Work Program

TR-5 Workover

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Abbreviations

BOP	Blow Out Preventer
AHD	Along Hole Depth
API	American Petroleum institute
BARMM	Besluit Algemene Regels Milieu Mijnbow
BGL	Below Ground Level
BHR	Basket Hand Railing
BPC	Ballance Point Control
BPV	Back Pressure Valve
CAST-M	Halliburton Ultrasonic Casing and Cement Evaluation tool
CBL	Cement Bond Log
CCL	Casing Collar Locator
CE	Closed End
CL	Custom Load
DAS	Data Acquisition System
DCB	Dual Completion Bore
DECT	Downhole Electrical Cutting Tool (BH)
DHV	Down Hole Video
EC	Electrical Cutting
EOB	End Of Build
ETRS89	European Terrestrial Reference System 1989
FFRP	Fire Fight & Rescue Plan
FMC	Floating Mud Cap
GL	Ground level
HMR	High Magnesium Resistance
HOP	Hang-off Point
HUD	Hold-up Depth
HWU	Hydraulic Workover Unit
ID	Inner Diameter
KOP	Kick Off Point
L/D	Lay Down
LCC	Last Cemented Casing
LSA	Low Specific Activity
m ODF	meter Old Drill Floor
M/U	Make Up
MBCHH	Meters Below Casing Head Housing
MD	Measured Depth
MFC	Multi Finger Calliper
MgCl2	Magnesium Chloride
MID	Magnetic Imaging Defectoscope (TGT)
mT	Metric Ton
N/U	Nipple Up
NAP	Normaal Amsterdams Peil
N-S	North-South
OD	Outer Diameter
P&ID	Piping and Instrumentation Diagram
P/U	Pick Up
PCE	Pressure Control Equipment
Perf.	Perforated
PJSM	Pre Job Safety Meeting
PLT	Production Logging Tool
POF	Pump Out Force
POOH	Pull Out Of Hole
PPF	Pound Per Foot
PSI	Pounds per Square Inch
PUW	Pick Up Weight
R/D	Rig Down
R/U	Rig Up
RD	Rijks Driehoek
RIH	Run In Hole
RMT	Reservoir Monitoring Tool (Halliburton)
s.g.	Specific Gravity
SIWHP	Shut In Well Head Pressure
SodM	Staatstoezicht op de Mijnen
SOOH	Snub Out Of Hole
SOW	Slack Off Weight
SST	Sandstone
SSV	Supervisor
SWOP	Snub Well On Paper
TBG	Tubing
THH	Tubing Head Housing
TIW	Texas iron Works (stab in safety valve)
TOC	Top Of Cement
TR-5	Tripscompagnie-5
TVD	True Vertical Depth
TWCV	Two Way Check Valve
VAM	Vallourec Mannesman
VE-4	Veendam-4
WE	Well Examiner
W-E	West - East
WECT	Westerton Electric Cutting Tool (Halliburton)
WEG	Wireline Entry Guide
WEP	Well Engineering Partners
WHC	Well Head Centre
WHP	Well Head Pressure
WOC	Wait On Cement
WRBP	Wireline Retievable Bridge Plug
WT	Wall Thickness
ZEZ	Zechstein Member

1. Revision Change Notice

Version	*Date*	*Brief description of Change*	*Author*	*Checked*
0.2	15-11-2019	Initial Draft for Review		
1.0	20-11-2019	Updated document based on internal review comments. Document supplied to client and well examiner for review		
2.0	11-12-2019	Updated document following SWOP session and well examiner comments with attachments from suppliers included. Attachment P&ID not received from supplier		

2. Authorized Signatures

Title	Name	Date	Signature
NEDMAG Project Manager			
WEP Project Manager			
WEP Operations Manager			

3. Summary

3.1. Abstract

The TR-5 well was drilled in 1982. In September 2019, a pressure drop in the well has been reported, suggesting a leak in the 10 ¾" casing. Following the decrease in pressure, several tests and investigations have been performed in order to evaluate the casing and the tubing condition. The findings of these are summarized in sections 4.1.1 and 4.1.2

The objective of this workover is to remove the existing completion from the well and determine the depth of the probable leak point in the 10 ¾" casing. Once the leak point is determined, the well will first be isolated from the TR cavern cluster by installing a deep cement plug opposite the sealing Zechstein formation. Remediation of the probable casing leak will be carried out by placing a second cement plug across the leak (if required). In the event that the casing leak is found to be deep, the deep cement plug will be extended to cover the leak interval.

See Figure 1 below for a schematic overview of before and after the workover.

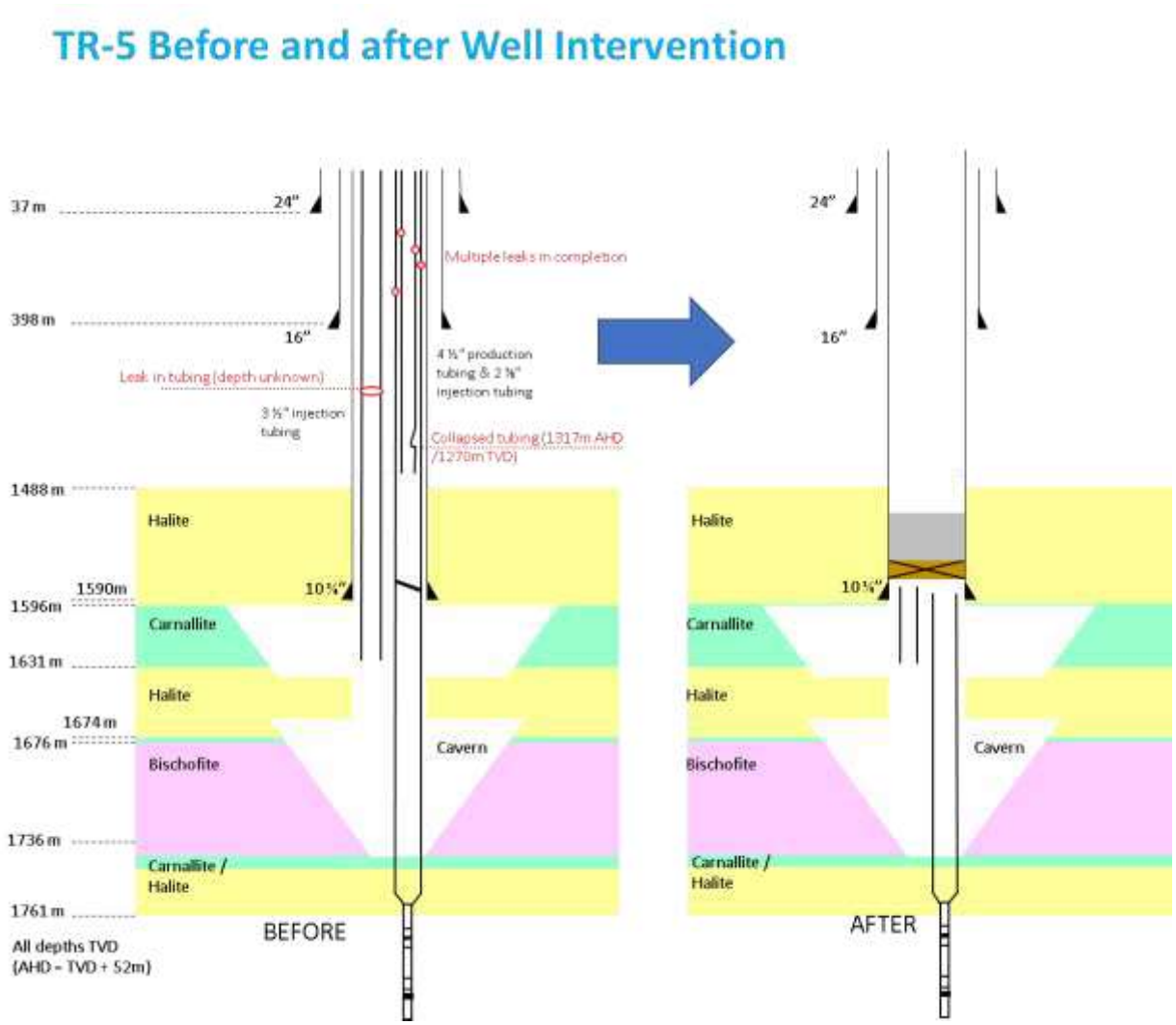


Figure 1. TR-5 before and after the workover

3.2. TR-5 well data

Well name	TCI-5 (TR-5)
Well location	WHC-2, Veendam
Municipality	Veendam
Operator	Nedmag Industries Mining & Manufacturing B.V.
Surface coordinates	RD: X 251.939,74; Y 571.424,57 ETRS89: X: 6°50'6.912"; Y: 53°7'14.980"
Bottomhole coordinates	RD: X 252.159,32; Y 571.185,27 ETRS89: X: 6°50'18.457"; Y: 53°7'7.101"
Type of well	Brine injection / production well
Originally drilled with	KCA Deutag T-36A, October-December 1982
Depth Reference for this report	Depth measured from ground level (GL = +1.90m NAP) along hole, unless otherwise specified
Max deviation	KOP @ ~425m EOB @ ~700m max 22.0 degrees
Completion	2 ⅞" dilution string 4 ½" production string 3 ½" injection string Section 8.1.1 for current completion drawing.
Start of operation	December 2019
HWU Contractor	BPC
Duration of operations	68 days (incl. R/U & R/D) – 12 hours operational
Expected well head pressures during operations	
2 ⅞" dilution string 4 ½" production string 10 ¾" last cemented casing	Surface pressures in2 ⅞" dilution, 4 ½" production string and 10 ¾" LCC are identical due the communication in presence of multiple leaks within the production & dilution string. 0 bar when well is killed
3 ½" injection string	100 bar, filled with water
Expected bottom hole cavern pressure	± 252 bar @ 10 ¾" shoe (1642 m MD / 1590 m TVD)
Max down hole temp	72°C at ca. 1600m BGL
Open flow potential	Estimated at approximately 15 m3/bar decrease in pressure, with a maximum potential of ca. 2000 m³ in total.
LSA Potential	There are no indications of LSA radioactive materials present in the salts or which might have accumulated in the flow equipment. This has been verified by radioactive measurements performed on the recovered tubing from the TR-7 and TR-8 well in 2001.
Project Organization	Refer to "NEDMAG TR-5 Project-Specific Safety & Health Document", 2019

4. Introduction

Based on the pressure responses over the course of the last few months, a leak in the 10 ¾" casing is suspected in TR-5 well. The objective of the workover operations is to remove the existing completion from the well, evaluate the 10 ¾" casing condition, set a reservoir level abandonment plug and remediate the casing damage by setting cement plugs across the leak. The completion is in poor condition, and will have to be removed in part under killed conditions to avoid pressure control problems.

The purpose of this document is to detail the technical operational steps of the well intervention operation on TR-5 to remove the completion and evaluate the casing with the use of a snubbing unit.

This document is to be combined with the ***"NEDMAG TR-5 Project-Specific Safety & Health Document", "Concurrent Operations Document TR-5", "FFRP Nedmag TR-5" and "Barmm melding well interventie Nedmag Veendam TR-5 (TCI-05)."***

4.1. History TR-5

The last workover operation performed on TR-5 was in 1995 where the leaking dilution string was replaced. Within five years (by 2000), a failure was reported in the replaced dilution string. Production and injection operations from the well were stopped in June 2000, after the tailpipe on the injection side was removed. The X-mas tree on the well was replaced in 1999, and serviced in 2001. Since 2000, no operations have been performed in the well except the biannual slickline runs on both injection and production side.

4.1.1. Pressure drop in well

Starting on September 26th 2019, a pressure drop was observed on TR-5. As there were no visible leaks at surface, 10 ¾" casing damage was suspected. Since then, several tests have been performed on the well to determine leak depth. An overview of the pressure between September 26th and November 28th is displayed in Figure 2. The pressure behaviour can be separated in several different phases.

1) **Phase 1:** Continuous drop in WHP between 26 September and 10 October. The pressure drop rate decreases slightly after ca. 1 week of steady drop. It is suspected that the pressure drop is at least partially caused by a leak at surface level.
2) **Phase 2:** Based on discussions regarding the well status, decision was made to bleed off pressure from the well to stimulate the brine-water interface towards the leak depth. A rapid decrease in pressure is followed by a continuous increase in pressure for 5 days. It was found out that the increase in pressure is caused by a leaking flange at the manifold.
3) **Phase 3:** Steady wellhead pressure observed between 15 October and 21 October after the leaking flanged has been fixed.
4) **Phase 4:** Erratic pressure readings as a result from ongoing wireline investigations on the well (22 – 25 October)
5) **Phase 5:** Rapid decrease in WHP observed after the well is displaced back to fresh water. Ca. 4.5 bar drop observed within 72 hours before pressure stabilizes (25 – 30 October).

6) **Phase 6:** The well is displaced back to fresh water to repeat leak test. Stable pressures observed in the well for 10 days (30 October – 9 November)
7) **Phase 7:** Rapid decrease in WHP observed before pressure stabilizes. Ca. 4.5 bar drop observed within 72 hours before stabilization (9 – 13 November)
8) **Phase 8:** Ca. 1.9 bar pressure drop observed in 72 hours before stabilization. The well was completely isolated from manifold on 19 November (15 – 26 November). Stable pressures observed after isolation.
9) **Phase 9:** Well displaced back to water on 26 November. WHP stable and responding to the pressure changes in the cavern cluster.

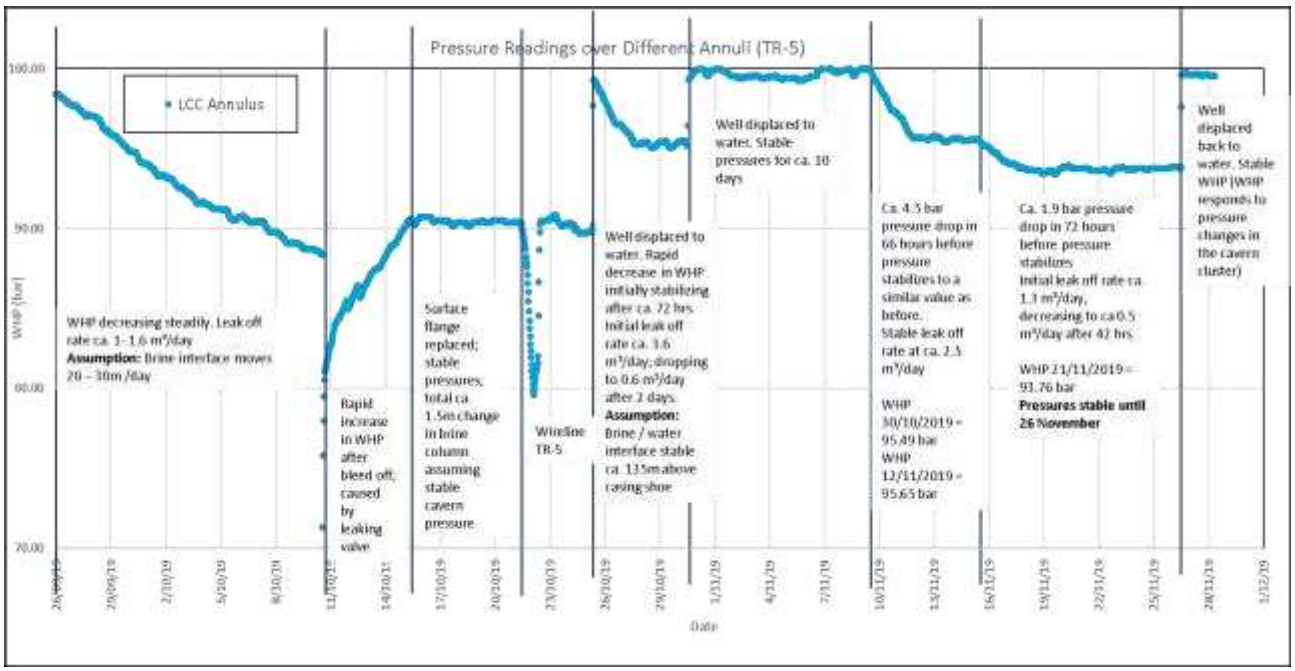


Figure 2. Overview of TR-5 WHP between 26/09/2019 and 28/11/2019

4.1.2. Wireline Investigations

In order to investigate the well condition, extensive wireline investigations were carried out in Week 40 and Week 43 of 2019. The following investigations were carried out:

- Multi-finger caliper (MFC) measurements in 3 ½" & 2 ⅞" string
- Pressure measurements in 3 ½" string to check brine – water interface → A brine / water interface corresponding to the expected depth based on pressure response was detected. However, the measurements are not representative for the well condition as the brine front was not stable.
- Camera survey in 3 ½" & 2 ⅞" strings
- Magnetic wall thickness (MID) measurements in 3 ½" & 2 ⅞" strings
- Magnetic wall thickness measurement of 4 ½" tubing through 2 ⅞" string
- Magnetic wall thickness measurement of 10 ¾" casing through 3 ½" string

The results of the investigations are summarized in the sections below. An overview of the well status following the investigations is displayed in section 8.1.1

4.1.2.1. 3 ½" Injection String

- Tubing bent at HUD at 1622m
  - Indications of damaged / buckled pipe below 1610m
- Maximum 11% circumferential metal loss measured with MID & MFC measurements
- Scattered pitting observed on tubing
  - Up to 57% wall penetration determined with MFC
- No leak depth could be determined from the measurements
- Ovality observed at various parts of the tubing
  - Connection at ca. 254m
  - 278m (mid-joint)
  - 1541m (mid-joint)
- Suspected scale deposition between 750 and 1200 meters
  - No ID values below pipe drift (2.797") has been measured

4.1.2.2. 2 ⅞" dilution string

- Multiple holes observed with the camera run on the tubing
- Tubing collapsed at HUD (1317 m); the outer wall of the tubing has folded inward, created the HUD (Figure 3).
- Multiple holes confirmed with MFC (100% wall penetration) at 250m, 353m, 396m, 637m and 992m
- Maximum 60% circumferential metal loss measured with MID & MFC measurements
  - 93 joints with significant (+20%) corrosion
- Increasing circumferential corrosion in pipe with increasing depth

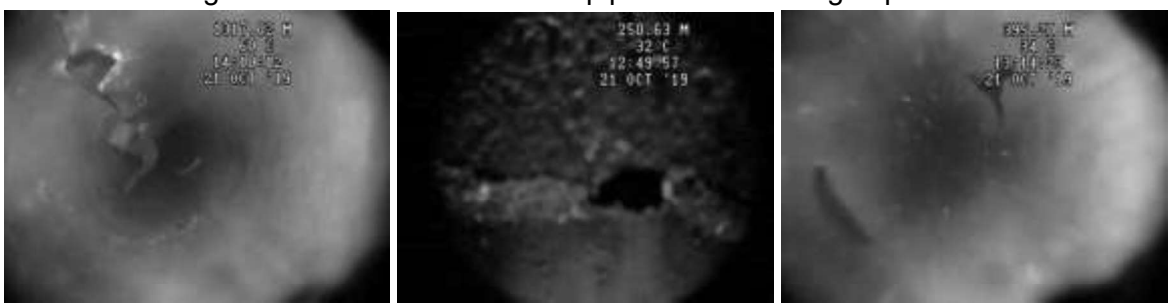


Figure 3. Observations from downhole camera run in 2 ⅞" tubing. Collapsed tubing at HUD (left), Hole in tubing at ca. 250m (middle), 2 holes across each other at ca. 395m (right)

4.1.2.3. 4 ½" production string

- 4 joints with significant (+20%) corrosion has been detected
- Several suspected holes have been identified across the tubing
  - Ca. 740m, 1006m, 1155m
- Increased corrosion measured across depth where holes / significant damage in 2 ⅞" tubing has been observed
- The condition of top 450m better (less corrosion measured)
  - Local corrosion observed between 10 – 40 meters (ca. 15% metal loss)
- Multiple leaks in tubing suspected. A leak as shallow as ca. 22m has been confirmed with diesel injection in 2000.

4.1.2.4. 10 ¾" last cemented casing

- No casing shoe has been identified during measurements which confirms that the casing is not broken above the HUD in 3 ½" tubing
- Maximum metal loss measured is 17%
- 30 joints identified with moderate (+13%) corrosion
- Potential casing damage at ca. 434m
    - While damage may be present, a leak at this depth is highly unlikely as the formation fracture gradient (1.50 s.g. or lower) at this point is lower than the equivalent pressure gradient of the cavern (1.68 s.g.)

4.2. Hydrogeology

In order to confirm there is no risk of groundwater contamination, the hydrogeology in the vicinity of the well has been studied. As a result, no groundwater contamination is foreseen during workover operations.

Two sections (W-E & N-S) around the vicinity of the well have been studied based on the groundwater layer information provided by DINOloket (Figure 4). Based on the REGIS II underground model, information regarding the shallow water bearing layers are available until a depth of 240 meters. From these profiles, it is observed that the clay bearing Breda formations serves as the sealing layer that separates the groundwater bearing layers from deeper formations. According to the data from DINOloket, the top of Breda formation is found to be at ca. 160 meters below ground level (Figure 5).

The indication that the Breda formation serves as the sealing layer for groundwater bearing formation is further supported by the Vertical Electrical Sounding data in the vicinity of the well. Based on the measurements carried out in 1975, the transition from sweet water to salt water has been calculated at 165 meters. This correlates with the top of the Breda formation.

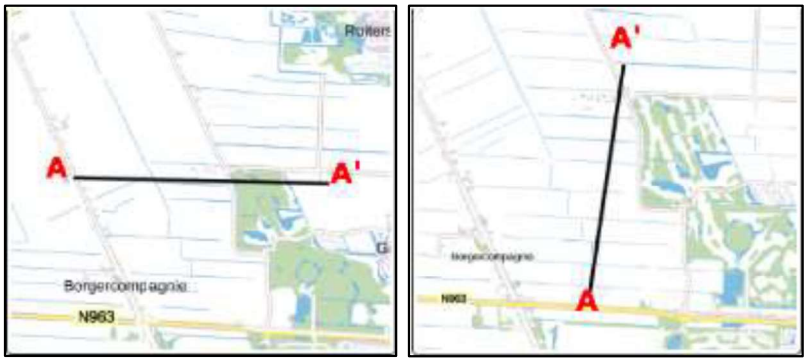


Figure 4. W-E (left) and N-S (right) sections investigated for hydrogeology

Based on the information gathered from DINOloket, all identified aquifers are behind the 16" casing, and are bound by a sealing layer of clay at the bottom.

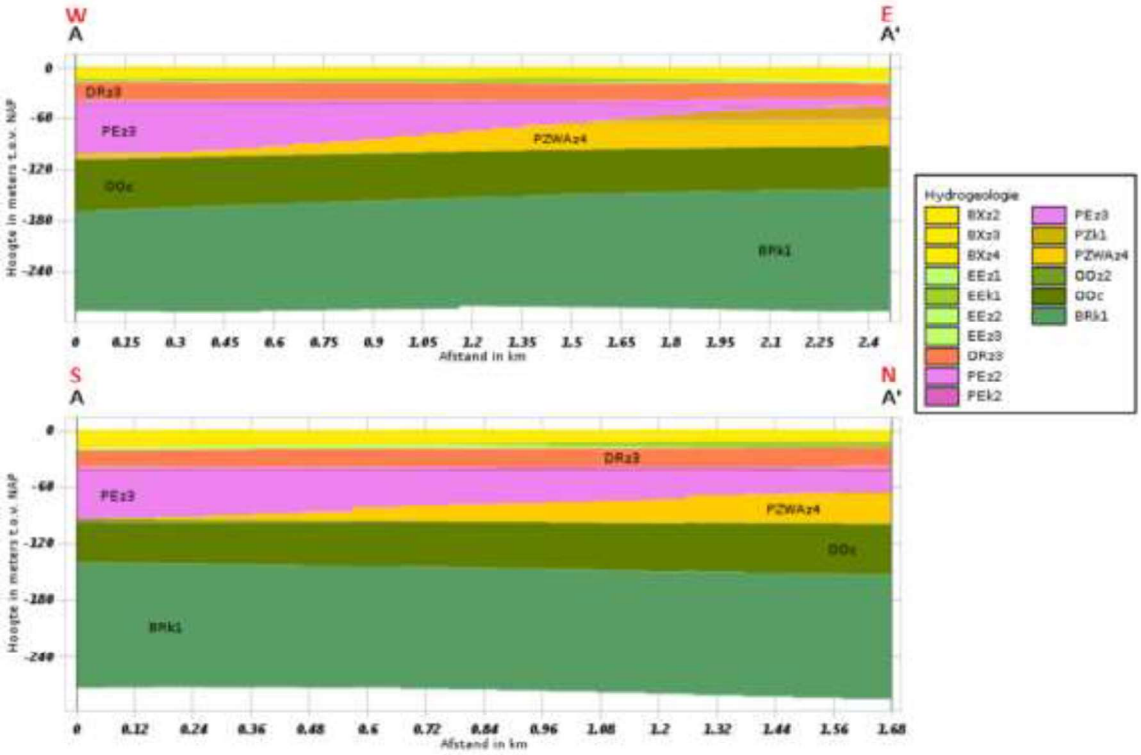


Figure 5. Underground aquifer and sealing layer information in TR-5 well vicinity

4.3. Scope of Work

The Scope of Work of the operations is to:

1) 6.0 Pre-Workover Wireline Operations
2) 6.1 Remove X-mas tree and rig up HWU
3) 6.2 POOH 2-7/8" dilution string
4) 6.3 Investigate & Cut 4 ½" string
5) 6.4 Lift 11" Blind Ram & Remove intermediate spool
6) 6.5 SOOH 3-1/2" injection string
7) 6.6 Lift BOP & reorient offset spool
8) 6.7 POOH 4 ½" production string
9) 6.8 Lift Unit and remove offset spool
10) 6.9 Investigate 10 ¾" casing
11) 6.10 Plug 10 ¾" Casing
12) 6.11 Set primary cement plug
13) 6.12 Remediate Damage in 10 ¾" Casing
14) 6.13 Install 7" Suspension String
15) 6.14 Rig down HWU unit & install X-mas tree

4.3.1. Workover phases overview

See figure below for an overview of the workover phases.

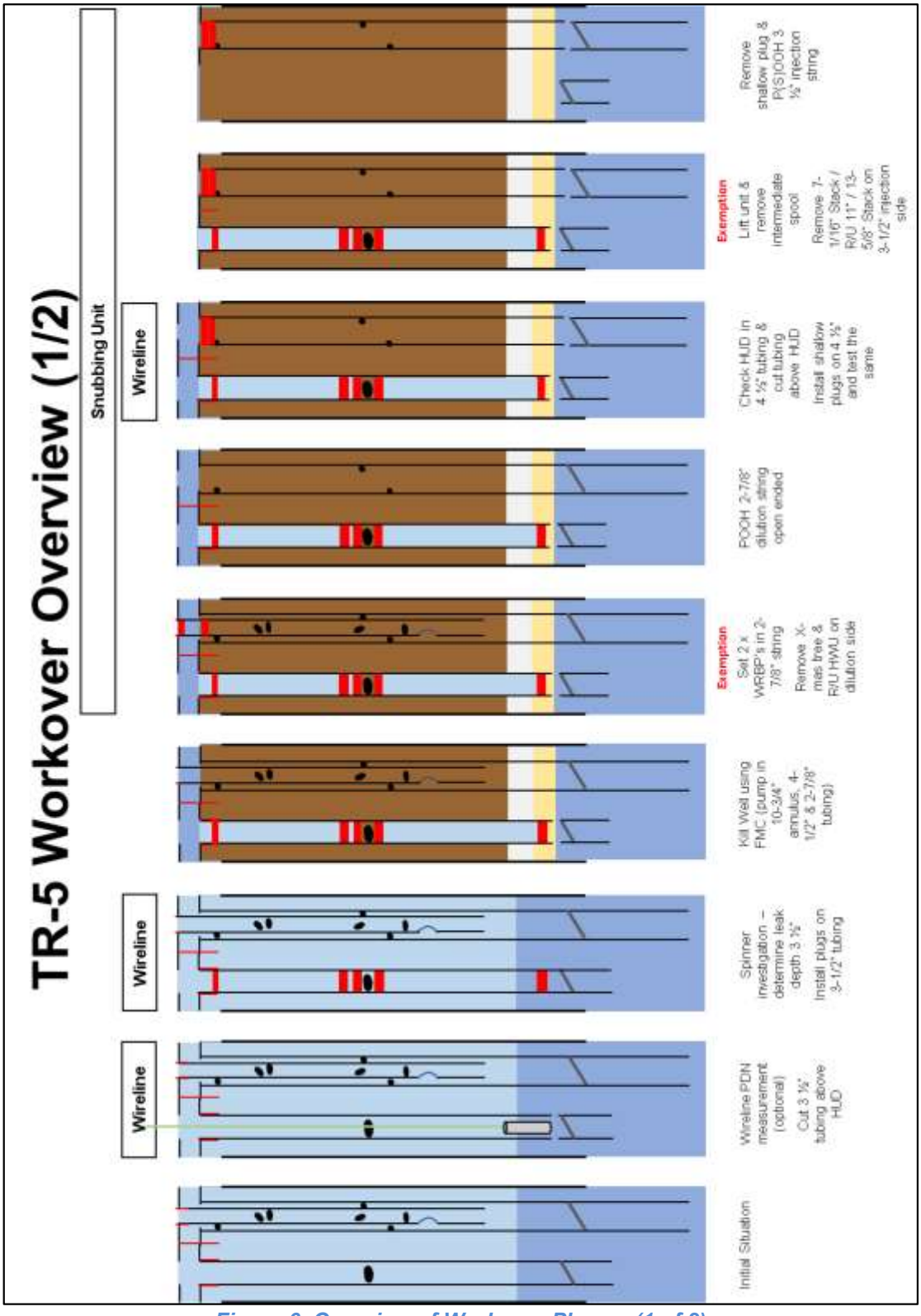


Figure 6. Overview of Workover Phases (1 of 2)

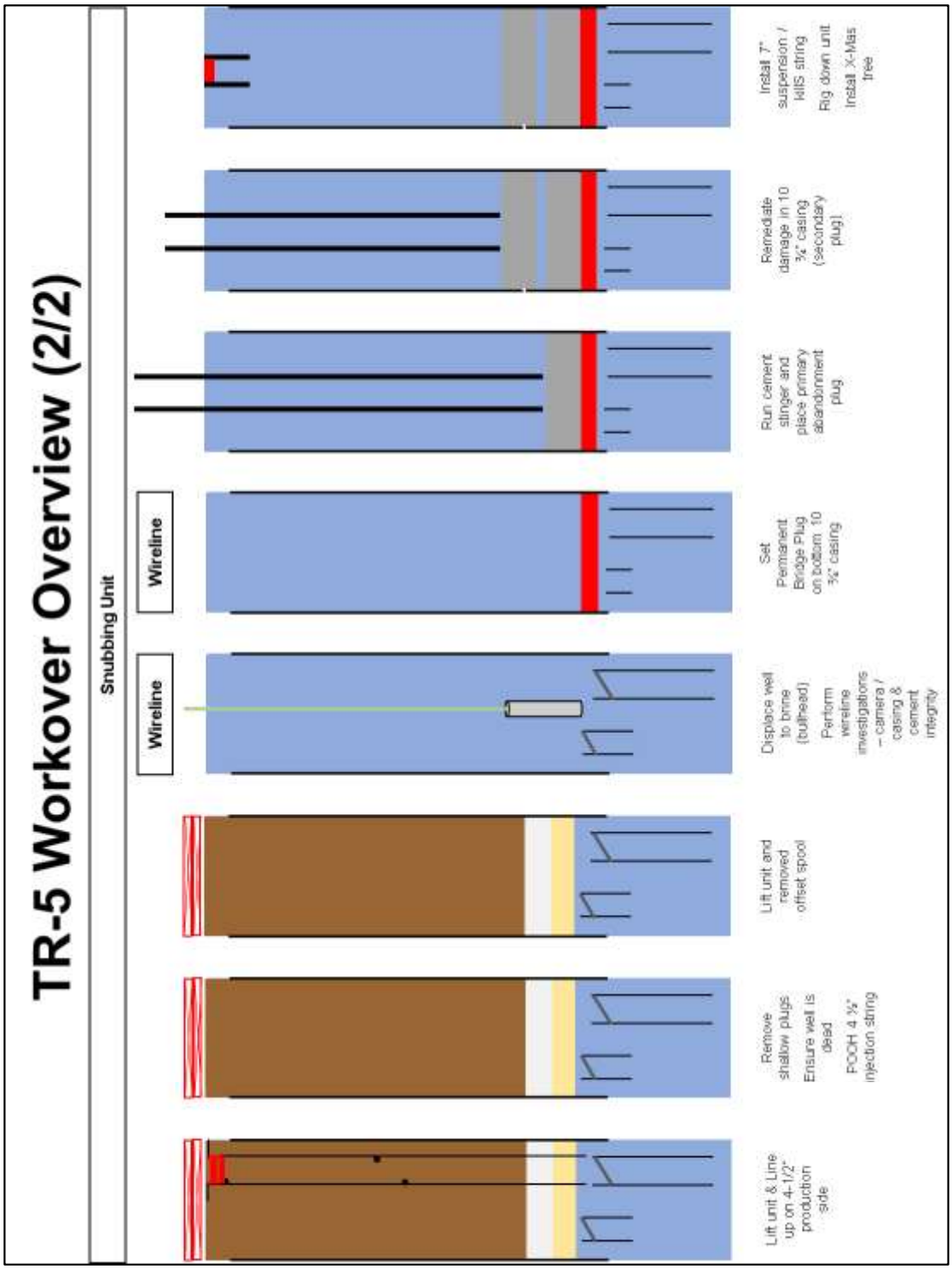


Figure 7. Overview of Workover Phases (2 of 2)

4.4. Location

The TR-5 well is located at WHC-2. Several of the surrounding wells will be in production, so care has to be taken not to interfere with concurring operations. Barriers and well shelters will be installed on the surrounding wells (TR-3, TR-4, TR-6, TR-7 and TR-8). A concurrent operation document is available on the site.

