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MI SWACO

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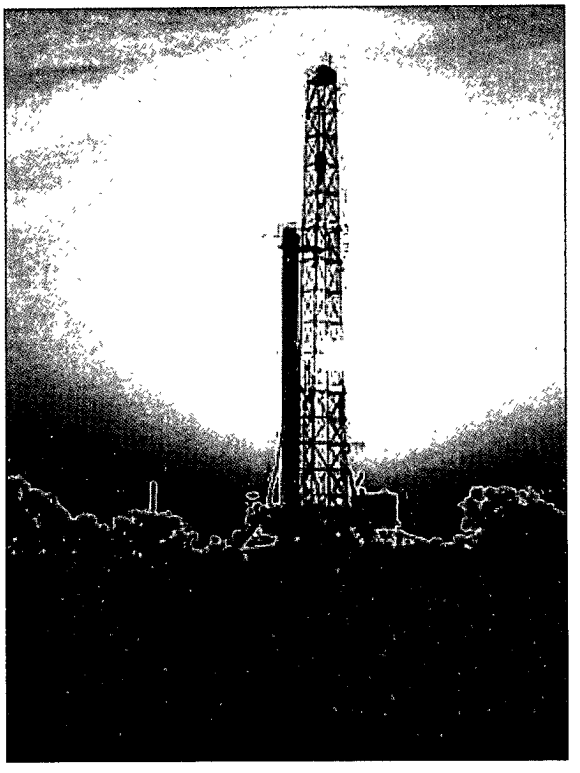
Torch Energy
'San Juan Mesa Prospect'
Sec 14, T-4-S, R-30-E
Roosevelt County, New Mexico



Integrated Fluids Program

Prepared for Mr. Dorsey Rogers

Date prepared: June 3, 2010

Prepared by: Wayne Cleere
Engineering Manager

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EXECUTIVE SUMMARY

- In reaching your objectives successfully, M-I SWACO will take a clear and precise drilling plan coupled with competent and experienced personnel with a personal goal in mind "To Succeed". Such will be the posture of M-I SWACO while working with TORCH ENERGY on this project.

- M-I's primary objective will be to assist TORCH ENERGY technically, competently as well as in a timely manner in order for all targets to be achieved. Our primary concern will be to perform safely and also apply the best drilling fluids practices for every interval of this well.

- Major challenges in this well will be:
  - A) Proper Well Hydraulics and Hole Cleaning.
  - B) Minimizing mud losses while drilling and running casing
  - C) Abnormal Pressures

KEY ISSUES

Lost Circulation - Causes and Preventative Measures

- **Mechanical:**
  - Improper hydraulics, excessive pump rates and annular velocities (causing high ECD's)
- **Drilling Practices:**
  - Increasing pump rates too rapidly after connections and trips
  - Raising and lowering the pipe too fast (Swab/Surge)
  - Excessive penetration rates which result in high cuttings concentration in the annulus
- **Hole Conditions:**
  - Kicks and well control procedures
  - Depleted sand zones
  - Slow penetration rates
- **Preventive Measures:**
  - Rotating the drill string when breaking circulation helps break the gels and minimize pump pressure surges.
  - Bring the pumps up slowly after connections and periods of non-circulation. Plan to break circulation at 1 to 2 different depths while tripping in the hole.
  - Additional LCM material (SAFE CARB fine, medium, and course and Vin Seal) should be ordered and stored at location to combat losses.

Hole Cleaning Recommendations

- Rheology and hydraulics calculations will be run as needed and the mud properties will be adjusted as needed to maximize hole cleaning.
- Use the highest possible annular velocity to maintain good hole cleaning without inducing excessive ECD's. Annular velocity provides the upward impact force necessary for good cuttings transport.
- Control drill to manage difficult hole cleaning situations.
- As much pipe rotation as possible while drilling.
- Pump a soap stick every 3 connections.
- Pump 1 1/2 gallons of MF-55 or Poly Plus at the pump every 3 connections. This sweep should be pumped one connection after the soap stick. **Sweeps should be monitored upon return.**
- DO NOT AT ANY TIME HAVE MORE THAN ONE SWEEP IN THE HOLE AT A TIME.
- Circulate at least one bottom up prior to pulling out of the hole.

