MWD: WHAT IS IT?

MEASUREMENT WHILE DRILLING

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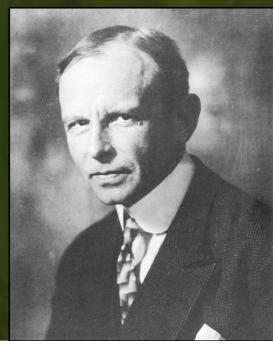
SEPTEMBER 18, 2025

In 1948, during his opening address to the 2nd International Conference on Soil Mechanics and Foundation engineering in Rotterdam, Netherlands, Karl Terzaghi stated:

"Further progress depends chiefly on the improvement of our methods for measurement in the field, on the scope and quality of the field observations, and on the adaptation of our methods of subsoil exploration to practical requirements."



Petroleum Industry: 1960's

Geotechnical Engineering: 1970's

U.S. Department of Transportation
Federal Highway Administration

- FHWA through their Every Day Counts Initiative, and
- State Transportation Innovation Council's Incentive Program

- FHWA grants fund the initial purchase and installation of MWD equipment for several DOTs

Every Day Counts
Innovation for a Nation on the Move

A State-based model that identifies and deploys proven, yet underutilized innovations — saving time, money and resources that can be used to deliver more projects.

WHY MWD?

- To improve drilling and in-field investigations
- To improve geotechnical models for foundation designs
- To fill in where SPT data may lack
- To go where CPT cannot go...into rock

MWD APPLICATIONS

- Geological profiling
- Rock quality evaluation
- Detect voids, fissures, and other anomalies
- Potentially increase productivity by reducing the number of SPT samples to test

HIGHER QUALITY GEOTECHNICAL INVESTIGATIONS

- Drillers can make coring adjustments
- To improve the quality of recovering rock cores

“THE DIGITAL DRILL RIG”

- Continuous
- Real-time data acquisition
- Recording drilling-related parameters
- With respect to depth

ALDOT'S BRAND NEW MWD DRILL RIG

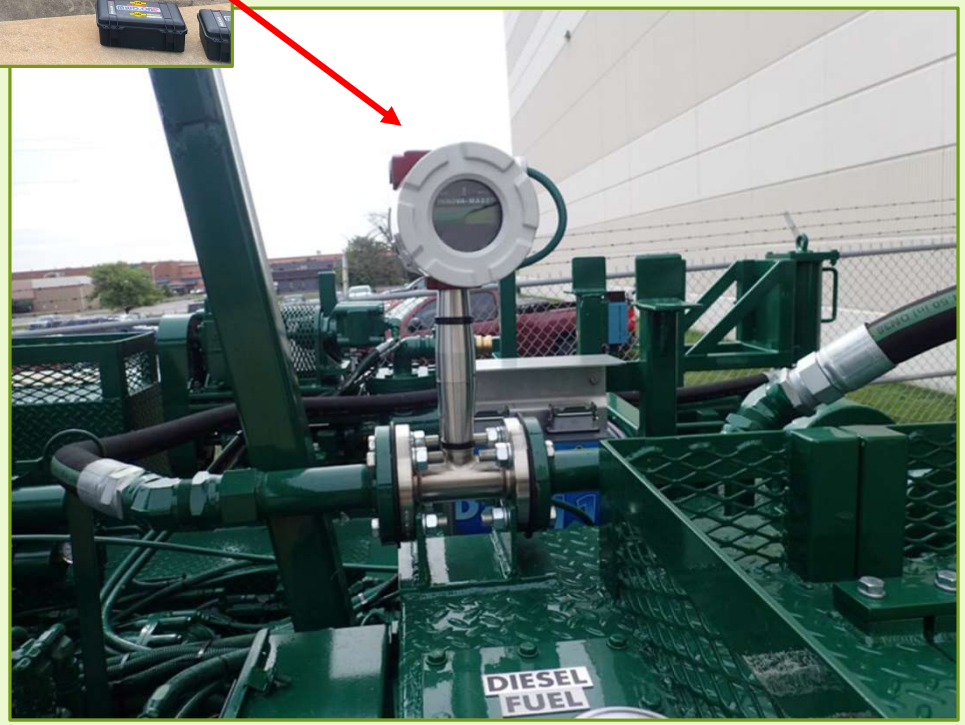
CME 550X

MWD SYSTEM COMPONENTS

DEPTH SENSOR

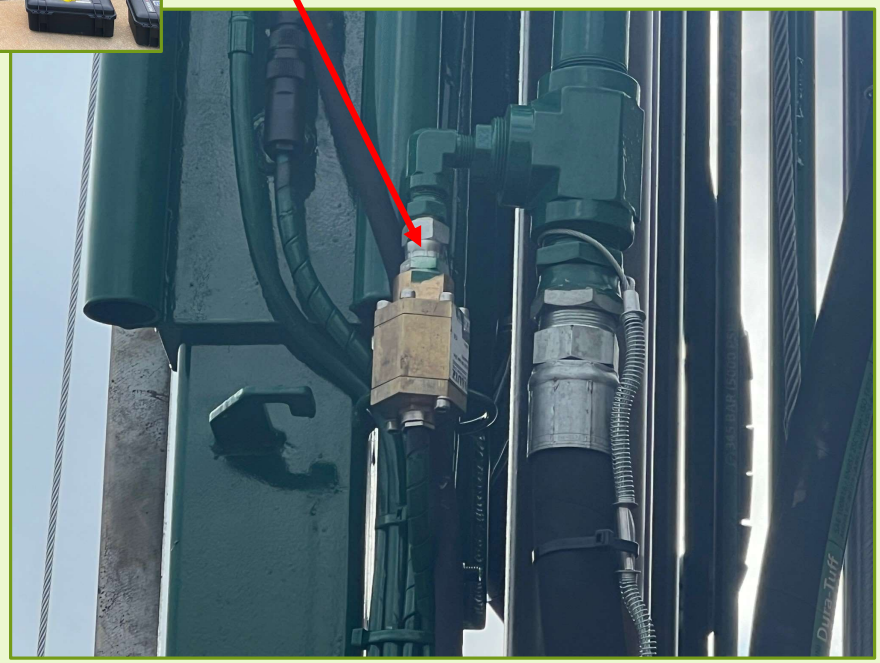
Measures both the:

