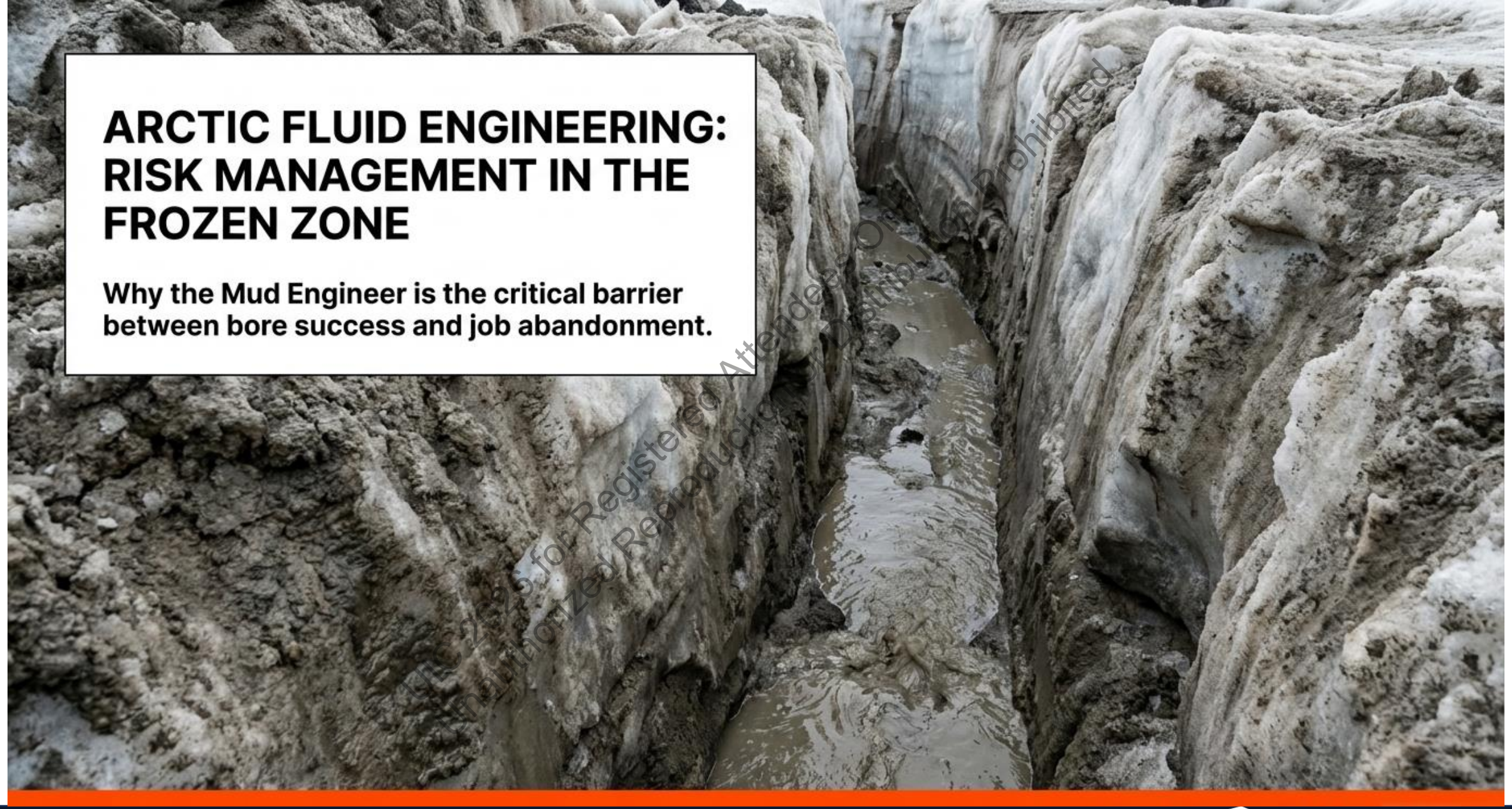
Drilling Mud on the Arctic Rocks!

Eamon Oveissy
Drilling Mud Direct

Clint Pitman
Drilling Mud Direct

Wednesday, Jan 28, 11:30-11:55am



ARCTIC FLUID ENGINEERING: RISK MANAGEMENT IN THE FROZEN ZONE

Why the Mud Engineer is the critical barrier between bore success and job abandonment.

Why have a mud engineer on the project?

- Contractually required
- Thorough Fluids Management
- Recipe adjustments on the fly
- Solids Control Management
- Inventory Management
- Education - for a few of the guys, it's like a mini Mud School
- Lastly, testing, record keeping and daily reports.

