



# Mitigating Inadvertent Returns

By: Cory Mass, Sales Manager, Intelligent Worksite Solutions

Tod Michael, Product Manager, Trenchless Core Products



# What are inadvertent returns?

- Drilling fluid that takes an unintended path to the surface
- Fluid return to unintended areas
- Drilling fluid that cannot be accounted for



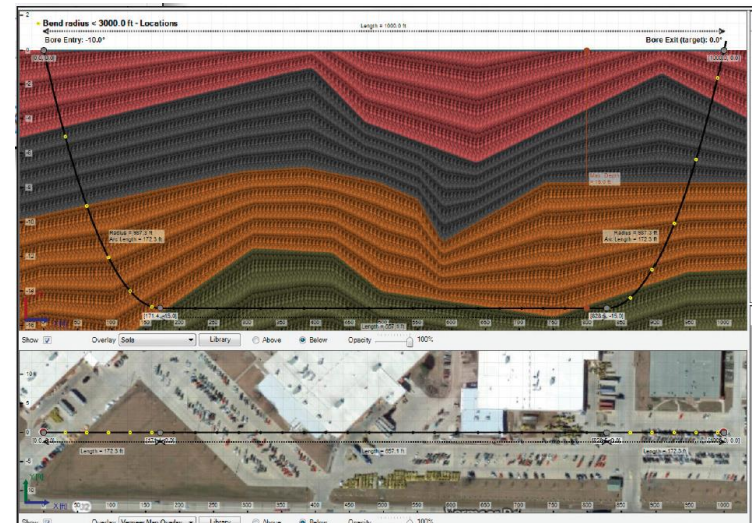
# Potential causes for inadvertent returns

- Excess fluid flow
- High fluid pressure
- Improper drilling fluid mixture
- Poor fluid quality
- Improper rate of penetration
- Unstable geological formations
- Annular space obstruction



# Avoidance practices

- Proper drilling fluid
- Pressure monitoring
- Pressure reduction
- Proper bore design





# Proper drilling fluid

- Correct additives
  - Bentonite
  - Polymer
  - Ash

- Proper mixing
  - Clean water
  - Continuous testing
  - Equipment maintenance
  - Bore hole stability





# Pressure monitoring

- Downhole monitoring
  - Live feedback
  - Adjust flow-to conditions

- On-rig monitoring
  - Long-term records
  - Review multiple machine parameters
  - Use historical data to help predict future conditions





# Pressure reduction

- Drilling procedure
  - Carrying cuttings from bore hole
  - Multiple bore passes - “swabbing”
  - Proper fluid flow
- Mechanical reduction
  - Vent holes
  - Fluid removal
  - Return pits