- Depth rate
- Drilling speed



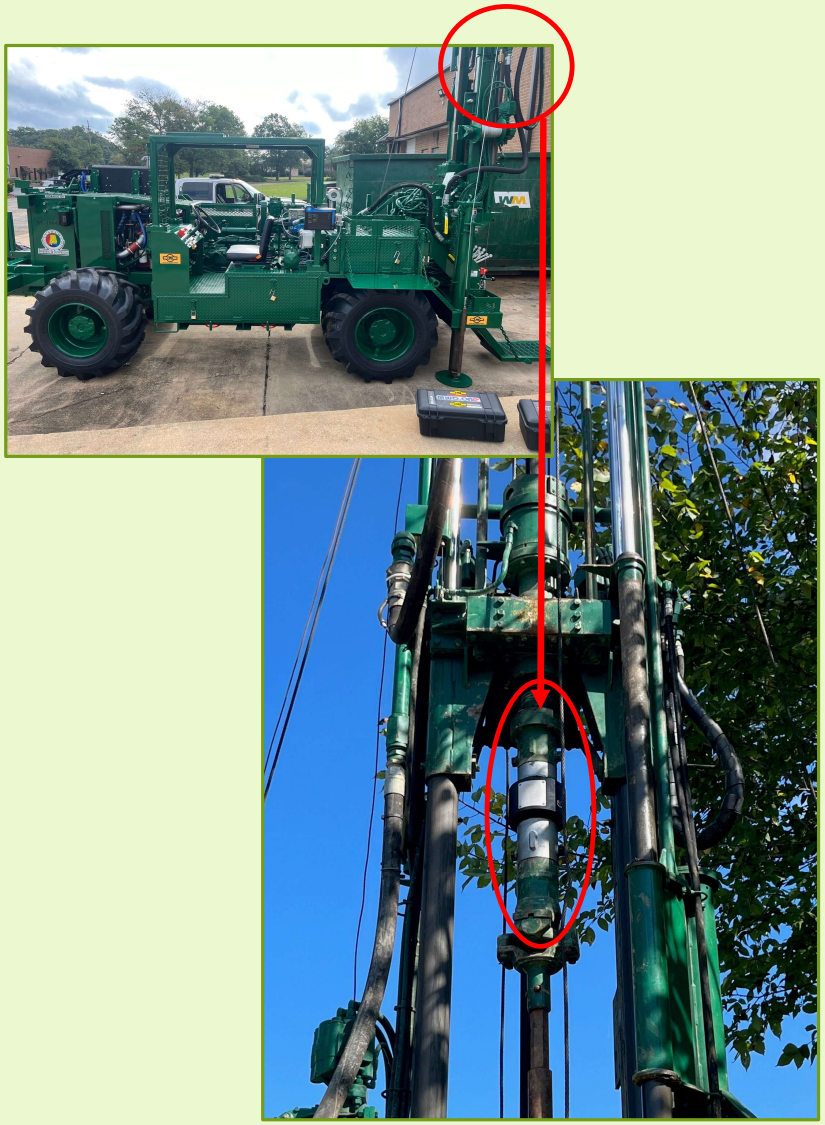
FLOW METER

- Measures the rate of flow of drilling fluids, water or mud



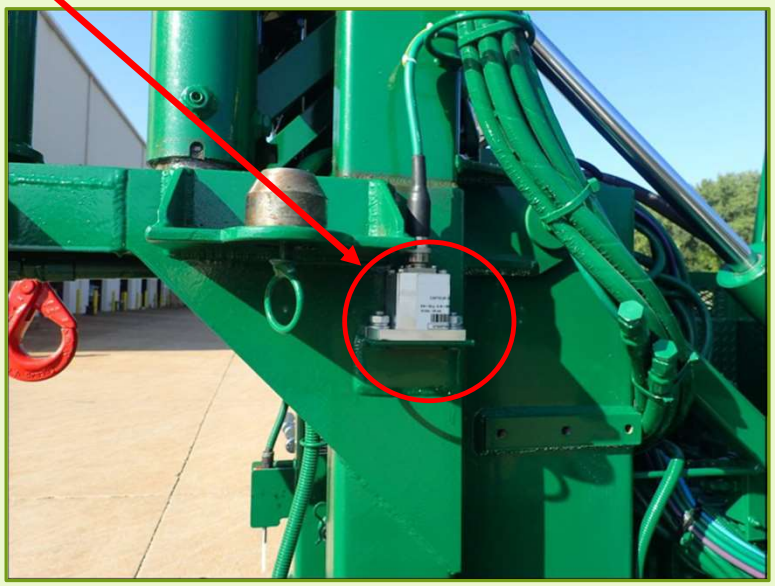
WATER PRESSURE SENSOR

- Measures the pressure of water flow



TORQUE SENSORS

- Measures torque in kipf-ft
- Placed within the mechanical drive line

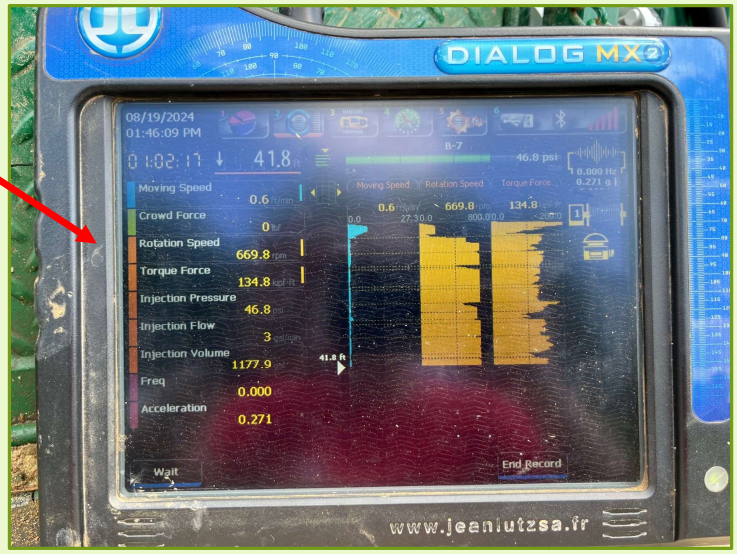


VIBRATION SENSOR

- Reflects maximum movement of rig while drilling
- Frequencies and accelerations recorded
- Evaluate strata changes and/or soil composition in granular deposits