DRILLING MUD DIRECT

Report Provided by PITBULL SERVICES & McCOOL CONSULTING | REPORT NO. 11

RIG, CLEANING SYSTEM, PUMP TYPE	CROSSING NUMBER	DATE
	Colville River - North Slope - Rig 30 (South)	2/28/2025
SUPERINTENDENT	CONTRACTOR	SPUD DATE
		2/24/2025
PROJECT MANAGER	ONE CALL NUMBER	TOTAL DEPTH MD
		3110
MUD ENGINEER	COUNTY, PARISH, OR O/S AREA	TOTAL DEPTH TVD
NAME: Darren Loup	Prudhoe Bay	
PHONE: 989-317-8183	STATE/ PROVINCE	PRESENT ACTIVITY
EMAIL: mudengineerdarren@gmail.com	Alaska	Drilling 12.25" Pilot Hole

CIRCULATION DATA

PILOT HOLE SIZE:	12 1/4	LENGTH:	3110	
CUT 1 HOLE SIZE:		LENGTH:		
CUT 2 HOLE SIZE:		LENGTH:		
CUT 3 HOLE SIZE:		LENGTH:		
CUT 4 HOLE SIZE:		LENGTH:		
DRILL PIPE OD:	6.625	ID:	5.9	
JETS:	3	X	14	
NOZZLE AREA (TFA) (in):			0.45	
JET VELOCITY (ft/min):			304	
ANNULAR PRESSURE LOSS (psi):				

SOLIDS CONTROL

SHAKER #1 SCREEN SIZE	65	45	45
SHAKER #2 SCREEN SIZE	200	200	200
ANNULAR VELOCITY (ft/min)	98.80		
RULE OF THUMB: Annular Velocity between 60 - 120 ft/min is optimim for hole cleaning and stability.			

MUD VOLUME (BBL)

P/T'S	8,000	GAL	
DRILL PIPE VOLUME	4417	GAL	
ANNULAR VOLUME	13,472	GAL	
DRILL PIPE DISPLACEMENT	1,152	GAL	
TOTAL CIR. VOLUME	25,889	GAL	4.331862007 GPF

MUD HAULED IN		GAL
MUD BUILT ON LOCATION		GAL
MUD GAINED FROM HOLE		GAL
MUD HAULED OFF		GAL
ANNULAR VOLUME PER FT		GAL/MIN

Pump Data

Triplex	6.75 x 7	
Quantiplex	7 x 6	
PUMP EFF.	95%	
STK/MIN	0	100
GAL/STK	4.28	
GAL/MIN	428	

CIRCULATION PRESSURE (PSI)	250	
BOTTOMS UP (MIN) / (STKS)	31	3,148
SURFACE TO BIT (MIN) / (STKS)	10	1,032
SURFACE TO SURFACE (MIN) / (STKS)	42	4,180
TOTAL OUTPUT (GAL/MIN)	428	

OBSERVATIONS SUMMARY

From	To	Elapsed (HR)	Depth (MD)	COMMENTS
6:00 AM				Crew Change and JSA Safety Meeting in Rig Building
6:15 AM				Moving in Pipe Trailer
				Resume 12.25" Pilot Hole operations. (Drilling Through Thaw Bulb.)
12:00 PM				Lunch Break
				Resume 12.25" Pilot Hole Operations
5:00 PM			3,110'	Drilling Pilot Hole @ Approx 3,110' @ Time of Report.
			****	

MUD PROPERTIES

SAMPLE FROM:	SAMPLE 1	SAMPLE 2	SAMPLE 3	SAMPLE 4	SAMPLE 5	SAMPLE 6
TIME	7:00	10:40	14:00	16:20		
SAMPLE FROM	Suction	Suction	Suction	Suction		
WEIGHT (PPG)	8.9	8.5	8.6	8.5		
FUNNEL VISCOSITY (sec/qt)	62	56	50	52		
PLASTIC VISCOSITY (cps)	12	11	9	8		
YIELD POINT (lb/100 sq. ft.)	33	23	29	30		
10 SEC/ 10 MIN GELS	24 / 35	18	19	17 / 25		
API FILTRATE (cc/30 min)	14.0		NC	NC		
CAKE THICKNESS (1/32 in)	2		2	2		
pH	9.3		9.0	9.2		
CHLORIDE (mg/1000 mL)	800		600	700		
CALCIUM (mg/1000 mL)	80		80	80		
SOLIDS CONTENT (% by volume)	4.16	1.16	1.91	1.16		
WATER CONTENT (% by volume)	95.84	98.84	98.09	98.84		
SAND CONTENT (% by volume)	0.25%	0.25%	TR	TR		
LOW GRAVITY SOLIDS (% by volume)	4.16	1.16	1.91	1.16		