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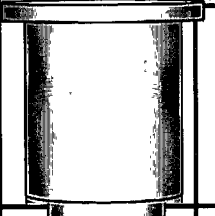
Project Summary with Well bore Geometry

Casing Size	Hole Size	Casing Intervals	Depth MD	Mud System	Mud Weight (ppg)	Cum Days
Conductor	Surface			Spud Mud	8.4	
13 3/8"	17.1/2"		350'		8.6	3
9 5/8"	Intermediate 12.1/4"		2,000'	Allow viscosity to increase with native clay	8.4 9.8	5
5 1/2"	Production 8.1/2"		8,900'	10ppg Brine Duo Vis/Poly Pac R /MyLoJel	10.0 10.5	16

17.5" OH Interval Procedures

0' MD – 350' MD 17.5" Open Hole - 13.375 " Casing	
Drilling Fluid System	*High Viscosity Sweeps / Fresh Water Spud Mud*
Key Products	**M-I Gel** , Lime
Solids Control	Linear & Dual Motion Shakers, Desander, Desilter, De-Watering Equipment
Potential Problems	Hole Cleaning, Lost Circulation

Interval Drilling Fluid Properties

Depth (MD ft)	Mud Wt. (ppg)	Funnel Viscosity (sec/qt)	Plastic Viscosity (cp)	Yield Point ($lb/100ft^2$)	API Fluid Loss (ml/30min)	Hardness (Ca^{2+})	pH
0'– 350'	8.4 – 8.6	30 - 32	1 - 4	1 – 4	NC	>400	10.0-10.5

Interval Objective:
Drill a 17.5" hole to 350' MD without mud losses while cleaning the hole. Run Conductor to 60 feet and set a full string of 13.375" casing to 350' and cement. To successfully utilize the MI-SWACO equipment to de-water the mud while drilling. This will lower the solids percentage while reclaiming water.

Interval Procedures:
Fluid
- This interval should be drilled with fresh water
- Maintain funnel viscosity at 28-30 sec/qt.
- The continuous use of the rig de-sander, desilter, and dewatering equipment are recommended to minimize low gravity solids. In addition water additions are recommended to minimize the density from increasing and reduce pump wear.
- Pump a soap stick every 3 connections.
- Pump 1 1/2 gallons of Poly plus at the pump every 3 connections. This sweep should be pumped one connection after the soap stick. Sweeps should be monitored upon return.

Dewatering

• Dry polymer mixed @ 0.2 to 0.25% in cold effluent @ 1-2 gpm for 60 gpm feed rate to centrifuge. Mix @ 0.25 to 0.5% when warm @ 0.5-1.0 gpm

• **Note for handling cement returns:**

After rigging up and while drilling the surface hole, a ditch shall be dug along the line of the flare line installation (to come later). This ditch should have sufficient volume to hold the surface hole cement returns. A bypass line will be run from the flow line to the ditch. Bypass the returned cement to the ditch and allow to harden.

Screens

• Use fine as possible without loosing fluid off end of shaker. DO NOT RAISE SHAKER TO HIGHEST SETTING! Suggest 84x84 mesh & 165x165 mesh on primaries

• 230x230 to 325x325 mesh on mud cleaner

Solids Control Equipment

Shakers:

• Operate for maximum solids removal & minimal fluid losses on cuttings.

Mud Cleaner:

• Operate for maximum solids removal & minimal losses on cuttings

Centrifuges:

• Operate @ low rpm bowl & minimum differential

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12.25" OH Interval Procedures

350' MD – 2,000' MD 12.25" Open Hole – 9.625 " Casing								
Drilling Fluid System	*Fresh/Native*							
Key Products	**MI Gel, Poly Plus ,** Lime							
Solids Control	Linear & Dual Motion Shakers, Desilter, De-Watering Equipment							
Potential Problems	Hole Cleaning, Lost Circulation, Stuck Pipe							
Interval Drilling Fluid Properties								
Depth (MD ft)	**Mud Wt. (ppg)**	**Funnel Viscosity**	**Plastic Viscosity (cp)**	**Yield Point (lb/100ft²)**	**API Fluid Loss (ml/30min)**	**Hardness (Ca^{2+})**	**pH**	**% Oil**
350'– 2,000'	8.5 – 9.8	28 – 32	1 - 4	1 – 4	N/C	>400	9.5 - 10.0	3-5%

Interval Objective:
Drill a 12.25" hole from 350' to 2,000' MD without mud losses while cleaning the hole. Run and cement a full string of 9.625" casing with full returns. To successfully utilize the MI-SWACO equipment to de-water the mud while drilling. This will lower the solids percentage while reclaiming water.