DATA RECORDERS

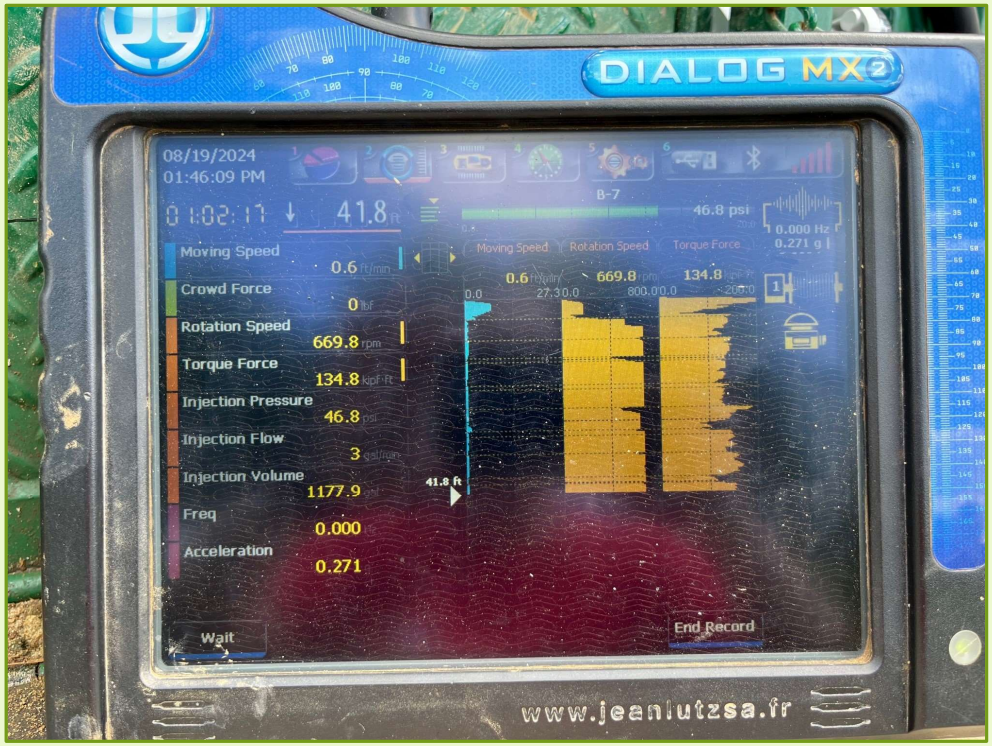
- Junction Box
- Electrical Box
- MWD Screen



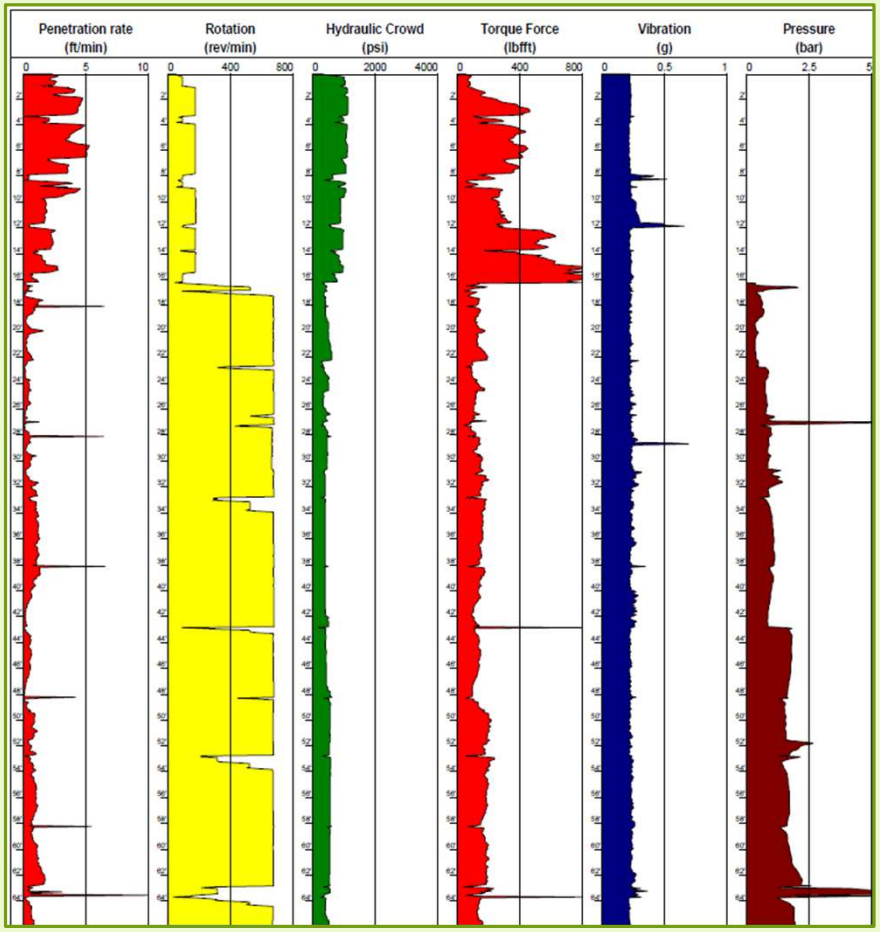

ALDOT
ALDOT


08/19/2024
10:14:41 AM
B-7
00:00:50
3.2 ft
7.5 psi
0.000 Hz
0.237 g
Moving Speed
Rotation Speed
Torque Force
Moving Speed 0.0 ft/min
Crowd Force 0 lbf
Rotation Speed 179.9 rpm
Torque Force 25.0 kpf·ft
Injection Pressure 7.5
Injection Flow 3
Injection Volume 0.6
Freq 0.000
Acceleration 0.237
0.0 ft/min
179.9 rpm
25.0 kpf·ft
3.2 ft
Wait
End Record