★ ENGINEERING ★ HDD

USAGE

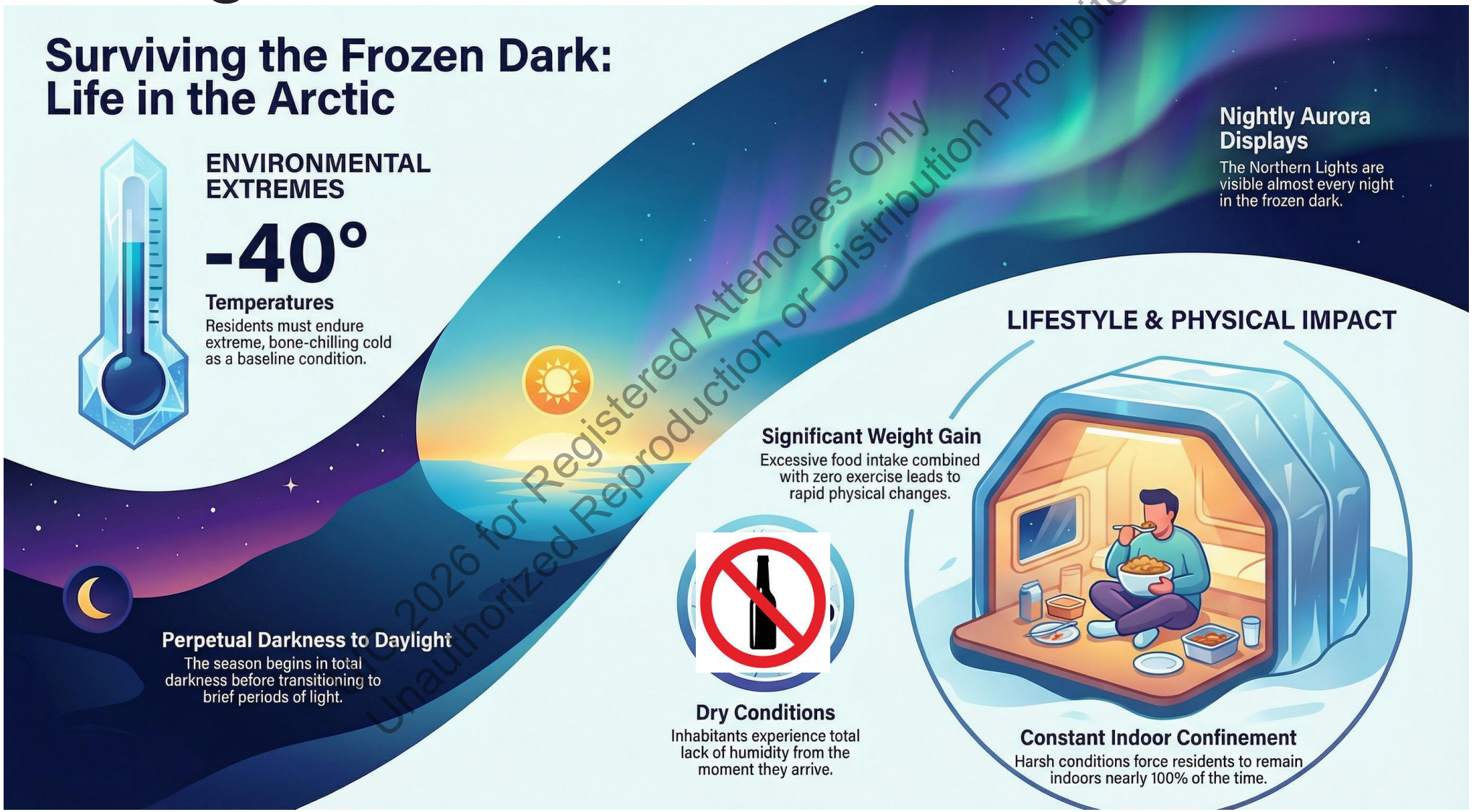
	UNIT COST	TOTAL DELIVERED	24 HOUR USAGE	CUMULATIVE USAGE	FINAL INVENTORY	TOTAL COST
MUD ENGINERING				0		0.00
XANTHAN GUM				0		0.00
PHPA				0		0.00
DRILLING DETERGENT				0		0.00
SODA ASH				0		0.00
CLAY STAR				0		0.00
PAC R				0		0.00
LUBRA STAR				0		0.00
PAC LV				0		0.00
BENTONITE (Palleta)				0		0.00
				0		0.00

SUBTOTAL	$0.00
TODAY'S TOTAL	$0.00
CUMULATIVE TOTAL	$0.00

DRILLING FLUID RECOMMENDATIONS

Pilot hole operations: Maintain 55-65 sec/qt Funnel Viscosity. Adding Soda Ash to Fresh Water to Treat for Hardness in Make Up Water. Additions of PolyVis1 for Bentonite Extender as Needed and @ Recomendation of MudEngineer. Mixing Bulk Sacks of Bentonite through Clean Slurry Technologies Hopper and Transferring to Frack Tank to Act as Suction. Please Contact Mud Engineer above at email or phone number listed with any Questions.

