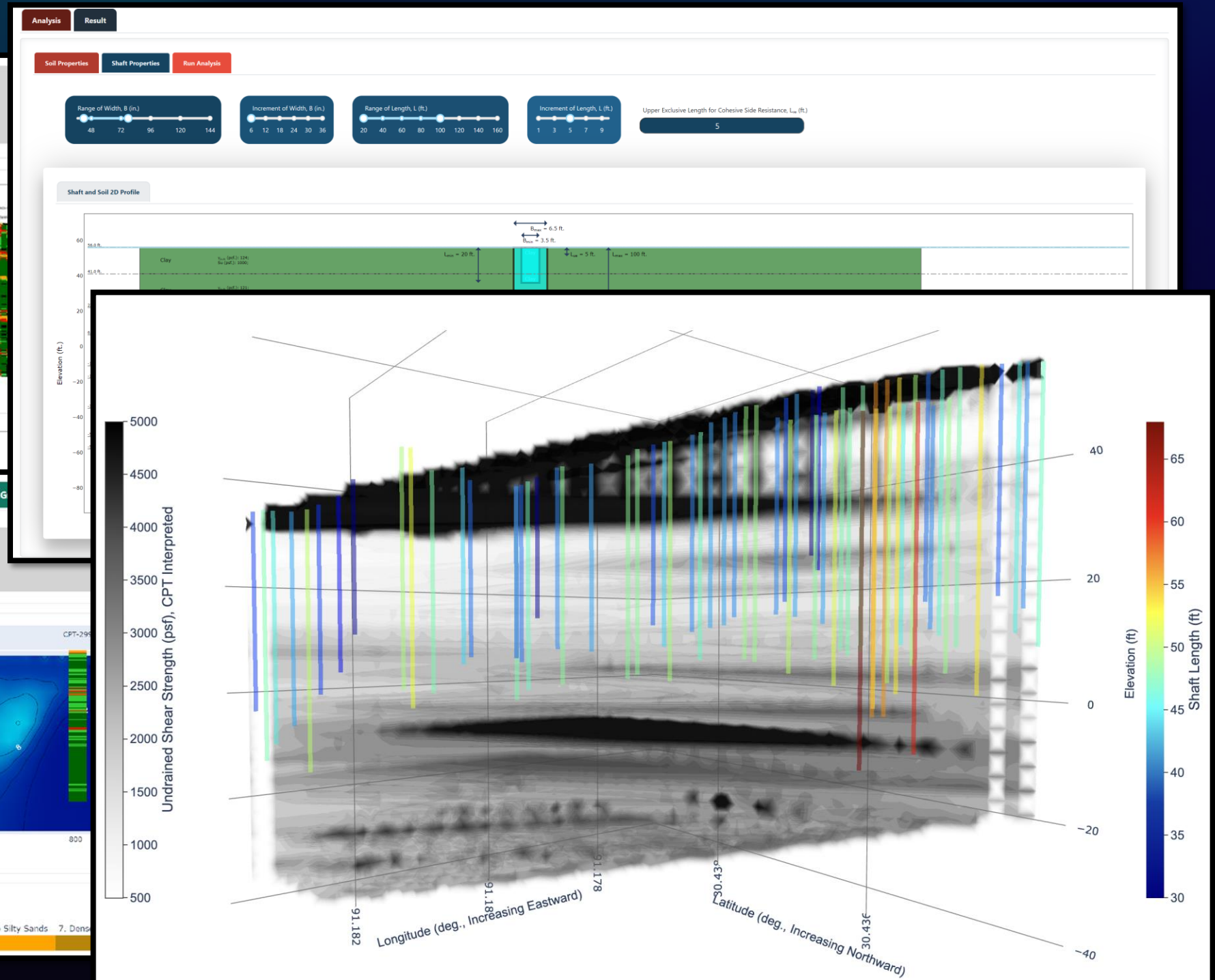
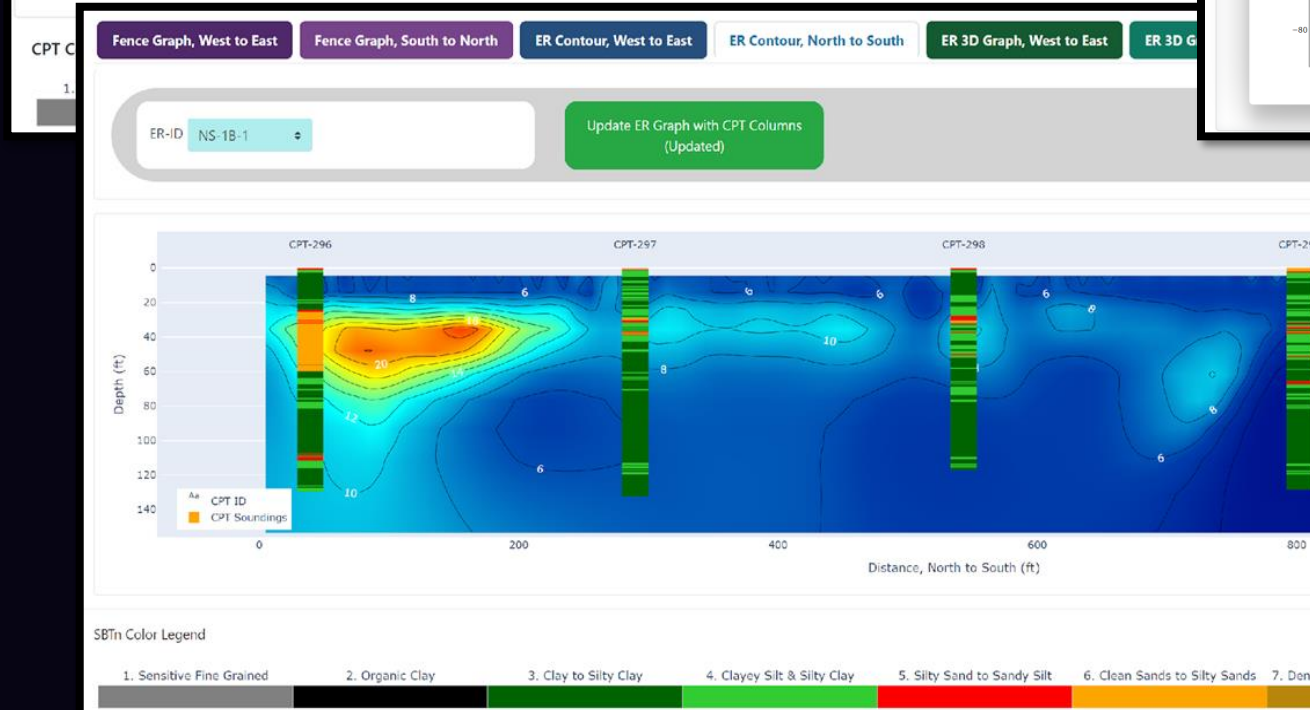