FINAL SCREEN VIEW

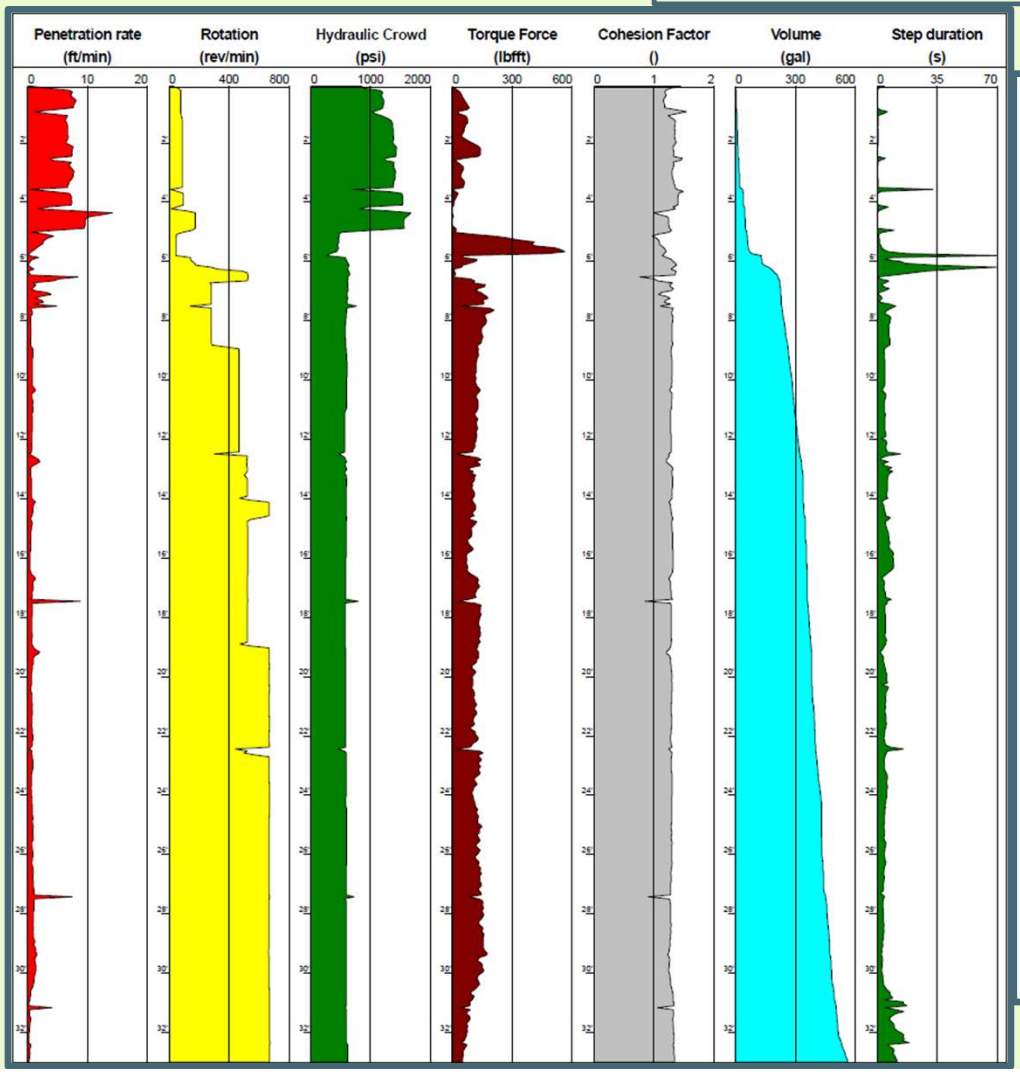


SOFTWARE OUTPUT



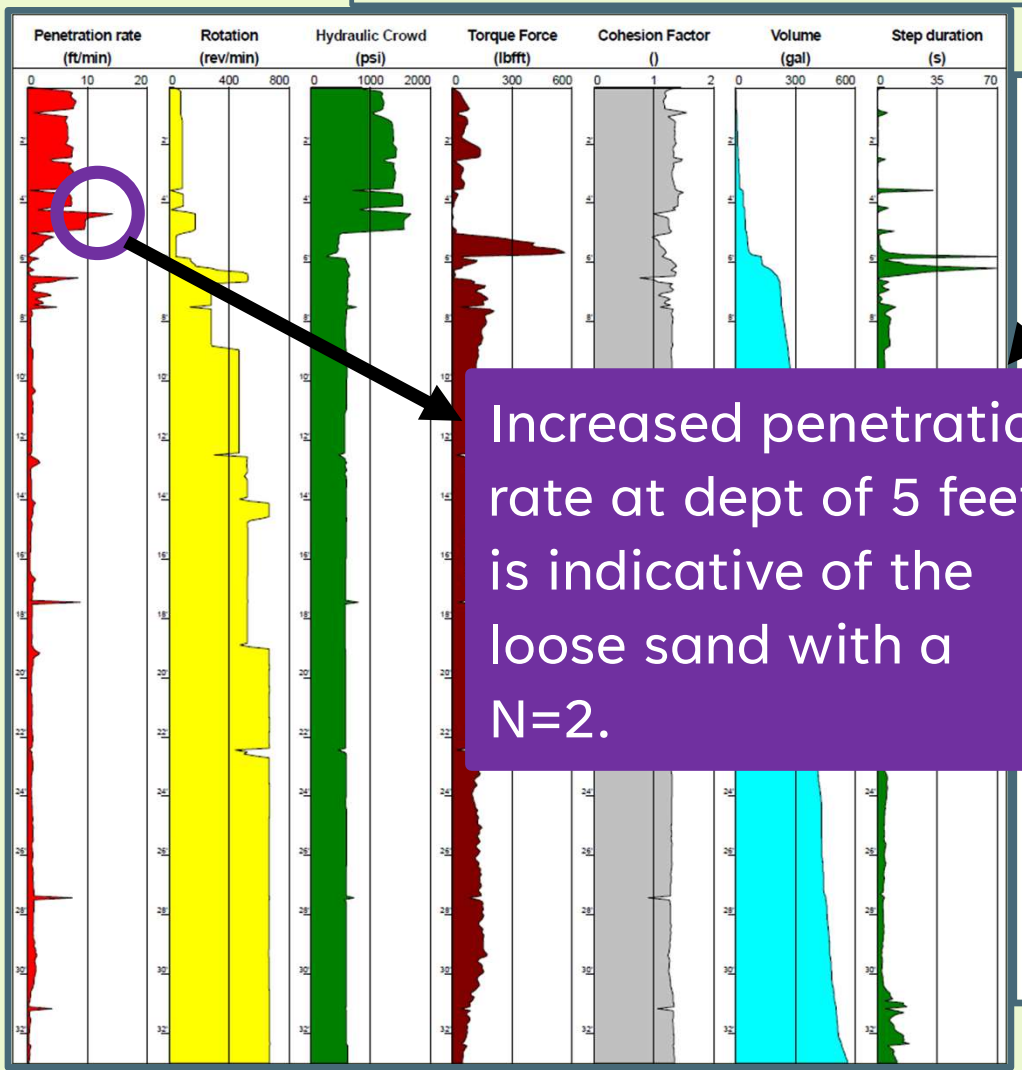
- Converts .lst and .fdl file types

COMPARISONS

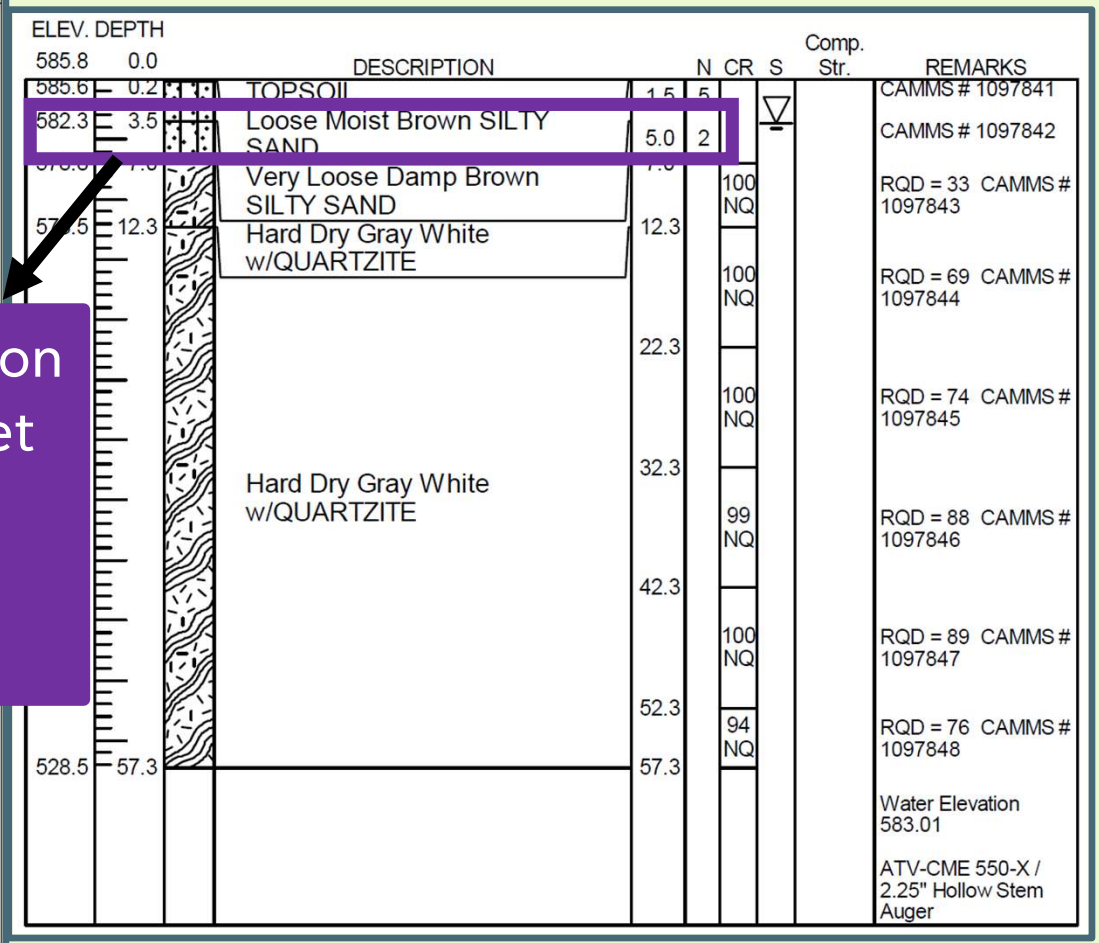


ELEV.	DEPTH	DESCRIPTION		N	CR	S	Comp. Str.	REMARKS
585.8	0.0							
585.6	0.2	TOPSOIL	1.5	5				CAMMS # 1097841
582.3	3.5	Loose Moist Brown SILTY SAND	5.0	2				CAMMS # 1097842
578.8	7.0	Very Loose Damp Brown SILTY SAND	7.0		100 NQ			RQD = 33 CAMMS # 1097843
573.5	12.3	Hard Dry Gray White w/QUARTZITE	12.3		100 NQ			RQD = 69 CAMMS # 1097844