4.5. Management of Change

Operational changes to the program may be needed as a result of conditions experienced while executing the work. Changes to the program may be initiated by NEDMAG, WEP project manager, HWU contractor operations manager or well site representatives.

The changes will need to be assessed by the initiator for the 'escalation level' as listed below in minor, medium or major.

Minor changes:
These changes shall have no environmental, safety or regulatory compliance impact on the operation or material impact to the program.

Minor changes are handled at the well site between the representatives of NEDMAG and HWU Contractor. These changes will be reported in the daily reports.

Medium changes
These changes have limited environmental, safety or regulatory compliance impact on the operation or material impact to the program. Additional measures are taken and/or work performed to ensure and show that the risk is limited.

These require approval of WEP project manager, NEDMAG Mine Manager and Well Examiner. A record of the risk assessment is put together for the relevant parties. NEDMAG and HWU Contractor will be notified of medium changes by email.

Medium changes with an impact on regulatory compliance will be reported to SodM.

Major changes:
These represent a major deviation from the program that has the potential to impact the objectives of the well and/or significantly alter the risk profile for the environment, health, safety or affect regulatory compliance.

These require approval of Project manager of WEP, NEDMAG Mine Manager and Well Examiner.

An amendment to the program will be sent to NEDMAG, WE, HWU Contractor and SodM.

5. Well Control procedures

5.1. Well Barriers

The following barriers will be in place during well intervention operations:

Table 1. Summary of well barriers

Section	Barriers		Internal Barriers		External Barriers	
	Activity	Side / String				
6.0	Pre-workover Wireline Operations	N/A	1	Flow tube	1	N/A
			2	Wireline BOP	2	N/A
			3	Swab valve	3	N/A
6.1	Remove X-mas tree and rig up HWU	Injection String (East)	1	WRBP #2 set in 3 ½"	1	3 ½" tubing hanger seals
			2	WRBP #3 set in 3 ½"	2	FMC
			3	WRBP #4 set in 3 ½"	3	Exemption
		Dilution String (West)	1	FMC	1	2 ⅞" tubing hanger seals
			2	Bridge plug #1 set in 2 ⅞"	2	FMC
			3	Bridge plug #2 set in 2 ⅞"	3	Exemption
6.2	POOH 2 ⅞" dilution string	N/A	1	FMC	1	FMC
			2	Kelly valve / stab-in safety valve	2	Kelly valve / stab-in safety valve
			3	Blind/shear ram	3	Blind/shear ram
6.3	Investigate & Cut 4 ½" production string	N/A	1	Flow tube	1	Stripping rams
			2	Wireline BOP	2	Blind / shear ram
			3	Blind/shear ram	3	Annular BOP
6.4	Lift 11" Blind Ram + remove intermediate spool	Injection String (East)	1	WRBP #2 set in 3 ½"	1	3 ½" tubing hanger seals
			2	WRBP #3 set in 3 ½"	2	FMC
			3	WRBP #4 set in 3 ½"	3	Exemption
		Production String (West)	1	WRBP #1 set in 4 ½"	1	4 ½" tubing hanger seals
			2	WRBP #2 set in 4 ½"	2	FMC
			3	FMC	3	Exemption
6.5	SOOH 3 ½" Injection string	N/A	1	Plug #1 set in 3 ½"	1	Stripping rams
			2	Plug #2 set in 3 ½"	2	Pipe rams
			3	Kelly valve / stab-in safety valve	3	Blind / shear ram
			4	Blind / shear ram	4	N/A
6.6	Lift BOP & align above 4 ½" production string	N/A	1	FMC	1	FMC
			2	Lower 11" Blind ram	2	Lower 11" Blind ram
			3	Upper 11" Blind ram	3	Upper 11" Blind ram
6.7	POOH 4 ½" string	N/A	1	FMC	1	FMC
			2	Kelly valve / stab-in safety valve	2	Kelly valve / stab-in safety valve
			3	Blind/shear ram	3	Blind/shear ram
6.8	Lift Unit and remove offset spool	N/A	1	FMC	1	FMC
			2	Lower 11" Blind ram	2	Lower 11" Blind ram
			3	Upper 11" Blind ram	3	Upper 11" Blind ram
6.9	Investigate 10-3/4" Casing	N/A	1	Flow tube	1	Stripping rams
			2	Wireline BOP	2	Blind / shear ram
			3	Blind/shear ram	3	Annular BOP
6.10	Plug 10-3/4" Casing	N/A	1	Flow tube	1	Stripping rams
			2	Wireline BOP	2	Blind / shear ram
			3	Blind/shear ram	3	Annular BOP
6.11	Set primary cement plug	N/A	1	10-3/4" Mechanical plug	1	Stripping rams
			2	Dart valve #1	2	Pipe rams
			3	Kelly valve/stab-in safety valve	3	Blind/shear ram
			4	Blind/shear ram	4	N/A
6.12	Remediate Damage in 10-3/4" Casing	N/A	1	10-3/4" Mechanical plug	1	Stripping rams
			2	Cement plug	2	Pipe rams
			3	Kelly valve/stab-in safety valve	3	Blind/shear ram
6.13	Install 7" suspension string	N/A	1	10-3/4" Mechanical plug	1	10-3/4" Mechanical plug
			2	Cement plug	2	Cement plug
			3	Kelly valve/stab-in safety valve	3	Stripping rams
6.14	Rig down HWU unit & install X-mas tree	N/A	1	10-3/4" Mechanical plug	1	10-3/4" Mechanical plug
			2	Cement plug	2	Cement plug
			3	BPV in tubing hanger	3	Hanger seals

An exemption according to Dutch Mining Regulations article 8.3.4.1.4 will be requested for activities related to X-mas tree removal and installation and unit lifting operations.

5.2. Well control equipment and testing

- As TR-5 is hydraulically connected to the TR field, the maximum surface pressure encountered is ca. 100 bar when the casing / tubing is completely filled with fresh water.
- Apart from blanket diesel which was used in the past, no hydrocarbons are present in the cavern field to which TR-5 is connected. However, this diesel will not be encountered during the workover operations.
- Conventional "drilling well control procedures" are not applicable. A floating mud cap will be placed in the well for killing operations (See section 5.5 on Floating mud cap).
- No fresh formations will be drilled.
- A 3" choke setup will be installed for reverse circulating and fluid displacement
- The 11" 5K Blind / Shear BOP is fitted with large bore bonnets – tandem boosters and Dual-string shearing blades. The 7 $^{1}/_{16}$" 5K blind / shear BOP rams are intended only to be used to handle 2 ⅞" tubing. There are no shearing limitations for either BOP stack (See section 8.3.2 for BOP details).

Rationale and Mitigation Measures;
For the various workstrings the following rationale and mitigations will be implemented.

1. A Pre-Job safety meeting will be held
2. Snubbing rams & pipe rams are in place (2 external barriers)
3. A stab-in full opening ball valve (TIW / Kelly Valve) with the proper X-overs will be present in the work basket.

5.3. BOP Testing Requirements

The BOP testing program is within the limits specified in article 8.3.2 of the mining regulations and is summarized as follows:

- **Pressure tests** on the BOP, wellhead, choke manifold, kill and choke lines and all inside-pipe shut-off devices are to be performed for a minimum of 10 mins;
  - At/prior the first installation 344 bar (Annular preventer to 242 bar)
    - BOP to be tested using the TWCV.
  - Every 3 weeks after installation 50% maximum SIWHP
  - Every 6 weeks after installation 100% maximum SIWHP
  - Every 13 weeks of continuous operations 345 bar (Annular preventer to 242 bar)

- **Weekly function tests** to be performed and recorded per Dutch Mining Regulations 8.3.2:
  - All BOP rams shall be tested weekly with respect to their mechanical operation
  - The presence of sufficient operating liquid shall be tested once a week under the operating pressure for BOP rams in use
- **Repairs:** Directly after repair work has been performed or modifications have been made, the referred modified or repaired parts and the parts directly connected thereto will be function and pressure tested as per the above requirements.

5.4. Uncontrolled Flow

The overall well control strategy is based on avoiding uncontrolled flow from the well at all times. In the unlikely event of fluids escaping from the well (through BOP's or by leakage), the fluids will be collected in the corner basin of the location and transported via a pump to a storage tank. This is the standard route for rainwater. As a precaution, the storage tank will have sufficient storage capacity during the operation. If the flow rate is too high the "*NEDMAG M-02 Calamiteitenplan Mining"* and the *"M-12 Blow-out draaiboek WHC1_2"* will be used.

5.5. Floating Mud Cap

Floating mud cap system will be utilized as a barrier during parts of the workover operations to maintain well control. The principle of floating mud cap is to have a column of high-density mud floating on (low density) brine from the salt cavern. The mud acts as a weight bar to balance the cavern pressure and effectively kills the well. This proven technology has been discussed and accepted by SodM.

Under normal circumstances, the heavier kill mud will drop into the cavern and would fail to serve as a barrier. To prevent this, a viscous barrier is placed in between the cavern brine and the kill mud. This viscous barrier is a mixture of $MgCl_2$ brine and pulverized liquid stopper solids. The mud (approx. 1.75 s.g.) will "float" on top of a successfully set liquid stopper layer, and will serve as a barrier. As the liquid stopper (1.25 s.g.) is soluble in high density cavern brine, a high viscosity pill (1.25 s.g.) is required between the cavern and the liquid stopper to protect the integrity of the barrier (Figure 8). The viscous spacer and the liquid stopper layer will be 50 – 100 m TVD thick.

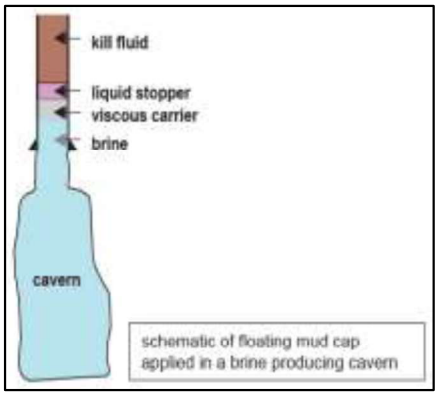


Figure 8: Floating Mud Cap Schematic

Due to the presence of multiple leaks in the completion, it is intended to "sandwich" the kill mud and the liquid stopper in several layers. It is assumed that by following this approach, the entire mud column will not be lost if the bottom viscous carrier layer is displaced out of the well. The application of the floating mud cap in the well is described in detail in the separate "***Floating Mud Cap Program.***"

5.6. First line responsibility for well control

All well control operations shall be carried out in accordance with the snubbing contractor (BPC) procedures. The BPC supervisor shall have the first line responsibility for well control and well intervention operations and must be kept advised of any well control or intervention problems if they occur. The DSV will co-operate with the NEDMAG Company Representative (SSV) at all times. Refer to ***"NEDMAG TR-5 Project-Specific Safety & Health Document"*** for more details.

6. Work program

Note 1: Below the base plan is described; all foreseen contingencies can be found in chapter 7 and 8.11

6.0. Pre-Workover Wireline Operations

1) Rig-up Wireline (E-line) unit and PCE on X-mast tree on 3 ½" injection side
   a. Hold a PJSM prior to R/U, discuss roles and responsibilities.
   b. 4 $^{1}/_{16}$ " 10K connection
   c. Pressure test PCE to 100 bar / 10 minutes against upper master valve.
2) Prepare 2 ¾" dummy cutting toolstring
3) Pick up & RIH dummy cutting toolstring to HUD and confirm HUD depth
   a. Equalize pressure across valve before opening
   b. Expected HUD depth ca. 1622m
4) Prepare neutron density logging toolstring
5) Perform neutron density log to determine the brine – water interface
   a. A stable brine – water interface will indicate the leak depth in the 10 ¾" casing as the heavier brine column will not rise above the leak in the casing
6) Prepare 2 ¾" Downhole Electric Cutting (EC) Toolstring
7) Pick up & RIH EC toolstring to HUD, and cut 3 ½" string as deep as possible
   a. Planned cut depth = 1620m; above connection at 1620.8m
   b. After cut, confirm with CCL if the cut part has dropped
8) Pick up 3 ½" permanent bridge plug and install the same at 1616m
   a. Ca. 4 meters above tubing end
   b. Slack off cable to confirm plug is set
9) Prepare spinner toolstring (inline and fullbore spinner)
10) Perform spinner run in 3 ½" string to confirm leak depth
    a. Inject water in 3 ½" tubing at 5 m³/hr to determine leak depth
    b. Run spinner to plug depth to confirm number of leaks in the string
        i. Suspected leak depths
            a. Collar at 255m
            b. Collar at 1163m
            c. Ca. 1467m (mid-joint)
    c. POOH to surface, close-in well.
11) Rig-down wireline unit and PCE and demobilize the same.
12) Rig-up wireline (E-line) unit and PCE on X-mas tree on 3 ½" injection side
    a. Wellhead is 4 $^{1}/_{16}$ " 10K connection
    b. Pressure test PCE to 100 bar / 10 minutes against upper master valve
    c. Equalize pressure over valve before opening
13) Set WRBP #1& junk basket at first full joint below leak
    a. Place WRBP minimum 2 meters below connection
    b. Beware temperature build-up in trapped volume
        i. Ensure temperature is stable before setting plug
14) Set WRBP #2 & junk basket ca. 2-3 m above the leak
    a. Place plug on the same joint as the leak (preferably)
    b. Inflow test string above WRBP #2.

i. Bleed-off WHP in 25 bar steps to 0 bar and monitor for 20 minutes

15) Set WRBP #3 & junk basket at ca. 3m above WRBP #2
   a. Plug to be placed at the same joint as WRBP #2
   b. Pressure test plug from above to 100 bar / 20 minutes
      i. Record volumes
16) Set WRBP #4 at first full joint below hanger
   a. Pressure test from above to 100 bar / 20 minutes
   b. Beware temperature build-up in trapped volume
      i. Ensure temperature is stable before setting plug
17) Rig down wireline and PCE.

6.1. Remove X-mas tree and rig up HWU

18) Displace well to 1.30 s.g. plant brine.
   a. Bullhead 1.30 s.g. plant brine in 10 ¾" annulus.
      i. 65 m³ fresh water will dissolve approximately 10 m³ of salt
   b. Confirm pressure in the well is stable
19) Arrive on location & spot equipment
   a. Hold a PJSM with all involved.
   b. Discuss lifting plan, communications and responsibilities.
   c. Assign a banksman and distribute work instructions.
20) Prepare lower BOP section with 11" blind rams, connected to the Koomey unit.
   a. Double 11" blind ram (See section 8.3**Error! Reference source not found.** for configuration)
   b. All BOP's to be function and pressure tested to 345 bar/10 minutes by the supplier prior to mobilization.
21) Perform well killing FMC operations as per separate well killing program
   a. Simultaneously pump into the 2 ⅞", 4 ½" & 10 ¾" outlets
   b. Set pop-off limits on pump
   c. Monitor and record pressures vs. volumes pumped
   d. Monitor well and confirm well is dead.
22) R/U Wireline unit & PCE on X-mas tree on 2 ⅞" Production (West) side
   a. Wellhead is 4 $^{1}/_{16}$ " 10K connection
23) Pick up 2 ⅞" WRBP #1 and set the same on the first full joint below hanger
   a. Pressure test plug from above to 100 bar / 10 min
24) Pick up 2 ⅞" WRBP #2 and set the same ca. 3m above WRBP #1.
   a. Pressure test plug from above to 100 bar / 10 min
25) R/D Wireline unit & PCE.
26) Lift X-Mas tree
   a. Check and bleed off pressure from the tree before removing the X-Mas tree
   b. Keep exposure time to a minimum
27) Rig up lower BOP section on top of the 11" 5K intermediate spool (Section 8.3.2.1)
28) Pressure test BOP connection to wellhead to 25 bar / 5 minutes; 344 bar / 10 minutes
   a. Against WRBP #4 on 3 ½" tubing and WRBP #2 on 2 ⅞" tubing
29) Close blind rams and pressure test the same from below to 25 bar / 5 minutes; 344 bar / 10 minutes
   a. Against WRBP #4 on 3 ½" tubing and WRBP #2 on 2 ⅞" tubing

30) Rig up remaining BOP sections (Section 8.3.2.1).
    a. Pre-assemble BOP stack to reduce rig-up time
    b. N/U offset spool above 11" Blind ram
31) Rig up snubbing unit and auxiliaries.
32) Rig up pump lines (pump lines, pumps, mix tanks)
    a. See attachment 8.5 for the P&ID
    b. Build Scaffolding platforms as required.
33) Function test unit
34) Commission unit as per BPC & WEP commissioning lists.
    a. Pressure test BOP's as per section 5.3 requirements
    b. The unit will be inspected (earthing) by NEDMAG electrician.
    c. Hook up DAS system in NEDMAG SV office

6.2. POOH 2-7/8" dilution string

35) Confirm well is dead
    a. If there is pressure on the wellhead, re-kill well only after removing the WRBP barriers from 2 ⅞" string.
36) P/U 2 ⅞" landing string and install the same on 2 ⅞" tubing hanger
    a. Space out landing string for slickline unit
    b. If hanger threads are worn, use landing string as shooting nipple
37) R/U Slickline unit and PCE on2 ⅞" landing string
    a. Pressure test PCE against WL valve to 50bar/10min
38) Retrieve 2 ⅞" WRBP #2 with slickline
39) Retrieve 2 ⅞" WRBP #1 with slickline
    a. Confirm if there is pressure below plug
40) Perform pull test to 20 mT with 2 ⅞" landing string
    a. Including jack weight
41) Release tie-down bolts
    a. Measure and record bolt lengths when in and out.
42) Pull 2 ⅞" tubing hanger in workbasket, remove & L/D the same.
43) POOH 1483m 2 ⅞" dilution string
    a. Snubbers dressed with 2 ⅞" Slips
    b. Record up/down weights (estimated string weight is 12 mT).
    c. The estimated pick up weight to unseat the hanger is estimated at ca. 17mT (see section 8.12)
    d. Based on worst case scenario from the wireline measurements, the margin of overpull is limited to ca. 7 mT.
        i. Maximum circumferential metal loss measured with wireline = 59.8%
        ii. Axial limit with ca. 60% metal loss is calculated as 19 mT.
    e. Scale build-up may be present inside and outside of the tubing
        i. Use mud bucket and drainage system to keep basket floor clear off scale and to minimize spray of fluids to the surrounding area
    f. Have HP cleaner ready in the unit for regular slip cleaning
    g. Compensate for metal displacement with mud to maintain a dead well.
        i. Pump 300 liters mud in 4 ½" tubing for every 250 meters pulled.

6.3. Investigate & Cut 4 ½" string

44) Prepare unit for 5" pipe
   a. Pressure test strippers to 100 bar / 10 minutes.
45) Install 5" shooting nipple and 4 $^{1}/_{16}$" wireline gate valve (see section 8.9).
   a. Place shooting nipple above minimum 2 blind rams.
46) R/U Wireline (Combi unit) and PCE on shooting nipple and wireline gate valve.
   a. Pressure test wireline PCE to 100 bar / 10 minutes against wireline gate valve.
47) Perform a slick line gauge cutter (96 mm) check run to establish the HUD.
   a. Last known HUD in the 4 ½" tubing is 1649m (16-02-1995)
   b. Scale suspected on the inside of 4 ½" tubing
48) Re-configure PCE to run E-line and prepare 2.75" Downhole Electric Cutting (EC) Toolstring (See 8.10.6)
49) R/U wireline & PCE on wireline gate valve
50) P-test PCE to 100 bar / 10 minutes against wireline gate valve
51) Cut 4 ½" tubing at first joint above HUD
   a. Ensure sufficient space between connection above and cut for plug setting.
   b. After cut, confirm with CCL if the cut part has dropped
52) Confirm well is dead and re-kill if required.
53) Install WRBP #1 in first joint under the hanger
   a. At ca. 7m BGL
   b. Pressure test from above with 100 bar to verify correct setting
54) Install WRBP #2 above WRBP #1.
   a. At ca. 4m BGL
   b. Pressure test from above with 100 bar to verify correct setting
55) R/D wireline and PCE.
   a. Remove shooting nipple and L/D the same

6.4. Lift 11" Blind Ram & Remove intermediate spool

56) Prepare unit for lifting
57) Lift HWU w/ BOP's
   a. Hold a PJSM with all involved
   b. Have work permit in place for heavy lifting operations
   c. Break connection between 11" 5K blind ram and 11" 5K Intermediate spool
   d. Splitters and auxiliary equipment to be supplied by snubbing contractor to assist the lift
   e. Discuss lifting plan, communications and responsibilities
58) Remove 11" x11" 5K intermediate spool
      i. Inspect landing threads on 4 ½" & 3 ½" tubing hangers
      ii. Limit exposure time as much as possible
59) Install unit with BOP's on 11" 5K DCB spool
60) Pressure test connection between 11" 5K blind ram and 11" 5K DCB spool to 25 bar / 5 min & 100 bar / 10 min
   a. Against shallow set plug on 3 ½" & 4 ½" string
61) R/D Workover unit & 7 $^{1}/_{16}$" BOP Stack (Section 8.3.2.1)
   a. Keep 11" Blind rams closed
   b. Dismantle unit in pieces ready for re-lifting

62) R/U 11" BOP stack on offset spool (Section 8.3.2.2)
63) P/U & install 11" BOP with offset spool on 11" blind ram
    a. Position offset spool to R/U on 3 ½" injection (east) side
64) Install HWU on 11" BOP stack
65) Pressure test connection between 11" blind ram & offset spool to 25 bar / 5 minutes; 100 bar / 10 minutes against shallow set plugs in 3 ½" & 4 ½" tubing.
66) Pressure test 11" BOP stack to 210 bar / 10 minutes
    a. Including connection between offset spool and 11" stack
    b. Low test 25 bar / 5 minutes
    c. **Note:** With the 15% average wall thickness reduction in addition to the API tolerance (87.5% wall thickness) in the top 10m the Pressure test to 344 bar cannot be performed without exceeding the operating envelop. The maximum allowable pressure test should not exceed 300 bar.

6.5. SOOH 3-1/2" injection string

67) Prepare unit for 3 ½" tubing
68) Install 3 ½" shooting nipple and 4 $^{1}/_{16}$" wireline gate valve.
    a. Place shooting nipple above minimum 2 blind rams.
69) R/U wireline & PCE on wireline gate valve
70) P-test PCE to 100 bar / 10 minutes against wireline gate valve
71) Retrieve WRBP#4 from 3 ½" tubing
72) R/D wireline unit, PCE & remove 3 ½" shooting nipple.
73) P/U 3 ½" landing string and install the same on tubing hanger
    a. If landing threads are worn, use tubing spear to pull hanger.
    b. Pull test landing string & hanger to 40 mT (including jack weight)
74) Release tie down bolts
    a. Equalize pressure over hanger
    b. Tie-down bolts: measure and note length full in and out.
75) Pull / Snub out of hole 3 ½" string until first hole is in the BOP stack
    a. Use updated tally based on pre-workover wireline actions
    b. Scale build-up may be present inside of the tubing
        i. Use mud bucket and drainage system to keep basket floor and surroundings clear from scale
    c. Record up/down weights (estimated string weight = 24 mT)
    d. The estimated pick up weight to unseat the hanger is estimated at ca. 39mT (see section 8.12)
        i. Maximum margin of overpull based on worst case scenario from wireline measurements is 41 mT (Total weight 65 mT)
    e. Compensate for closed end displacement of pipe pulled out of hole
        i. Use kill mud to maintain wellhead pressure to a minimum.
        ii. Pump 1.2 m³ kill mud for every 20 joints pulled.
76) With the hole isolated in the BOP stack, rig up slick line and PCE on 3 ½" tubing (Section 8.9)
    a. Space out to allow sufficient working height for wireline gate valve
77) Pressure test PCE to 100 bar / 10 minutes against wireline gate valve
78) Retrieve WRBP #3 from 3 ½" string

79) Retrieve WRBP #2 from 3 ½" string
80) Retrieve WRBP #1 from 3 ½" string
81) Inflow test string below hole
    a. Bleed off pressure in steps to zero bar
82) Set second permanent bridge plug in 3 ½" tubing above plug bottom
    a. Plug to be placed at the same joint as previous plug
    b. Pressure test plug from above to 100 bar / 20 minutes
        i. P-test between Wireline PCE & plug
        ii. Record volumes
83) Continue to SOOH remaining 3 ½" injection string
84) Close blind ram(s) and inflow test same

6.6. Lift BOP & reorient offset spool

85) Prepare unit for 3 ½" DP
86) Lift HWU w/ BOP's
    a. Hold a PJSM with all involved
    b. Have work permit in place for heavy lifting operations
    c. Discuss lifting plan, communications and responsibilities
    d. Break connection between 11" BOP stack and 11" offset spool top connection (See section 8.3.2.2 for reference)
    e. Keep 11" blind ram(s) closed
87) Reorient offset spool to line up on 4 ½" production string
88) Re-install HWU & BOP stack on offset spool
89) Inflow test spool connections against WHP (50bar) for 10 minutes.

6.7. POOH 4 ½" production string

90) Prepare unit for 4 ½" pipe
    a. Pressure test rams to 25 bar / 5 minutes; 100 bar / 10 minutes against Stripper #3.
91) Install 4 ½" shooting nipple and 4 $^{1}/_{16}$" wireline gate valve.
    a. Place shooting nipple above minimum 2 blind rams.
92) R/U Wireline (Combi unit) and PCE on shooting nipple and wireline gate valve.
93) Pressure test PCE to 100 bar / 10 minutes against wireline gate valve
94) Retrieve WRBP #2 from 4 ½" string with slickline
95) Retrieve WRBP #1 from 4 ½" string with slickline
96) Confirm well is dead
    a. Re-kill well if required as per separate well killing program
97) Rig down slickline & remove shooting nipple from the unit
98) P/U 4 ½" landing string and install the same on tubing hanger
    a. If landing threads are worn, use tubing spear to pull hanger.
    b. Pull test hanger to 40 mT
99) Release tie-down bolts
    a. Measure and record bolt lengths when in and out.
100) Pull 4 ½" tubing hanger in workbasket, remove & L/D the same.
    a. The estimated pick up weight to unseat the hanger is estimated at ca. 40mT (see section 8.12)
101) POOH 4 ½" production string

a. Snubbers dressed with 4 ½" slips
b. Record up/down weights
c. For the worst case maximum percentage Circumferential Wall Loss of 39% the Margin Of Overpull will be limited, to ca. 18mT (43mT – est. string weight of 25mT).
d. Scale build-up may be present inside of the tubing
    i. Use mud bucket and drainage system to keep basket floor and surroundings clear from scale
e. Compensate for metal displacement with mud to maintain a dead well.
    i. Pump 450 liters mud in 10 ¾" casing for every 20 joints pulled.

6.8. Lift Unit and remove offset spool

102) Prepare unit for 5"DP to lift unit.
103) Lift HWU w/ BOP's
    a. Hold a PJSM with all involved
    b. Have work permit in place for heavy lifting operations
    c. Discuss lifting plan, communications and responsibilities
    d. Break connection between 11" BOP stack and 11" offset spool top connection (See section 8.3.2.2).
    e. Keep 11" blind ram(s) closed
104) Remove offset spool & adapter spool
105) Re-install HWU & BOP stack on 11" blind ram(s)
    a. Limit exposure time to as short as possible
106) Displace well top-down to 1.30 s.g. plant brine
107) Inflow test BOP's connection to WHP for 10 minutes.
    a. Bleed-off pressure in steps to zero
    b. Record and monitor fluid volumes retrieved.