Interval Procedures:
Fluid
- This interval should be drilled first with drill water to allow native clays to yield in fluid to give some viscosity.
- Prior to drilling through 'Red Bed' begin additions of Oil **IF NEEDED**. Maintain between 3 to 5 percent oil in the drilling fluid until TD.
- Maintain pH between 9.5 and 10.0 with lime.
- Pump a soap stick every 3 connections.
- Pump 1 1/2 gallons of Poly Plus at the pump every 3 connections. This sweep should be pumped one connection after the soap stick. Sweeps should be monitored upon return.
- Keep mud weights as low as hole conditions will allow.
- **Prior to pulling out of hole circulate at least one bottom up to determine if hole is clean.**
- Prior to running casing circulate two hi-vis sweeps to insure hole is clean.
- Set 9 5/8" casing at 2,000'.

Dewatering

• Dry polymer mixed @ 0.2 to 0.25% in cold effluent @ 1-2 gpm for 60 gpm feed rate to centrifuge. (Adjust as needed) Mix @ 0.25 to 0.5% when warm @ 0.5-1.0 gpm
• Discontinue running polymer when salt formation is encountered
• Keep polymer tanks covered
• Run agitators for 1-2 hours after mixing then discontinue, run occasionally thereafter.
• Keep blended Polymer volume to a minimum at end of interval - These weak solutions will break down over several days and in Ultraviolet light (Sun Light)
• Drill Solids: 2% v/v - If drill solids are at 4% contact: Charles Wilson at (469) 693-5921 and Casey Allen at (432) 664-7754

Screens

• Adjust screen size to drilling operations to control retention on cuttings (105 to 200 mesh screens)
• Fit mud cleaner with 230 to 325 mesh screens

Solids Control Equipment

Shakers:

• Set in BEM & Deck angle @ +1° to minimize pool depth & maximum dryness (promotes screen life)
• Adjust as needed for maximum drying potential - Linear for high ROP & BEM mode for dryer cuttings

Mud Cleaner:

• Set @ +1° for pool & maximum dryness;
• Maintain 32-35 psi (water) for off brand hydrocyclones, SWACO Twin clones @ 40-45 psi (water) spray discharge

Centrifuges:

• Operate for maximum volume & dryness
• Adjust pool depth to control ROC
• Monitor load on main drive motor for high torque

8.5" OH Interval Procedures

2,000' MD – 8,900' MD
8.5" Open Hole – 5.5" Casing

Drilling Fluid System	*Brine/Duo Vis/Poly PacR/MyLoJel*
Key Products	MF-55, Duo Vis, Poly Pac R, MyLoJel, Caustic
Solids Control	Linear & Dual Motion Shakers
Potential Problems	Hole Cleaning, Lost Circulation, Stuck Pipe

Interval Drilling Fluid Properties

2,000' - 8,900'

Depth (MD ft)	Mud Wt. (ppg)	Funnel Viscosity (sec/qt)	Plastic Viscosity (cp)	Yield Point ($lb/100ft^2$)	API Fluid Loss (ml/30min)	Hardness (Ca^{2+})	pH
2,000'– 6,300'	9.8 – 10.0	28 – 29	1 – 4	1 – 4	N/C	< 400	9.5 – 10.0
6,300 – 7,500'	9.8 – 10.0	42 – 44	8 – 10	10 – 12	10 – 12	<400	9.5 – 10.0
7,500' – 8,900'	10.0 – 10.5	45 – 48	10 - 12	10 - 12	< 6	<400	9.5 – 10.0

Interval Objective:

Drill a 8.5" hole to 8,900' MD without mud losses while cleaning the hole. Run a full string of 5.5" production casing and cement. To successfully utilize the MI-SWACO equipment to de-water the mud while drilling.