			22.3		100 NQ			RQD = 74 CAMMS # 1097845
		Hard Dry Gray White w/QUARTZITE	32.3		99 NQ			RQD = 88 CAMMS # 1097846
			42.3		100 NQ			RQD = 89 CAMMS # 1097847
			52.3		94 NQ			RQD = 76 CAMMS # 1097848
528.5	57.3		57.3					Water Elevation 583.01
								ATV-CME 550-X / 2.25" Hollow Stem Auger

COMPARISONS – ROCK PRESENT



Increased penetration rate at dept of 5 feet is indicative of the loose sand with a N=2.



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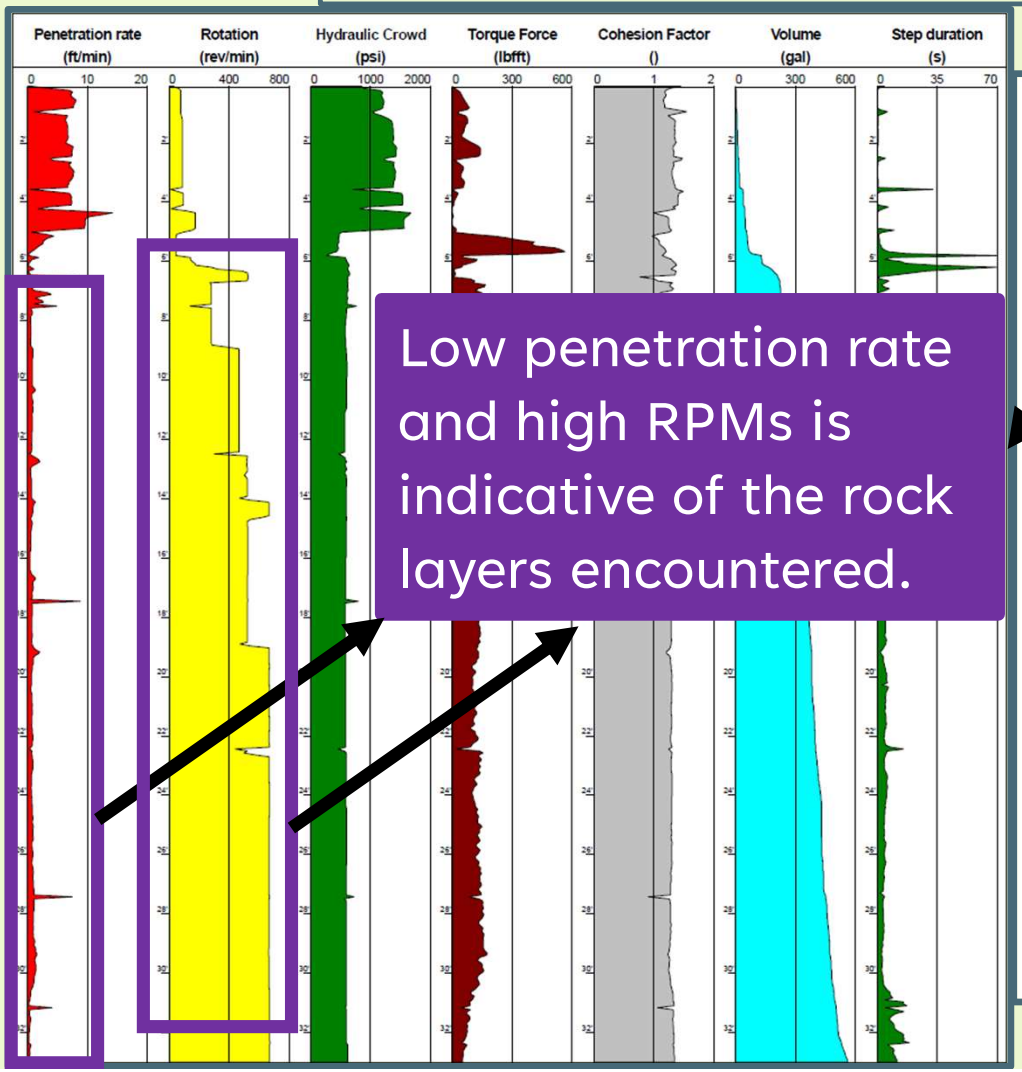