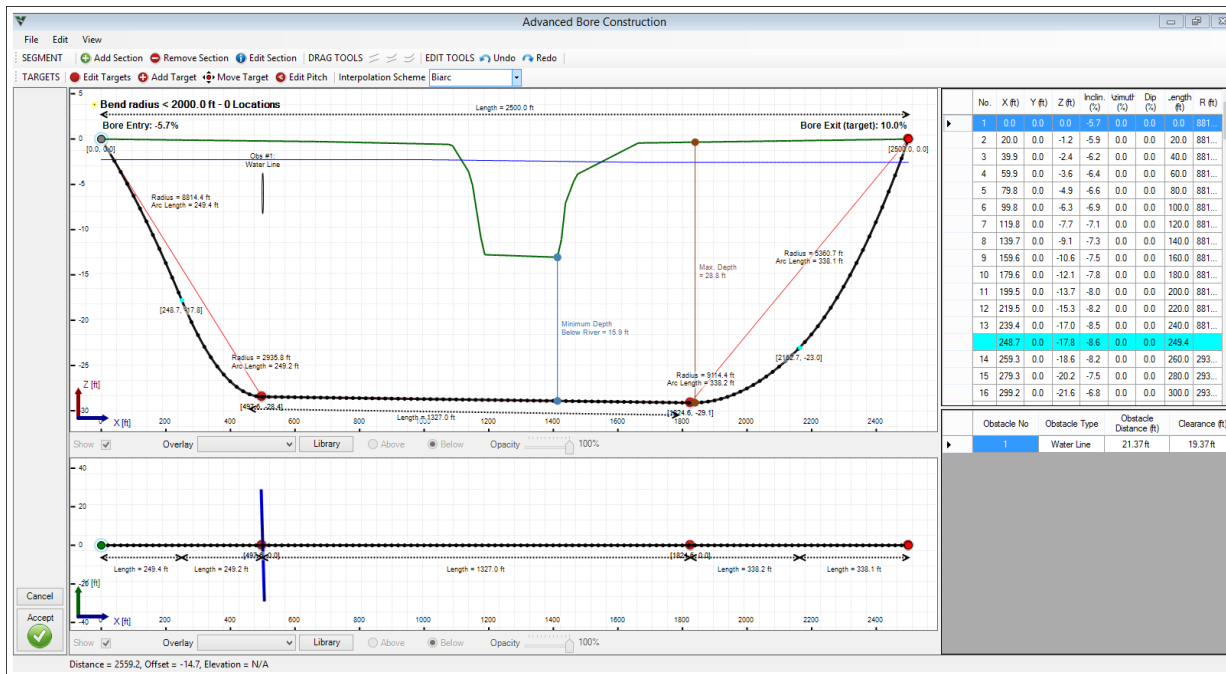




# Bore planning

- Bore profile

- Proper minimum distance from below-grade features
- Proper geometry to help reduce drag during pullback





# Bore planning

- Geotechnical data

General

Surface Topography

Soil Description

Site Specifications

Bore Path

Results

Layer Type

Layer #

4

Rock

Geological Classifical

Sedimentary Rocks

Input Method

☒ Thickness
 

30 ft

☐ Read Profile

☐ BoreAid® Soils Assistant
 

Open

Water Table

Elevation

0 ft

Add

Remove

Edit

Layer	Type	Details
1	SW	Depth = 10
2	GW	Depth = 15
3	Sedimentary Ro...	Depth = 30

View



# Bore planning

- Calculate installation and stress calculations

Parameter	@Max Pullback	Abs. Max.	View
Pullback Force [lb]	113615.8	113615.8	View
Pullback Stress [psi]	3709.2	3709.2	View
Pullback Strain	1.279E-4	1.279E-4	View
Bending Stress [psi]	2741.7	8231.8	View
Bending Strain	9.454E-5	2.839E-4	View
Hoop Stress [psi]	8.0	134.2	View
Hoop Strain	2.744E-7	4.627E-6	View

Additional Features

☒ Ballast

☐ Rollers

☐ Additional bend at pipe exit

☐ Reverse pull

☐ Pipe assembled prior to pull

Fluid Drag Coefficient

Export Results

Information	Pipe	Installation Parameters	Operational	Installation	Evaluate	Summary
<b>In-service Loads</b>						
	Calculated	Allowable	Factor of Safety	Check		
Internal Hoop Stress [psi]	0.0	30240.0	Infinity	OK		
Longitudinal Stress [psi]	6414.7	37800.0	5.9	OK		
Shear Stress [psi]	3123.7	18900.0	6.1	OK		
<b>Installation Loads</b>						
	Calculated	Allowable	Factor of Safety	Check		
Tensile Stress [psi]	3709.2	37800.0	10.2	OK		
Bending Stress [psi]	8231.8	31046.4	3.8	OK		
Hoop Stress [psi]	134.2	10633.3	79.3	OK		
Tensile/Bending	0.36	<1.0	-	OK		
Tensile/Bending/Hoop	0.13	<1.0	-	OK		
<div>Preview</div> <div>Print</div>						



# Bore planning

- Plan bore tooling sequence

Project Information | Drill Sequence | Requirements

Pilot Bore Diameter

8 in

☒ Install Pipe With Final Ream

Pre-ream Specifications

Diameter [in]	Time [min/rod]
22.000	5.0
30.000	5.0
36.000	5.0

Ream Sequence



# Bore planning

- Drilling fluid usage

Project Information

Drill Sequence

Requirements

	Ream	Diameter	Soil Volume	Fluid Volume	Time/Rod	Fluid Rate	# Tanks	Drill Time	Check
▶	Pilot Bore	8	52.2	130.6	5.0	26.1	3.3	8.4	OK
	1	22	342.7	856.8	5.0	171.4	21.6	8.4	OK
	2	30	339.5	848.6	5.0	169.7	21.4	8.4	OK
	3	36	323.1	807.8	5.0	161.6	20.4	8.4	OK