6.9. Investigate 10 ¾" casing

108) Install 7" shooting nipple (see attachment 8.9.2)
109) Install 7 $^{1}/_{16}$" wireline gate valve on shooting nipple.
110) R/U Wireline PCE on wireline gate valve
    a. Perform PJSM with all involved
111) P-test PCE to 100 bar / 10 minutes against wireline gate valve
112) Prepare downhole camera toolstring and perform camera run to investigate 10 ¾" casing
    a. Equalize pressure across wireline gate valve, open the same & RIH
    b. Check casing condition on collar at ca. 434m
    c. Check casing condition at top salt bottom Bunter (1480m – 1540m)
    d. Check casing end and confirm sufficient space is present to place cement plug
113) Perform ultrasonic wall thickness and radial cement bond log
    a. Note: TR-5 has been used for gypsum injection and gypsum deposits on the casing wall may decrease the quality of the data gathered
    b. CAST-M tool in pipe and cement inspection mode
    c. Include radial CBL tool in the toolstring to complement measurements
    d. Check and confirm casing and cement integrity

i. Casing wall thickness
ii. Potential leak point
iii. Top of cement and cement condition

114) POOH to surface and close 11" blind rams.

6.10. Plug 10 ¾" Casing

115) Prepare 10 ¾" permanent bridge plug
116) Lift 7" shooting nipple and wireline PCE from unit
117) P/U bridge plug setting toolstring and pull into the shooting nipple as much as possible
118) Lift toolstring with 7" shooting nipple and PCE and install back in the unit
119) Fill up stack & P-test wireline PCE to WHP for 10 minutes against the safety ram and blind ram
120) Open well and set 10 ¾" bridge plug as deep as possible on 10 ¾" casing
   a. Equalize pressure over WL valve before opening
   b. Target depth for plug ca. 1620m depth
   c. Minimum depth is 1600m to ensure 50m of good cement plug across the salt formation
      i. Top ZEZ at 1540m (See section 8.1.1)
121) Inflow test 10 ¾" bridge plug
   a. Bleed off pressure in steps to 0 bar and monitor pressure for 20 minutes.
   b. Record volume returned (expected volume ~ 190 liter with 55 bar WHP)
122) Pressure test 10 ¾" casing to 115 bar against the permanent bridge plug for 20 minutes
   a. Record volume required to pressure up the well from 0 bar to 115 bar (expected volume ~ 390 liter)
   b. **Note:** The pressure test value may be revised depending on the results of casing integrity measurements. The casing can withstand 115 bar pressure test with up to 40% metal loss (See section 8.12 for details)
123) POOH to surface, close 11" blind rams.
124) R/D wireline unit & PCE, remove 7" shooting nipple.

6.11. Set primary cement plug

125) Prepare unit for 5" pipe
   a. Pressure test rams to 25 bar / 5 min; 100 bar / 20 min against permanent bridge plug
126) P/U & RIH 5" drill pipe and tag permanent bridge plug
   a. Have 1 x dart sub installed in the workstring
127) Pull up 10 – 20 meters and space out for cementing equipment
128) Install 7 $^{1}/_{16}$" wireline gate valve, R/U wireline unit and PCE
129) P-test PCE to 100 bar / 10 minutes against wireline gate valve.
130) Retrieve dart plug from 5" drill pipe
131) R/U cement unit and pump lines.
   a. Pressure test pump lines to 344 bar / 10 min
132) Perform circulation test with cement pumps
133) Mix minimum 4m³ of 1.9 s.g. HMR cement slurry as per cementing program

a. 80 meters (top salt to 1620m) with capacity of 48.3 l/m

134) Pump 2 m³ spacer (fresh water) and set ca. 80-meter balanced cement plug on permanent bridge plug.
   a. Cement plug set from 1620m to 1540m.
   b. Take samples of cement
   c. Max. WHP 100 bar
   d. Displace with 1.29sg MgCl brine
   e. Pump spongeball to clean pipe.
135) Pull 5" drill pipe to 1400 meters
136) WOC for minimum 12 hours
   a. Monitor pressures overnight
      i. Max. WHP 100 bar
   b. Record volume bled-off or injected
137) Tag top of cement with 5" drill pipe
   a. Set down 10mT weight
   b. If tag unsuccessful, wait for cement for another 12 hours and re-attempt
138) Perform inflow test on cement plug
   a. Bleed off pressure in steps to 0 bar
   b. Monitor pressure for 20 minutes at each step
   c. Record pressures and volumes
139) POOH 5" Drill pipe to surface
   a. Line over trip tank and keep well full with 1.30 s.g. brine
140) Pressure test cement plug from above for 20 minutes
   a. Test pressure to be defined
   b. Isolation packer required to isolate leak from cement plug if pressure test fails
      i. Run isolation packer on 5" Drill Pipe
141) R/D cement unit & lines.

6.12. Remediate Damage in 10 ¾" Casing

142) P/U & RIH 5" drill pipe and tag cement plug
   a. No barriers installed on drill pipe
   b. **Note:** In the event that the casing leak is found to be +50 meters away from the top of the cement plug, a second mechanical support will be set in the casing to serve as a base for the cement plug
143) Pull drill pipe to leak depth in 10 ¾" casing
   a. Space out to allow for installation of cement unit & pump lines
144) R/U cement unit and pump lines.
   a. Pressure test pump lines to 344 bar / 10 min
145) Perform circulation test with cement pumps
146) Mix minimum 2.5m³ of 1.9 s.g. Class G cement as per cementing program
   a. 50 meters with capacity of 48.3 l/m
147) Pump 2 m³ spacer (fresh water) and set ca. 50-meter cement plug across casing leak
   a. Take samples of cement
   b. Max. WHP 100 bar
148) Pull 5" drill pipe to minimum 50 meters above theoretical TOC
149) WOC for minimum 12 hours

a. Monitor pressures overnight
    i. Max. WHP 100 bar
b. Record volume bled-off or injected

150) Tag top of cement with 5” drill pipe
a. Set down 10mT weight
b. If tag unsuccessful, wait for cement for another 12 hours and re-attempt

151) Perform inflow test on cement plug
a. Bleed off pressure in steps to 0 bar
b. Monitor pressure for 20 minutes at each step
c. Record pressures and volumes

152) POOH 5” Drill pipe to surface
a. Line over trip tank and keep well full with 1.30 s.g. brine

153) Pressure test cement plug from above for 20 minutes
a. Test pressure to be defined

154) R/D cement unit & lines.

6.13. Install 7” Suspension String

155) P/U 7” tubing hanger with single joint below and run the same through the stack
a. Have 6-5/16” TWCV installed in hanger

156) Run and land hanger in DCB spool
a. Use 7” VAM TOP landing string
b. Secure hanger with tie-down bolts
c. Pressure test hanger seals to 100 bar / 10 minutes from above
    i. Test between hanger seals and safety ram.

157) L/D 7” landing string

158) Remove 6-5/16” TWCV and install 6-5/16” BPV on tubing hanger

6.14. Rig down HWU unit & install X-mas tree

159) Rig-down HWO Unit
a. Hold PJSM & Have Work permit in place for heavy lifting operations

160) Rig down BOP’s & demobilize

161) Install X-mas tree, see attachment 8.2 for wellhead configuration after workover
a. 11” 5K x 7-$^{1}/_{16}$” 5K Adapter spool on 11” 5K DCB Spool
    i. The spool will not seal on the hanger neck
b. 2 x 7-$^{1}/_{16}$” 5K Manual Gate Valves

162) Remove 6-5/16” BPV from 7” tubing hanger

163) Install 6-5/16” TWCV on tubing hanger

164) P-test flange 11” 5K flange connection to 100 bar / 10 minutes against TWCV.

165) Install 7-$^{1}/_{16}$” 5K Blind Flange above tree

166) Hand over well to Nedmag

7. Major Contingencies to Work Program

Due to the complex nature and several uncertainties surrounding the well, alternative approaches to remove each completion strings have also been worked out in detail. The two largest uncertainties regarding the well (at the time of compiling this document) are:

a) Number of leaks in 3 ½" string
b) Whether the well can be killed successfully with multiple leaks in the completion
c) Whether the completion strings can be removed from the well in a single piece

As it is not possible to quantify the success rate of the uncertainties above, alternative approaches have been developed in the event that the initial plan cannot be executed.

7.1. Multiple leaks in 3 ½" Injection String

While the wireline investigations indicate the 3 ½" string is in relatively good condition compared to the rest of the completion, it is known that there is pressure communication between the injection string and the remainder of the completion; indicating the presence of one (or more) leak paths on the injection string.

To simplify the well kill process in presence of multiple leak points, the objective is to isolate the injection string in order to reduce the number of inlets required for a successful kill operation. With minimal metal loss, and a single leak path; the injection string can be isolated by use of wireline set plugs. However, the isolation process becomes significantly more challenging in the presence of multiple leaks (at varying depths) within the string. In principle, plugs can still be used to isolate the leaks. However, this would cause operational delays due to additional wireline runs and introduce additional equipment. In addition, the stock of wireline retrievable bridge plugs is limited, and it is not possible to redress the plugs on location which may cause additional delays for the project.

The alternative of using readily available permanent bridge plugs instead of WRBP's is not advised, as permanent plugs would introduce significant problems, if the 3 ½" is stuck and cannot be pulled out entirely (See section 7.3 for more details).

As a result, it is advised to abandon the well kill prior to rig-up (See section 6.1) and proceed with the pull & cut option (Section 7.2.1) to remove the 2 ⅞" dilution string from the well. A kill can be attempted once the dilution string and the 3 ½" injection string has been removed from the well. In addition, a BPV will be required on the 4 ½" string above the 2 WRBP's prior to the removal of the intermediate spool from the wellhead (See 6.4).

7.2. Remove 2 ⅞" Dilution String

7.2.1. Well kill unsuccessful (Pull & Cut)

In the event that the initial attempts to kill the well prior to rig-up (Step 21) fails, the dilution string will be removed by pulling the live pipe into the stack and shearing each joint. The remaining string will then be retrieved in the BOP stack of the HWU with a specially machined overshot and the process will be repeated until the entire string is removed from the well. The specific procedure for this operation has been supplied by the snubbing contractor:

1) With Overshot attached to the tubing and pulled up to marked position to allow picking up the cut piece above the working blind ram.
2) Close slip ram & perform pull test
3) Activate top shear ram

4) Pick up cut piece above upper blind, close Blind ram
5) Bleed off pressure and inflow test working blind ram
6) Open stripping rams and retrieve cut part and lay down same
7) P/U Overshot BHA and slowly Run in BOP stack Close travelling and stationary slips
8) Close Stripper #1 BOP Equalize pressure and inflow test stripping rams Equalize pressure over STR #3
9) Open upper blind ram Open B/S , Snub in hole latch on fish.
10) Engauge top of fish and perform pull test
11) Release Slip rams
12) Repeat step 1-12 until tubing is out of the hole

In order to allow the pull & cut operation, additional cavities have been added to the BOP stack. In addition to the standard snubbing stack of a single blind and a single blind / shear ram, a second blind / shear ram (working ram responsible of shearing each joint) and two additional blind rams, positioned above the working blind / shear ram are required in the stack.

In order to have sufficient barriers in place prior to rig-up of the unit, in the event of an unsuccessful kill, an additional wireline retrievable bridge plug must be placed on the 2 ⅞" tubing string, and pressure tested (100 bar / 10 min) from above before the X-mas tree is removed.

7.2.2. Dilution string stuck in production string

The 2 ⅞" dilution string is collapsed at ca. 1317m inside the 4 ½" production string. From wireline investigations, it is observed that the 4 ½" production string is intact. With a limited clearance between the 4 ½" and 2 ⅞" (27mm clearance between 4 ½" nominal ID and 2 ⅞" OD), and the unknown condition of the outside of the dilution string at and below the point of collapse; there is a considerable chance that the 2 ⅞" string will be stuck inside the 4 ½" tubing.

If it is not possible to move the 2 ⅞" string after rig-up has been completed (Step 42):

1) Land 2 ⅞" tubing hanger back in bowl and tighten tie-down bolts
2) Remove 2 ⅞" spear assembly and L/D the same
3) Install 2 ⅞" shooting nipple in stack & 4 $^{1}/_{16}$" Wireline gate valve above
4) R/U wireline unit and PCE on wireline gate valve.
5) P/U electric cutting toolstring and cut 2 ⅞" tubing at ca. 1315m
    a. As close to the collapse point as possible
6) R/D wireline unit and PCE
7) Remove 2 ⅞" string above cut as per program
    a. As per section 6.2 if well is dead
    b. As per section 7.2.1 if well is live
8) Prepare 2 ⅞" milling assembly with junk mill (See 8.6.4 for details)
9) RIH 2 ⅞" milling assembly on drill pipe to top of fish
    a. Tag top of fish and report depth
10) Dress top of fish to allow access with overshot
    a. Mill minimum 2 meters of tubing
    b. Allow sufficient space above collar to latch on with the overshot
11) POOH 2 ⅞" milling assembly
12) P/U 2 ⅞" slimhole overshot assembly and RIH to top of fish

a. Have barriers installed on string
13) Latch onto top of fish
    a. Pull test to confirm pipe is moving
14) POOH 2 ⅞" pipe until the fish is in the stack
15) Space out fish and continue removing 2 ⅞" string with the pull & cut method
    a. As per section 7.2.1

7.3. Remove 3 ½" Injection String

The 3 ½" string shows signs of bending and buckling in the downhole video footage of October 2019. In addition, the condition of the 10 ¾" casing at the HUD depth (1622m) is uncertain. In the event that the last cemented casing is bent or damage around the HUD depth, it is likely that the 3 ½" string cannot be pulled out in its entirety (Step 75).

In such an event the bottom part of the string will be cut and fished out of the well:

1) Land 3 ½" tubing hanger back in bowl and tighten tie-down bolts
2) Remove 3 ½" spear assembly and L/D the same
3) Install 3 ½" shooting nipple in stack & 4 $^{1}/_{16}$" Wireline gate valve above
4) R/U wireline unit and PCE on 4 $^{1}/_{16}$" Wireline gate valve
5) Retrieve all four WRBP's from 3 ½" tubing with slickline
6) Switch to E-line
7) Prepare EC toolstring, P/U and RIH the same
8) Cut 3 ½" injection string at the first full joint below the leak
9) Set WRBP #1 on first full joint above the leak
    a. Ca. 2m above connection
10) Inflow test WRBP#1
    a. Bleed off pressure in steps to 0 bar and monitor pressure for 20 minutes.
11) Set WRBP #2 ca. 2-3m above plug #1
    a. Set plug on the same joint as the previous
12) RIH 3 ½" spear assembly and set spear on first joint below hanger
13) Undo tie-down bolts
    a. Measure and record in and out lengths
14) SOOH 3 ½" string above cut
15) Prepare 3 ½" overshot assembly and RIH the same
    a. Have barriers installed on the string
16) Latch onto top of fish with overshot assembly
17) SOOH 3 ½" fish to surface

7.4. Remove 4 ½" Production String

Based on the initial wireline measurements, it is very likely that the 4 ½" string has multiple leaks throughout. In addition, the condition of the pipe below 1317m is unknown and could be severely damaged. The initial plan is to remove the production string under killed conditions in one run (Step 100), but the poor condition of the string might lead to some parts of the string failing. In order to access the 10 ¾" casing, all parts of the string are required to be removed until at least 1620m.

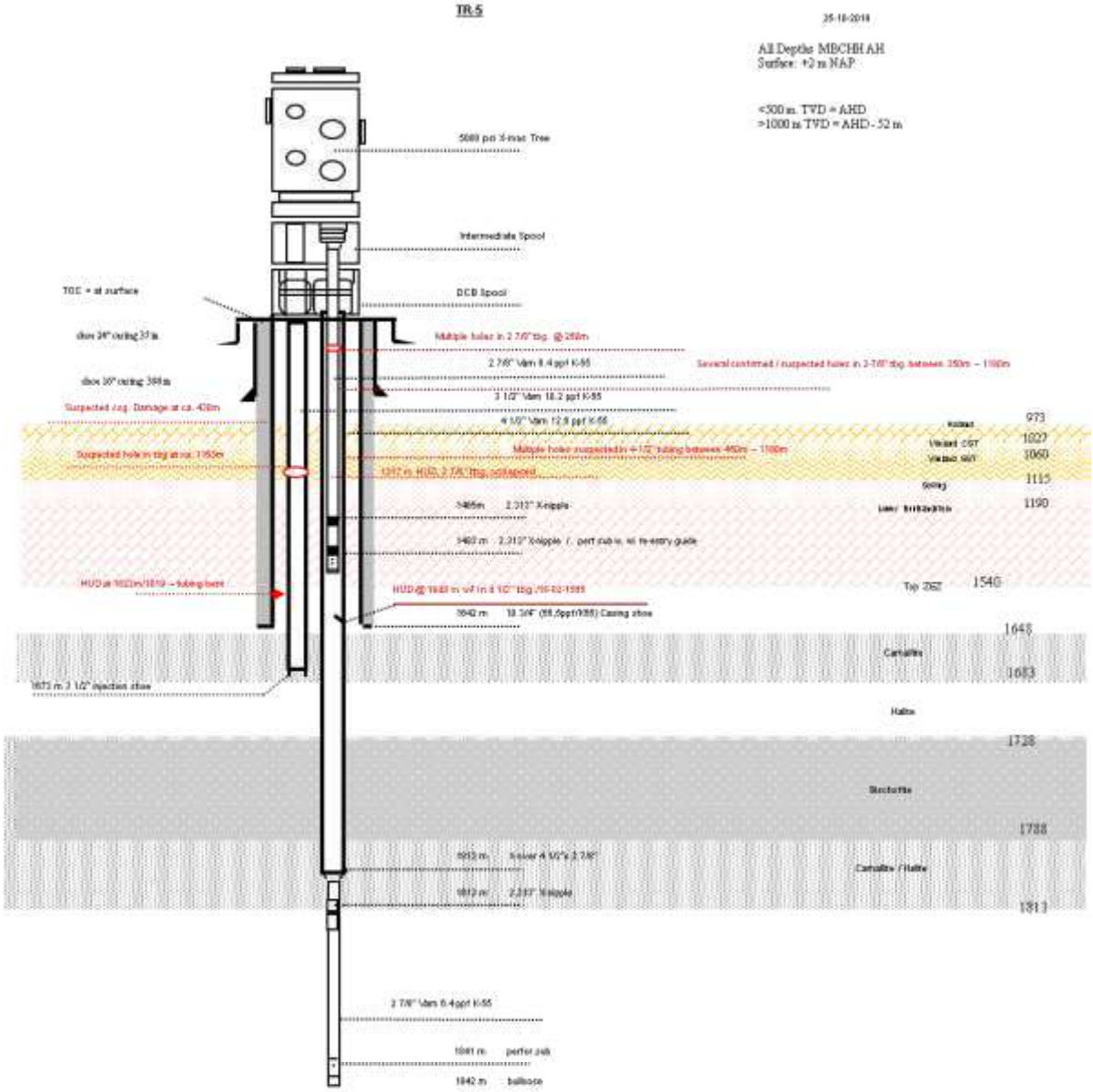
1) Prepare overshot assembly to fish 4 ½" string
    a. Have barriers installed in the string

   b. Have milling assembly available on location in case top of fish needs to be dressed
2) SIH 4 ½" overshot assembly on 5" drill pipe
   a. Change slips when switching from 4 ½" to 5"
3) Latch onto fish and confirm overshot is engaged
4) Kill well with floating mud cap as per mud program
   a. If mud cap is lost
5) POOH 4 ½" fish from the well
6) Repeat steps 1 through 5 if multiple fish are present

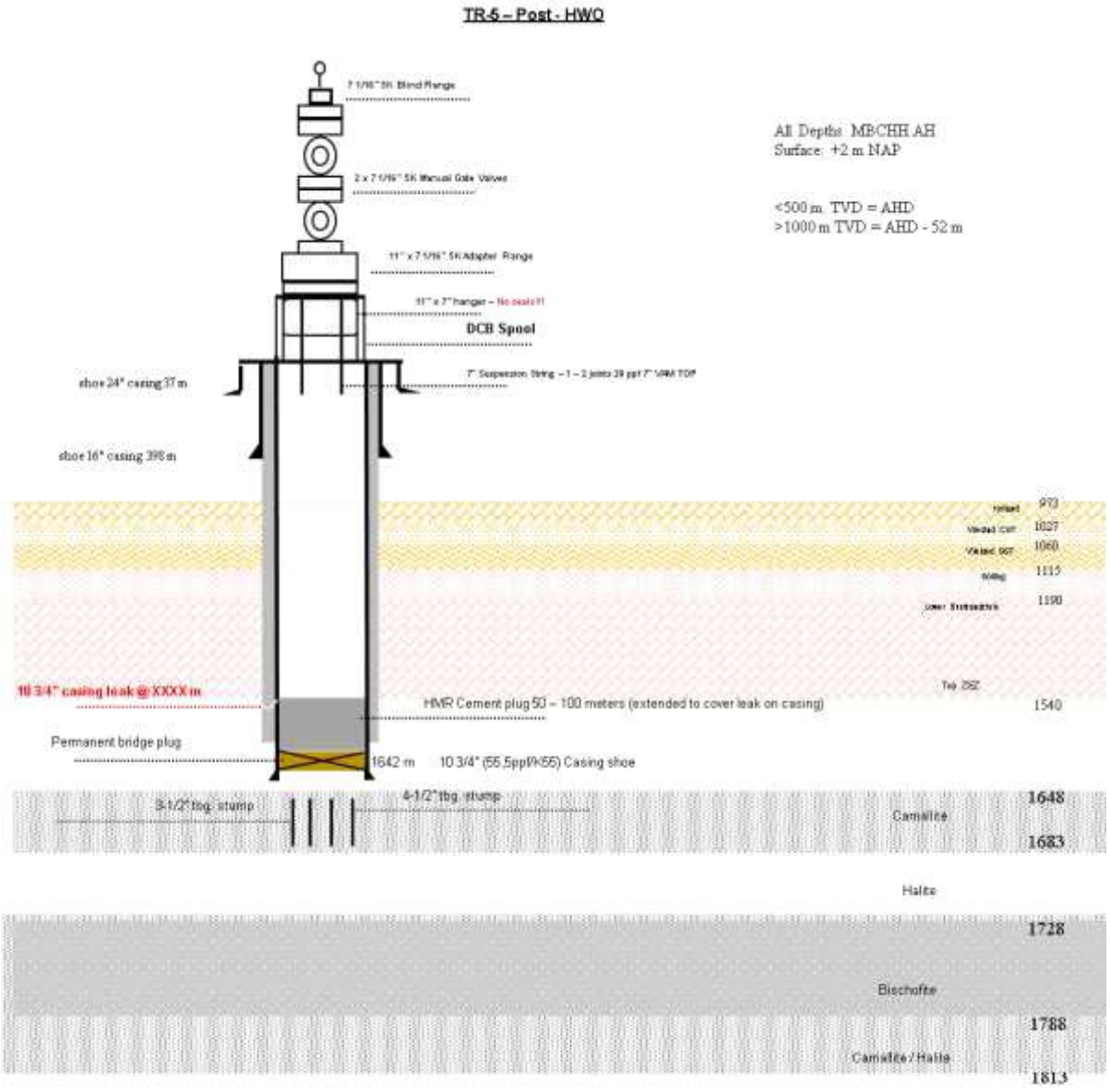
8. Attachments

8.1. Well Schematics

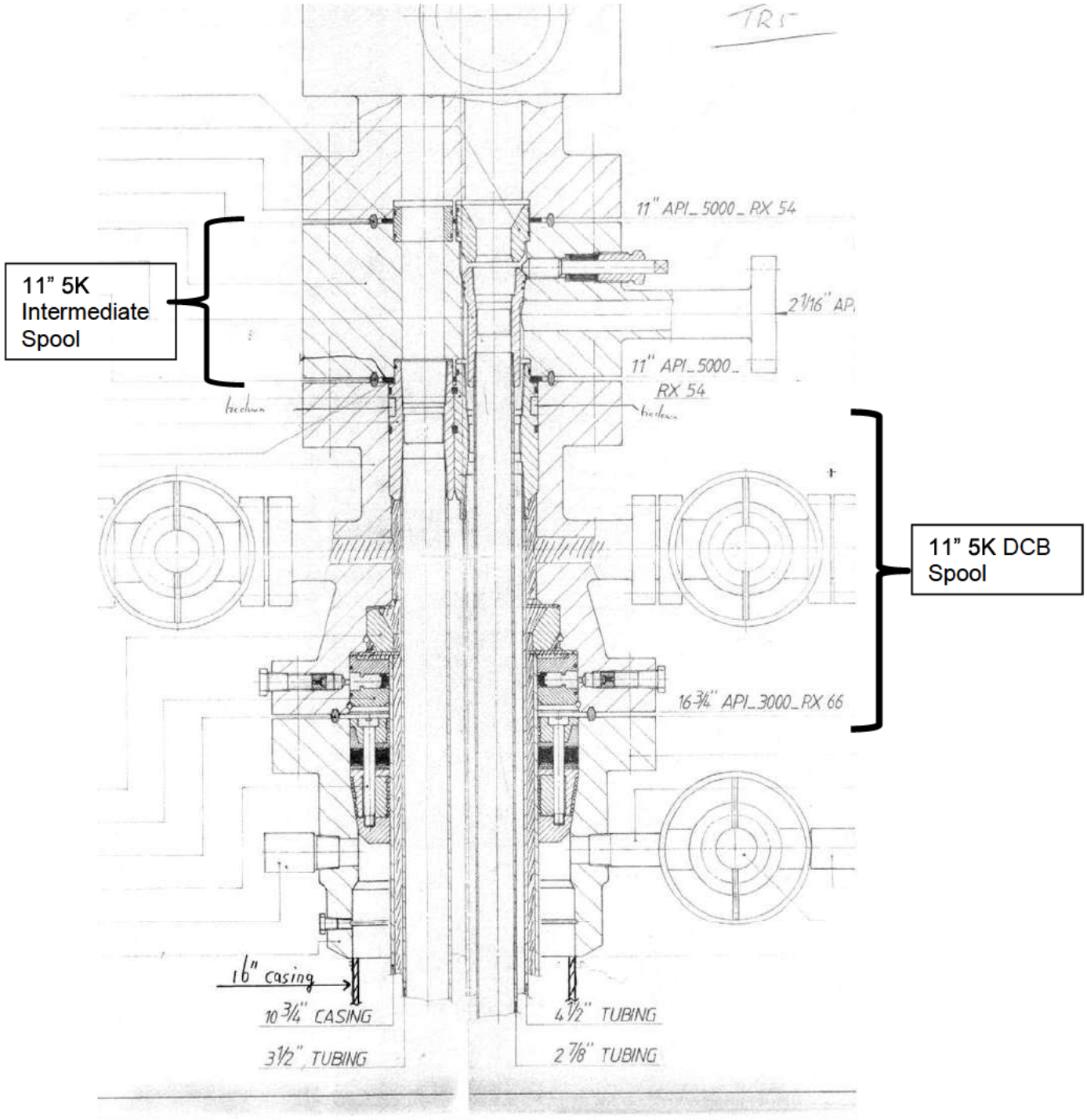
8.1.1. Current Status (25-10-2019)