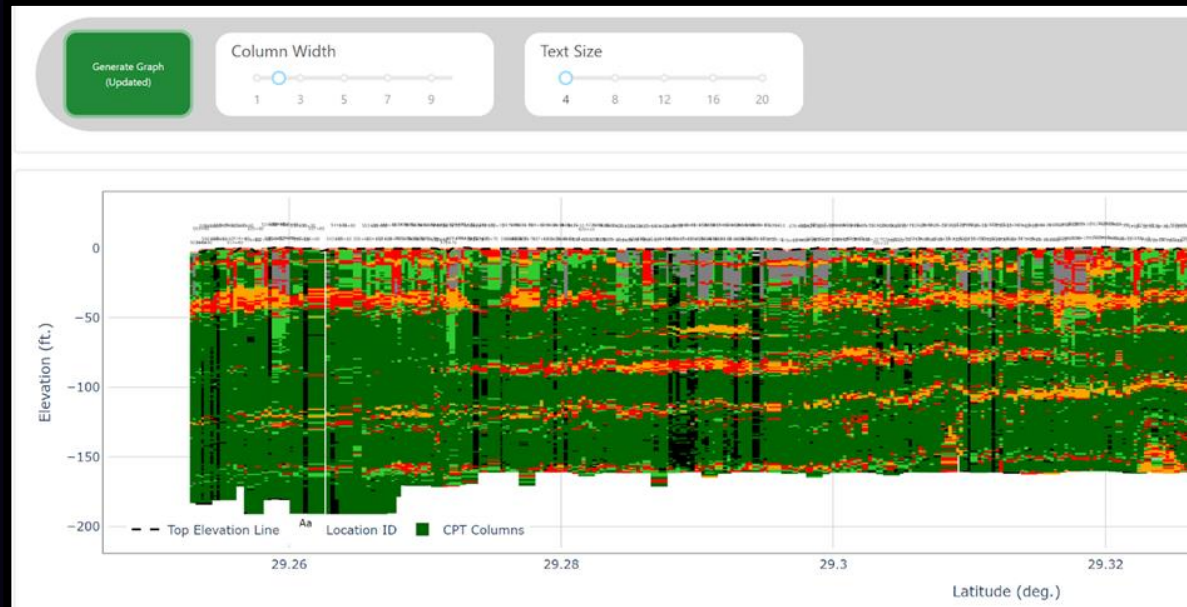
CV Value