Note

- Soil Volume (Cubic Units Per Rod)
- Fluid Volume (Cubic Units Per Rod)
- Time / Rod (Minutes Per Rod)
- Fluid Rate (Cubic Units Per Minute)
- Drill Time (Minutes)

Summary

Total Drill Time

33.7 hr

Total Volume of Drill Fluid

267025.9 US (liquid) gall

Total Number of Tanks

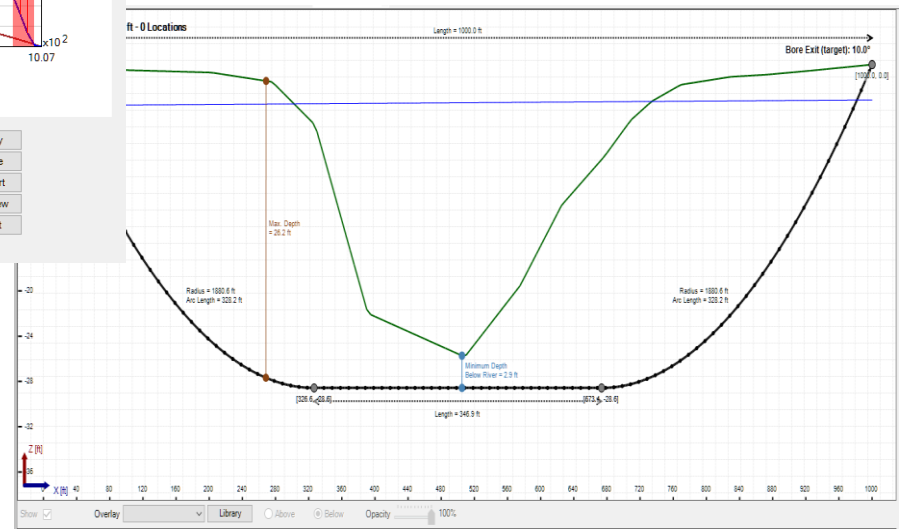
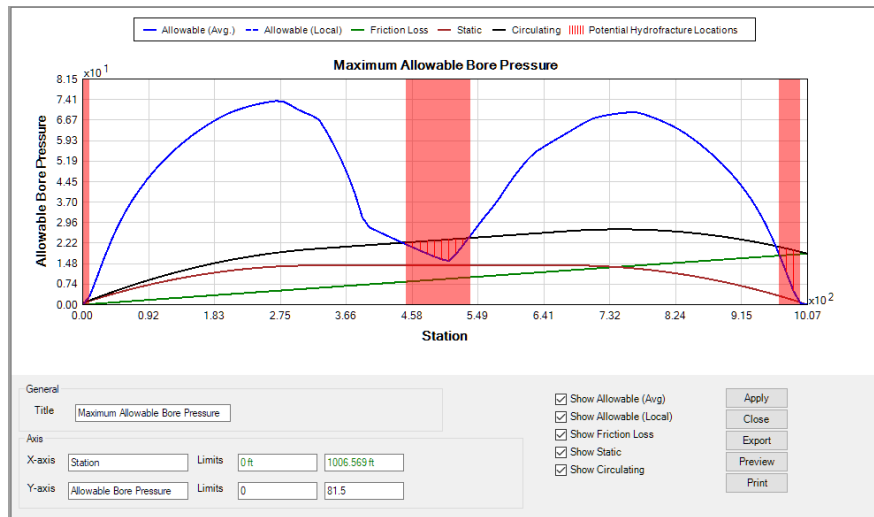
66.8

View Results



# Bore planning

- Bore pressure calculations





# Contact

- Cory Mass – Sales Manager, Intelligent Worksite – Vermeer Corporation
  - [cmass@vermeer.com](mailto:cmass@vermeer.com)
- Tod Michael – Product Manager, Trenchless Core Products – Vermeer Corporation
  - [tmichael@vermeer.com](mailto:tmichael@vermeer.com)



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