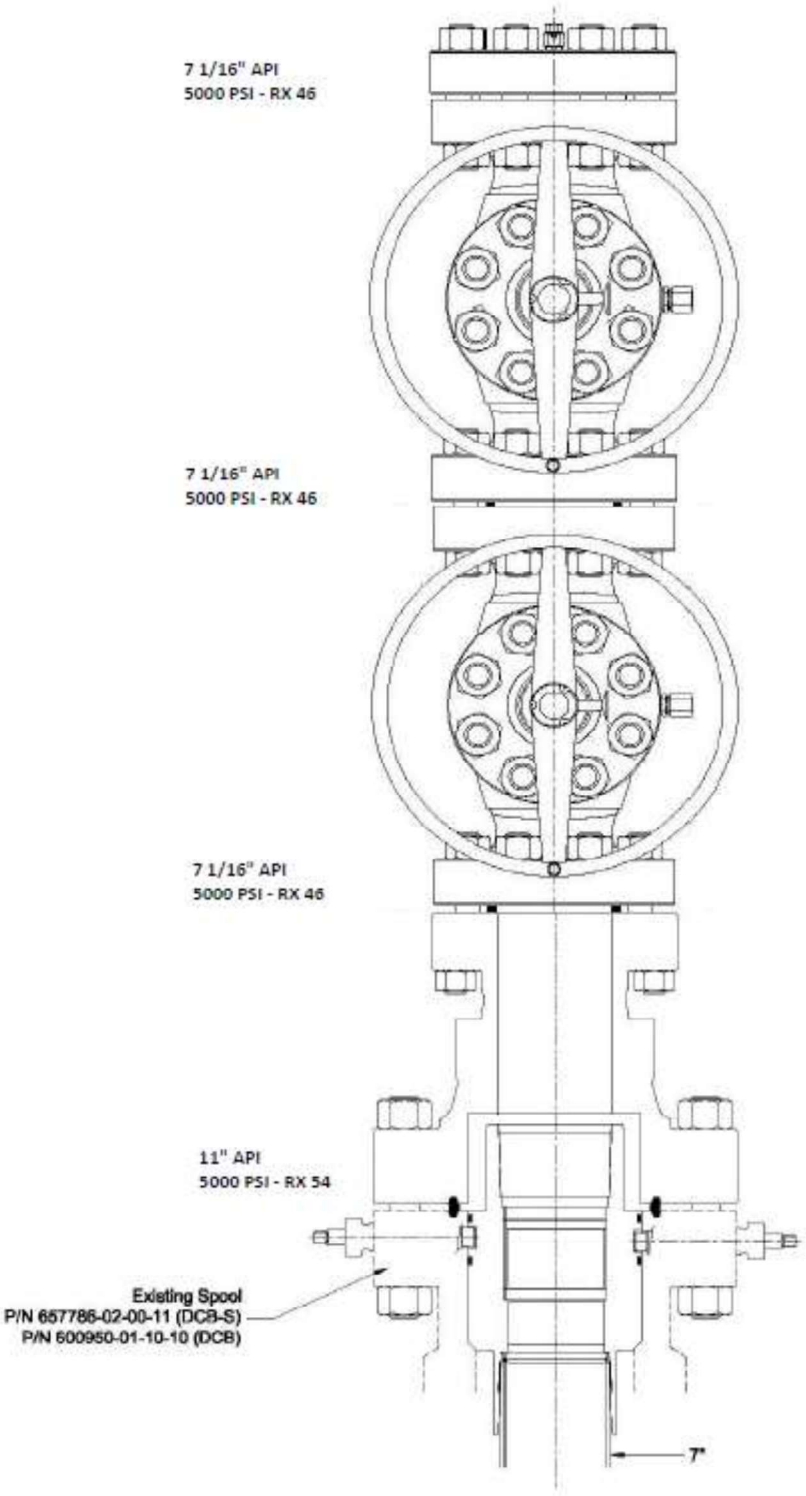
8.1.2. Well status after Workover



8.2. Wellhead



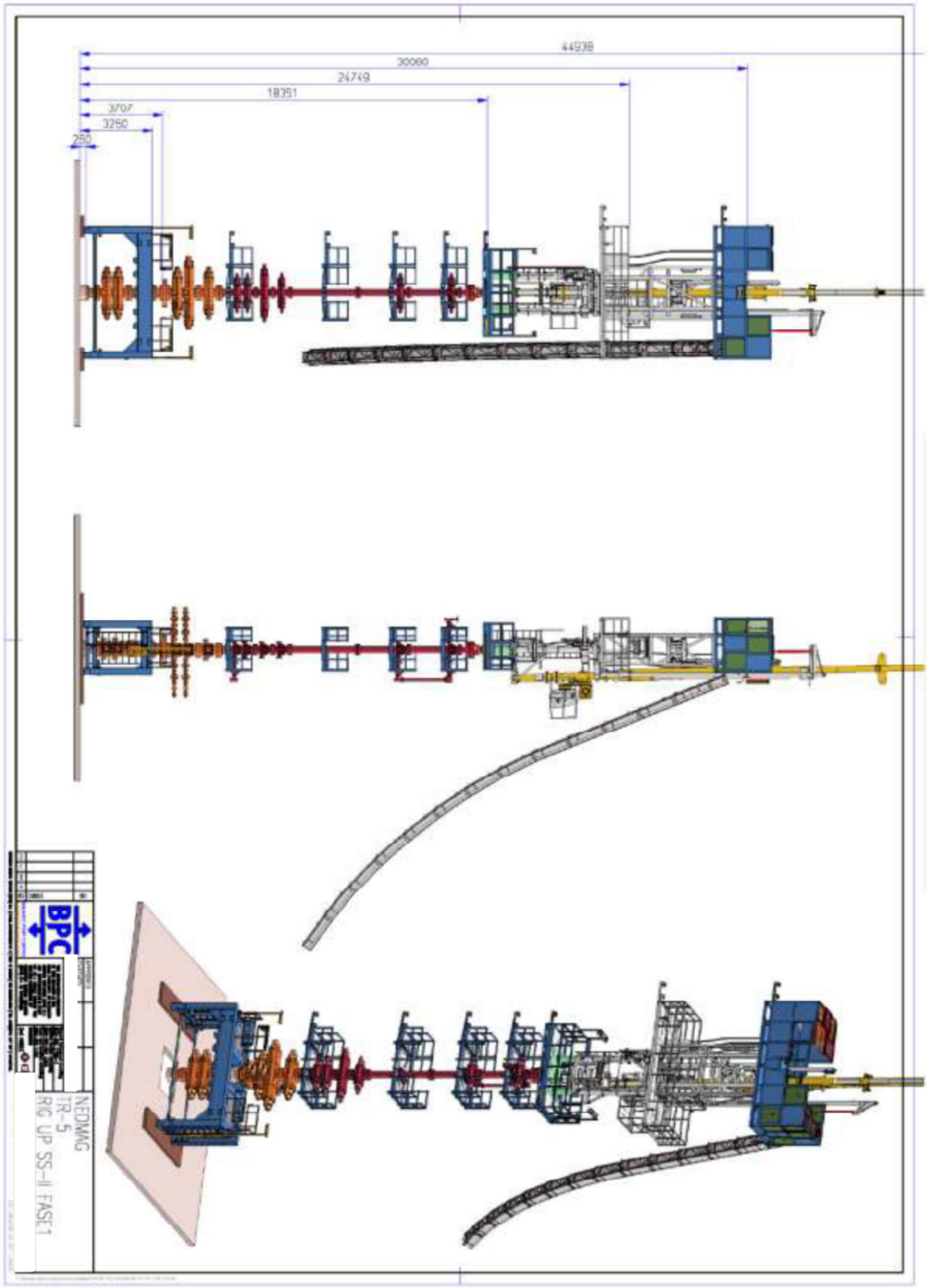
Wellhead before operations



Wellhead after operations

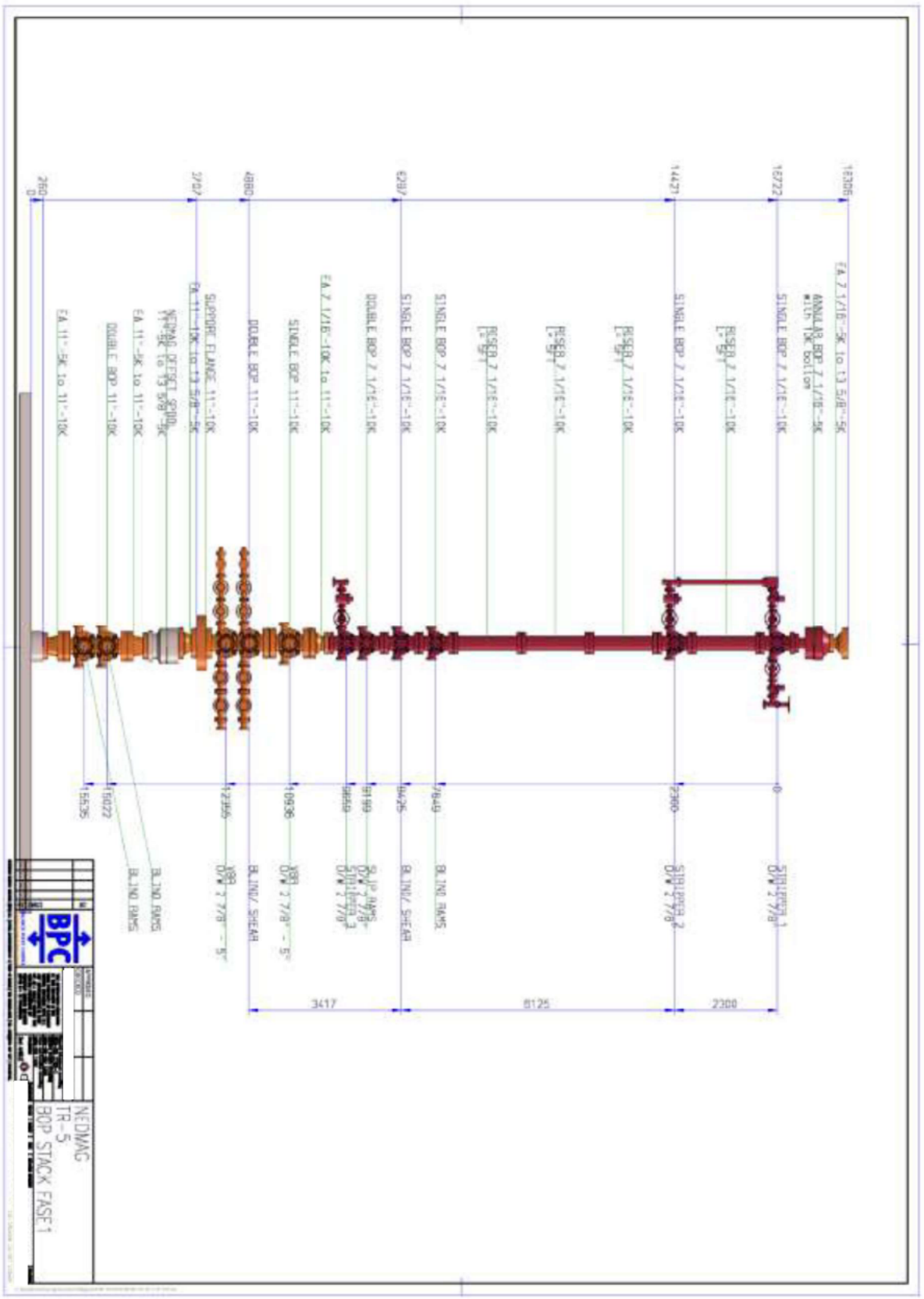
8.3. Unit and BOP stack up drawing

8.3.1. Unit Drawing (Rig-up)

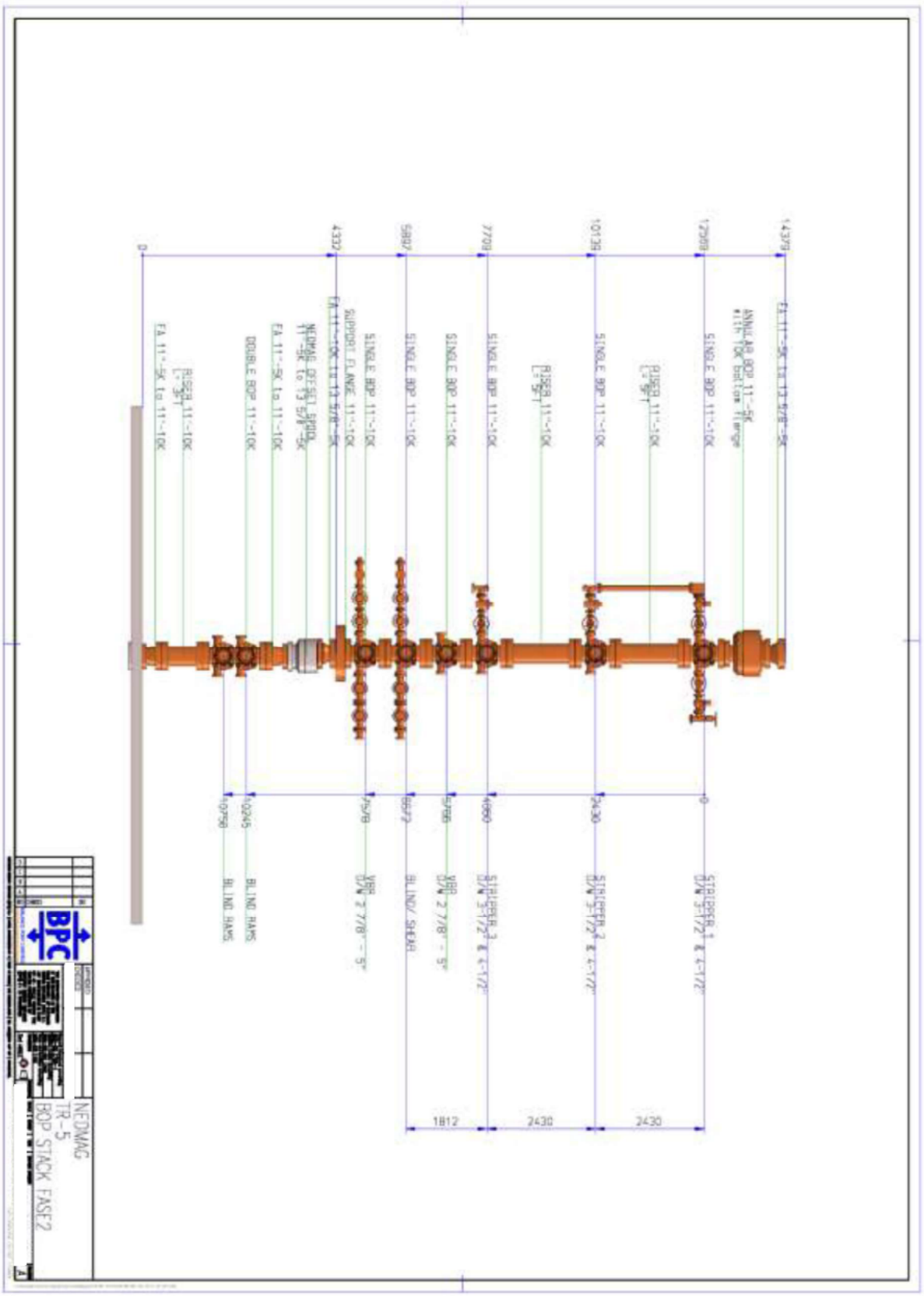


8.3.2. BOP Stack

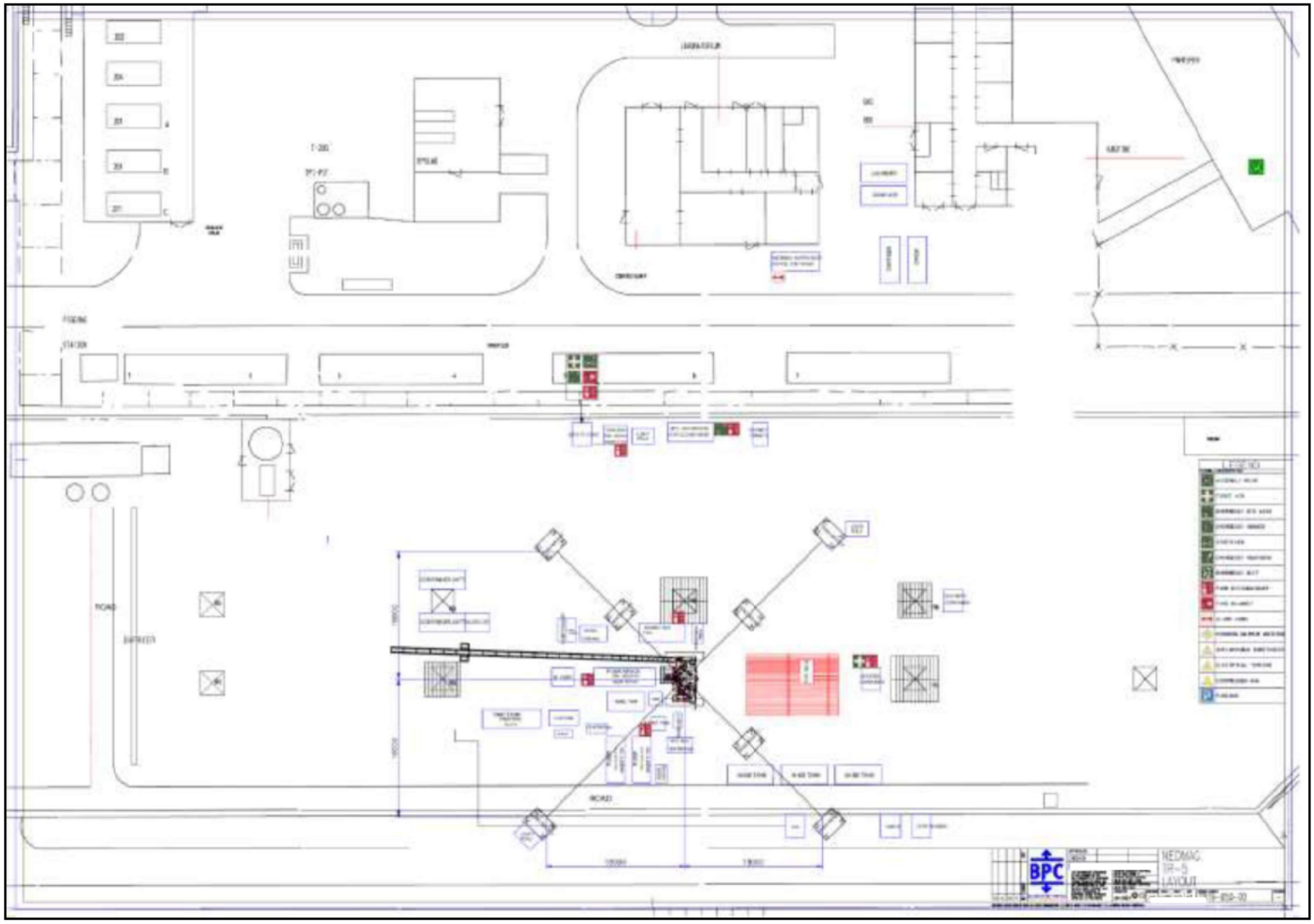
8.3.2.1. $7\,^{1}/_{16}$" 10K x 11" 10K Combi-Stack



8.3.2.2. 11" 10K / 5K Stack



8.4. Location layout



8.5. P & ID HWU installation w/ auxiliaires

P&ID will be included on update.

8.5.1.1. P&ID – Sections 6.1 to 6.3

8.5.1.2. P&ID – Sections 6.4 & 6.5

8.5.1.3. P&ID – Sections 6.6 & 6.7

8.5.1.4. P&ID – Sections 6.8 to 6.14

8.6. BHA lists

8.6.1. 2 ⅞" Spear Assembly

- Spear with grapple
- Spearstop
- X-over to 2 ⅞" HT PAC
- 2 ⅞" HT PAC workstring (3-4 joints)
    - 2 barriers placed in workstring

8.6.2. 3 ½" Spear Assembly

- Spear with grapple
- X-over to NC38
- 3 ½" NC38 Drill Pipe (3-4 joints)
    - 2 barriers placed in workstring

8.6.3. 4 ½" Spear Assembly

- Spear with grapple
- X-over to NC38
- X-over NC38 to NC50
- 5" NC50 Drill pipe
    - 2 barriers placed in workstring

8.6.4. 2 ⅞" Dress Mill Assembly (Contingency)

- 97.3mm Super Junk / Viper Mill
- 95.3mm String stabilizer
- X-over to 2 ⅞" HT PAC
- 2 ⅞" HT PAC workstring (1500 meters)
    - 2 barriers placed in workstring

8.6.5. 2 ⅞" Overshot Assembly (Contingency)

- Slimhole overshot with spiral grapple
- Fishing jar
- X-over to 2 ⅞" VAM TOP
- 2 ⅞" L-80 VAM TOP workstring (1500 meters)
    - Use Nedmag stock pipe

8.6.6. 3 ½" Tubing fishing Assembly (Contingency)

- 8 ⅛" Overshot w/ 3 ½" basket grapple
- Fishing jar
- X-over NC38 to NC50
- 5" NC50 Drill pipe
    - 2 x Dart subs for barrier setting

8.6.7. 4 ½" Tubing fishing Assembly (Contingency)

- 8 ⅛" Overshot w/ 4 ½" basket grapple
- Fishing jar
- X-over NC38 to NC50
- 5" NC50 Drill pipe
    - 2 x Dart subs for barrier setting

8.6.8. Completion Milling Assembly (Contingency)

- 9.604" Super Junk Mill
- Bit sub
- 9.604" String Stabilizer
- Fishing jar
- X-over NC38 to NC50
- 5" NC50 Drill pipe
    - 2 x Dart subs for barrier setting

8.7. Tallies

8.7.1. 2 ⅞" Dilution Tubing tally

NEDMAG

2 7/8" Dilution String

Rig : TR-5
DSV: 20/10/1995

Depth reference :	CHH	**TD :**	1,673	mBGL	**Buoyancy :**	0.87	
BHR-THH :	0.00 m	**Rat hole :**	190.78	m	**Block weight :**		Klbs
BHR- HOP :	0.00 m	**Shoe depth :**	1482.22	mBGL	**PUW (with 90 bar whp):**		Klbs
GL - HOP:	-0.26 m	**Mud weight :**	1.00	sg	**SOW (with 90 bar whp) :**		Klbs

Casing or DP data (DP used as running string)

Type	OD	ID	Grade	Weight	Capacity	CE displ.	Metal displ.		Make up torque ft.lb			MU Loss
	(inch)	(inch)		(lb/ft)	(l/m)	(l/m)	(l/m)		Min	Optimum	Max	(m)
1	2 7/8	2.441	K55	6.40	3.02	4.19	1.17	VAM	1,568	1,742	1,916	0.000
2	2 7/8	2.441	L80	6.40	3.02	4.19	1.17	VAM	2,152	2,391	2,630	0.000
3												
4												

Joint n° or name	Type n°	Total length	Make up length	In string	Cumul. length	Top depth BRT/ BHR	Top depth CHH (GL)	Top depth THH	Thread (bottom)	Remark
		m	m	Y/N	m	m	**m**	m		
				Y		1,482.22	**1,482.22**	1,482.48		
163 - WEG	1	0.150	0.150	Y	0.150	1482.070	**1482.070**	1482.330	VAM	Below HUD
162 - Pup	1	1.000	1.000	Y	1.150	1481.070	**1481.070**	1481.330	VAM	Below HUD
161 - X-Nipple	1	0.310	0.310	Y	1.460	1480.760	**1480.760**	1481.020	VAM	Below HUD
160	1	8.360	8.360	Y	9.820	1472.400	**1472.400**	1472.660	VAM	Below HUD
159 - X-Nipple	1	0.310	0.310	Y	10.130	1472.090	**1472.090**	1472.350	VAM	Below HUD
158	1	9.220	9.220	Y	19.350	1462.870	**1462.870**	1463.130	VAM	Below HUD
157	1	9.240	9.240	Y	28.590	1453.630	**1453.630**	1453.890	VAM	Below HUD
156	1	9.160	9.160	Y	37.750	1444.470	**1444.470**	1444.730	VAM	Below HUD
155	1	9.290	9.290	Y	47.040	1435.180	**1435.180**	1435.440	VAM	Below HUD
154	1	9.480	9.480	Y	56.520	1425.700	**1425.700**	1425.960	VAM	Below HUD
153	1	9.420	9.420	Y	65.940	1416.280	**1416.280**	1416.540	VAM	Below HUD
152	1	9.100	9.100	Y	75.040	1407.180	**1407.180**	1407.440	VAM	Below HUD
151	1	9.370	9.370	Y	84.410	1397.810	**1397.810**	1398.070	VAM	Below HUD
150	1	9.450	9.450	Y	93.860	1388.360	**1388.360**	1388.620	VAM	Below HUD
149	1	9.480	9.480	Y	103.340	1378.880	**1378.880**	1379.140	VAM	Below HUD
148	1	9.490	9.490	Y	112.830	1369.390	**1369.390**	1369.650	VAM	Below HUD
147	1	9.390	9.390	Y	122.220	1360.000	**1360.000**	1360.260	VAM	Below HUD
146	1	9.280	9.280	Y	131.500	1350.720	**1350.720**	1350.980	VAM	Below HUD
145	1	9.520	9.520	Y	141.020	1341.200	**1341.200**	1341.460	VAM	Below HUD
144	1	9.600	9.600	Y	150.620	1331.600	**1331.600**	1331.860	VAM	Below HUD
143	1	9.220	9.220	Y	159.840	1322.380	**1322.380**	1322.640	VAM	Below HUD
142	1	9.210	9.210	Y	169.050	1313.170	**1313.170**	1313.430	VAM	
141	1	9.460	9.460	Y	178.510	1303.710	**1303.710**	1303.970	VAM	
140	1	9.420	9.420	Y	187.930	1294.290	**1294.290**	1294.550	VAM	
139	1	9.550	9.550	Y	197.480	1284.740	**1284.740**	1285.000	VAM	
138	1	9.420	9.420	Y	206.900	1275.320	**1275.320**	1275.580	VAM	
137	1	9.360	9.360	Y	216.260	1265.960	**1265.960**	1266.220	VAM	
136	1	9.480	9.480	Y	225.740	1256.480	**1256.480**	1256.740	VAM	
135	1	9.420	9.420	Y	235.160	1247.060	**1247.060**	1247.320	VAM	
134	1	9.420	9.420	Y	244.580	1237.640	**1237.640**	1237.900	VAM	
133	1	9.420	9.420	Y	254.000	1228.220	**1228.220**	1228.480	VAM	
132	1	9.220	9.220	Y	263.220	1219.000	**1219.000**	1219.260	VAM	
131	1	9.190	9.190	Y	272.410	1209.810	**1209.810**	1210.070	VAM	
130	1	9.300	9.300	Y	281.710	1200.510	**1200.510**	1200.770	VAM	
129	1	9.210	9.210	Y	290.920	1191.300	**1191.300**	1191.560	VAM	
128	1	9.170	9.170	Y	300.090	1182.130	**1182.130**	1182.390	VAM	
127	1	9.340	9.340	Y	309.430	1172.790	**1172.790**	1173.050	VAM	
126	1	9.170	9.170	Y	318.600	1163.620	**1163.620**	1163.880	VAM	
125	1	9.470	9.470	Y	328.070	1154.150	**1154.150**	1154.410	VAM	
124	1	9.060	9.060	Y	337.130	1145.090	**1145.090**	1145.350	VAM	
123	1	9.580	9.580	Y	346.710	1135.510	**1135.510**	1135.770	VAM	
122	1	9.600	9.600	Y	356.310	1125.910	**1125.910**	1126.170	VAM	
121	1	9.240	9.240	Y	365.550	1116.670	**1116.670**	1116.930	VAM	
120	1	9.560	9.560	Y	375.110	1107.110	**1107.110**	1107.370	VAM	
119	1	9.190	9.190	Y	384.300	1097.920	**1097.920**	1098.180	VAM	
118	1	9.190	9.190	Y	393.490	1088.730	**1088.730**	1088.990	VAM	
117	1	9.390	9.390	Y	402.880	1079.340	**1079.340**	1079.600	VAM	
116	1	9.420	9.420	Y	412.300	1069.920	**1069.920**	1070.180	VAM	
115	1	9.330	9.330	Y	421.630	1060.590	**1060.590**	1060.850	VAM	
114	1	9.200	9.200	Y	430.830	1051.390	**1051.390**	1051.650	VAM	
113	1	9.010	9.010	Y	439.840	1042.380	**1042.380**	1042.640	VAM	
112	1	9.560	9.560	Y	449.400	1032.820	**1032.820**	1033.080	VAM	
111	1	9.220	9.220	Y	458.620	1023.600	**1023.600**	1023.860	VAM	
110	1	9.590	9.590	Y	468.210	1014.010	**1014.010**	1014.270	VAM	
109	1	9.610	9.610	Y	477.820	1004.400	**1004.400**	1004.660	VAM	
108	1	9.380	9.380	Y	487.200	995.020	**995.020**	995.280	VAM	
107	1	9.530	9.530	Y	496.730	985.490	**985.490**	985.750	VAM	
106	1	9.530	9.530	Y	506.260	975.960	**975.960**	976.220	VAM	
105	1	9.580	9.580	Y	515.840	966.380	**966.380**	966.640	VAM	
104	1	9.340	9.340	Y	525.180	957.040	**957.040**	957.300	VAM	
103	1	9.390	9.390	Y	534.570	947.650	**947.650**	947.910	VAM	
102	1	9.500	9.500	Y	544.070	938.150	**938.150**	938.410	VAM	
101	1	9.340	9.340	Y	553.410	928.810	**928.810**	929.070	VAM	
100	1	9.220	9.220	Y	562.630	919.590	**919.590**	919.850	VAM	
99	1	9.600	9.600	Y	572.230	909.990	**909.990**	910.250	VAM	
98	1	9.490	9.490	Y	581.720	900.500	**900.500**	900.760	VAM	
97	1	9.540	9.540	Y	591.260	890.960	**890.960**	891.220	VAM	
96	1	9.540	9.540	Y	600.800	881.420	**881.420**	881.680	VAM	
95	1	9.420	9.420	Y	610.220	872.000	**872.000**	872.260	VAM	

NEDMAG

2 7/8" Dilution String

Rig : TR-5

DSV: 20/10/1995

Depth reference :	CHH	TD :	1,673	mBGL	Buoyancy :	0.87	
BHR-THH :	0.00 m	Rat hole :	190.78	m	Block weight :		Klbs
BHR- HOP :	0.00 m	Shoe depth :	1482.22	mBGL	PUW (with 90 bar whp):		Klbs
GL - HOP:	-0.26 m	Mud weight :	1.00	sg	SOW (with 90 bar whp) :		Klbs

Casing or DP data (DP used as running string)

Type	OD	ID	Grade	Weight	Capacity	CE displ.	Metal displ.		Make up torque ft.lb			MU Loss
	(inch)	(inch)		(lb/ft)	(l/m)	(l/m)	(l/m)		Min	Optimum	Max	(m)
1	2 7/8	2.441	K55	6.40	3.02	4.19	1.17	VAM	1,568	1,742	1,916	0,000
2	2 7/8	2.441	L80	6.40	3.02	4.19	1.17	VAM	2,152	2,391	2,630	0,000
3												
4												

Joint n° or name	Type n°	Total length m	Make up length m	In string Y/N	Cumul. length m	Top depth BRT/ BHR m	Top depth CHH (GL) m	Top depth THH m	Thread (bottom)	Remark
				Y		1,482.22	1,482.22	1,482.48		
94	1	9.390	9.390	Y	619.610	862.610	862.610	862.870	VAM	
93	1	9.440	9.440	Y	629.050	853.170	853.170	853.430	VAM	
92	1	9.600	9.600	Y	638.650	843.570	843.570	843.830	VAM	
91	1	9.520	9.520	Y	648.170	834.050	834.050	834.310	VAM	
90	1	9.350	9.350	Y	657.520	824.700	824.700	824.960	VAM	
89	1	9.060	9.060	Y	666.580	815.640	815.640	815.900	VAM	
88	1	9.370	9.370	Y	675.950	806.270	806.270	806.530	VAM	
87	1	9.550	9.550	Y	685.500	796.720	796.720	796.980	VAM	
86	1	9.510	9.510	Y	695.010	787.210	787.210	787.470	VAM	
85	1	9.570	9.570	Y	704.580	777.640	777.640	777.900	VAM	
84	1	9.510	9.510	Y	714.090	768.130	768.130	768.390	VAM	
83	1	9.600	9.600	Y	723.690	758.530	758.530	758.790	VAM	
82	1	9.610	9.610	Y	733.300	748.920	748.920	749.180	VAM	
81	1	9.600	9.600	Y	742.900	739.320	739.320	739.580	VAM	
80	1	9.510	9.510	Y	752.410	729.810	729.810	730.070	VAM	
79	1	9.320	9.320	Y	761.730	720.490	720.490	720.750	VAM	
78	1	9.600	9.600	Y	771.330	710.890	710.890	711.150	VAM	
77	1	9.600	9.600	Y	780.930	701.290	701.290	701.550	VAM	
76	1	9.350	9.350	Y	790.280	691.940	691.940	692.200	VAM	
75	1	9.480	9.480	Y	799.760	682.460	682.460	682.720	VAM	
74	1	9.490	9.490	Y	809.250	672.970	672.970	673.230	VAM	
73	1	9.440	9.440	Y	818.690	663.530	663.530	663.790	VAM	
72	1	9.240	9.240	Y	827.930	654.290	654.290	654.550	VAM	
71	1	9.520	9.520	Y	837.450	644.770	644.770	645.030	VAM	
70	1	9.430	9.430	Y	846.880	635.340	635.340	635.600	VAM	
69	1	9.210	9.210	Y	856.090	626.130	626.130	626.390	VAM	
68	1	9.410	9.410	Y	865.500	616.720	616.720	616.980	VAM	
67	1	9.600	9.600	Y	875.100	607.120	607.120	607.380	VAM	
66	1	9.430	9.430	Y	884.530	597.690	597.690	597.950	VAM	
65	1	9.600	9.600	Y	894.130	588.090	588.090	588.350	VAM	
64	1	9.370	9.370	Y	903.500	578.720	578.720	578.980	VAM	
63	1	9.480	9.480	Y	912.980	569.240	569.240	569.500	VAM	
62	1	9.500	9.500	Y	922.480	559.740	559.740	560.000	VAM	
61	1	9.470	9.470	Y	931.950	550.270	550.270	550.530	VAM	
60	1	9.600	9.600	Y	941.550	540.670	540.670	540.930	VAM	
59	1	9.150	9.150	Y	950.700	531.520	531.520	531.780	VAM	
58	1	9.600	9.600	Y	960.300	521.920	521.920	522.180	VAM	
57	1	9.500	9.500	Y	969.800	512.420	512.420	512.680	VAM	
56	1	9.500	9.500	Y	979.300	502.920	502.920	503.180	VAM	
55	1	9.260	9.260	Y	988.560	493.660	493.660	493.920	VAM	
54	1	9.330	9.330	Y	997.890	484.330	484.330	484.590	VAM	
53	1	9.370	9.370	Y	1007.260	474.960	474.960	475.220	VAM	
52	1	9.340	9.340	Y	1016.600	465.620	465.620	465.880	VAM	
51	1	9.580	9.580	Y	1026.180	456.040	456.040	456.300	VAM	
50	1	9.600	9.600	Y	1035.780	446.440	446.440	446.700	VAM	
49	1	9.600	9.600	Y	1045.380	436.840	436.840	437.100	VAM	
48	1	9.510	9.510	Y	1054.890	427.330	427.330	427.590	VAM	
47	1	9.320	9.320	Y	1064.210	418.010	418.010	418.270	VAM	
46	1	9.300	9.300	Y	1073.510	408.710	408.710	408.970	VAM	
45	1	9.470	9.470	Y	1082.980	399.240	399.240	399.500	VAM	
44	1	9.400	9.400	Y	1092.380	389.840	389.840	390.100	VAM	
43	1	9.110	9.110	Y	1101.490	380.730	380.730	380.990	VAM	
42	1	9.510	9.510	Y	1111.000	371.220	371.220	371.480	VAM	
41	1	9.190	9.190	Y	1120.190	362.030	362.030	362.290	VAM	
40	1	9.450	9.450	y	1129.640	352.580	352.580	352.840	VAM	
39	1	9.500	9.500	y	1139.140	343.080	343.080	343.340	VAM	
38	1	9.390	9.390	y	1148.530	333.690	333.690	333.950	VAM	
37	1	9.400	9.400	y	1157.930	324.290	324.290	324.550	VAM	
36	1	8.950	8.950	y	1166.880	315.340	315.340	315.600	VAM	
35	1	9.270	9.270	y	1176.150	306.070	306.070	306.330	VAM	
34	1	9.320	9.320	Y	1185.470	296.750	296.750	297.010	VAM	
33	1	9.200	9.200	Y	1194.670	287.550	287.550	287.810	VAM	
32	1	9.360	9.360	Y	1204.030	278.190	278.190	278.450	VAM	
31	1	9.160	9.160	Y	1213.190	269.030	269.030	269.290	VAM	
30	1	9.190	9.190	Y	1222.380	259.840	259.840	260.100	VAM	