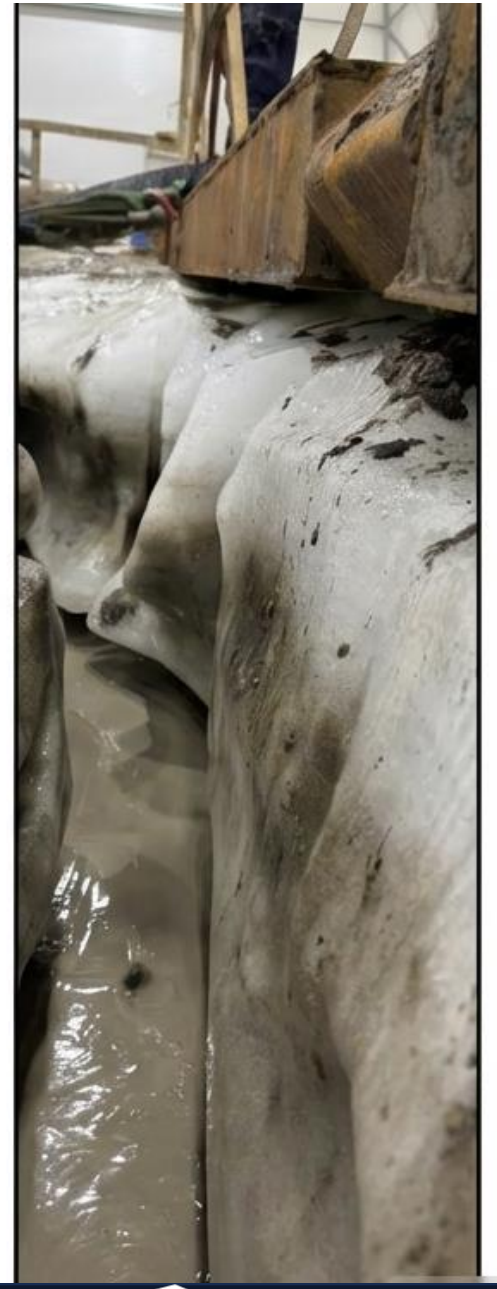
Mud Engineer Feedback



A MUD ENGINEER IS NOT A LUXURY— THEY ARE RISK MANAGEMENT

- **BORE INTEGRITY:** Preventing collapse in permafrost.
- **SCHEDULE PROTECTION:** Avoiding downtime in limited weather windows.
- **ENVIRONMENTAL COMPLIANCE:** Protecting the license to operate.

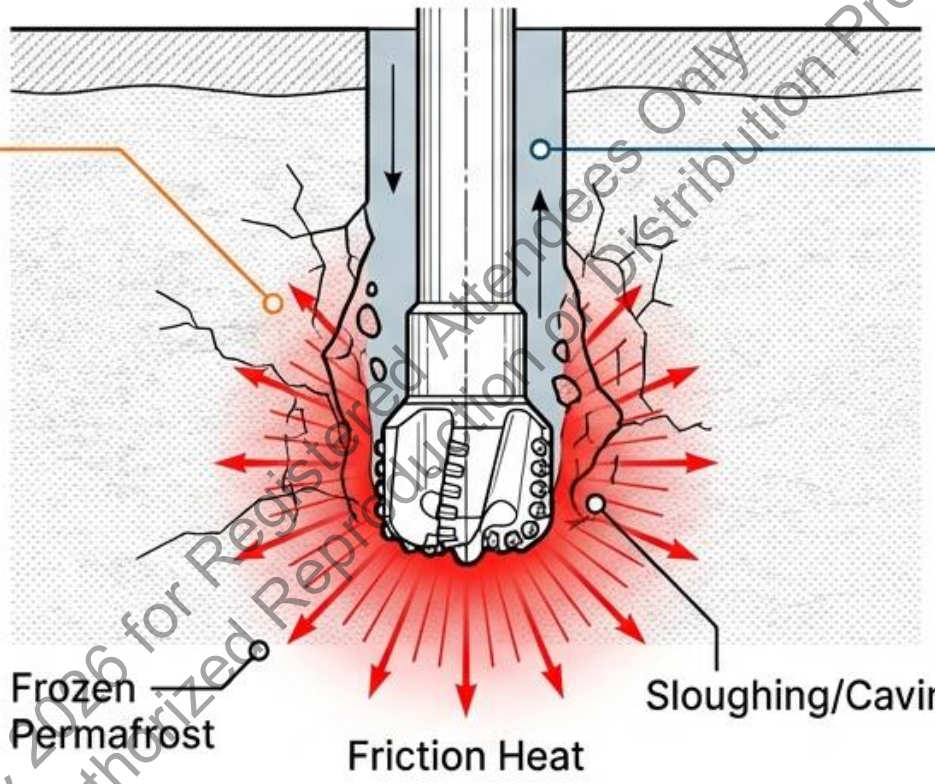
Ensuring the project ends with a successful bore, not an explanation of failure.