0.27

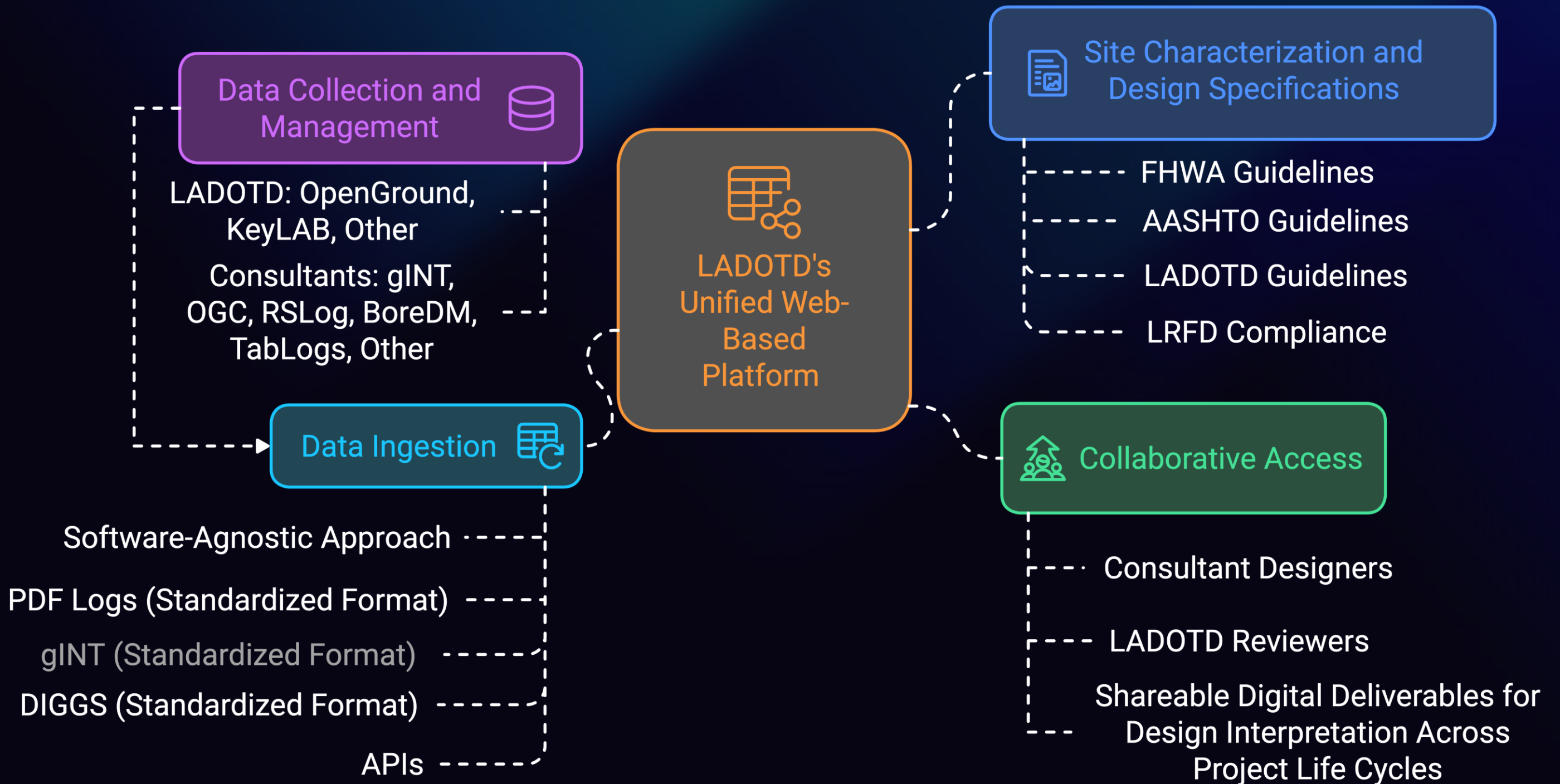
Resistance Factor: 0.5

This resistance curve is calibrated based Projects A, B, and C in 2025.

# Other Prototypes







# A Transformed Geotechnical Design Workflow



# Video Demo 5

Cloud Module—Effectively Integrate Data from Multiple Sources

-  Upload Data
-  Design Analysis
-  Export Project
-  Load Project

 Cloud Data

☐



# Video Demo 6

AI Module for PDF Boring Logs —Effectively Digitize and Load Data for Design Analysis

11/9/16 14:15

Report Form: LADOTD 2016 - ENGLISH Project File: G:\PROJECTS\2012\12-80-3768 I-10 HWY 73 TO HWY 3012-80-3768 DOTD.GPJ