NEDMAG

2 7/8" Dilution String

Rig : TR-5

DSV: 20/10/1995

Depth reference :	CHH	TD :	1,673	mBGL	Buoyancy :	0.87	
BHR-THH :	0.00 m	Rat hole :	190.78	m	Block weight :		Klbs
BHR- HOP :	0.00 m	Shoe depth :	1482.22	mBGL	PUW (with 90 bar whp):		Klbs
GL - HOP:	-0.26 m	Mud weight :	1.00	sg	SOW (with 90 bar whp) :		Klbs

Casing or DP data (DP used as running string)

Type	OD	ID	Grade	Weight	Capacity	CE displ.	Metal displ.		Make up torque ft.lb			MU Loss
	(inch)	(inch)		(lb/ft)	(l/m)	(l/m)	(l/m)		Min	Optimum	Max	(m)
1	2 7/8	2.441	K55	6.40	3.02	4.19	1.17	VAM	1,568	1,742	1,916	0.000
2	2 7/8	2.441	L80	6.40	3.02	4.19	1.17	VAM	2,152	2,391	2,630	0.000
3												
4												

Joint n° or name	Type n°	Total length	Make up length	In string	Cumul. length	Top depth BRT/ BHR	Top depth CHH (GL)	Top depth THH	Thread (bottom)	Remark
		m	m	Y/N	m	m	m	m		
29	1	9.490	9.490	y	1231.870	250.350	**250.350**	250.610	VAM	
28	2	9.220	9.220	y	1241.090	241.130	**241.130**	241.390	VAM	
27	2	9.370	9.370	y	1250.460	231.760	**231.760**	232.020	VAM	
26	2	9.170	9.170	y	1259.630	222.590	**222.590**	222.850	VAM	
25	2	9.280	9.280	y	1268.910	213.310	**213.310**	213.570	VAM	
24	2	9.140	9.140	y	1278.050	204.170	**204.170**	204.430	VAM	
23	2	9.120	9.120	Y	1287.170	195.050	**195.050**	195.310	VAM	
22	2	9.450	9.450	Y	1296.620	185.600	**185.600**	185.860	VAM	
21	2	9.310	9.310	Y	1305.930	176.290	**176.290**	176.550	VAM	
20	2	9.320	9.320	Y	1315.250	166.970	**166.970**	167.230	VAM	
19	2	9.340	9.340	Y	1324.590	157.630	**157.630**	157.890	VAM	
18	2	9.360	9.360	y	1333.950	148.270	**148.270**	148.530	VAM	
17	2	9.330	9.330	y	1343.280	138.940	**138.940**	139.200	VAM	
16	2	9.390	9.390	y	1352.670	129.550	**129.550**	129.810	VAM	
15	2	9.240	9.240	y	1361.910	120.310	**120.310**	120.570	VAM	
14	2	9.350	9.350	Y	1371.260	110.960	**110.960**	111.220	VAM	
13	2	9.270	9.270	Y	1380.530	101.690	**101.690**	101.950	VAM	
12	2	9.040	9.040	Y	1389.570	92.650	**92.650**	92.910	VAM	
11	2	8.840	8.840	y	1398.410	83.810	**83.810**	84.070	VAM	
10	2	9.060	9.060	y	1407.470	74.750	**74.750**	75.010	VAM	
9	2	9.410	9.410	y	1416.880	65.340	**65.340**	65.600	VAM	
8	2	8.870	8.870	y	1425.750	56.470	**56.470**	56.730	VAM	
7	2	9.360	9.360	y	1435.110	47.110	**47.110**	47.370	VAM	
6	2	9.340	9.340	Y	1444.450	37.770	**37.770**	38.030	VAM	
5	2	9.250	9.250	Y	1453.700	28.520	**28.520**	28.780	VAM	
4	2	9.280	9.280	Y	1462.980	19.240	**19.240**	19.500	VAM	
3	2	9.150	9.150	y	1472.130	10.090	**10.090**	10.350	VAM	
2	2	9.260	9.260	y	1481.390	0.830	**0.830**	1.090	VAM	
1 - Hanger	1	1.090	1.090	y	1482.480	-0.260	**-0.260**	0.000	VAM	

8.7.2. 3 ½" Injection Tubing Tally

NEDMAG

3 1/2" injection String

Rig : TR-5

DSV: 15/10/2019

Depth reference :	CHH	TD :	1,673	mBGL	Buoyancy :	0.87	
BHR-THH :	0.00 m	Rat hole :	0.00	m	Block weight :		Klbs
BHR- HOP :	0.00 m	Shoe depth :	1673.00	mBGL	PUW (with 90 bar whp):		Klbs
GL - HOP:	0.58 m	Mud weight :	1.00	sg	SOW (with 90 bar whp) :		Klbs

Casing or DP data (DP used as running string)

Type	OD (inch)	ID (inch)	Grade	Weight (lb/ft)	Capacity (l/m)	CE displ. (l/m)	Metal displ. (l/m)		Make up torque ft.lb Min	Optimum	Max	MU Loss (m)
1	3 1/2	2.922	J55	10.20	4.33	6.21	1.88	VAM				0.000
2												
3												
4												

Joint n° or name	Type n°	Total length m	Make up length m	In string Y/N	Cumul. length m	Top depth BRT/ BHR m	Top depth CHH (GL) m	Top depth THH m	Thread (bottom)	Remark
				Y		1,673.00	1,673.00	1,672.42		Heat/ batch no
15	1	4.490	4.490	Y	4.490	1668.510	1668.510	1667.930	VAM	Joint below HUD
16	1	9.250	9.250	Y	13.740	1659.260	1659.260	1658.680	VAM	Joint below HUD
17	1	9.370	9.370	Y	23.110	1649.890	1649.890	1649.310	VAM	Joint below HUD
18	1	9.250	9.250	Y	32.360	1640.640	1640.640	1640.060	VAM	Joint below HUD
19	1	1.500	1.500	Y	33.860	1639.140	1639.140	1638.560	VAM	Joint below HUD
20	1	9.100	9.100	Y	42.960	1630.040	1630.040	1629.460	VAM	Joint below HUD
21	1	9.260	9.260	Y	52.220	1620.780	1620.780	1620.200	VAM	
22	1	9.410	9.410	Y	61.630	1611.370	1611.370	1610.790	VAM	
23	1	9.300	9.300	Y	70.930	1602.070	1602.070	1601.490	VAM	
24	1	9.550	9.550	Y	80.480	1592.520	1592.520	1591.940	VAM	
25	1	9.280	9.280	Y	89.760	1583.240	1583.240	1582.660	VAM	
26	1	9.260	9.260	Y	99.020	1573.980	1573.980	1573.400	VAM	
27	1	9.350	9.350	Y	108.370	1564.630	1564.630	1564.050	VAM	
28	1	9.420	9.420	Y	117.790	1555.210	1555.210	1554.630	VAM	
29	1	9.360	9.360	Y	127.150	1545.850	1545.850	1545.270	VAM	
30	1	9.230	9.230	Y	136.380	1536.620	1536.620	1536.040	VAM	
31	1	9.360	9.360	Y	145.740	1527.260	1527.260	1526.680	VAM	
32	1	9.280	9.280	Y	155.020	1517.980	1517.980	1517.400	VAM	
33	1	9.330	9.330	Y	164.350	1508.650	1508.650	1508.070	VAM	
34	1	9.360	9.360	Y	173.710	1499.290	1499.290	1498.710	VAM	
35	1	9.340	9.340	Y	183.050	1489.950	1489.950	1489.370	VAM	
36	1	9.240	9.240	Y	192.290	1480.710	1480.710	1480.130	VAM	
37	1	9.210	9.210	Y	201.500	1471.500	1471.500	1470.920	VAM	
38	1	9.530	9.530	Y	211.030	1461.970	1461.970	1461.390	VAM	
39	1	9.350	9.350	Y	220.380	1452.620	1452.620	1452.040	VAM	
40	1	9.370	9.370	Y	229.750	1443.250	1443.250	1442.670	VAM	
41	1	9.350	9.350	Y	239.100	1433.900	1433.900	1433.320	VAM	
42	1	9.240	9.240	Y	248.340	1424.660	1424.660	1424.080	VAM	
43	1	9.370	9.370	Y	257.710	1415.290	1415.290	1414.710	VAM	
44	1	9.350	9.350	Y	267.060	1405.940	1405.940	1405.360	VAM	
45	1	9.300	9.300	Y	276.360	1396.640	1396.640	1396.060	VAM	
46	1	9.090	9.090	Y	285.450	1387.550	1387.550	1386.970	VAM	
47	1	9.200	9.200	Y	294.650	1378.350	1378.350	1377.770	VAM	
48	1	9.250	9.250	Y	303.900	1369.100	1369.100	1368.520	VAM	
49	1	9.330	9.330	Y	313.230	1359.770	1359.770	1359.190	VAM	
50	1	9.510	9.510	Y	322.740	1350.260	1350.260	1349.680	VAM	
51	1	9.360	9.360	Y	332.100	1340.900	1340.900	1340.320	VAM	
52	1	9.450	9.450	Y	341.550	1331.450	1331.450	1330.870	VAM	
53	1	9.510	9.510	Y	351.060	1321.940	1321.940	1321.360	VAM	
54	1	9.090	9.090	Y	360.150	1312.850	1312.850	1312.270	VAM	
55	1	9.200	9.200	Y	369.350	1303.650	1303.650	1303.070	VAM	
56	1	9.420	9.420	Y	378.770	1294.230	1294.230	1293.650	VAM	
57	1	9.360	9.360	Y	388.130	1284.870	1284.870	1284.290	VAM	
58	1	9.400	9.400	Y	397.530	1275.470	1275.470	1274.890	VAM	
59	1	9.460	9.460	Y	406.990	1266.010	1266.010	1265.430	VAM	
60	1	9.380	9.380	Y	416.370	1256.630	1256.630	1256.050	VAM	
61	1	9.400	9.400	Y	425.770	1247.230	1247.230	1246.650	VAM	
62	1	9.230	9.230	Y	435.000	1238.000	1238.000	1237.420	VAM	
63	1	8.950	8.950	Y	443.950	1229.050	1229.050	1228.470	VAM	
64	1	9.400	9.400	Y	453.350	1219.650	1219.650	1219.070	VAM	
65	1	9.470	9.470	Y	462.820	1210.180	1210.180	1209.600	VAM	
66	1	9.380	9.380	Y	472.200	1200.800	1200.800	1200.220	VAM	
67	1	9.140	9.140	Y	481.340	1191.660	1191.660	1191.080	VAM	
68	1	9.450	9.450	Y	490.790	1182.210	1182.210	1181.630	VAM	
69	1	9.330	9.330	Y	500.120	1172.880	1172.880	1172.300	VAM	
70	1	9.350	9.350	Y	509.470	1163.530	1163.530	1162.950	VAM	
71	1	9.100	9.100	Y	518.570	1154.430	1154.430	1153.850	VAM	
72	1	9.140	9.140	Y	527.710	1145.290	1145.290	1144.710	VAM	
73	1	9.240	9.240	Y	536.950	1136.050	1136.050	1135.470	VAM	
74	1	9.160	9.160	Y	546.110	1126.890	1126.890	1126.310	VAM	
75	1	9.120	9.120	Y	555.230	1117.770	1117.770	1117.190	VAM	
76	1	9.230	9.230	Y	564.460	1108.540	1108.540	1107.960	VAM	
77	1	9.270	9.270	Y	573.730	1099.270	1099.270	1098.690	VAM	
78	1	8.990	8.990	Y	582.720	1090.280	1090.280	1089.700	VAM	
79	1	9.260	9.260	Y	591.980	1081.020	1081.020	1080.440	VAM	
80	1	9.390	9.390	Y	601.370	1071.630	1071.630	1071.050	VAM	
81	1	9.390	9.390	Y	610.760	1062.240	1062.240	1061.660	VAM	
82	1	9.110	9.110	Y	619.870	1053.130	1053.130	1052.550	VAM	
83	1	9.500	9.500	Y	629.370	1043.630	1043.630	1043.050	VAM	
84	1	9.350	9.350	Y	638.720	1034.280	1034.280	1033.700	VAM	

NEDMAG

3 1/2" injection String

Rig : TR-5

DSV: 15/10/2019

Depth reference :	CHH	TD :	1,673	mBGL	Buoyancy :	0.87	
BHR-THH :	0.00 m	Rat hole :	0.00	m	Block weight :		Klbs
BHR- HOP :	0.00 m	Shoe depth :	1673.00	mBGL	PUW (with 90 bar whp):		Klbs
GL - HOP:	0.58 m	Mud weight :	1.00	sg	SOW (with 90 bar whp) :		Klbs

Casing or DP data (DP used as running string)

Type	OD	ID	Grade	Weight	Capacity	CE displ.	Metal displ.		Make up torque ft.lb			MU Loss
	(inch)	(inch)		(lb/ft)	(l/m)	(l/m)	(l/m)		Min	Optimum	Max	(m)
1	3 1/2	2.922	J55	10.20	4.33	6.21	1.88	VAM				0.000
2												
3												
4												

Joint n° or name	Type n°	Total length	Make up length	In string	Cumul. length	Top depth BRT/ BHR	Top depth CHH (GL)	Top depth THH	Thread (bottom)	Remark
		m	m	Y/N	m	m	m	m		
85	1	9.340	9.340	Y	648.060	1024.940	**1024.940**	1024.360	VAM	
86	1	9.320	9.320	Y	657.380	1015.620	**1015.620**	1015.040	VAM	
87	1	8.910	8.910	Y	666.290	1006.710	**1006.710**	1006.130	VAM	
88	1	8.800	8.800	Y	675.090	997.910	**997.910**	997.330	VAM	
89	1	9.180	9.180	Y	684.270	988.730	**988.730**	988.150	VAM	
90	1	9.330	9.330	Y	693.600	979.400	**979.400**	978.820	VAM	
91	1	9.430	9.430	Y	703.030	969.970	**969.970**	969.390	VAM	
92	1	9.450	9.450	Y	712.480	960.520	**960.520**	959.940	VAM	
93	1	9.370	9.370	Y	721.850	951.150	**951.150**	950.570	VAM	
94	1	9.330	9.330	Y	731.180	941.820	**941.820**	941.240	VAM	
95	1	9.230	9.230	Y	740.410	932.590	**932.590**	932.010	VAM	
96	1	8.910	8.910	Y	749.320	923.680	**923.680**	923.100	VAM	
97	1	9.090	9.090	Y	758.410	914.590	**914.590**	914.010	VAM	
98	1	8.850	8.850	Y	767.260	905.740	**905.740**	905.160	VAM	
99	1	9.200	9.200	Y	776.460	896.540	**896.540**	895.960	VAM	
100	1	9.410	9.410	Y	785.870	887.130	**887.130**	886.550	VAM	
101	1	9.370	9.370	Y	795.240	877.760	**877.760**	877.180	VAM	
102	1	9.370	9.370	Y	804.610	868.390	**868.390**	867.810	VAM	
103	1	9.080	9.080	Y	813.690	859.310	**859.310**	858.730	VAM	
104	1	9.400	9.400	Y	823.090	849.910	**849.910**	849.330	VAM	
105	1	9.490	9.490	Y	832.580	840.420	**840.420**	839.840	VAM	
106	1	9.440	9.440	Y	842.020	830.980	**830.980**	830.400	VAM	
107	1	8.960	8.960	Y	850.980	822.020	**822.020**	821.440	VAM	
108	1	9.600	9.600	Y	860.580	812.420	**812.420**	811.840	VAM	
109	1	9.370	9.370	Y	869.950	803.050	**803.050**	802.470	VAM	
110	1	9.380	9.380	Y	879.330	793.670	**793.670**	793.090	VAM	
111	1	9.400	9.400	Y	888.730	784.270	**784.270**	783.690	VAM	
112	1	9.550	9.550	Y	898.280	774.720	**774.720**	774.140	VAM	
113	1	9.390	9.390	Y	907.670	765.330	**765.330**	764.750	VAM	
114	1	9.230	9.230	Y	916.900	756.100	**756.100**	755.520	VAM	
115	1	9.400	9.400	Y	926.300	746.700	**746.700**	746.120	VAM	
116	1	9.010	9.010	Y	935.310	737.690	**737.690**	737.110	VAM	
117	1	9.010	9.010	Y	944.320	728.680	**728.680**	728.100	VAM	
118	1	9.330	9.330	Y	953.650	719.350	**719.350**	718.770	VAM	
119	1	9.370	9.370	Y	963.020	709.980	**709.980**	709.400	VAM	
120	1	9.090	9.090	Y	972.110	700.890	**700.890**	700.310	VAM	
121	1	9.390	9.390	Y	981.500	691.500	**691.500**	690.920	VAM	
122	1	9.290	9.290	Y	990.790	682.210	**682.210**	681.630	VAM	
123	1	9.120	9.120	Y	999.910	673.090	**673.090**	672.510	VAM	
124	1	9.300	9.300	Y	1009.210	663.790	**663.790**	663.210	VAM	
125	1	8.920	8.920	Y	1018.130	654.870	**654.870**	654.290	VAM	
126	1	9.360	9.360	Y	1027.490	645.510	**645.510**	644.930	VAM	
127	1	9.320	9.320	Y	1036.810	636.190	**636.190**	635.610	VAM	
128	1	9.400	9.400	Y	1046.210	626.790	**626.790**	626.210	VAM	
129	1	9.450	9.450	Y	1055.660	617.340	**617.340**	616.760	VAM	
130	1	9.420	9.420	Y	1065.080	607.920	**607.920**	607.340	VAM	
131	1	9.210	9.210	Y	1074.290	598.710	**598.710**	598.130	VAM	
132	1	9.580	9.580	Y	1083.870	589.130	**589.130**	588.550	VAM	
133	1	9.380	9.380	Y	1093.250	579.750	**579.750**	579.170	VAM	
134	1	9.590	9.590	Y	1102.840	570.160	**570.160**	569.580	VAM	
135	1	9.280	9.280	Y	1112.120	560.880	**560.880**	560.300	VAM	
136	1	9.140	9.140	Y	1121.260	551.740	**551.740**	551.160	VAM	
137	1	9.570	9.570	Y	1130.830	542.170	**542.170**	541.590	VAM	
138	1	9.010	9.010	Y	1139.840	533.160	**533.160**	532.580	VAM	
139	1	9.530	9.530	Y	1149.370	523.630	**523.630**	523.050	VAM	
140	1	9.540	9.540	Y	1158.910	514.090	**514.090**	513.510	VAM	
141	1	9.430	9.430	Y	1168.340	504.660	**504.660**	504.080	VAM	
142	1	9.300	9.300	Y	1177.640	495.360	**495.360**	494.780	VAM	
143	1	9.020	9.020	Y	1186.660	486.340	**486.340**	485.760	VAM	
144	1	9.100	9.100	Y	1195.760	477.240	**477.240**	476.660	VAM	
145	1	9.370	9.370	Y	1205.130	467.870	**467.870**	467.290	VAM	
146	1	8.940	8.940	Y	1214.070	458.930	**458.930**	458.350	VAM	
147	1	9.400	9.400	Y	1223.470	449.530	**449.530**	448.950	VAM	
148	1	9.220	9.220	Y	1232.690	440.310	**440.310**	439.730	VAM	

NEDMAG

3 1/2" injection String

Rig : TR-5

DSV: 15/10/2019

Depth reference :	CHH	TD :	1,673	mBGL	Buoyancy :	0.87	
BHR-THH :	0.00 m	Rat hole :	0.00	m	Block weight :		Klbs
BHR- HOP :	0.00 m	Shoe depth :	1673.00	mBGL	PUW (with 90 bar whp):		Klbs
GL - HOP:	0.58 m	Mud weight :	1.00	sg	SOW (with 90 bar whp) :		Klbs

Casing or DP data (DP used as running string)

Type	OD	ID	Grade	Weight	Capacity	CE displ.	Metal displ.		Make up torque ft.lb			MU Loss
	(inch)	(inch)		(lb/ft)	(l/m)	(l/m)	(l/m)		Min	Optimum	Max	(m)
1	3 1/2	2.922	J55	10.20	4.33	6.21	1.88	VAM				0.000
2												
3												
4												

Joint n° or name	Type n°	Total length	Make up length	In string	Cumul. length	Top depth BRT/ BHR	Top depth CHH (GL)	Top depth THH	Thread (bottom)	Remark
		m	m	Y/N	m	m	m	m		
149	1	9.390	9.390	Y	1242.080	430.920	**430.920**	430.340	VAM	
150	1	9.360	9.360	Y	1251.440	421.560	**421.560**	420.980	VAM	
151	1	8.980	8.980	Y	1260.420	412.580	**412.580**	412.000	VAM	
152	1	9.080	9.080	Y	1269.500	403.500	**403.500**	402.920	VAM	
153	1	9.120	9.120	Y	1278.620	394.380	**394.380**	393.800	VAM	
154	1	9.410	9.410	Y	1288.030	384.970	**384.970**	384.390	VAM	
155	1	9.220	9.220	Y	1297.250	375.750	**375.750**	375.170	VAM	
156	1	9.260	9.260	Y	1306.510	366.490	**366.490**	365.910	VAM	
157	1	9.470	9.470	Y	1315.980	357.020	**357.020**	356.440	VAM	
158	1	9.060	9.060	Y	1325.040	347.960	**347.960**	347.380	VAM	
159	1	9.350	9.350	Y	1334.390	338.610	**338.610**	338.030	VAM	
160	1	9.500	9.500	Y	1343.890	329.110	**329.110**	328.530	VAM	
161	1	9.390	9.390	Y	1353.280	319.720	**319.720**	319.140	VAM	
162	1	9.180	9.180	Y	1362.460	310.540	**310.540**	309.960	VAM	
163	1	9.430	9.430	Y	1371.890	301.110	**301.110**	300.530	VAM	
164	1	9.210	9.210	Y	1381.100	291.900	**291.900**	291.320	VAM	
165	1	9.290	9.290	Y	1390.390	282.610	**282.610**	282.030	VAM	
166	1	9.250	9.250	Y	1399.640	273.360	**273.360**	272.780	VAM	
167	1	9.350	9.350	Y	1408.990	264.010	**264.010**	263.430	VAM	
168	1	9.020	9.020	Y	1418.010	254.990	**254.990**	254.410	VAM	
169	1	9.370	9.370	Y	1427.380	245.620	**245.620**	245.040	VAM	
170	1	9.210	9.210	Y	1436.590	236.410	**236.410**	235.830	VAM	
171	1	9.360	9.360	Y	1445.950	227.050	**227.050**	226.470	VAM	
172	1	9.370	9.370	Y	1455.320	217.680	**217.680**	217.100	VAM	
173	1	9.640	9.640	Y	1464.960	208.040	**208.040**	207.460	VAM	
174	1	9.520	9.520	Y	1474.480	198.520	**198.520**	197.940	VAM	
175	1	9.240	9.240	Y	1483.720	189.280	**189.280**	188.700	VAM	
176	1	9.370	9.370	Y	1493.090	179.910	**179.910**	179.330	VAM	
177	1	9.480	9.480	Y	1502.570	170.430	**170.430**	169.850	VAM	
178	1	9.490	9.490	Y	1512.060	160.940	**160.940**	160.360	VAM	
179	1	9.590	9.590	y	1521.650	151.350	**151.350**	150.770	VAM	
180	1	9.380	9.380	y	1531.030	141.970	**141.970**	141.390	VAM	
181	1	9.400	9.400	y	1540.430	132.570	**132.570**	131.990	VAM	
182	1	9.230	9.230	y	1549.660	123.340	**123.340**	122.760	VAM	
183	1	9.550	9.550	y	1559.210	113.790	**113.790**	113.210	VAM	
184	1	8.930	8.930	y	1568.140	104.860	**104.860**	104.280	VAM	
185	1	9.520	9.520	y	1577.660	95.340	**95.340**	94.760	VAM	
186	1	9.170	9.170	y	1586.830	86.170	**86.170**	85.590	VAM	
187	1	9.470	9.470	y	1596.300	76.700	**76.700**	76.120	VAM	
188	1	9.560	9.560	y	1605.860	67.140	**67.140**	66.560	VAM	
189	1	8.960	8.960	y	1614.820	58.180	**58.180**	57.600	VAM	
190	1	9.590	9.590	y	1624.410	48.590	**48.590**	48.010	VAM	
191	1	9.530	9.530	y	1633.940	39.060	**39.060**	38.480	VAM	
192	1	9.360	9.360	y	1643.300	29.700	**29.700**	29.120	VAM	
193	1	9.580	9.580	y	1652.880	20.120	**20.120**	19.540	VAM	
194	1	9.410	9.410	y	1662.290	10.710	**10.710**	10.130	VAM	
195	1	9.580	9.580	y	1671.870	1.130	**1.130**	0.550	VAM	
Hanger assembly	1	1.130	1.130	y	1673.000	0.000	**0.000**	-0.580	VAM	

8.7.3. 4 ½" Production String

NEDMAG

4 1/2" Production String

Rig : TR-5

DSV: 29/11/1982

Depth reference :	CHH	TD :	1,843	mBGL	Buoyancy :	0.87	
BHR-THH :	0.00 m	Rat hole :	0.00	m	Block weight :		Klbs
BHR- HOP :	0.00 m	Shoe depth :	1842.90	mBGL	PUW (with 90 bar whp):		Klbs
GL - HOP:	0.58 m	Mud weight :	1.00	sg	SOW (with 90 bar whp) :		Klbs

Casing or DP data (DP used as running string)

Type	OD (inch)	ID (inch)	Grade	Weight (lb/ft)	Capacity (l/m)	CE displ. (l/m)	Metal displ. (l/m)		Make up torque ft.lb Min	Optimum	Max	MU Loss (m)
1	4 1/2	3.958	J55	12.60	7.94	10.26	2.32	VAM				0.000
2												
3												
4												