PERMAFROST IS UNFORGIVING OF THERMAL INSTABILITY

THE CONFLICT

- **Heat Generation:** Drilling creates friction; warm fluid melts the bore wall.
- **Over-Hydration:** Causes ground heaving.
- **Under-Hydration:** Causes bore collapse.

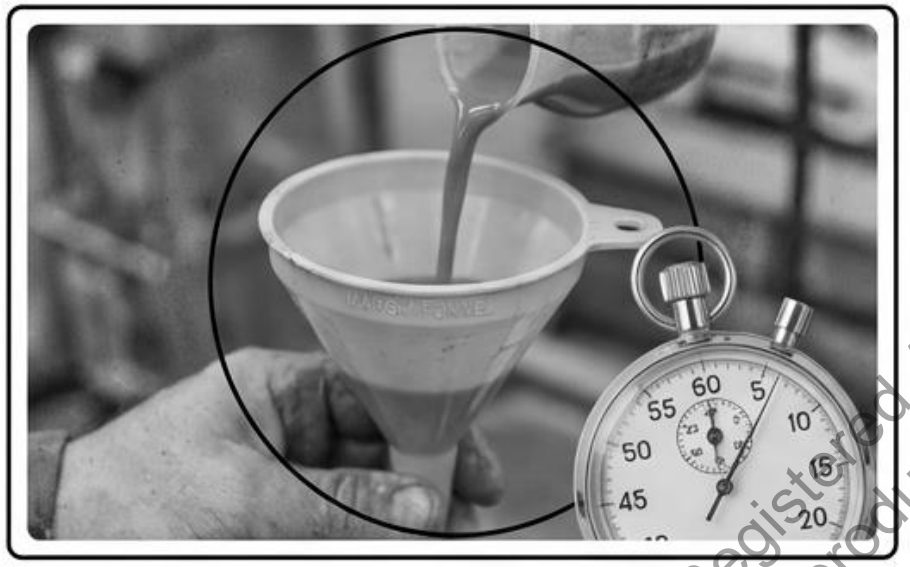


THE INTERVENTION

- **Thermal Control:** Fluid cooling systems to prevent thaw.
- **Filtrate Control:** Regulation of fluid loss into formation.
- **Rheology Tuning:** Precise gel strength to support frozen walls.

BOTTOM LINE: PREVENTION OF THAW-INDUCED INSTABILITY THAT KILLS BORES.