Interval Procedures:

Fluid

- This interval will be drilled with Brine Water and a Duo Vis/Poly PacR mud system. Barite will used for weight to approximately 8,900'.
- After drilling cement, casing shoe and 10' of new formation, test casing shoe.
- Keep mud weights as low as hole conditions will allow.

- Have enough LCM material on hand at all times. If losses occur follow lost circulation plan on page 16.
- Do a light mud up at 6,300' with Duo Vis and Poly PacR.
- At 7,500' drop water loss below 6cc.
- Set a full string of 5.5" casing at 8,900'
- Pump a soap stick every 3 connections while on clear fluid.
- Pump 1 1/2 gallons of Poly plus or MF-55 at the pump every 3 connections while on clear fluid. This sweep should be pumped one connection after the soap stick. Sweeps should be monitored upon return.
- ***Hole stability is an issue with the Abo section in this area.***

Dewatering

• Dry polymer mixed @ 0.2 to 0.25% in cold effluent @ 1-2 gpm for 60 gpm feed rate to centrifuge. (Adjust as needed) Mix @ 0.25 to 0.5% when warm @ 0.5-1.0 gpm
• Control LGS to 1%
• Discontinue polymer below 1% LGS to conserve
• Pilot Test with alternative polymers as drilling fluids change: Suggest Ciba Anionic products Magnafloc 351, 10, & 24-Cytec 1147 dry or SD 2081 liquid.
▶ Caution: Adding polymer to the system also adds fresh water.
  • Record water added and communicate
  • Run polymer as concentrated as possible to control amount of water added
• Dewatering unit should be ran constantly to prevent low gravity spikes. Speed up or slow down the unit as need to maintain the mud weight.

Screens

• 210x210 mesh & 175x175 mesh on primaries
• Adjust flow to maximize 210x210 mesh primary; divert remainder of flow to 175x175 mesh primary
• 325x325 mesh on mud cleaner
• Clean & reuse screen when possible
• Wash screens with flow to reduce cloth tearing

Solids Control Equipment

Shakers:
• Set in BEM & Deck angle @ +1° for pool creation & maximum dryness
• Use one primary shaker only, when flow will allow (fitted with 200 mesh)

Mud Cleaner:
• Set @ +1° for pool & maximum dryness;
• Maintain 32-35 psi (water) for off brand hydrocyclones, SWACO Twin clones @ 40-45 psi (water) spray discharge

Centrifuges:

- Operate for maximum volume & dryness
- Adjust pool depth to control ROC
- Monitor load on main drive motor for high torque