Joint n° or name	Type n°	Total length m	Make up length m	In string Y/N	Cumul. length m	Top depth BRT/ BHR m	Top depth CHH (GL) m	Top depth THH m	Thread (bottom)	Remark	Remark
				Y		1,842.90	1,842.90	1,842.32			Heat/ batch no
BULL NOSE	1	0.200	0.200	y	0.200	1842.700	1842.700	1842.120	VAM		No access (below HUD 1995)
PERF JT	1	0.660	0.660	y	0.860	1842.040	1842.040	1841.460	VAM		No access (below HUD 1995)
2	1	9.600	9.600	y	10.460	1832.440	1832.440	1831.860	VAM		No access (below HUD 1995)
1	1	8.680	8.680	Y	19.140	1823.760	1823.760	1823.180	VAM		No access (below HUD 1995)
3	1	9.460	9.460	Y	28.600	1814.300	1814.300	1813.720	VAM		No access (below HUD 1995)
X-Nipple	1	0.290	0.290	Y	28.890	1814.010	1814.010	1813.430	VAM		No access (below HUD 1995)
PUP JT	1	0.630	0.630	y	29.520	1813.380	1813.380	1812.800	VAM		No access (below HUD 1995)
XO	1	0.330	0.330	y	29.850	1813.050	1813.050	1812.470	VAM		No access (below HUD 1995)
200	1	9.200	9.200	y	39.050	1803.850	1803.850	1803.270	VAM		No access (below HUD 1995)
199	1	9.560	9.560	y	48.610	1794.290	1794.290	1793.710	VAM		No access (below HUD 1995)
198	1	9.390	9.390	y	58.000	1784.900	1784.900	1784.320	VAM		No access (below HUD 1995)
197	1	9.200	9.200	Y	67.200	1775.700	1775.700	1775.120	VAM		No access (below HUD 1995)
196	1	9.480	9.480	Y	76.680	1766.220	1766.220	1765.640	VAM		No access (below HUD 1995)
195	1	9.450	9.450	Y	86.130	1756.770	1756.770	1756.190	VAM		No access (below HUD 1995)
194	1	9.180	9.180	y	95.310	1747.590	1747.590	1747.010	VAM		No access (below HUD 1995)
193	1	9.600	9.600	y	104.910	1737.990	1737.990	1737.410	VAM		No access (below HUD 1995)
192	1	9.600	9.600	y	114.510	1728.390	1728.390	1727.810	VAM		No access (below HUD 1995)
191	1	9.320	9.320	y	123.830	1719.070	1719.070	1718.490	VAM		No access (below HUD 1995)
190	1	9.400	9.400	Y	133.230	1709.670	1709.670	1709.090	VAM		No access (below HUD 1995)
189	1	9.530	9.530	Y	142.760	1700.140	1700.140	1699.560	VAM		No access (below HUD 1995)
188	1	9.300	9.300	Y	152.060	1690.840	1690.840	1690.260	VAM		No access (below HUD 1995)
187	1	9.110	9.110	Y	161.170	1681.730	1681.730	1681.150	VAM		No access (below HUD 1995)
186	1	9.500	9.500	Y	170.670	1672.230	1672.230	1671.650	VAM		No access (below HUD 1995)
185	1	8.990	8.990	y	179.660	1663.240	1663.240	1662.660	VAM		No access (below HUD 1995)
184	1	9.420	9.420	y	189.080	1653.820	1653.820	1653.240	VAM		No access (below HUD 1995)
183	1	9.450	9.450	y	198.530	1644.370	1644.370	1643.790	VAM		No access (below HUD 1995)
182	1	9.290	9.290	y	207.820	1635.080	1635.080	1634.500	VAM		Joint below HUD in 3 1/2"
181	1	9.440	9.440	y	217.260	1625.640	1625.640	1625.060	VAM		
180	1	9.150	9.150	y	226.410	1616.490	1616.490	1615.910	VAM		
179	1	9.320	9.320	Y	235.730	1607.170	1607.170	1606.590	VAM		
178	1	9.540	9.540	Y	245.270	1597.630	1597.630	1597.050	VAM		
177	1	9.430	9.430	Y	254.700	1588.200	1588.200	1587.620	VAM		
176	1	9.410	9.410	Y	264.110	1578.790	1578.790	1578.210	VAM		
175	1	9.550	9.550	Y	273.660	1569.240	1569.240	1568.660	VAM		
174	1	9.370	9.370	y	283.030	1559.870	1559.870	1559.290	VAM		
173	1	9.320	9.320	y	292.350	1550.550	1550.550	1549.970	VAM		
172	1	9.250	9.250	y	301.600	1541.300	1541.300	1540.720	VAM		
171	1	9.400	9.400	y	311.000	1531.900	1531.900	1531.320	VAM		
170	1	9.490	9.490	y	320.490	1522.410	1522.410	1521.830	VAM		
169	1	9.200	9.200	y	329.690	1513.210	1513.210	1512.630	VAM		
168	1	9.400	9.400	Y	339.090	1503.810	1503.810	1503.230	VAM		
167	1	9.390	9.390	Y	348.480	1494.420	1494.420	1493.840	VAM		
166	1	9.420	9.420	Y	357.900	1485.000	1485.000	1484.420	VAM		
165	1	9.510	9.510	Y	367.410	1475.490	1475.490	1474.910	VAM		
164	1	9.380	9.380	Y	376.790	1466.110	1466.110	1465.530	VAM		
163	1	9.540	9.540	Y	386.330	1456.570	1456.570	1455.990	VAM		
162	1	9.590	9.590	Y	395.920	1446.980	1446.980	1446.400	VAM		
161	1	9.240	9.240	Y	405.160	1437.740	1437.740	1437.160	VAM		
160	1	9.390	9.390	Y	414.550	1428.350	1428.350	1427.770	VAM		
159	1	9.020	9.020	Y	423.570	1419.330	1419.330	1418.750	VAM		
158	1	9.390	9.390	Y	432.960	1409.940	1409.940	1409.360	VAM		
157	1	9.420	9.420	Y	442.380	1400.520	1400.520	1399.940	VAM		
156	1	9.310	9.310	Y	451.690	1391.210	1391.210	1390.630	VAM		
155	1	9.370	9.370	Y	461.060	1381.840	1381.840	1381.260	VAM		
154	1	9.130	9.130	Y	470.190	1372.710	1372.710	1372.130	VAM		
153	1	9.370	9.370	Y	479.560	1363.340	1363.340	1362.760	VAM		
152	1	9.500	9.500	Y	489.060	1353.840	1353.840	1353.260	VAM		
151	1	9.550	9.550	Y	498.610	1344.290	1344.290	1343.710	VAM		
150	1	9.370	9.370	Y	507.980	1334.920	1334.920	1334.340	VAM		
149	1	9.260	9.260	Y	517.240	1325.660	1325.660	1325.080	VAM		Joint Below HUD in 2 7/8"
148	1	9.450	9.450	Y	526.690	1316.210	1316.210	1315.630	VAM		
147	1	9.550	9.550	Y	536.240	1306.660	1306.660	1306.080	VAM		
146	1	9.470	9.470	Y	545.710	1297.190	1297.190	1296.610	VAM		
145	1	9.370	9.370	Y	555.080	1287.820	1287.820	1287.240	VAM		
144	1	9.250	9.250	Y	564.330	1278.570	1278.570	1277.990	VAM		
143	1	9.510	9.510	Y	573.840	1269.060	1269.060	1268.480	VAM		
142	1	9.390	9.390	Y	583.230	1259.670	1259.670	1259.090	VAM		
141	1	9.140	9.140	Y	592.370	1250.530	1250.530	1249.950	VAM		
140	1	9.530	9.530	Y	601.900	1241.000	1241.000	1240.420	VAM		
139	1	9.540	9.540	Y	611.440	1231.460	1231.460	1230.880	VAM		

NEDMAG

4 1/2" Production String

Rig : TR-5

DSV: 29/11/1982

Depth reference :	CHH	TD :	1,843	mBGL	Buoyancy :	0.87	
BHR-THH :	0.00 m	Rat hole :	0.00	m	Block weight :		Klbs
BHR- HOP :	0.00 m	Shoe depth :	1842.90	mBGL	PUW (with 90 bar whp):		Klbs
GL - HOP:	0.58 m	Mud weight :	1.00	sg	SOW (with 90 bar whp) :		Klbs

Casing or DP data (DP used as running string)

Type	OD	ID	Grade	Weight	Capacity	CE displ.	Metal displ.		Make up torque ft.lb			MU Loss
	(inch)	(inch)		(lb/ft)	(l/m)	(l/m)	(l/m)		Min	Optimum	Max	(m)
1	4 1/2	3.958	J55	12.60	7.94	10.26	2.32	VAM				0.000
2												
3												
4												

Joint n° or name	Type n°	Total length	Make up length	In string	Cumul. length	Top depth BRT/ BHR	Top depth CHH (GL)	Top depth THH	Thread (bottom)	Remark	Remark
		m	m	Y/N	m	m	m	m			
138	1	9.540	9.540	Y	620.980	1221.920	**1221.920**	1221.340	VAM		
137	1	9.530	9.530	Y	630.510	1212.390	**1212.390**	1211.810	VAM		
136	1	9.350	9.350	Y	639.860	1203.040	**1203.040**	1202.460	VAM		
135	1	9.260	9.260	Y	649.120	1193.780	**1193.780**	1193.200	VAM		
134	1	9.520	9.520	Y	658.640	1184.260	**1184.260**	1183.680	VAM		
133	1	9.380	9.380	Y	668.020	1174.880	**1174.880**	1174.300	VAM		
132	1	9.290	9.290	Y	677.310	1165.590	**1165.590**	1165.010	VAM		
131	1	9.300	9.300	Y	686.610	1156.290	**1156.290**	1155.710	VAM		
130	1	9.380	9.380	Y	695.990	1146.910	**1146.910**	1146.330	VAM		
129	1	9.570	9.570	Y	705.560	1137.340	**1137.340**	1136.760	VAM		
128	1	9.310	9.310	Y	714.870	1128.030	**1128.030**	1127.450	VAM		
127	1	9.540	9.540	Y	724.410	1118.490	**1118.490**	1117.910	VAM		
126	1	9.200	9.200	Y	733.610	1109.290	**1109.290**	1108.710	VAM		
125	1	9.310	9.310	Y	742.920	1099.980	**1099.980**	1099.400	VAM		
124	1	9.520	9.520	Y	752.440	1090.460	**1090.460**	1089.880	VAM		
123	1	9.570	9.570	Y	762.010	1080.890	**1080.890**	1080.310	VAM		
122	1	9.550	9.550	Y	771.560	1071.340	**1071.340**	1070.760	VAM		
121	1	9.280	9.280	Y	780.840	1062.060	**1062.060**	1061.480	VAM		
120	1	9.380	9.380	Y	790.220	1052.680	**1052.680**	1052.100	VAM		
119	1	9.100	9.100	Y	799.320	1043.580	**1043.580**	1043.000	VAM		
118	1	9.570	9.570	Y	808.890	1034.010	**1034.010**	1033.430	VAM		
117	1	9.390	9.390	Y	818.280	1024.620	**1024.620**	1024.040	VAM		
116	1	9.540	9.540	Y	827.820	1015.080	**1015.080**	1014.500	VAM		
115	1	9.460	9.460	Y	837.280	1005.620	**1005.620**	1005.040	VAM		
114	1	9.330	9.330	Y	846.610	996.290	**996.290**	995.710	VAM		
113	1	9.560	9.560	Y	856.170	986.730	**986.730**	986.150	VAM		
112	1	9.500	9.500	Y	865.670	977.230	**977.230**	976.650	VAM		
111	1	9.400	9.400	Y	875.070	967.830	**967.830**	967.250	VAM		
110	1	9.310	9.310	Y	884.380	958.520	**958.520**	957.940	VAM		
109	1	9.380	9.380	Y	893.760	949.140	**949.140**	948.560	VAM		
108	1	9.350	9.350	Y	903.110	939.790	**939.790**	939.210	VAM		
107	1	9.540	9.540	Y	912.650	930.250	**930.250**	929.670	VAM		
106	1	9.260	9.260	Y	921.910	920.990	**920.990**	920.410	VAM		
105	1	9.250	9.250	Y	931.160	911.740	**911.740**	911.160	VAM		
104	1	9.520	9.520	Y	940.680	902.220	**902.220**	901.640	VAM		
103	1	9.590	9.590	Y	950.270	892.630	**892.630**	892.050	VAM		
102	1	9.540	9.540	Y	959.810	883.090	**883.090**	882.510	VAM		
101	1	9.360	9.360	Y	969.170	873.730	**873.730**	873.150	VAM		
100	1	9.490	9.490	Y	978.660	864.240	**864.240**	863.660	VAM		
99	1	9.480	9.480	Y	988.140	854.760	**854.760**	854.180	VAM		
98	1	9.610	9.610	Y	997.750	845.150	**845.150**	844.570	VAM		
97	1	9.340	9.340	Y	1007.090	835.810	**835.810**	835.230	VAM		
96	1	9.610	9.610	Y	1016.700	826.200	**826.200**	825.620	VAM		
95	1	9.200	9.200	Y	1025.900	817.000	**817.000**	816.420	VAM		
94	1	9.310	9.310	Y	1035.210	807.690	**807.690**	807.110	VAM		
93	1	9.550	9.550	Y	1044.760	798.140	**798.140**	797.560	VAM		
92	1	9.500	9.500	Y	1054.260	788.640	**788.640**	788.060	VAM		
91	1	9.510	9.510	Y	1063.770	779.130	**779.130**	778.550	VAM		
90	1	9.140	9.140	Y	1072.910	769.990	**769.990**	769.410	VAM		
89	1	9.500	9.500	Y	1082.410	760.490	**760.490**	759.910	VAM		
88	1	9.370	9.370	Y	1091.780	751.120	**751.120**	750.540	VAM		
87	1	9.460	9.460	Y	1101.240	741.660	**741.660**	741.080	VAM		
86	1	9.400	9.400	Y	1110.640	732.260	**732.260**	731.680	VAM		
85	1	9.310	9.310	Y	1119.950	722.950	**722.950**	722.370	VAM		
84	1	9.520	9.520	Y	1129.470	713.430	**713.430**	712.850	VAM		
83	1	9.480	9.480	Y	1138.950	703.950	**703.950**	703.370	VAM		
82	1	9.540	9.540	Y	1148.490	694.410	**694.410**	693.830	VAM		
81	1	9.340	9.340	Y	1157.830	685.070	**685.070**	684.490	VAM		
80	1	9.500	9.500	Y	1167.330	675.570	**675.570**	674.990	VAM		
79	1	9.390	9.390	Y	1176.720	666.180	**666.180**	665.600	VAM		
78	1	9.510	9.510	Y	1186.230	656.670	**656.670**	656.090	VAM		
77	1	9.160	9.160	Y	1195.390	647.510	**647.510**	646.930	VAM		
76	1	9.390	9.390	Y	1204.780	638.120	**638.120**	637.540	VAM		
75	1	9.550	9.550	Y	1214.330	628.570	**628.570**	627.990	VAM		
74	1	9.550	9.550	Y	1223.880	619.020	**619.020**	618.440	VAM		
73	1	9.390	9.390	Y	1233.270	609.630	**609.630**	609.050	VAM		
72	1	9.540	9.540	Y	1242.810	600.090	**600.090**	599.510	VAM		
71	1	9.550	9.550	Y	1252.360	590.540	**590.540**	589.960	VAM		
70	1	9.300	9.300	Y	1261.660	581.240	**581.240**	580.660	VAM		
69	1	9.400	9.400	Y	1271.060	571.840	**571.840**	571.260	VAM		
68	1	9.140	9.140	Y	1280.200	562.700	**562.700**	562.120	VAM		

NEDMAG

4 1/2" Production String

Rig : TR-5

DSV: 29/11/1982

Depth reference :	CHH	TD :	1,843	mBGL	Buoyancy :	0.87	
BHR-THH :	0.00 m	Rat hole :	0.00	m	Block weight :		Klbs
BHR- HOP :	0.00 m	Shoe depth :	1842.90	mBGL	PUW (with 90 bar whp):		Klbs
GL - HOP:	0.58 m	Mud weight :	1.00	sg	SOW (with 90 bar whp) :		Klbs

Casing or DP data (DP used as running string)

Type	OD	ID	Grade	Weight	Capacity	CE displ.	Metal displ.		Make up torque ft.lb			MU Loss
	(inch)	(inch)		(lb/ft)	(l/m)	(l/m)	(l/m)		Min	Optimum	Max	(m)
1	4 1/2	3.958	J55	12.60	7.94	10.26	2.32	VAM				0.000
2												
3												
4												

Joint n° or name	Type n°	Total length	Make up length	In string	Cumul. length	Top depth BRT/ BHR	Top depth CHH (GL)	Top depth THH	Thread (bottom)	Remark	Remark
		m	m	Y/N	m	m	m	m			
67	1	9.400	9.400	Y	1289.600	553.300	**553.300**	552.720	VAM		
66	1	9.310	9.310	Y	1298.910	543.990	**543.990**	543.410	VAM		
65	1	9.540	9.540	Y	1308.450	534.450	**534.450**	533.870	VAM		
64	1	9.010	9.010	Y	1317.460	525.440	**525.440**	524.860	VAM		
63	1	9.460	9.460	Y	1326.920	515.980	**515.980**	515.400	VAM		
62	1	9.380	9.380	Y	1336.300	506.600	**506.600**	506.020	VAM		
61	1	9.550	9.550	Y	1345.850	497.050	**497.050**	496.470	VAM		
60	1	9.380	9.380	Y	1355.230	487.670	**487.670**	487.090	VAM		
59	1	9.430	9.430	Y	1364.660	478.240	**478.240**	477.660	VAM		
58	1	9.530	9.530	Y	1374.190	468.710	**468.710**	468.130	VAM		
57	1	9.400	9.400	Y	1383.590	459.310	**459.310**	458.730	VAM		
56	1	9.510	9.510	Y	1393.100	449.800	**449.800**	449.220	VAM		
55	1	9.150	9.150	Y	1402.250	440.650	**440.650**	440.070	VAM		
54	1	9.550	9.550	Y	1411.800	431.100	**431.100**	430.520	VAM		
53	1	9.450	9.450	Y	1421.250	421.650	**421.650**	421.070	VAM		
52	1	9.500	9.500	Y	1430.750	412.150	**412.150**	411.570	VAM		
51	1	9.320	9.320	Y	1440.070	402.830	**402.830**	402.250	VAM		
50	1	9.070	9.070	Y	1449.140	393.760	**393.760**	393.180	VAM		
49	1	9.550	9.550	Y	1458.690	384.210	**384.210**	383.630	VAM		
48	1	9.280	9.280	Y	1467.970	374.930	**374.930**	374.350	VAM		
47	1	9.610	9.610	Y	1477.580	365.320	**365.320**	364.740	VAM		
46	1	9.290	9.290	Y	1486.870	356.030	**356.030**	355.450	VAM		
45	1	9.590	9.590	Y	1496.460	346.440	**346.440**	345.860	VAM		
44	1	9.470	9.470	Y	1505.930	336.970	**336.970**	336.390	VAM		
43	1	9.540	9.540	Y	1515.470	327.430	**327.430**	326.850	VAM		
42	1	9.430	9.430	Y	1524.900	318.000	**318.000**	317.420	VAM		
41	1	9.190	9.190	Y	1534.090	308.810	**308.810**	308.230	VAM		
40	1	9.550	9.550	Y	1543.640	299.260	**299.260**	298.680	VAM		
39	1	9.400	9.400	Y	1553.040	289.860	**289.860**	289.280	VAM		
38	1	9.580	9.580	Y	1562.620	280.280	**280.280**	279.700	VAM		
37	1	9.480	9.480	Y	1572.100	270.800	**270.800**	270.220	VAM		
36	1	9.300	9.300	Y	1581.400	261.500	**261.500**	260.920	VAM		
35	1	9.190	9.190	Y	1590.590	252.310	**252.310**	251.730	VAM		
34	1	9.480	9.480	Y	1600.070	242.830	**242.830**	242.250	VAM		
33	1	9.200	9.200	Y	1609.270	233.630	**233.630**	233.050	VAM		
32	1	9.080	9.080	Y	1618.350	224.550	**224.550**	223.970	VAM		
31	1	9.470	9.470	Y	1627.820	215.080	**215.080**	214.500	VAM		
30	1	9.310	9.310	Y	1637.130	205.770	**205.770**	205.190	VAM		
29	1	9.400	9.400	Y	1646.530	196.370	**196.370**	195.790	VAM		
28	1	9.460	9.460	Y	1655.990	186.910	**186.910**	186.330	VAM		
27	1	9.540	9.540	Y	1665.530	177.370	**177.370**	176.790	VAM		
26	1	9.460	9.460	Y	1674.990	167.910	**167.910**	167.330	VAM		
25	1	9.580	9.580	Y	1684.570	158.330	**158.330**	157.750	VAM		
24	1	9.560	9.560	Y	1694.130	148.770	**148.770**	148.190	VAM		
23	1	9.290	9.290	Y	1703.420	139.480	**139.480**	138.900	VAM		
22	1	9.430	9.430	Y	1712.850	130.050	**130.050**	129.470	VAM		
21	1	9.410	9.410	Y	1722.260	120.640	**120.640**	120.060	VAM		
20	1	9.280	9.280	Y	1731.540	111.360	**111.360**	110.780	VAM		
19	1	9.000	9.000	Y	1740.540	102.360	**102.360**	101.780	VAM		
18	1	9.280	9.280	Y	1749.820	93.080	**93.080**	92.500	VAM		
17	1	9.540	9.540	Y	1759.360	83.540	**83.540**	82.960	VAM		
16	1	9.590	9.590	Y	1768.950	73.950	**73.950**	73.370	VAM		
15	1	9.350	9.350	Y	1778.300	64.600	**64.600**	64.020	VAM		
14	1	9.550	9.550	Y	1787.850	55.050	**55.050**	54.470	VAM		
12	1	9.540	9.540	Y	1797.390	45.510	**45.510**	44.930	VAM		
11	1	9.370	9.370	Y	1806.760	36.140	**36.140**	35.560	VAM		
10	1	9.360	9.360	Y	1816.120	26.780	**26.780**	26.200	VAM		
9	1	9.390	9.390	Y	1825.510	17.390	**17.390**	16.810	VAM		
201	1	1.000	1.000	Y	1826.510	16.390	**16.390**	15.810	VAM		
202	1	3.000	3.000	Y	1829.510	13.390	**13.390**	12.810	VAM		
203	1	2.970	2.970	Y	1832.480	10.420	**10.420**	9.840	VAM		
6	1	9.300	9.300	Y	1841.780	1.120	**1.120**	0.540	VAM		
204	1	1.120	1.120	y	1842.900	0.000	**0.000**	-0.580	VAM		

8.7.4. 10 ¾" Casing

NEDMAG

10 3/4" injection String

Rig : TR-5

DSV: 29/11/1982

Depth reference :	CHH	TD :	1,673	mBGL	Buoyancy :	0.87	
BHR-THH :	0.00 m	Rat hole :	0.00	m	Block weight :		Klbs
BHR- HOP :	7.54 m	Shoe depth :	1673.00	mBGL	PUW (with 90 bar whp):		Klbs
GL - HOP:	-0.55 m	Mud weight :	1.00	sg	SOW (with 90 bar whp) :		Klbs

Casing or DP data (DP used as running string)

Type	OD	ID	Grade	Weight	Capacity	CE displ.	Metal displ.		Make up torque ft.lb			MU Loss
	(inch)	(inch)		(lb/ft)	(l/m)	(l/m)	(l/m)		Min	Optimum	Max	(m)
1	10 3/4	9.760	K-55	55.50	48.27	58.56	10.29	VAM				0.000
2												
3												
4												

Joint n° or name	Type n°	Total length	Make up length	In string	Cumul. length	Top depth BRT/ BHR	Top depth CHH	Top depth BGL	Thread (bottom)	Remark	Remark
		m	m	Y/N	m	m	**m**	m			
				Y		1,648.70	**1,641.16**	1,641.71			Heat/ batch no
shoe	1	0.610	0.610	y	0.610	1648.090	**1640.550**	1641.100	VAM		
151	1	11.450	11.450	y	12.060	1636.640	**1629.100**	1629.650	VAM		
149	1	11.040	11.040	y	23.100	1625.600	**1618.060**	1618.610	VAM		
collar	1	0.500	0.500	Y	23.600	1625.100	**1617.560**	1618.110	VAM		
150	1	10.390	10.390	Y	33.990	1614.710	**1607.170**	1607.720	VAM		
148	1	10.410	10.410	Y	44.400	1604.300	**1596.760**	1597.310	VAM		
147	1	11.950	11.950	y	56.350	1592.350	**1584.810**	1585.360	VAM		
146	1	12.000	12.000	y	68.350	1580.350	**1572.810**	1573.360	VAM		
145	1	11.000	11.000	y	79.350	1569.350	**1561.810**	1562.360	VAM		
144	1	10.310	10.310	y	89.660	1559.040	**1551.500**	1552.050	VAM		
143	1	10.560	10.560	y	100.220	1548.480	**1540.940**	1541.490	VAM		
142	1	11.740	11.740	Y	111.960	1536.740	**1529.200**	1529.750	VAM		
141	1	11.170	11.170	Y	123.130	1525.570	**1518.030**	1518.580	VAM		
140	1	12.110	12.110	Y	135.240	1513.460	**1505.920**	1506.470	VAM		
139	1	11.720	11.720	y	146.960	1501.740	**1494.200**	1494.750	VAM		
138	1	11.070	11.070	y	158.030	1490.670	**1483.130**	1483.680	VAM		
137	1	11.080	11.080	y	169.110	1479.590	**1472.050**	1472.600	VAM		
136	1	12.040	12.040	y	181.150	1467.550	**1460.010**	1460.560	VAM		
135	1	11.110	11.110	Y	192.260	1456.440	**1448.900**	1449.450	VAM		
134	1	11.740	11.740	Y	204.000	1444.700	**1437.160**	1437.710	VAM		
133	1	11.260	11.260	Y	215.260	1433.440	**1425.900**	1426.450	VAM		
132	1	11.630	11.630	Y	226.890	1421.810	**1414.270**	1414.820	VAM		
131	1	11.650	11.650	Y	238.540	1410.160	**1402.620**	1403.170	VAM		
130	1	11.180	11.180	y	249.720	1398.980	**1391.440**	1391.990	VAM		
129	1	11.290	11.290	y	261.010	1387.690	**1380.150**	1380.700	VAM		
128	1	12.160	12.160	y	273.170	1375.530	**1367.990**	1368.540	VAM		
127	1	10.920	10.920	y	284.090	1364.610	**1357.070**	1357.620	VAM		
126	1	10.800	10.800	y	294.890	1353.810	**1346.270**	1346.820	VAM		
125	1	12.020	12.020	Y	306.910	1341.790	**1334.250**	1334.800	VAM		
124	1	11.420	11.420	Y	318.330	1330.370	**1322.830**	1323.380	VAM		
123	1	11.730	11.730	Y	330.060	1318.640	**1311.100**	1311.650	VAM		
122	1	10.530	10.530	Y	340.590	1308.110	**1300.570**	1301.120	VAM		
121	1	11.570	11.570	Y	352.160	1296.540	**1289.000**	1289.550	VAM		
120	1	11.070	11.070	y	363.230	1285.470	**1277.930**	1278.480	VAM		
119	1	11.060	11.060	y	374.290	1274.410	**1266.870**	1267.420	VAM		
118	1	11.890	11.890	y	386.180	1262.520	**1254.980**	1255.530	VAM		
117	1	10.810	10.810	y	396.990	1251.710	**1244.170**	1244.720	VAM		
116	1	11.010	11.010	y	408.000	1240.700	**1233.160**	1233.710	VAM		
115	1	11.220	11.220	y	419.220	1229.480	**1221.940**	1222.490	VAM		
114	1	11.990	11.990	Y	431.210	1217.490	**1209.950**	1210.500	VAM		
113	1	10.890	10.890	Y	442.100	1206.600	**1199.060**	1199.610	VAM		
112	1	11.470	11.470	Y	453.570	1195.130	**1187.590**	1188.140	VAM		
111	1	10.860	10.860	Y	464.430	1184.270	**1176.730**	1177.280	VAM		
110	1	10.980	10.980	Y	475.410	1173.290	**1165.750**	1166.300	VAM		
109	1	11.610	11.610	Y	487.020	1161.680	**1154.140**	1154.690	VAM		
108	1	11.740	11.740	Y	498.760	1149.940	**1142.400**	1142.950	VAM		
107	1	11.020	11.020	Y	509.780	1138.920	**1131.380**	1131.930	VAM		
106	1	10.560	10.560	Y	520.340	1128.360	**1120.820**	1121.370	VAM		
105	1	11.570	11.570	Y	531.910	1116.790	**1109.250**	1109.800	VAM		
104	1	10.830	10.830	Y	542.740	1105.960	**1098.420**	1098.970	VAM		
103	1	11.400	11.400	Y	554.140	1094.560	**1087.020**	1087.570	VAM		
102	1	11.740	11.740	Y	565.880	1082.820	**1075.280**	1075.830	VAM		
101	1	11.320	11.320	Y	577.200	1071.500	**1063.960**	1064.510	VAM		
100	1	12.180	12.180	Y	589.380	1059.320	**1051.780**	1052.330	VAM		
99	1	11.620	11.620	Y	601.000	1047.700	**1040.160**	1040.710	VAM		
98	1	11.290	11.290	Y	612.290	1036.410	**1028.870**	1029.420	VAM		
97	1	11.400	11.400	Y	623.690	1025.010	**1017.470**	1018.020	VAM		
96	1	11.240	11.240	Y	634.930	1013.770	**1006.230**	1006.780	VAM		
95	1	11.360	11.360	Y	646.290	1002.410	**994.870**	995.420	VAM		
94	1	10.920	10.920	Y	657.210	991.490	**983.950**	984.500	VAM		
93	1	11.160	11.160	Y	668.370	980.330	**972.790**	973.340	VAM		
92	1	11.730	11.730	Y	680.100	968.600	**961.060**	961.610	VAM		
91	1	10.980	10.980	Y	691.080	957.620	**950.080**	950.630	VAM		
90	1	11.510	11.510	Y	702.590	946.110	**938.570**	939.120	VAM		
89	1	10.550	10.550	Y	713.140	935.560	**928.020**	928.570	VAM		
88	1	11.080	11.080	Y	724.220	924.480	**916.940**	917.490	VAM		
87	1	10.260	10.260	Y	734.480	914.220	**906.680**	907.230	VAM		
86	1	11.370	11.370	Y	745.850	902.850	**895.310**	895.860	VAM		
85	1	11.290	11.290	Y	757.140	891.560	**884.020**	884.570	VAM		

NEDMAG

10 3/4" injection String

Rig : TR-5

DSV: 29/11/1982

Depth reference :	CHH	TD :	1,673	mBGL	Buoyancy :	0.87	
BHR-THH :	0.00 m	Rat hole :	0.00	m	Block weight :		Klbs
BHR- HOP :	7.54 m	Shoe depth :	1673.00	mBGL	PUW (with 90 bar whp):		Klbs
GL - HOP:	-0.55 m	Mud weight :	1.00	sg	SOW (with 90 bar whp) :		Klbs

Casing or DP data (DP used as running string)

Type	OD	ID	Grade	Weight	Capacity	CE displ.	Metal displ.		Make up torque ft.lb			MU Loss
	(inch)	(inch)		(lb/ft)	(l/m)	(l/m)	(l/m)		Min	Optimum	Max	(m)
1	10 3/4	9.760	K-55	55.50	48.27	58.56	10.29	VAM				0.000
2												
3												
4												