NORTH SLOPE DRILLING IS NOT A 'SET IT AND FORGET IT' OPERATION



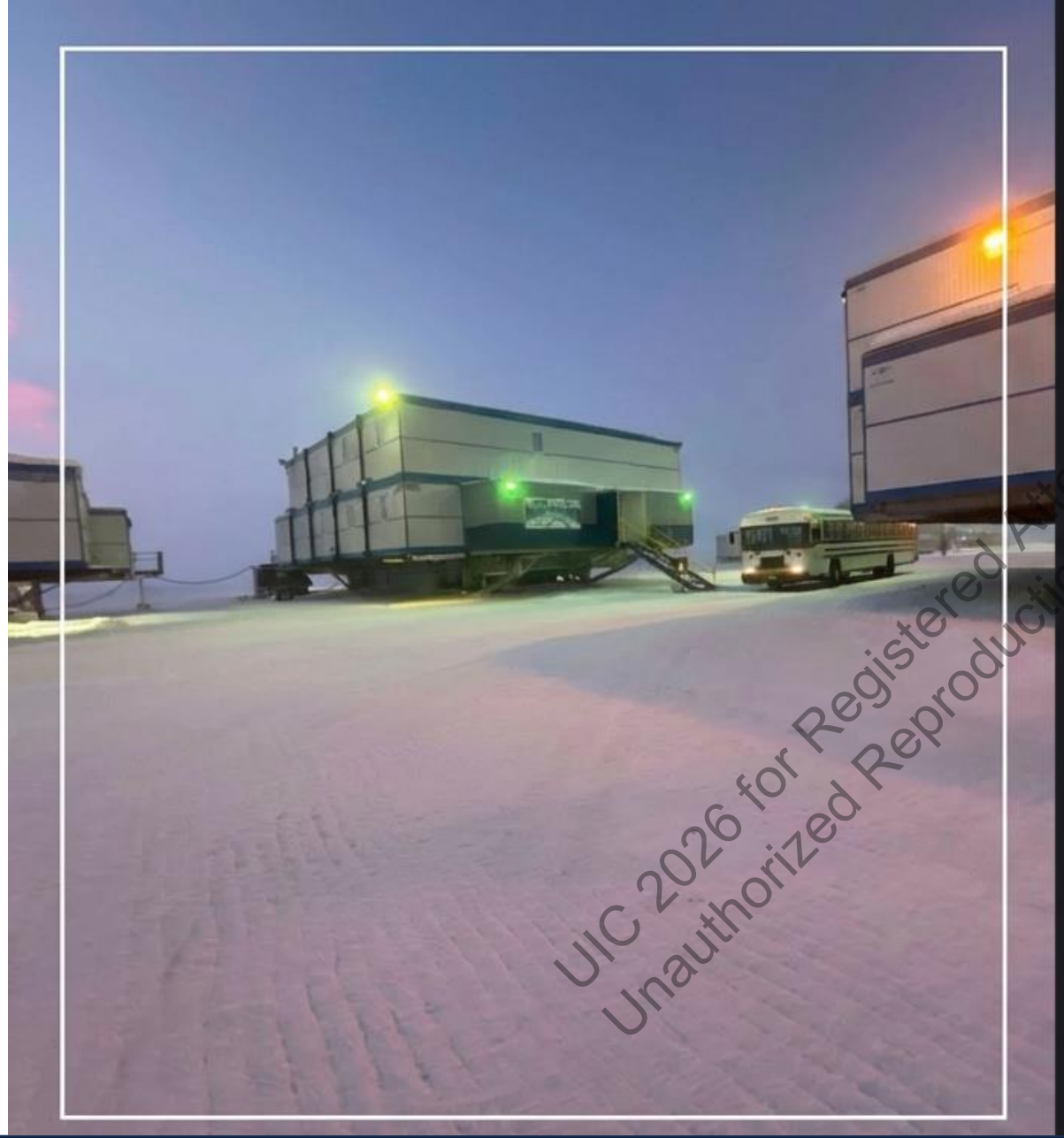
PASSIVE: Basic Viscosity Check.

ACTIVE: Reading the Hole.

Real-Time Decision Making requires analyzing:

- **Cuttings Size & Shape** (Hole cleaning efficiency)
- **Torque Trends** (Friction analysis)
- **Returns Behavior** (Flow consistency)

Catching problems proactively, not troubleshooting disasters retroactively.



DATA INTESRITY: 99.9%

ENGINEERING LOG // ENTRY 01

THE REALITY ON THE GROUND

This is not a standard job site. The North Slope is remote, highly regulated, and actively hostile to standard engineering practices.

SITE DATA

TEMPERATURE	CONSTRAINTS	LOCATION
-40°F / -40°C	Strict Seasonal Windows & Zero-Discharge	Deadhorse, Alaska

DATA INTEGRITY: 99.9%

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ENGINEERING LOG // ENTRY 01

WARNING: Your normal HDD mud program will not survive unchanged.