DEPTH	ELEVATION	GRAPHIC	SOIL TYPE AND COLOR	WET DENSITY	MOISTURE CONTENT	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200	SPT	FAILURE MODE/ SPT TERMINATION	SAMPLE TYPE NUMBER	DRILL RIG AND EQUIPMENT
0	17.0		Stiff to very stiff brown and gray LEAN CLAY (CL)	129	23	42	26	3.19@3.00	M.S.		C-1	DRILL RIG MODEL: Arco K-1000 DRILLING METHOD: Auger / Rotary Wash HOLE DIAMETER: 4" SPT HAMMER / ETR Automatic Hammer 100%
10	7.0		Soft brown LEAN CLAY (CL)	126	21	43	27	1.52@5.00	SL		C-2	
20	-3.0		Loose gray CLAYEY SAND (SC)	123	26	31	10	0.56@5.00	SL		C-3	
30	-13.0		Medium stiff dark gray SANDY CLAY (CL)	125	26	31	9	0.37@6.00	SL		C-4	
40	-23.0		Very stiff dark gray SILTY CLAY (CL-ML)	27				2-3-4 (6)	4		D-6	
50	-33.0		Stiff to very stiff gray and brown FAT CLAY (CH)	26				2-3-3 (6)	4		D-7	
60	-43.0		Stiff to very stiff gray and brown FAT CLAY (CH)	30	29	7		2-3-4 (7)	4		D-8	
70	-53.0		Stiff to very stiff gray and brown FAT CLAY (CH)	118	38	92	65	5-8-9 (17)	4		D-9	
80	-63.0		Stiff to very stiff gray and brown FAT CLAY (CH)	115	39	84	56	10-10-10 (20)	4		D-10	
90	-73.0		Stiff to very stiff gray and brown FAT CLAY (CH)	116	35	52	34	10-11-14 (25)	4		D-11	
100	-83.0		Stiff to very stiff gray and brown FAT CLAY (CH)	118	29	33	13	2.00@20.00	60 S.		C-12	
110	-93.0		Stiff to very stiff gray and brown FAT CLAY (CH)	115	39	84	56	1.75@22.00	M.S.		C-13	
120	-103.0		Stiff to very stiff gray and brown FAT CLAY (CH)	116	35	52	34	1.78@24.00	60 S.		C-14	
130	-113.0		Stiff to very stiff gray and brown FAT CLAY (CH)	114	38	73	49	99.2			C-15	
140	-123.0		Stiff to very stiff gray and brown FAT CLAY (CH)	120	32	59	37	1.78@26.00	M.S.		C-16	
150	-133.0		Stiff to very stiff gray and brown FAT CLAY (CH)	112	44	92	62	1.82@30.00	M.S.		C-17	
160	-143.0		Stiff to very stiff gray and brown FAT CLAY (CH)	112	44	92	62	1.28@32.00	M.S.		C-18	
170	-153.0		Stiff to very stiff gray and brown FAT CLAY (CH)	123	29	58	36	4.09@44.00	M.S.		C-19	
180	-163.0		Stiff to very stiff gray and brown FAT CLAY (CH)	123	29	58	36	2.44@36.00	SL		C-20	
190	-173.0		Stiff to very stiff gray and brown FAT CLAY (CH)	30	41	24	96.7	25-25	5		D-21	
200	-183.0		Stiff to very stiff gray and brown FAT CLAY (CH)	125	23	57	37	20-15-15 (30)	4		D-22	
210	-193.0		Stiff to very stiff gray and brown FAT CLAY (CH)	125	23	57	37	4.09@44.00	M.S.		C-23	
220	-203.0		Stiff to very stiff gray and brown FAT CLAY (CH)	125	25	40	22	3.24@46.00	M.S.		C-24	
230	-213.0		Stiff to very stiff gray and brown FAT CLAY (CH)	121	27	32	12	2.15@48.00	SL		C-25	
240	-223.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-26	
250	-233.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-27	
260	-243.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-28	
270	-253.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-29	
280	-263.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-30	
290	-273.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-31	
300	-283.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-32	
310	-293.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-33	
320	-303.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-34	
330	-313.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-35	
340	-323.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-36	
350	-333.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-37	
360	-343.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-38	
370	-353.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-39	
380	-363.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-40	
390	-373.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-41	
400	-383.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-42	
410	-393.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-43	
420	-403.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-44	
430	-413.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-45	
440	-423.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-46	
450	-433.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-47	
460	-443.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-48	
470	-453.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-49	
480	-463.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-50	
490	-473.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-51	
500	-483.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-52	
510	-493.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-53	
520	-503.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-54	
530	-513.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-55	
540	-523.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-56	
550	-533.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-57	