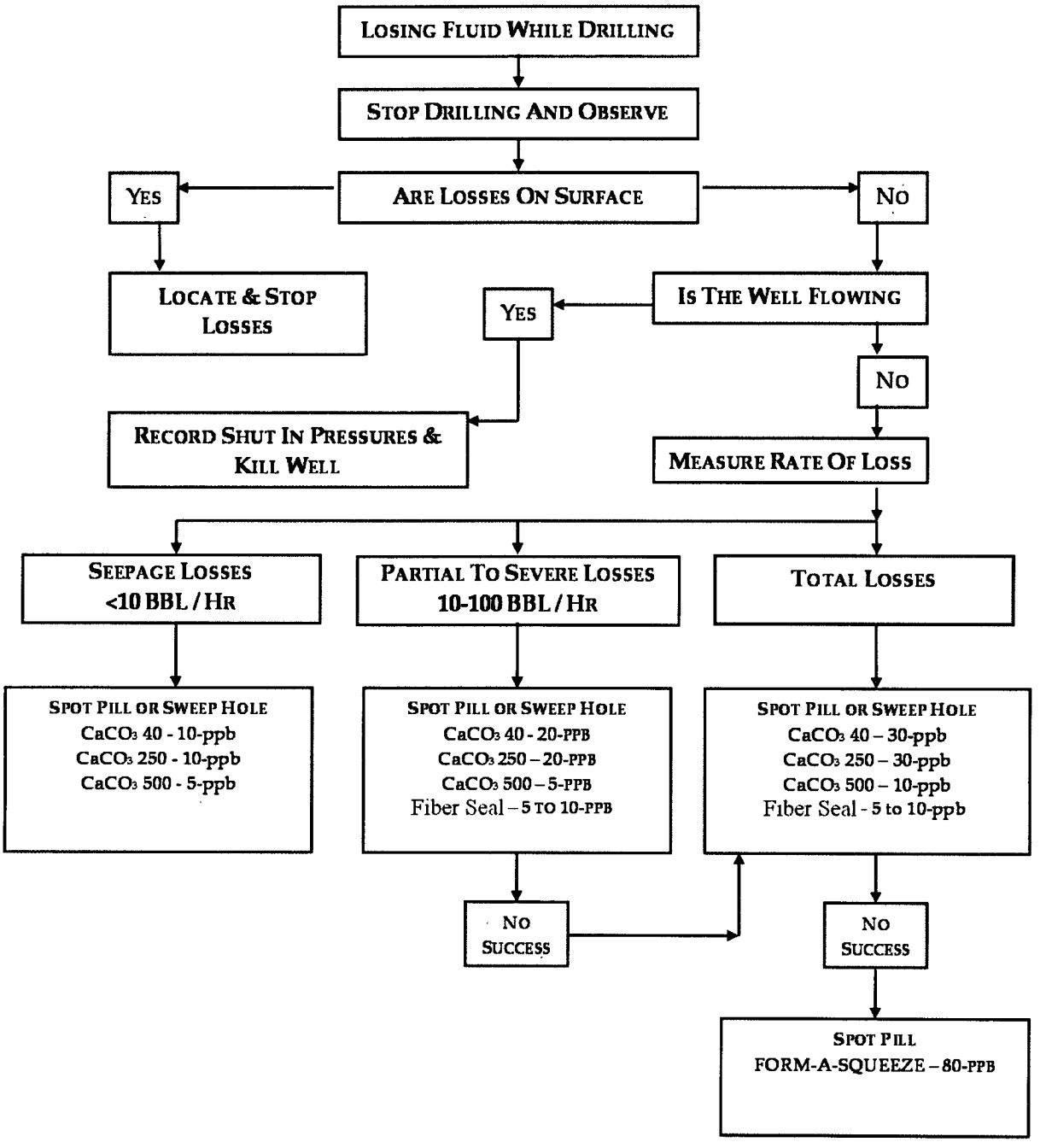
Mud Engineer Roll and Responsibility

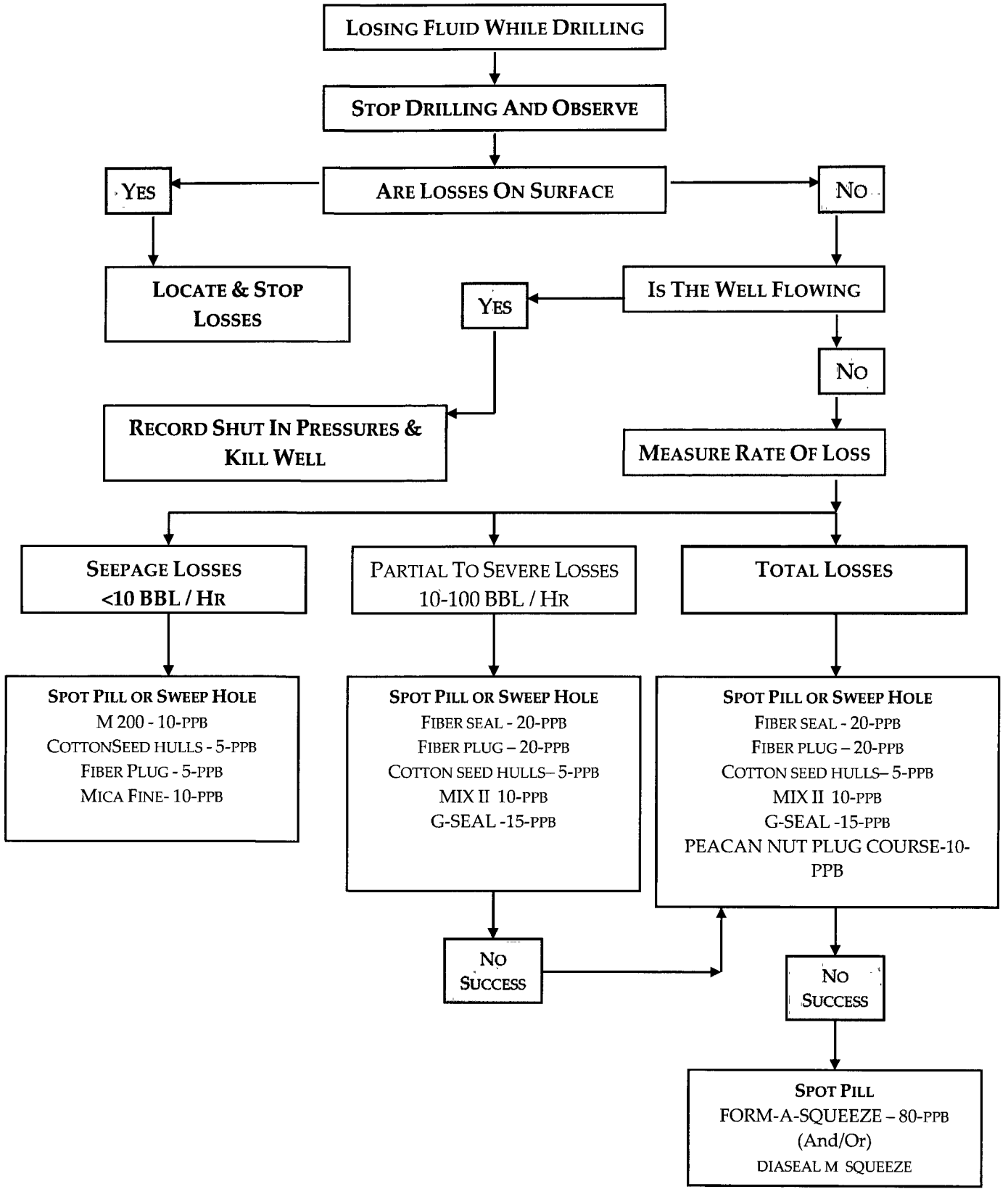
- Accountable to: District Mgr. / Project Engineer
- Perform mud checks & fill out ONE-TRAX report form; maintain accurate inventory for both chemicals and fluid volumes; make recommendations to achieve customer design input
- Maintain clear communication line between customer, supervisory personnel in district office & EPS personnel
- Monitor & report any deviations from program, e.g., LGS, excess chemical usage, disposal, storage concerns, etc., to customer, TSE & PE
- Produce accurate end of well recap summaries

EPS Technician:

- Accountable to: District Mgr. / Project Engineer
- Supervise solids removal from fluids and maintain all solids control equipment
- Monitor & report any environmental issues, deviations from program, e.g., LGS, excess chemical usage, disposal concerns, equipment failures, to customer, TSE & PE