DATA INTEGRITY: 99.9%

ENGINEERING LOG // ENTRY 02

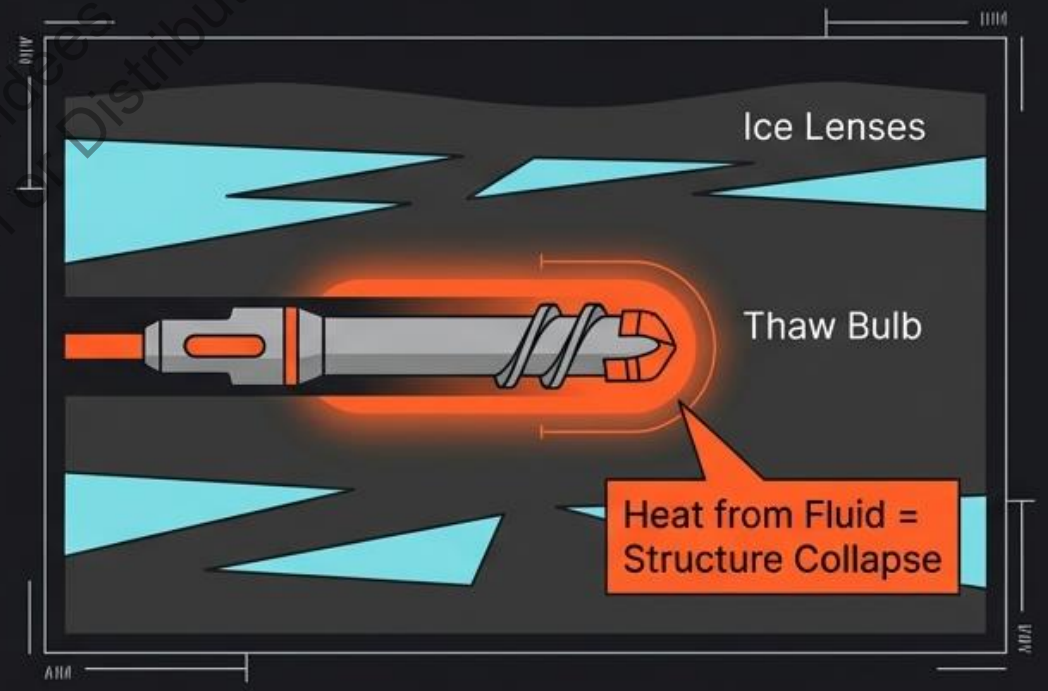
THE SUBSURFACE PARADOX: HEAT IS FAILURE

Permafrost is the #1 driver of complexity in Arctic operations.

THE ENEMY: Discontinuous and ice-rich permafrost dominates the geology.

- THAW INSTABILITY: Drilling fluids introduce heat. Heat melts ice lenses. Melting causes borehole enlargement, collapse, and loss of grade.

THE OBSTACLE: Alternating frozen soil and pure ice results in sudden torque spikes, bit deflection, and erratic penetration rates.

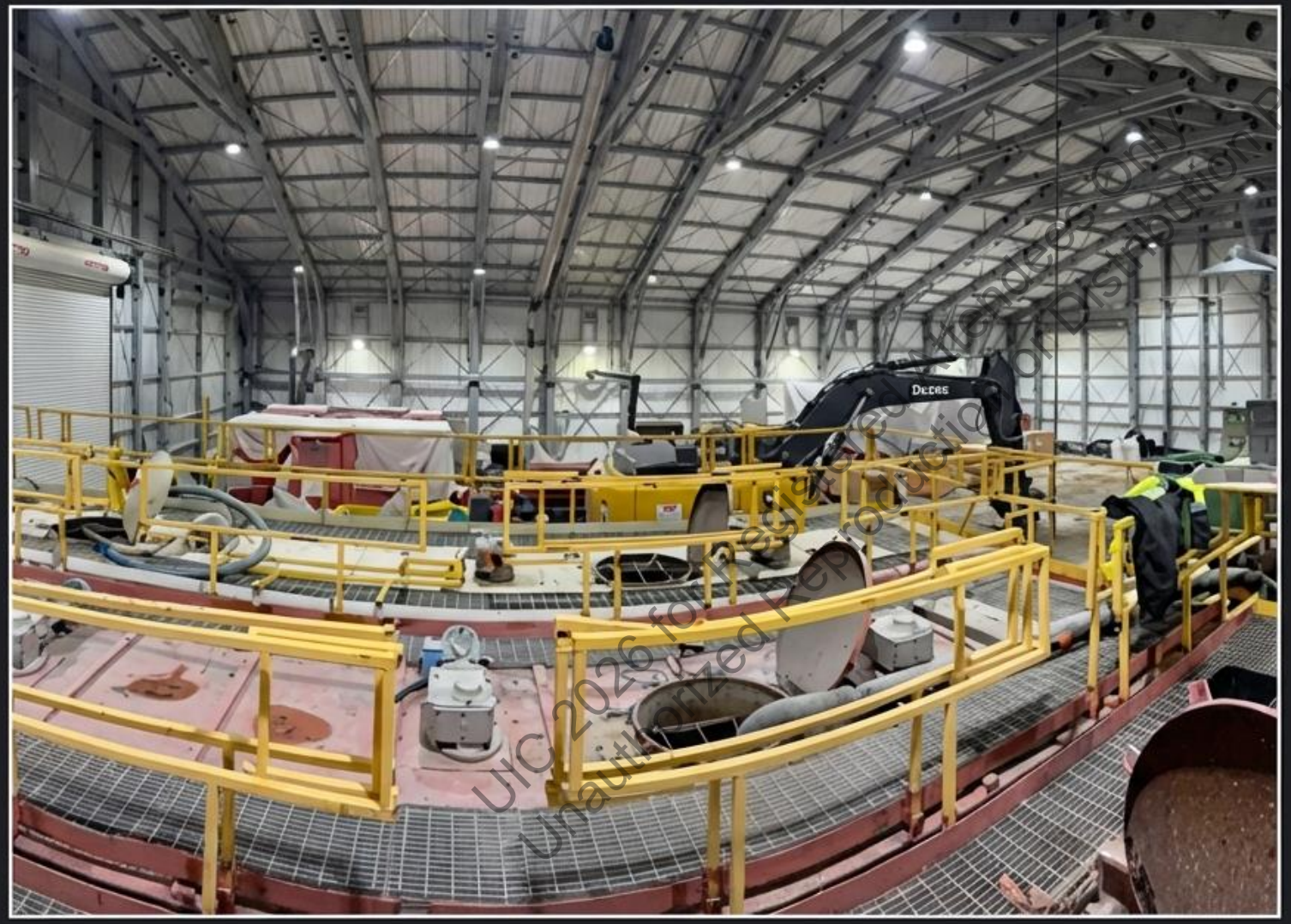


SUBSURFACE DATA

THAW INDEX: CRITICAL

FREEZE-THAW CYCLING: Seasonal transitions change ground behavior mid-project.