Joint n° or name	Type n°	Total length m	Make up length m	In string Y/N	Cumul. length m	Top depth BRT/ BHR m	Top depth CHH m	Top depth BGL m	Thread (bottom)	Remark	Remark
84	1	11.050	11.050	Y	768.190	880.510	872.970	873.520	VAM		
83	1	11.200	11.200	Y	779.390	869.310	861.770	862.320	VAM		
82	1	10.810	10.810	Y	790.200	858.500	850.960	851.510	VAM		
81	1	11.530	11.530	Y	801.730	846.970	839.430	839.980	VAM		
80	1	10.700	10.700	Y	812.430	836.270	828.730	829.280	VAM		
79	1	10.420	10.420	Y	822.850	825.850	818.310	818.860	VAM		
78	1	12.300	12.300	Y	835.150	813.550	806.010	806.560	VAM		
77	1	11.180	11.180	Y	846.330	802.370	794.830	795.380	VAM		
76	1	10.420	10.420	Y	856.750	791.950	784.410	784.960	VAM		
75	1	10.940	10.940	Y	867.690	781.010	773.470	774.020	VAM		
74	1	11.030	11.030	Y	878.720	769.980	762.440	762.990	VAM		
73	1	10.700	10.700	Y	889.420	759.280	751.740	752.290	VAM		
72	1	11.180	11.180	Y	900.600	748.100	740.560	741.110	VAM		
71	1	10.880	10.880	Y	911.480	737.220	729.680	730.230	VAM		
70	1	11.780	11.780	Y	923.260	725.440	717.900	718.450	VAM		
69	1	10.850	10.850	Y	934.110	714.590	707.050	707.600	VAM		
68	1	11.370	11.370	Y	945.480	703.220	695.680	696.230	VAM		
67	1	11.790	11.790	Y	957.270	691.430	683.890	684.440	VAM		
66	1	11.690	11.690	Y	968.960	679.740	672.200	672.750	VAM		
65	1	11.670	11.670	Y	980.630	668.070	660.530	661.080	VAM		
64	1	11.950	11.950	Y	992.580	656.120	648.580	649.130	VAM		
62	1	11.450	11.450	Y	1004.030	644.670	637.130	637.680	VAM		
61	1	11.190	11.190	Y	1015.220	633.480	625.940	626.490	VAM		
60	1	11.080	11.080	Y	1026.300	622.400	614.860	615.410	VAM		
59	1	11.630	11.630	Y	1037.930	610.770	603.230	603.780	VAM		
58	1	10.810	10.810	Y	1048.740	599.960	592.420	592.970	VAM		
57	1	12.030	12.030	Y	1060.770	587.930	580.390	580.940	VAM		
55	1	11.500	11.500	Y	1072.270	576.430	568.890	569.440	VAM		
54	1	11.000	11.000	Y	1083.270	565.430	557.890	558.440	VAM		
53	1	11.320	11.320	Y	1094.590	554.110	546.570	547.120	VAM		
52	1	10.780	10.780	Y	1105.370	543.330	535.790	536.340	VAM		
51	1	11.430	11.430	Y	1116.800	531.900	524.360	524.910	VAM		
49	1	11.700	11.700	Y	1128.500	520.200	512.660	513.210	VAM		
48	1	11.760	11.760	Y	1140.260	508.440	500.900	501.450	VAM		
47	1	11.160	11.160	Y	1151.420	497.280	489.740	490.290	VAM		
46	1	11.790	11.790	Y	1163.210	485.490	477.950	478.500	VAM		
45	1	11.070	11.070	Y	1174.280	474.420	466.880	467.430	VAM		
44	1	11.640	11.640	Y	1185.920	462.780	455.240	455.790	VAM		
43	1	11.660	11.660	Y	1197.580	451.120	443.580	444.130	VAM		
42	1	10.660	10.660	Y	1208.240	440.460	432.920	433.470	VAM		
41	1	11.510	11.510	Y	1219.750	428.950	421.410	421.960	VAM		
40	1	11.230	11.230	Y	1230.980	417.720	410.180	410.730	VAM		
39	1	11.400	11.400	Y	1242.380	406.320	398.780	399.330	VAM		
38	1	10.900	10.900	Y	1253.280	395.420	387.880	388.430	VAM		
37	1	11.180	11.180	Y	1264.460	384.240	376.700	377.250	VAM		
36	1	11.130	11.130	Y	1275.590	373.110	365.570	366.120	VAM		
35	1	11.550	11.550	Y	1287.140	361.560	354.020	354.570	VAM		
34	1	10.680	10.680	Y	1297.820	350.880	343.340	343.890	VAM		
33	1	11.440	11.440	Y	1309.260	339.440	331.900	332.450	VAM		
32	1	11.580	11.580	Y	1320.840	327.860	320.320	320.870	VAM		
31	1	11.570	11.570	Y	1332.410	316.290	308.750	309.300	VAM		
29	1	11.350	11.350	Y	1343.760	304.940	297.400	297.950	VAM		
28	1	11.670	11.670	Y	1355.430	293.270	285.730	286.280	VAM		
27	1	11.880	11.880	Y	1367.310	281.390	273.850	274.400	VAM		
25	1	11.300	11.300	Y	1378.610	270.090	262.550	263.100	VAM		
24	1	11.320	11.320	Y	1389.930	258.770	251.230	251.780	VAM		
23	1	11.160	11.160	Y	1401.090	247.610	240.070	240.620	VAM		
22	1	11.340	11.340	Y	1412.430	236.270	228.730	229.280	VAM		
21	1	11.580	11.580	Y	1424.010	224.690	217.150	217.700	VAM		
20	1	11.240	11.240	Y	1435.250	213.450	205.910	206.460	VAM		
19	1	10.550	10.550	Y	1445.800	202.900	195.360	195.910	VAM		
18	1	11.590	11.590	Y	1457.390	191.310	183.770	184.320	VAM		
17	1	10.520	10.520	Y	1467.910	180.790	173.250	173.800	VAM		
16	1	11.690	11.690	Y	1479.600	169.100	161.560	162.110	VAM		
15	1	11.950	11.950	Y	1491.550	157.150	149.610	150.160	VAM		
14	1	11.170	11.170	Y	1502.720	145.980	138.440	138.990	VAM		
13	1	11.500	11.500	Y	1514.220	134.480	126.940	127.490	VAM		
12	1	11.000	11.000	Y	1525.220	123.480	115.940	116.490	VAM		
11	1	11.560	11.560	Y	1536.780	111.920	104.380	104.930	VAM		
10	1	11.970	11.970	Y	1548.750	99.950	92.410	92.960	VAM		
9	1	10.490	10.490	Y	1559.240	89.460	81.920	82.470	VAM		
8	1	11.550	11.550	Y	1570.790	77.910	70.370	70.920	VAM		
7	1	10.920	10.920	Y	1581.710	66.990	59.450	60.000	VAM		
6	1	11.180	11.180	Y	1592.890	55.810	48.270	48.820	VAM		
5	1	11.820	11.820	Y	1604.710	43.990	36.450	37.000	VAM		
4	1	10.910	10.910	Y	1615.620	33.080	25.540	26.090	VAM		
26	1	12.480	12.480	Y	1628.100	20.600	13.060	13.610	VAM		
2	1	10.670	10.670	Y	1638.770	9.930	2.390	2.940	VAM		
1	1	11.130	11.130	Y	1649.900	-1.200	-8.740	-8.190	VAM		

8.8. VAM Connection / Tubing Data Sheets

vallourec

VAM pressure ratings

tubing

OUTSIDE DIAMETER	NOMINAL WEIGHT	WALL THICKNESS	COLLAPSE PRESSURE (*)					MINIMUM INTERNAL YIELD PRESSURE (*)				
			K - 55	C - 75	N/L - 80	C - 95	P - 105	K - 55	C - 75	N/L - 80	C - 95	P - 105
in	lb/ft	in	psi					psi				
2⅜	4.60	0.190	8100	11040	11780	13980	15460	7700	10500	11200	13300	14700
	5.10	0.218	9170	12500	13340	15840	17510	8840	12050	12850	15260	16870
	5.80	0.254	10510	14330	15280	18150	20060	10290	14040	14970	17760	19650
2⅞	6.40	0.217	7680	10470	11170	12930	14010	7280	9910	10570	12550	13670
	7.70	0.276	9550	13020	13880	16490	18220	9240	12600	13440	15960	17640
	8.60	0.308	10520	14350	15300	18170	20090	10310	14060	15000	17810	19690
	8.80	0.362	12110	16510	17610	20910	23110	12120	16530	17630	20930	23140
3½	7.70	0.216	5970	7540	7870	8640	9440	5940	8100	8640	10260	11340
	9.20	0.254	7400	10040	10530	12060	13050	6980	9520	10160	12060	13330
	10.20	0.289	8330	11360	12120	14390	15910	7950	10840	11560	13730	15170
	12.70	0.375	10520	14350	15310	18180	20090	10310	14060	15000	17810	19690
	13.70	0.413	11450	15610	16650	19770	21860	11360	15490	16520	19620	21680
	14.70	0.450	12320	16810	17930	21290	23530	12370	16870	18000	21370	23620
4	9.50	0.226	5110	6350	6590	7290	7710	5440	7420	7910	9390	10380
	10.90	0.262	6590	8410	8800	9960	10700	6300	8600	9170	10890	12040
	13.00	0.330	8330	11350	12110	14380	15900	7940	10830	11550	13720	15160
	14.80	0.380	9460	12900	13760	16340	18050	9140	12470	13300	15790	17460
	16.50	0.430	10550	14390	15350	18230	20150	10350	14110	15050	17870	19750
4½	12.60	0.271	5720	7200	7500	8400	8950	5800	7900	8430	10010	11070

vallourec

VAM tubing performance properties

C : *coupling*
P : *pipe*

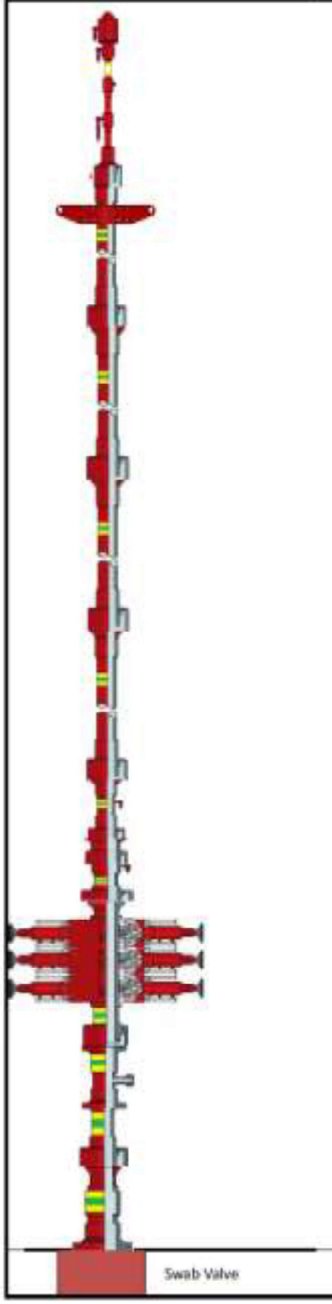
OUTSIDE DIAMETER	NOMINAL WEIGHT	DRIFT DIAMETER	COUPLING OUTSIDE DIAMETER		CRITICAL CROSS-SECTION AREA	JOINT YIELD STRENGTH (regular coupling)					PARTING LOAD (regular coupling)				
			REGULAR	SPECIAL CLEARANCE		K - 55	C - 75	N - 80 L - 80	C - 95	P - 105	K - 55	C - 75	N - 80	C - 95	P - 105
in	lb/ft	in	in	in	in²	1000 lb					1000 lb				
2⅜	4.60	1.901	2.697	2.618	1.304 P	72	98	104	124	137	118	118	124	132	150
	5.10	1.845	2.697	2.618	1.443 C	79	108	115	137	152	130	130	137	144	164
	5.80	1.773	2.776	2.697	1.682 P	93	127	135	161	178	159	159	161	171	195
2⅞	6.40	2.347	3.197	3.150	1.812 P	100	136	145	172	190	156	162	171	182	207
	7.70	2.229	3.327	3.264	2.254 P	124	169	180	214	237	197	202	213	226	258
	8.60	2.165	3.327	3.267	2.483 C	137	186	199	236	261	217	222	234	248	283
	9.80	2.057	3.327	3.327	2.483 C	—	—	—	—	—	—	—	—	—	—
3½	7.70	2.943	3.803	—	2.228 P	123	167	178	212	234	191	197	208	221	252
	9.20	2.867	3.862	3.795	2.590 C	142	194	207	246	272	223	229	241	257	293
	10.20	2.797	3.917	3.854	2.915 P	160	219	233	277	306	250	258	272	290	330
	12.70	2.625	4.035	3.957	3.663 C	201	275	293	348	385	316	326	343	366	416
	13.70	2.549	4.138	4.028	4.005 P	220	300	320	381	421	343	354	373	398	453
	14.70	2.475	4.138	4.028	4.312 P	237	323	345	410	453	370	381	402	428	486
4	9.50	3.423	4.327	—	2.680 P	147	201	214	255	281	226	234	247	264	300
	10.90	3.351	4.366	4.315	3.077 P	169	231	246	292	323	260	269	284	303	345
	13.00	3.215	4.469	4.358	3.794 C	209	285	304	360	398	321	333	351	375	427
	14.80	3.115	4.606	4.461	4.322 P	238	324	346	411	454	365	378	399	426	484
	16.50	3.015	4.606	—	4.770 C	262	358	382	453	501	407	422	445	475	541
4½	12.60	3.833	4.862	4.803	3.591 C	197	269	287	341	377	300	312	329	352	400

8.9. Wireline PCE Diagrams

8.9.1. PCE Plugging and Cutting Operations (Pre- / Post-Workover)

BPC wireline

Customer:	Nedmag Mining		
Well No: Tr-5	Well Type:	Date:	
Location:			
Job Description:			



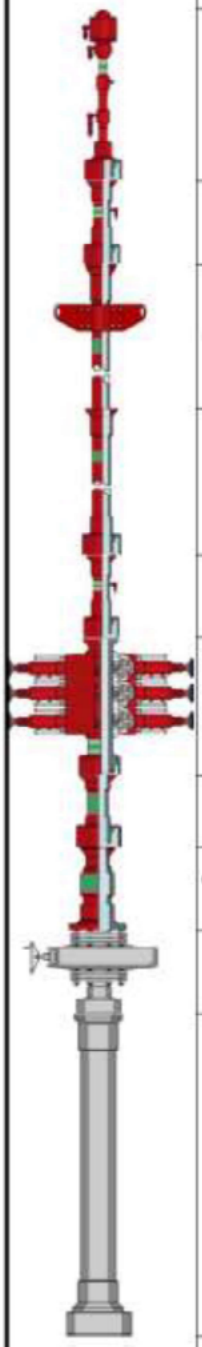
Description	Equipt I.D Number	Pin Size/Type	Box Size/Type	Length (meters)	I.D. (inches)	Pressure (psi)
Grease Head + Catcher		4 3/4" Elmar	N/A	3	N/A	10,000 psi H2S
Lubricator Section Complete With Lifting Clamp		4 3/4" Elmar	4 3/4" Elmar	2.4	3.00	10,000 psi H2S
Lubricator Section		4 3/4" Elmar	4 3/4" Elmar	2.4	3.00	10,000 psi H2S
Lubricator Section		4 3/4" Elmar	4 3/4" Elmar	2.4	3.00	10,000 psi H2S
Lubricator Section		4 3/4" Elmar	4 3/4" Elmar	2.4	3.00	10,000 psi H2S
Tool Trap		4 3/4" Elmar	4 3/4" Elmar	0.6	3.00	10,000 psi H2S
QTS		4 3/4" Elmar	4 3/4" Elmar	0.7	3.00	10,000 psi H2S
Wireline Valve (BOP) Tripple Ram		4 3/4" Elmar	4 3/4" Elmar	1	3.00	10,000 psi H2S
Pump in T		4 3/4" Elmar	4 3/4" Elmar	0.5	3.00	10,000 psi H2S
X-Over		8 1/4" Bowen	4 3/4" Elmar	0.4	3.00	10,000 psi H2S
4 1/16" 10K Flange		8 1/4" Bowen	4 1/6"	0.4	3.00	10,000 psi H2S
	Total Length	**16.20**	**Meters**	**Min ID:**	**3.00**	**#REF!**

8.9.2. PCE WL on Snubbing Unit

Schedule below is for wireline on 2 7/8", 3 ½", 4 ½" tubing strings, on the 5" DP string and on the 7" shooting nipple (for wireline on 10 ¾" casing).

HALLIBURTON Rig Up Number:

Customer: Nedmag	TR-5 No: TR-9	Date:	
Location: Veendam	Well Type: Salt Mining		
Operation Details:	7" shoot nipple		



Description	Equipt I.D Number	Pin Size/Type	Box Size/Type	Length (m)	Weight (lbs)	I.D. (inches)	Pressure (psi)
Braided Line Grease Head with cutter sub							5000 psi H2S
Tool Catcher							5000 psi H2S
Lubricator Section Complete With Lifting Clamp				2.5		4.000	5000 psi H2S
Lubricator Section				2.5		4.000	5000 psi H2S
Bleed off sub						4.000	5000 psi H2S
Wireline Valve (BOP) Tripple Ram						4.00	5000 psi H2S
X-Over						4.00	5000 psi H2S
Quick Union /Flanged X-Over		71/16" API Flange				7.000	5000 psi H2S
Gate valve		71/16" API Flange	71/16" API Flange				5000 psi H2S
7" Shoot nipple , 29 ppf			71/16" API Flange	20		6.0	

Approx Total Weight 0.00 lbs | Total Length 22.50 (M) | Minimum Equipt I.D. 4.00 (inches)

8.10. Wireline Toolstring Diagrams

8.10.1. Dummy / WECT Toolstring

8.10.1.1. Dummy Run

TOOLSTRING DIAGRAM

HALLIBURTON

Client	Nedmag	Field	Nedmag	
Rig	N/A	Well	TR-5	
Min id	2.797	Liner	N/A	

RUN 1 - CCL drift run on E-line

Eline CCL drift (Mock-up WECT)

Length (ft)	OD (in)	Weight (lb)	Tool Description
1.50	1.44	5.00	Stnd Mono Cablehead 1.4375"
5.00	2.00	35.00	Steel Sinker Bar
5.00	2.00	88.00	Tungsten Sinker Bar
5.00	2.00	88.00	Tunsten Sinker Bar
5.00	2.00	88.00	Tungsten Sinker Bar
0.75	2.00	5.00	Rope Socket
1.58	3.13	30.00	Passive Collar Locator CCL
0.20	1.90	1.00	X-Over G-series x Go
0.20	1.50	1.00	X-Over Gox 15/16"SR
1.17	2.13	10.00	Gauge Cutter 2.8in OD

Total Length (ft)/(m)	Max OD (in)	Total Weight (lbs)
25.40 7.74	3.13	351.00

8.10.1.2. WECT Mechanical Pipe Cutter

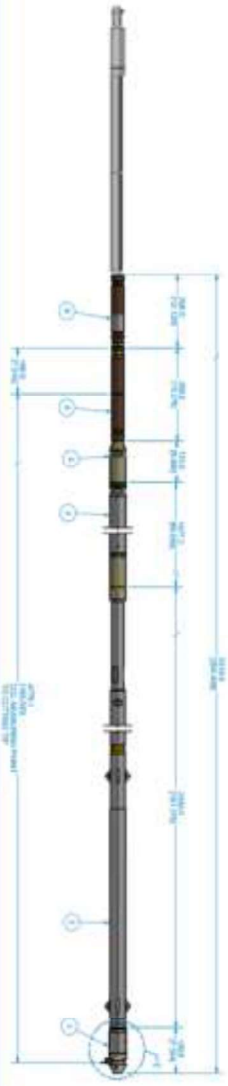
TOOLSTRING DIAGRAM

HALLIBURTON

Client	Nedmag	Field	Nedmag
Rig	N/A	Well	TR-5
Min Id	2.797	Liner	N/A

RUN 3 - Electro-Mechanical Cutter

Mechanical Cutter Tool String



Length (ft)	OD (in)	Weight (lb)	Tool Description
1.50	1.44	5.00	Stnd Mono Cablehead 1.4375"
5.00	2.00	88.00	Tungsten Sinker Bar
5.00	2.00	88.00	Tungsten Sinker Bar
17.45	2.75	200.00	2.75" Mechanical Cutter - 001
			Weight is approx & pending update

Total Length (ft)/(m)	Max OD (in)	Total Weight (lbs)
28.95 / 8.82	2.75	581.00

8.10.2. Halliburton Bridge plug setting toolstring

TOOLSTRING DIAGRAM

HALLIBURTON

Client	Nedmag	Field	Nedmag	
Rig	N/A	Well	TR-5	
Min id	2.707	Liner	N/A	

RUN 4 - EZ Drill Packer

Setting Tool for 3.5" EZ Drill

Length (ft)	OD (in)	Weight (lb)	Tool Description
1.50	1.44	5.00	Stnd Mono Cablehead 1.4375"
5.00	2.00	88.00	Tungsten Sinker Bar
5.00	2.00	88.00	Tungsten Sinker Bar
5.00	2.00	88.00	Tungsten Sinker Bar
1.19	2.13	20.00	2.125" Passive CCL
0.33	1.50	1.00	XO - GO Pin - GO-Pin (Or G-Series Pin to GO-Pin)
0.23	1.50	1.00	High Pressure Firing Head
4.54	2.50	49.50	2.5 Shorty Setting Tool
0.50	2.50	10.00	Shorty to Baker # 10 Crossover Kit Part # 101223301
			Dimentions to be verified before RIH
0.50	2.50	10.00	HCT Supplied Baker #10 to EZ Drill Part # 100072787
			Dimentions to be verified before RIH
1.50	2.59	15.00	Customer Owned 3.5" EZ Drill Packer Part # 100073040
			Dimentions to be verified before RIH
Total Length (ft)/(m)	Max OD (in)	Total Weight (lbs)	
25.29 7.71	2.59	375.50	

8.10.3. RMT (Pulse Neutron Capture) toolstring

TOOLSTRING DIAGRAM

HALLIBURTON

Client	Nedmag	Field	Nedmag	
Rig	N/A	Well	TR-5	
Min id	2.797	Liner	N/A	

RUN 2 - Reservoir Monitor Tool

Reservoir Monitor Tool

	Length (ft)	OD (in)	Weight (lb)	Tool Description
	1.50	1.44	5.00	Stnd Mono Cablehead 1.4375"
	5.00	2.00	88.00	Tungsten Sinker Bar
	5.00	2.00	88.00	Tungsten Sinker Bar
	7.32	1.69	45.00	Telemetry Cartridge TTTCU-002
	1.57	1.69	9.00	Telemetry Adaptor 1553 to U/W XHU003
	14.60	2.13	86.00	Reservoir Monitor Tool detector [NB - Tool maybe RMT-I or RMT-3D]
	0.75	1.69	3.00	Adaptor + AUH001
	0.25	1.69	1.00	ASB004 or BUL006
	Total Length (ft)/(m)	Max OD (in)	Total Weight (lbs)	
	35.99 10.97	2.13	325.00	

8.10.4. PLT (Spinner) toolstring

TOOLSTRING DIAGRAM

HALLIBURTON

Client	Nedmag	Field	Nedmag	
Rig	N/A	Well	TR-5	
Min id	2.707	Liner	N/A	

RUN 5 - Basic Spinner PLT

Spinner PLT

Length (ft)	OD (in)	Weight (lb)	Tool Description
1.50	1.44	5.00	Stnd Mono Cablehead 1.4375"
5.00	2.00	88.00	Tungsten Sinker Bar
5.00	2.00	88.00	Tungsten Sinker Bar
7.32	1.69	45.00	Telemetry Cartridge TTTCU-002
1.57	1.69	9.00	Telemetry Adaptor 1553 to U/W XHU003
0.75	1.69	3.00	Adaptor + AUH001
2.77	1.69	13.00	PRC034 - Roller Centraliser
1.58	1.69	9.00	QPC003 - Quartz Pressure and CCL
1.44	2.13	6.00	ILS-022 In line Spinner
2.77	1.69	13.00	PRC034 - Roller Centraliser
1.54	1.69	5.40	CTF004 - Capacitance Water Hold-Up/ Temperature
0.84	2.13	2.00	2.125in CFSM / CFJM

Total Length (ft)/(m)	Max OD (in)	Total Weight (lbs)
32.08 9.78	2.13	286.40

8.10.5. BPC Bridge plug setting toolstring

8.10.5.1. Junk Catcher Setting

BPC wireline

Balance Point Control GmbH
Bruchkampweg 28
29227 Celle
Tel. +49 (0)5141 8 20 33
Fax. +49 (0)5141 8 60 69

Date: 29.11.2019					
Customer:	Nedmag		Min. ID in tubing:		
Field:			Max. ID in tubing:		3.5"
Well No:			Well fluid:		
Location:	Netherlands		BPC Rep:		
Wire size:	.125"		Customer Rep:		
BHA Sketch	Item No.	OD (mm)	Length (m)	F/Neck	Discription
	1	38.1mm	0.38m		1 1/2" Rope Socket
	2	38.1mm	1.52m		1 1/2" 5 ftStem
	3	38.1mm	1.52m		1 1/2" 5 ft Stem
	4	38.1mm	1.17m		1 1/2" DTI Spring jar closed jar
					Set to fire 500kg
			1.33m		Open jar
	5	38.1mm	1.63m		1 1/2" 8ft Spang Jar closed
			2.38m		Open jar
					75cm Stroke
	6	67.31 mm			Junkcatcher
Total length					
Total weight					

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BPC BHA 2013

8.10.5.2. Bridge plug setting

BPC wireline

Balance Point Control GmbH
Bruchkampweg 28
29227 Celle
Tel. +49 (0)5141 8 20 33
Fax. +49 (0)5141 8 60 69

Date: 29.11.2019					
Customer:	Nedmag		Min. ID in tubing:		
Field:			Max. ID in tubing:		3.5"
Well No:			Well fluid:		
Location:	Netherlands		BPC Rep:		
Wire size:	7/32"		Customer Rep:		
BHA Sketch	Item No.	OD (mm)	Length (m)	F/Neck	Discription
	1	36.5 mm	0.3 m	35 mm	Cable Head
	2	50.8 mm	1.5 m		Sinker Bar
	3	50.8 mm	1.5 m		Sinker Bar
	4	53.975 mm	0.4 m		CCL
	5	53.975 mm	2.15 m		Multistage Setting Tool
	6	67.31 mm	1.85 m	63.5 mm	WRBP
Total length			7.7 m		
Total weight					

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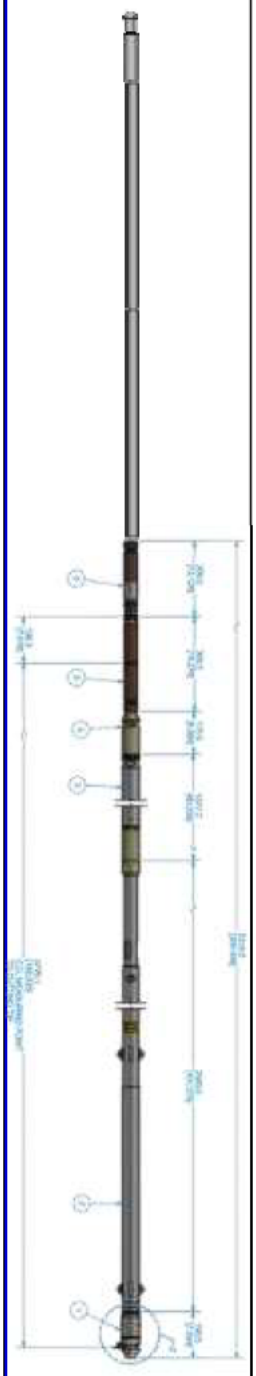
BPC BHA 2013

8.10.6. DECT Toolstring

TOOLSTRING DIAGRAM

Client	Nedmag	Field	Nedmag	
Rig	N/A	Well	TR-5	
Min id	3.833	Liner	N/A	

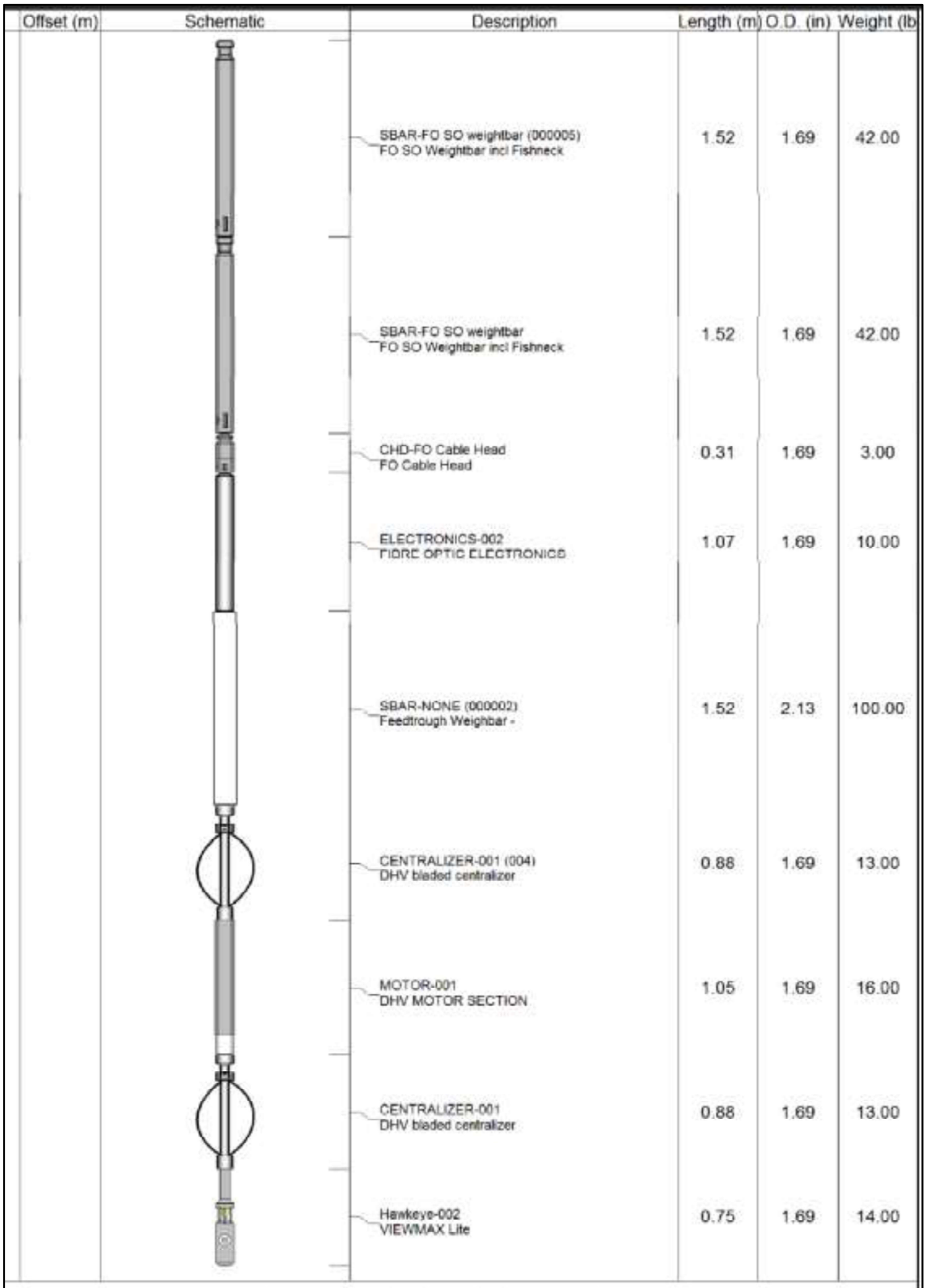
Mechanical Cutter Tool String



Length (ft)	OD (in)	Weight (lb)	Tool Description
1.50	1.44	5.00	Stnd Mono Cablehead 1.4375"
5.00	2.13	88.00	Tungsten Sinker Bar
5.00	2.13	88.00	Tungsten Sinker Bar
1.00	2.13	3.66	Swivel Joint
1.25	2.13	8.00	CCL
6.00	2.75	65.00	Electronics Cartridge w/ GO X-Over Weight is approximate
8.50	2.75	125.00	2.75" Mechanical Cutter - 001 Weight is approx & pending update

Total Length (ft)/(m)	Max OD (in)	Total Weight (lbs)
28.25 8.61	2.75	382.66

8.10.7. Downhole Camera Toolstring



Offset (m)	Schematic	Description	Length (m)	O.D. (in)	Weight (lb
		SBAR-FO SO weightbar (000005) FO SO Weightbar incl Fishneck	1.52	1.69	42.00
		SBAR-FO SO weightbar FO SO Weightbar incl Fishneck	1.52	1.69	42.00
		CHD-FO Cable Head FO Cable Head	0.31	1.69	3.00
		ELECTRONICS-002 FIBRE OPTIC ELECTRONICS	1.07	1.69	10.00
		SBAR-NONE (000002) Feedtrough Weighbar -	1.52	2.13	100.00
		CENTRALIZER-001 (004) DHV bladed centralizer	0.88	1.69	13.00
		MOTOR-001 DHV MOTOR SECTION	1.05	1.69	16.00
		CENTRALIZER-001 DHV bladed centralizer	0.88	1.69	13.00
		Hawkeye-002 VIEWMAX Lite	0.75	1.69	14.00

Dataset:	Fibre Optic - DHV Configuration
Total length:	9.53 m
Total weight:	253.00 lb
O.D.:	2.13 in

8.10.8. CAST-M Toolstring

HALLIBURTON

TOOL STRING DIAGRAM

Customer:	NEDMAG	
Engineer:	TBA	
FSM:	TBA	Sign:
TA:	TBA	Sign:

JOB TYPE:
4.375" CAST / RBT

Tool Diagram	Item No.	Weight (lbs)	Length (ft)	Description of Item	Fish Neck Size (inches)	OD (inches)	SAP P/N
		1.10	1.35	Cable Head	1.375	1.440	
		1.00	0.21	AGS		1.690	
		20.00	2.90	PRC65		2.750	
		1.00	0.21	ASG		1.690	
		30.00	7.65	TTTCU		1.690	
		7.00	1.58	XHU		1.690	
		36.50	2.16	LEMO Centralizer		3.130	
		116.00	9.38	RCBL-M		2.750	
		36.50	2.16	LEMO Centralizer		3.130	
		2.00	0.00	DITS Overbody Cent		4.000	
		73.00	7.57	CAST-I Electronics		2.750	
		2.00	0.00	DITS Overbody Cent		4.500	
		128.00	6.59	CAST-M Mandrel		4.375	
			501.12	IN			
	Total	454.10	41.76	FT	Max OD	4.500	

Note - CAST head size subject to review of CAST planner result.