560	-543.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-58	
570	-553.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-59	
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610	-593.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-63	
620	-603.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-64	
630	-613.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-65	
640	-623.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-66	
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670	-653.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-69	
680	-663.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-70	
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700	-683.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-72	
710	-693.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-73	
720	-703.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-74	
730	-713.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-75	
740	-723.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-76	
750	-733.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-77	
760	-743.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-78	
770	-753.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-79	
780	-763.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-80	
790	-773.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-81	
800	-783.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-82	
810	-793.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-83	
820	-803.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-84	
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850	-833.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-87	
860	-843.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-88	
870	-853.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-89	
880	-863.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-90	
890	-873.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-91	
900	-883.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-92	
910	-893.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-93	
920	-903.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-94	
930	-913.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-95	
940	-923.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-96	
950	-933.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-97	
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1060	-1043.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-108	
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1100	-1083.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-112	
1110	-1093.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-113	
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1130	-1113.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-115	
1140	-1123.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-116	
1150	-1133.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-117	
1160	-1143.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-118	
1170	-1153.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-119	
1180	-1163.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-120	
1190	-1173.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-121	
1200	-1183.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-122	
1210	-1193.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-123	
1220	-1203.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-124	
1230	-1213.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-125	
1240	-1223.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-126	
1250	-1233.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-127	
1260	-1243.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-128	
1270	-1253.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-129	
1280	-1263.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-130	
1290	-1273.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-131	
1300	-1283.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-132	
1310	-1293.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-133	
1320	-1303.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-134	
1330	-1313.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-135	
1340	-1323.0		Stiff to very stiff gray and brown FAT CLAY (CH)								C-136	
1350	-1333.0		Stiff to very stiff gray and brown FAT CLAY (CH)									

# Key Benefits to LADOTD

1

## Elevated Design Efficiency

Boost productivity and collaboration with advanced data interpretation.

2

## Industrial Standard Compliance

Align with national and state standards, integrating latest AASHTO requirements.