DATA INTEGRITY: 99.9%



MUD PROGRAM = THERMAL CONTROL SYSTEM

THE CHALLENGE:
In -40°F, water freezes in surface lines, polymers lose performance, and Bentonite hydration slows.

THE MITIGATION:

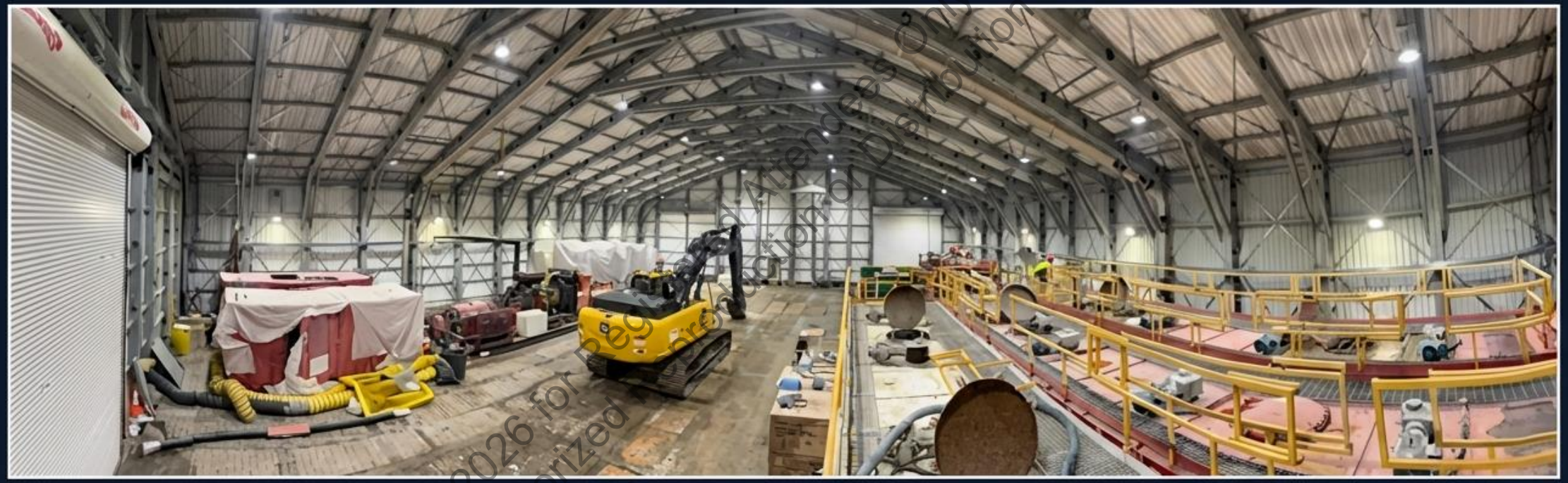
1. **HEATED SYSTEMS:** All water tanks and fluid systems must be heated.
2. **CHEMICAL SELECTION:** High-quality bentonite with fast hydration; freeze-resistant polymers.
3. **MOTION:** Continuous circulation is mandatory. No idle lines.

"Gel strengths can spike unexpectedly overnight."

DATA INTEGRITY: 99.9%

ENGINEERING LOG // ENTRY 13

THE 'IGLOO' STRATEGY: ENCLOSED OPERATIONS



INFRASTRUCTURE

Massive heated tent structures enclose the rig, mud systems, and workspaces.

OPERATIONAL RULE

Bring the 'indoors' outdoors. Create a controlled industrial environment in the frozen wasteland.

CIRCULATION

Continuous fluid movement prevents flash-freezing in lines.

DATA INTEGRITY: 99.9%

ENGINEERING LOG // ENTRY 15

THE LOGISTICS OF ISOLATION

- **DEADHORSE IS THE END OF THE LINE.**
- **SUPPLY CHAIN:** No local suppliers for Bentonite, polymers, or HDD tooling.
- **ACCESS:** Trucking limited to ice road windows. Air freight is slow/expensive.
- **THE MANDATE:** Over-plan consumables. Redundancy is mandatory. A single missing fitting can halt work for days.

OBSERVATION LOG: WILDLIFE INTERFERENCE RISK: LOW // TEMP: -35°C