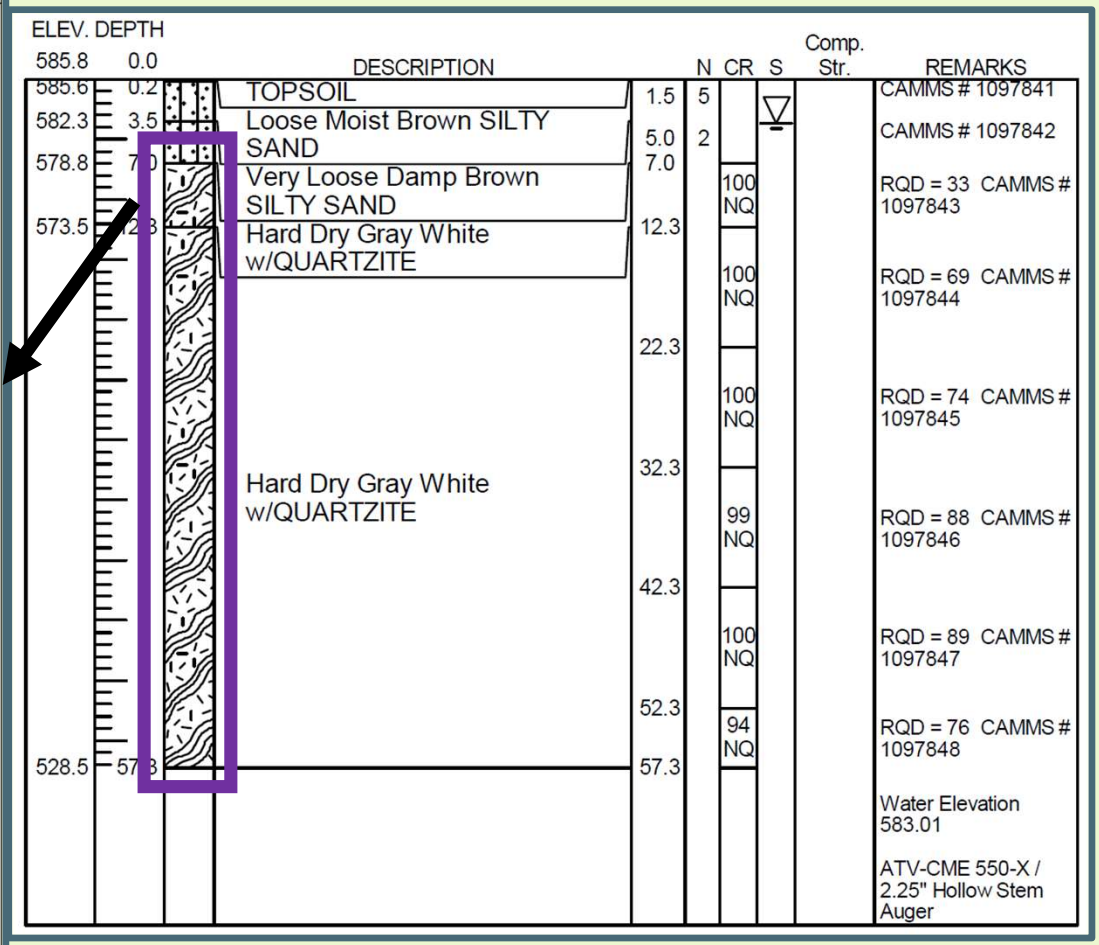

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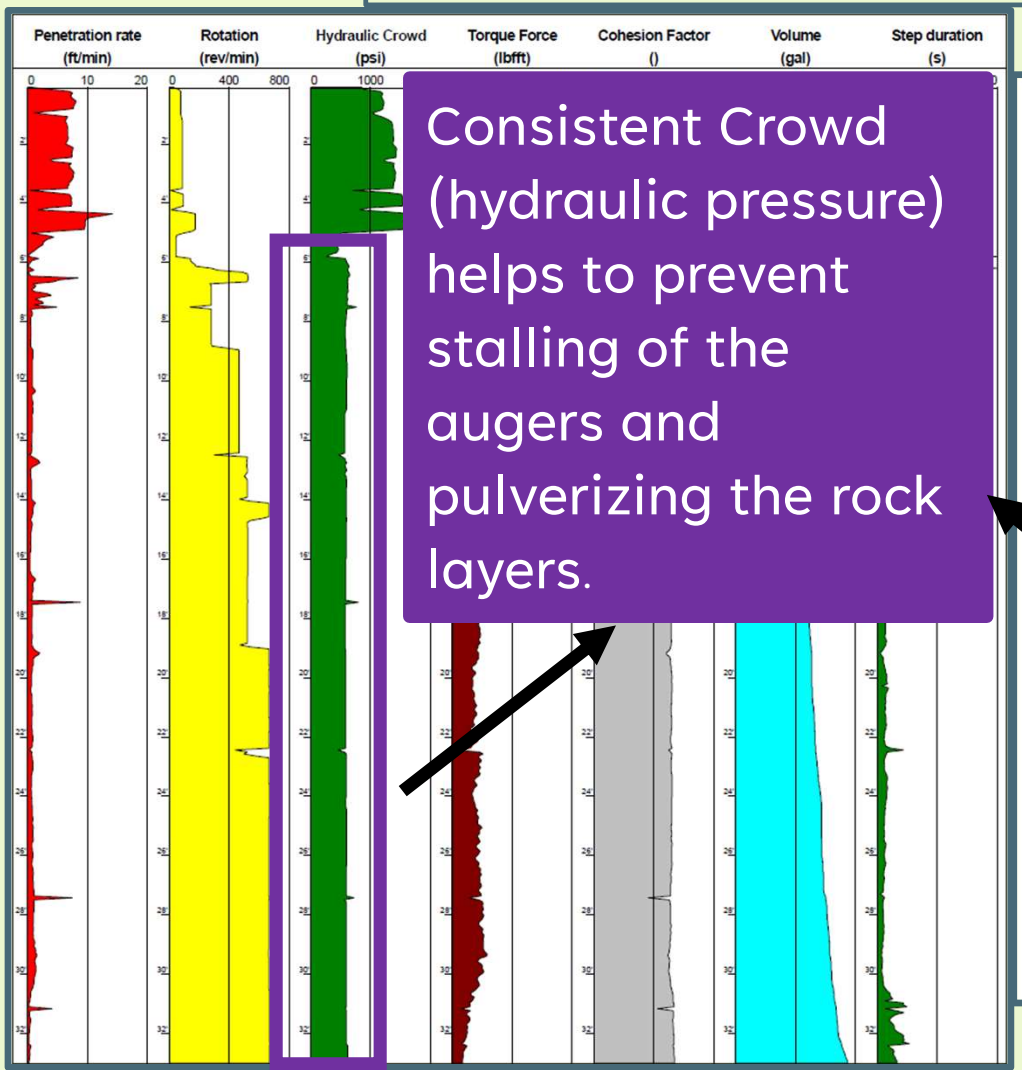