3

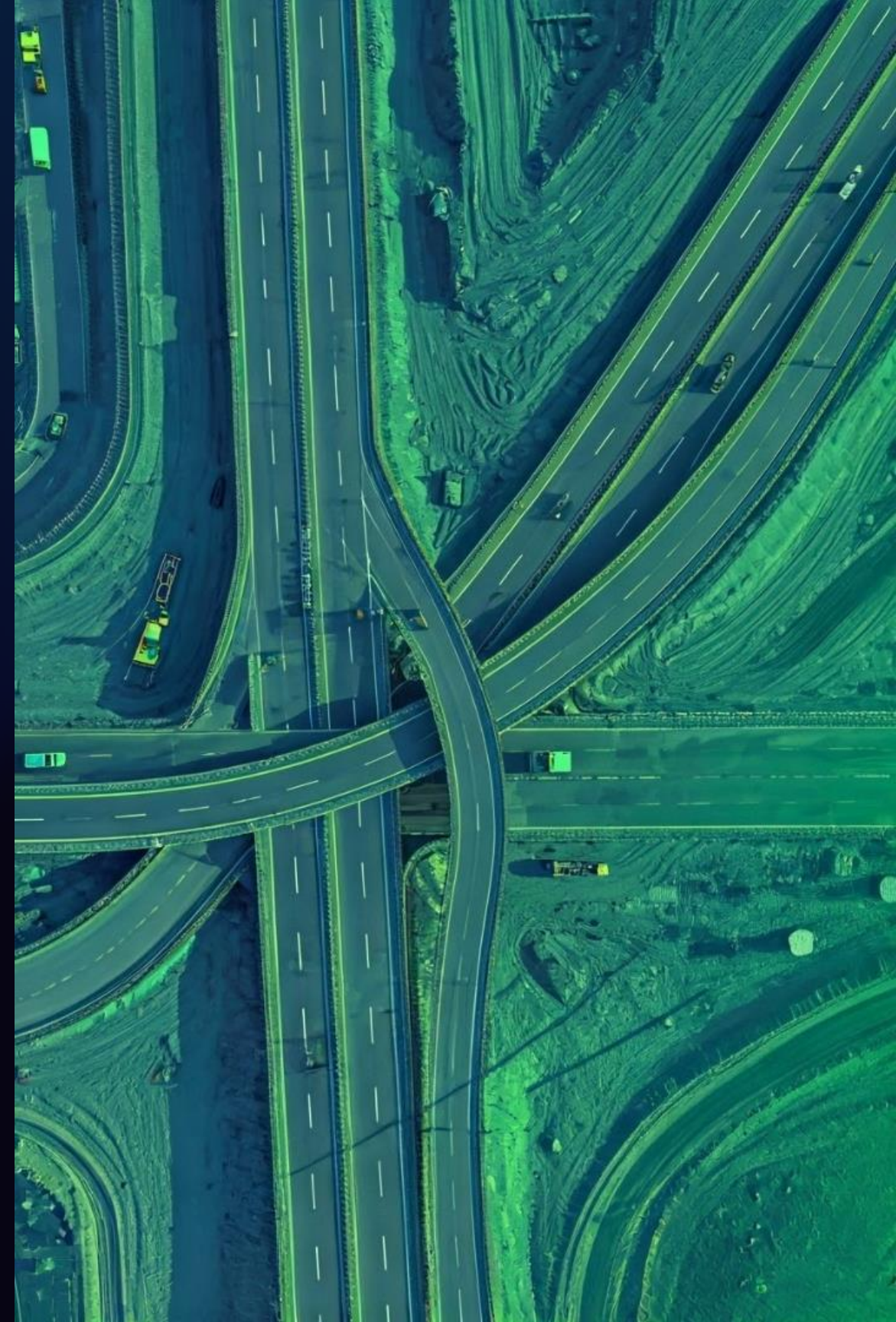
## Ground-up Solution with Software-Agnostic Approach

Digests data across databases and formats, operating independently of any commercial software.

4

## Adaptive Customization with Powered Capabilities

Provides flexibility with AI-powered capabilities for evolving engineering needs.



# Acknowledgement

## **Leadership & Vision:**

Jesse Rauser, PE, LADOTD

## **Project Management & Support:**

Gavin Gautreau, PE, LTRC