- Fill out ONE-TRAX dewatering report form daily
- Liaise daily with project engineer concerning operations

Lost Circulation Plan




LOSING FLUID WHILE DRILLING
STOP DRILLING AND OBSERVE
ARE LOSSES ON SURFACE
YES
NO
LOCATE & STOP LOSSES
IS THE WELL FLOWING
YES
NO
RECORD SHUT IN PRESSURES & KILL WELL
MEASURE RATE OF LOSS
SEEPAGE LOSSES <10 BBL / HR
PARTIAL TO SEVERE LOSSES 10-100 BBL / HR
TOTAL LOSSES
SPOT PILL OR SWEEP HOLE
M 200 - 10-PPB
COTTONSEED HULLS - 5-PPB
FIBER PLUG - 5-PPB
MICA FINE- 10-PPB
SPOT PILL OR SWEEP HOLE
FIBER SEAL - 20-PPB
FIBER PLUG – 20-PPB
COTTON SEED HULLS– 5-PPB
MIX II 10-PPB
G-SEAL -15-PPB
SPOT PILL OR SWEEP HOLE
FIBER SEAL - 20-PPB
FIBER PLUG – 20-PPB
COTTON SEED HULLS– 5-PPB
MIX II 10-PPB
G-SEAL -15-PPB
PEACAN NUT PLUG COURSE-10-PPB
NO SUCCESS
NO SUCCESS
SPOT PILL
FORM-A-SQUEEZE – 80-PPB
(And/Or)
DIASEAL M SQUEEZE

Contacts

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