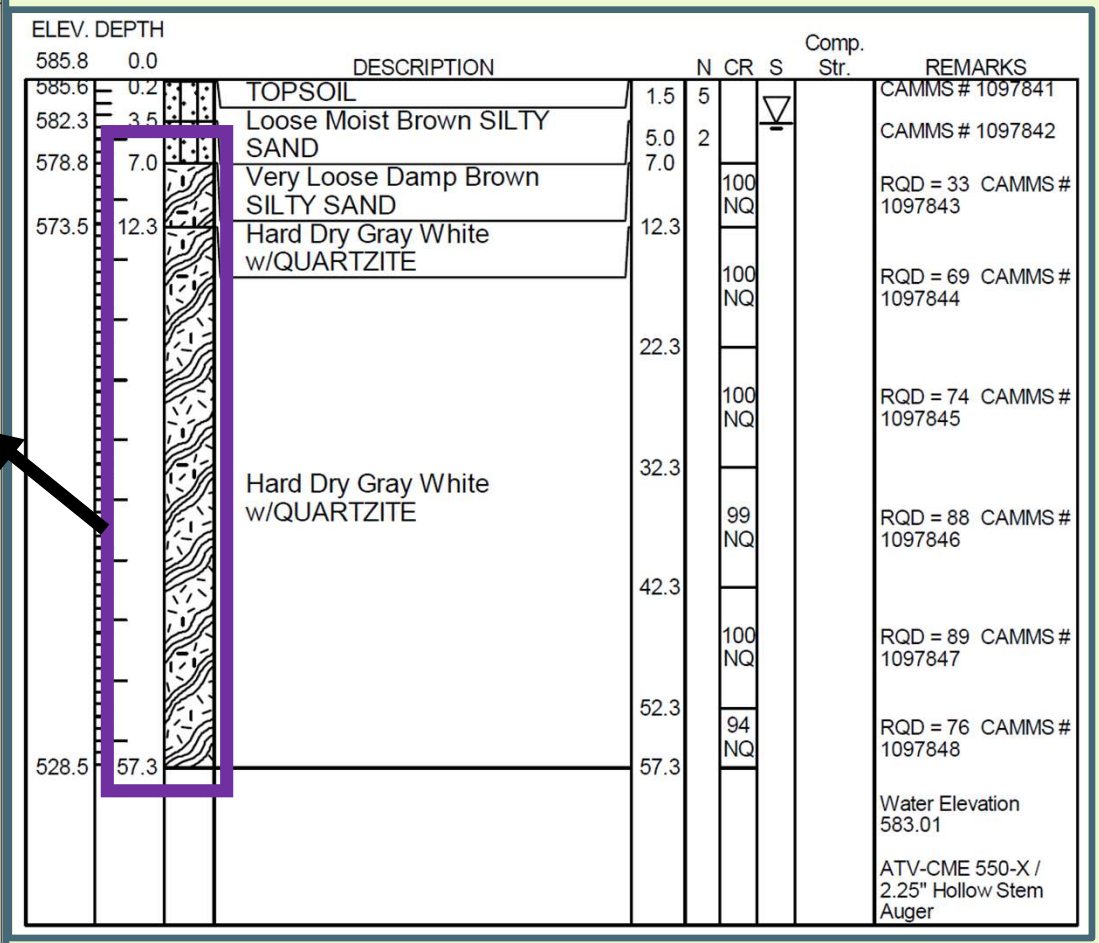

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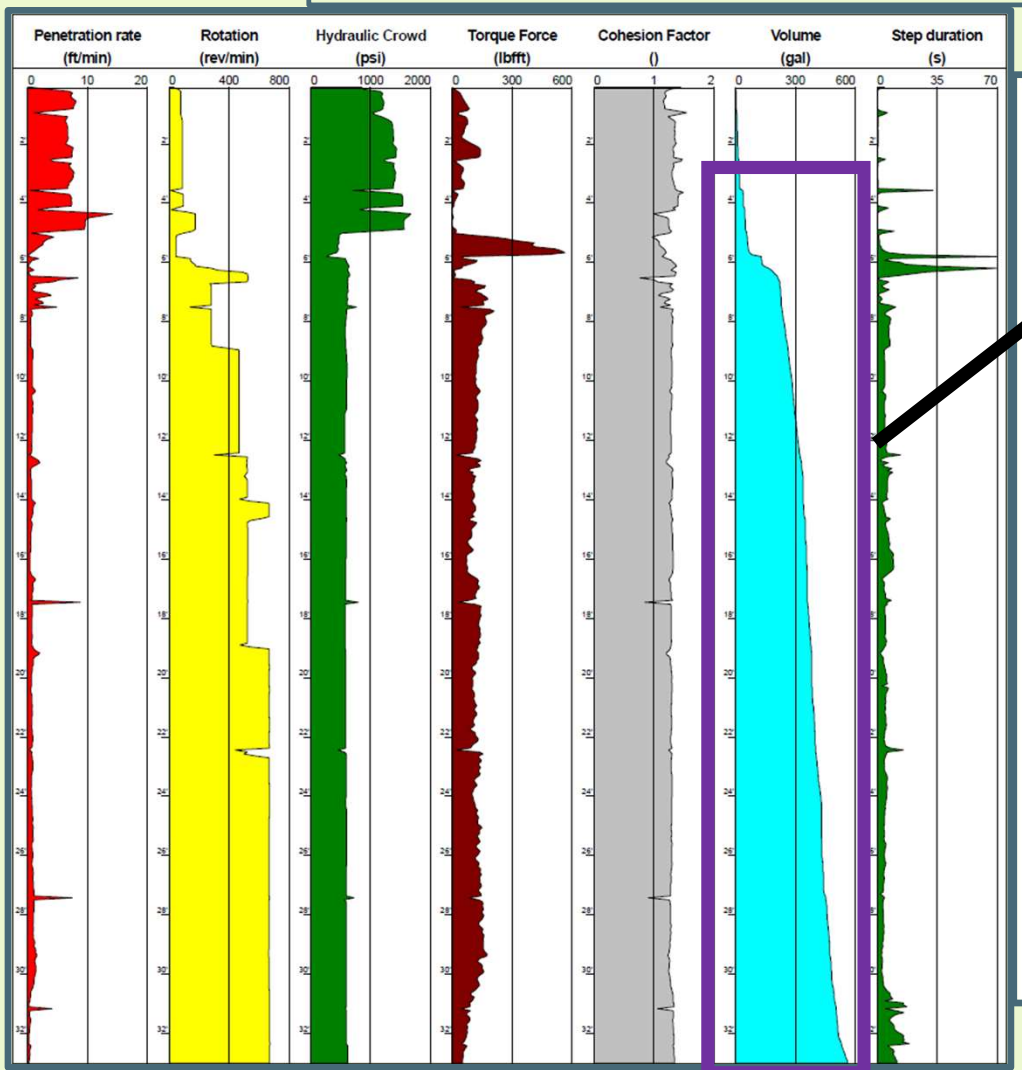

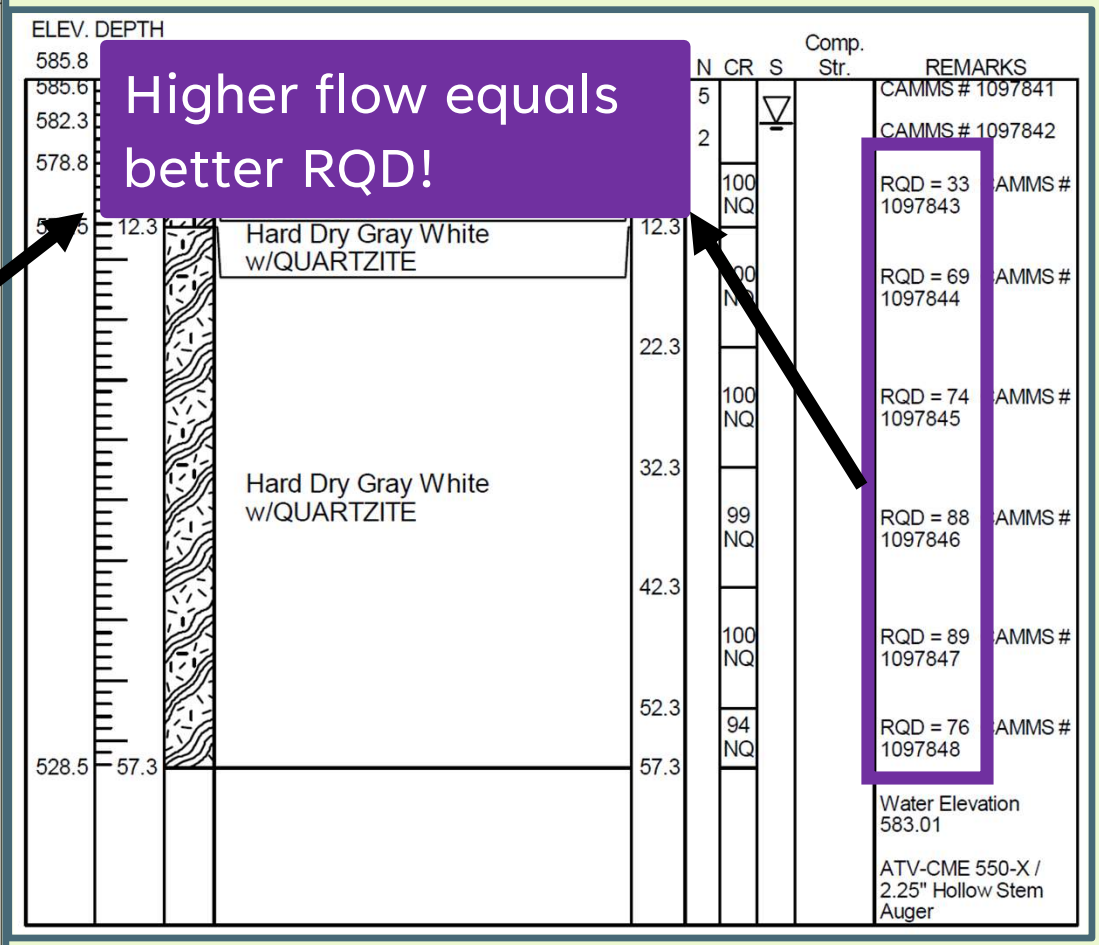

FINAL THOUGHTS

- Learning Software
- Learning correlation for MWD parameters
- Design reports and/or Construction QC Tool
- Can MWD determine pile tip elevation in friction piles (Kansas DOT)?

FINAL THOUGHTS

- AASHTO Taskforce 21-02 – MWD Standard
- FHWA User Group through DFI
- DIGGS
- Convincing people…$30-$40k

THANK YOU

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