8.11. Contingencies

Major contingencies have been listed in Section 7 of this document. In addition to these, the following contingencies have been considered. All equipment to carry out these operations will be available on the well site / call off.

- Use spear to retrieve 2 ⅞", 3 ½" & 4 ½" string
- Fishing operations on broken / cut 2 ⅞" string
- Fishing operations on broken 4 ½" string
- Fishing 3 ½" and 4 ½" string to allow sufficient space to set deep cement plug
- Milling run to allow sufficient space to set deep cement plug

8.12. Wellplan drag & StressCheck Simulations

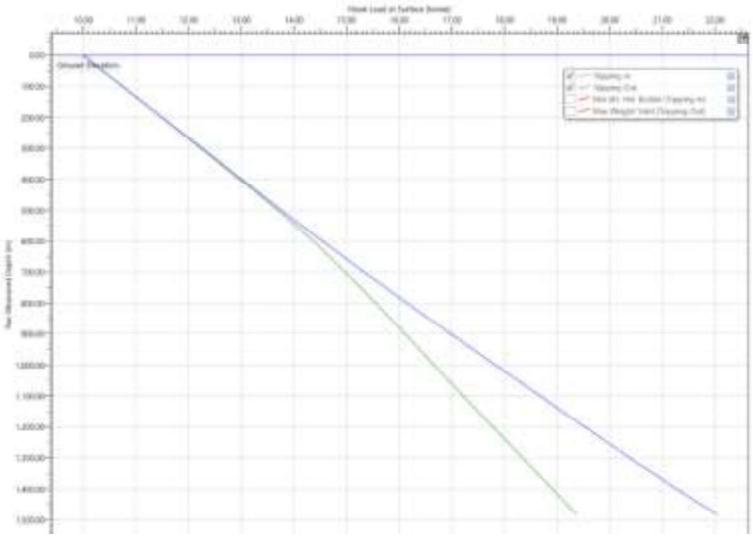
Simulations have been run on Landmark™ Wellplan software to determine expected drag during the retrieving of the tubulars. The following assumptions have been used for the calculations:

- A jack weight of 10mT
- Friction factor in casing 0.2 when tripping out, 0.3 when tripping in (based on data received during VE-4 operations)
- No rotation while tripping
- Pump out force has not been taken in account.
- Friction of stripping rams not taken in account

2-7/8" Estimated P/U weight

Mud inside:	1.75 s.g.
Mud outside:	1.75 s.g.
WHP:	0.00 s.g.

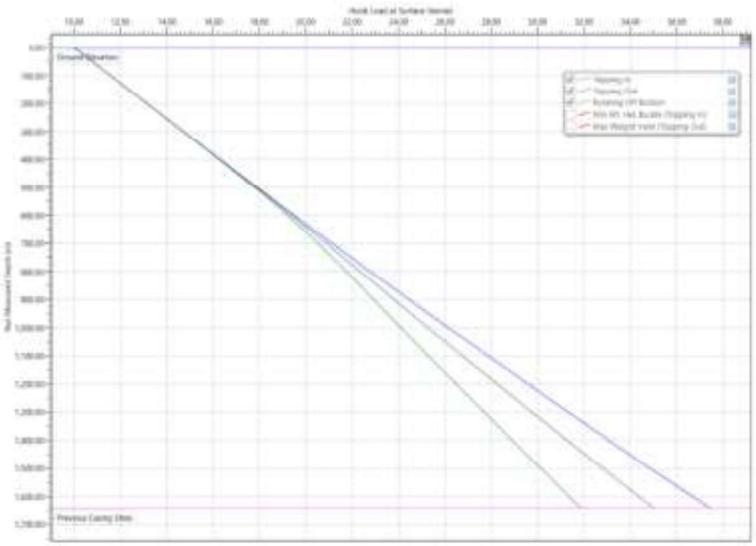
With an additional 5 mT to unseat the hanger the expected weight for free pipe is estimated at ca. 27mT



3-1/2" Estimated P/U weight – snubbing modus

Fluid inside: 1.295 s.g. plant brine
Fluid outside: 1.295 s.g. plant brine
WHP: 55 bar

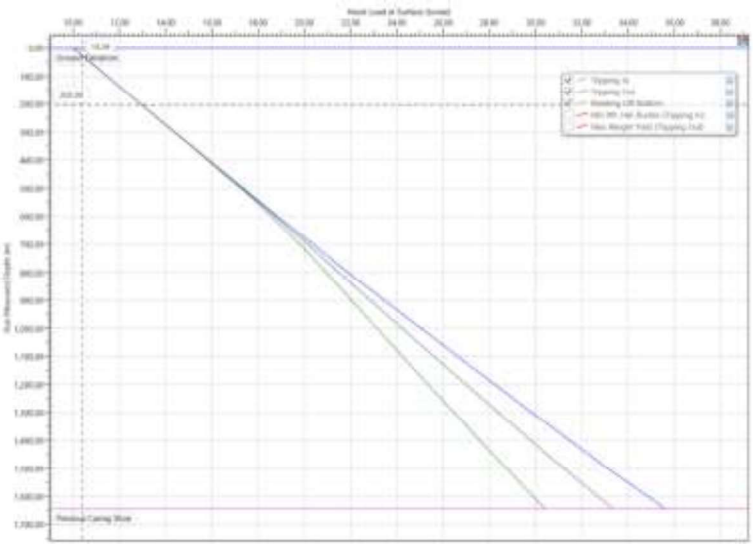
With an additional 5 mT to unseat the hanger and subtracting the POF 3.5 mT the expected weight for free pipe is estimated at ca. 39mT



3-1/2" Estimated P/U weight – partially killed

Fluid inside: 1.295 s.g. plant brine
Fluid outside: 1.4 s.g. Mud / brine mixture
WHP: 38 bar

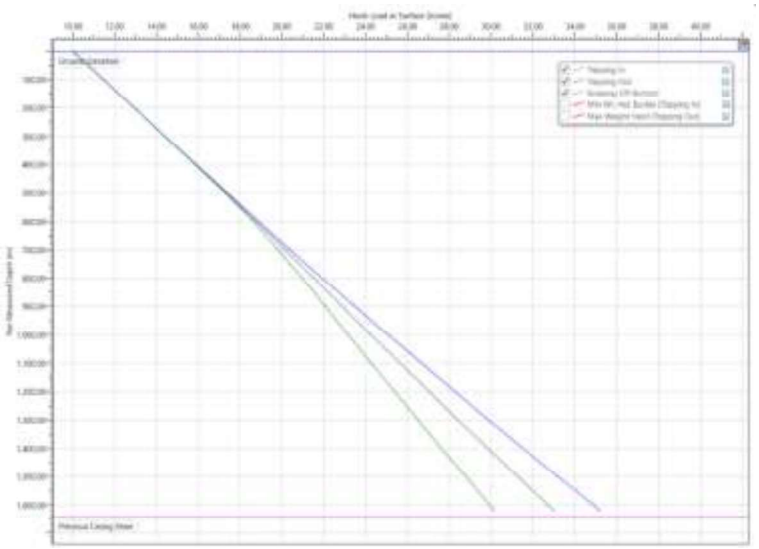
With an additional 5 mT to unseat the hanger and subtracting the POF 2.4 mT the expected weight for free pipe is estimated at ca. 38mT



4-1/2" Estimated P/U weight

Mud inside: 1.75 s.g.
Mud outside: 1.75 s.g.
WHP: 0.00 s.g.

With an additional 5 mT to unseat the hanger the expected weight for free pipe is estimated at ca. 40mT.



StressCheck

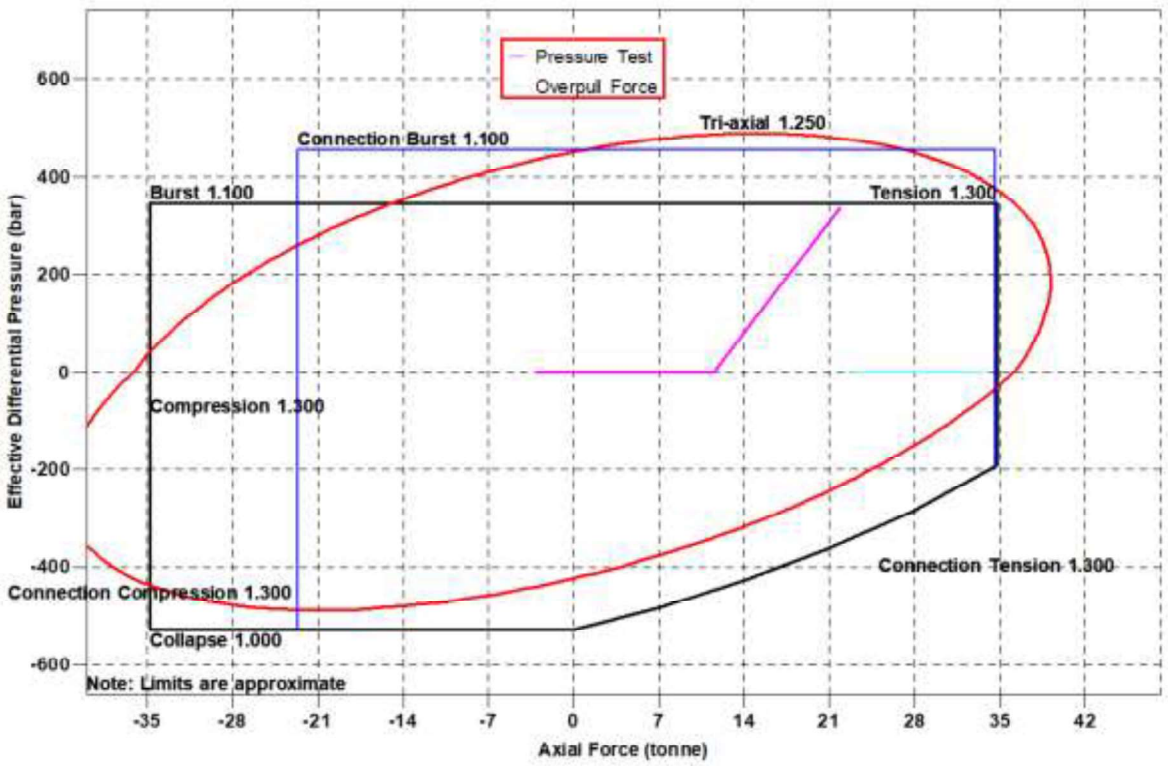
Simulations have been run on Landmark™ stresscheck software to determine ability to pressure test the BOP's to 345 bar against a WRBP installed in the first joint below the hanger and to determine the maximum allowable pull. For these evaluations the following assumptions are made.

2-7/8" string

Average Maximum % Circumferential Wall Loss total string	24%
Maximum penetration top 10m	24%

Load cases

- Pressure test BOP's to 345 bar against WRBP set at 10m, with 55 bar WHP on the outside
- 24 mT overpull with 0 bar WHP well filled with 1.75 s.g. killmud



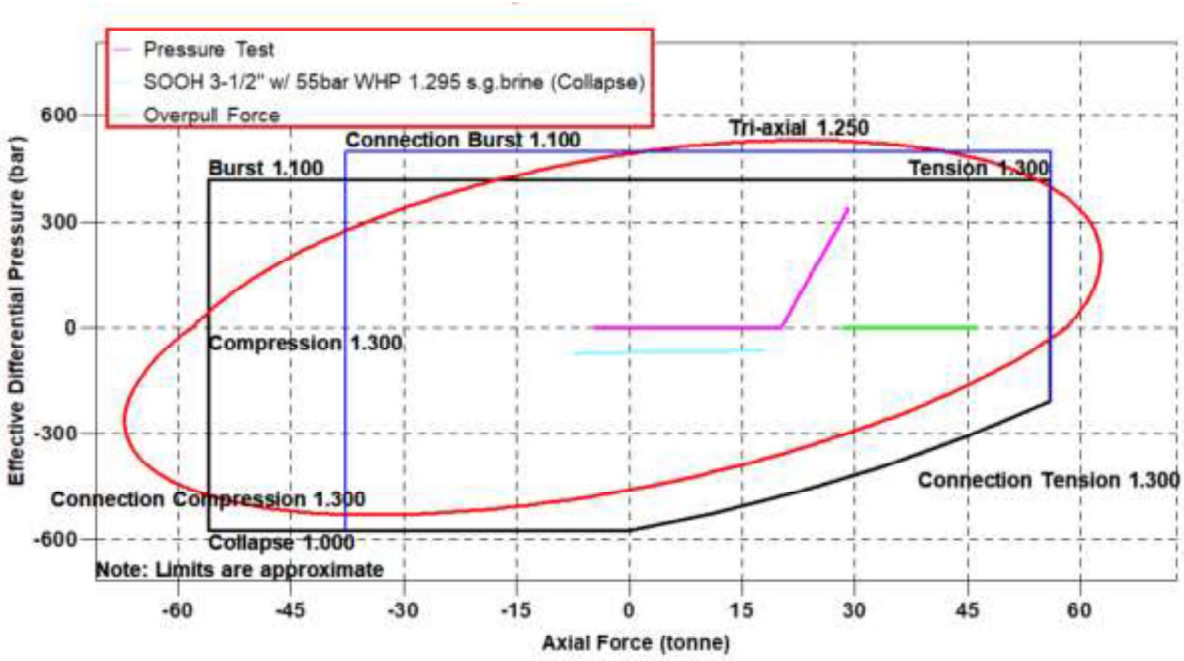
For the worst case Max. Percentage Circumferential Wall Loss of 59.8% the Margin Of Overpull will be limited, to ca. 7mT (19mT – est. string weight of 12mT).

OD	2.88 in	WT @ 100%	6.49 in2				
ID	2.44 in	0.217 in	4.68 in2		1.81	in^2	
Yield	55000				99610.9	Lbs	
					45.2	ton	100%
OD	2.88 in	WT @ 40.2%	6.49 in2				
ID	2.70 in	0.087 in	5.73 in2		0.76	in^2	
Yield	55000				41982.7		
					19.1	ton	40%

3-1/2" string

Average Maximum % Circumferential Wall Loss total string 6.5%
Maximum penetration top 10m 15.7%

- Pressure test BOP's to 345 bar against WRBP set at 10m, with 55 bar WHP on the outside
- SOOH 3-1/2" string with 55 bar WHP.



For the worst case Max. Percentage Circumferential Wall Loss of 11.3% the Margin Of Overpull will be limited, to ca. 41mT (65mT – est. string weight of 24mT)

OD	3.50 in	WT @ 100%	9.62 in2			
ID	2.922 in	0.289 in	6.70 in2	2.91385406	in^2	
Yield	55000			160262.0	Lbs	
				72.8	ton	100%
OD	3.50 in	WT @ 88.7%	9.62 in2			
ID	2.99 in	0.256 in	7.01 in2	2.61	in^2	
Yield	55000			143575.9		
				65.2	ton	89%

4-1/2" string

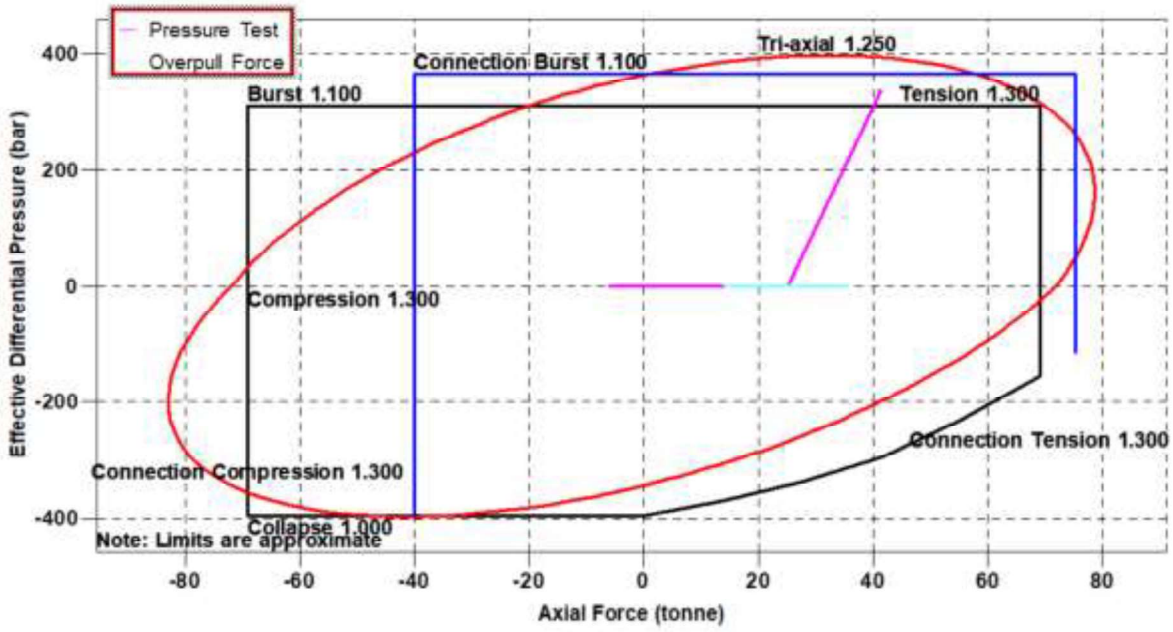
No direct data is acquired during the wireline operations, average MID data has been used

Average Maximum % Circumferential Wall Loss total string 15.0%

Maximum penetration top 10m 15.0%

Load cases

- Pressure test BOP's to 345 bar against WRBP set at 10m, with 55 bar WHP on the outside
- POOH with 0 bar WHP well filled with 1.75 s.g. killmud



With the 15% average wallthickness reduction of 87.5% in the top 10m the Pressure test to 345bar cannot be performed without exceeding the envelop. The maximum allowable pressure test should not exceed 300 bar.

For the worst case Max. Percentage Circumferential Wall Loss of 39% the Margin of overpull will be limited, to ca. 18mT (43mT – est. string weight of 25mT)

OD	4.50 in	WT @ 100%	15.90 in2				
ID	3.958 in	0.271 in	12.30 in2		3.59862526	in^2	
Yield	55000				197924.4	Lbs	
					89.9	ton	100%
OD	3.50 in	WT @ 61%	9.62 in2				
ID	3.17 in	0.165 in	7.89 in2		1.73	in^2	
Yield	55000				95202.2		
					43.2	ton	61%

10 ¾" Casing

Note: The actual burst and collapse values of the 10 ¾" casing has to be evaluated based on the casing integrity measurements (Section 6.9) before executing the following steps,

Two scenario's have been evaluated;

1) 15% wall thickness reduction, pressure test to 190 bar, inflow test to zero bar, well filled with 1.30 s.g. brine and 2.2 s.g. lithostatic gradient over the salt section.

Input data for for StressCheck custom loads

Pore pressure gradient	1.05	s.g.
Lithostatic pressure gradient salt	2.2	s.g.
Brine density	1.3	s.g.
Top ZEZ salt	1488	m TVD
10-3/4" shoe (55.5# K55 - BTC)	1590	m TVD
Yield	55000	
ID	9.76	in
Nominal WT	0.495	in
Corrosion (av %)	15	%

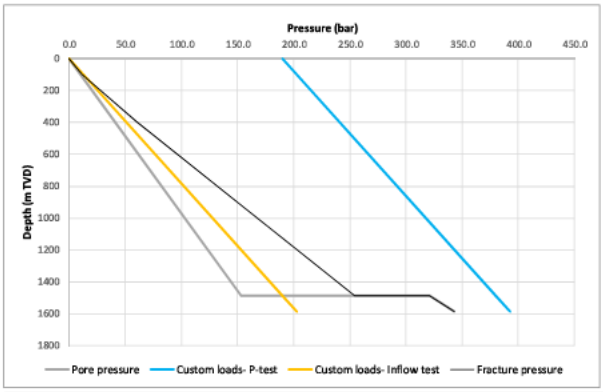
Calculated ID & WT	
9.909	in
0.421	in

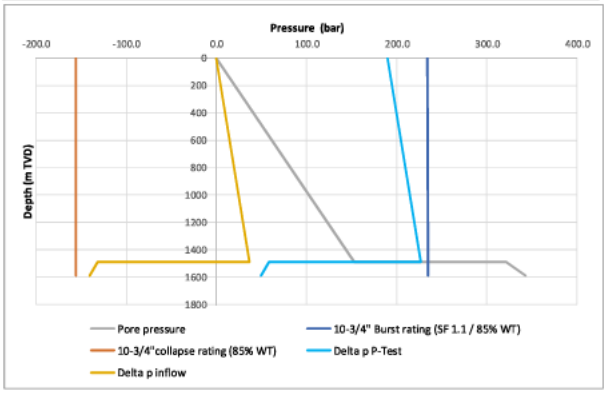
			Burst 1.1 SF / Collapse 1.0		TVD
Burst	3767	260	234	234	0
Collapse	2882	-156	-156	-156	1590

Formation strength		
Depth (m TVD)	FS gradient	Pressure
0	1.15	0.0
100	1.15	11.3
393	1.55	59.8
949	1.7	158.3
1488	1.74	254.0
1488.1	2.2	321.2
1590	2.2	343.2

Custom loads- Inflow test			
Pore-P outside			
Brine inside - 0 bar WHP			
Depth (m TVD)	External	Internal	Delta p inflow
0	0.0	0.0	0.0
1488	153.3	189.8	36.5
1488.1	321.2	189.8	-131.4
1590	343.2	202.8	-140.4

Custom loads- P-test			
Pore-P outside			
Brine inside - Pressure test	190	bar test pressure	
Depth (m TVD)	External	Internal	Delta p P-Test
0	0.0	190.0	190.0
1488	153.3	379.8	226.5
1488.1	321.2	379.8	58.6
1590	343.2	392.8	49.6





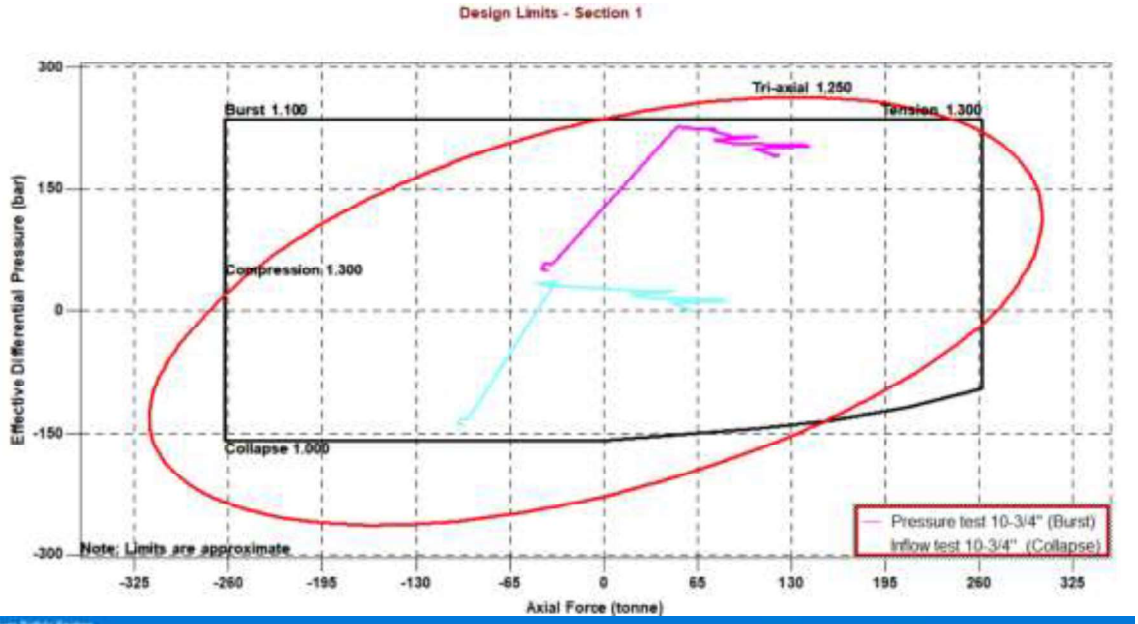
StressCheck output data

Custom Loads

	Measured Depth (m)	Pressures (bar)	
		Internal	External
1	0.00	0.0000	0.0000
2	1540.00	189.8000	153.3000
3	1540.10	189.8000	321.2000
4	1642.00	202.8000	343.2000
5			

Custom Loads

	Measured Depth (m)	Pressures (bar)	
		Internal	External
1	0.00	190.0000	0.0000
2	1540.00	379.8000	153.3000
3	1540.10	379.8000	321.2000
4	1642.00	392.8000	343.2000
5			



Minimum Safety Factors

	Depth (MD) (m)	OD/Weight/Grade	Connection	Minimum Safety Factor (Abs)			
				Burst	Collapse	Axial	Triaxial
1	0	10 3/4", 55.500 ppf, K-55	N/A	1.37 CL	5.73 CL	N/A	1.72 CL
2	25			1.36 CL	—	N/A	1.71 CL
3	25			1.36 CL	—	N/A	1.72 CL
4	398			1.30 CL	—	N/A	1.65 CL
5	500			1.28 CL	—	N/A	1.58 CL
6	500			1.28 CL	—	N/A	1.57 CL
7	575			1.27 CL	—	N/A	1.55 CL
8	575			1.27 CL	—	N/A	1.57 CL
9	650			1.26 CL	—	N/A	1.59 CL
10	850			1.23 CL	—	N/A	1.55 CL
11	1025			1.21 CL	—	N/A	1.46 CL
12	1025			1.21 CL	—	N/A	1.49 CL
13	1325			1.17 CL	—	N/A	1.41 CL
14	1425			1.16 CL	—	N/A	1.38 CL
15	1425			1.16 CL	—	N/A	1.40 CL
16	1540			1.15 CL	—	N/A	1.38 CL
17	1540			1.37 CL	+ 100.00 CL	N/A	1.53 CL
18	1540			4.43 CL	1.21 CL	N/A	2.46 CL
19	1550			4.50 CL	1.20 CL	N/A	2.44 CL
20	1550			4.50 CL	1.20 CL	N/A	2.43 CL
21	1625			5.08 CL	1.14 CL	N/A	2.34 CL
22	1642			5.24 CL	1.13 CL	N/A	2.33 CL
23							
24	CL	Custom Loads					
25							

2) 40% wall thickness reduction, test pressure to 115 bar (50 bar above fracture gradient of the Lower Bunter), inflow test to zero bar, well filled with 1.30 s.g. brine and 1.70 s.g. lithostatic gradient over the salt section.

Input data for for StressCheck custom loads

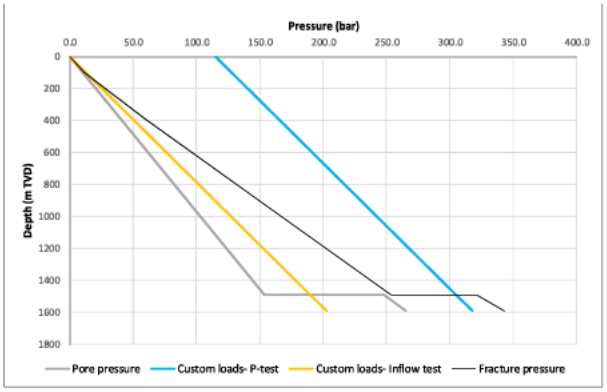
Pore pressure gradient	1.05	s.g.		
Lithostatic pressure gradient salt	1.7	s.g.		
Brine density	1.3	s.g.		
Top ZEZ salt	1488	m TVD		
10-3/4" shoe (55.5# K55 - BTC)	1590	m TVD		
Yield	55000		Calculated ID & WT	
ID	9.76	in	10.156	in
Nominal WT	0.495	in	0.297	in
Corrosion (av %)	40%			

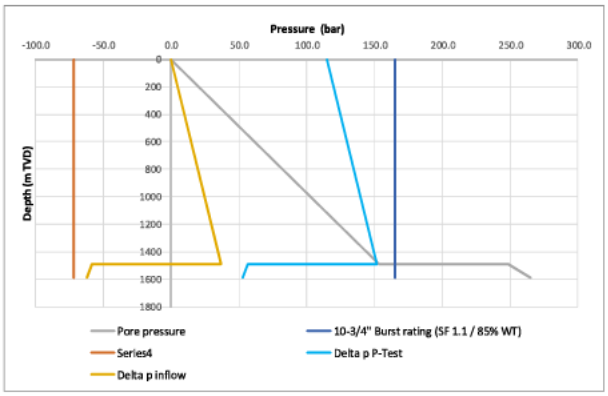
	PSI	Bar	Burst 1.1 SF / Collapse 1.0		TVD
Burst	2659	183	165	165	0
Collapse	1044	-72	-72	-72	1590

Formation strength				
Depth (m TVD)	FS gradient	Pressure		
0	1.15	0.0		
100	1.15	11.3		
393	1.55	59.8		
949	1.7	158.3		
1488	1.74	254.0	304.0	50 bar above FS
1488.1	2.2	321.2		
1590	2.2	343.2		

Custom loads- Inflow test			
Pore-P outside			
Brine inside - 0 bar WHP			
Depth (m TVD)	External	Internal	Delta p inflow
0	0.0	0.0	0.0
1488	153.3	189.8	36.5
1488.1	248.2	189.8	-58.4
1590	265.2	202.8	-62.4

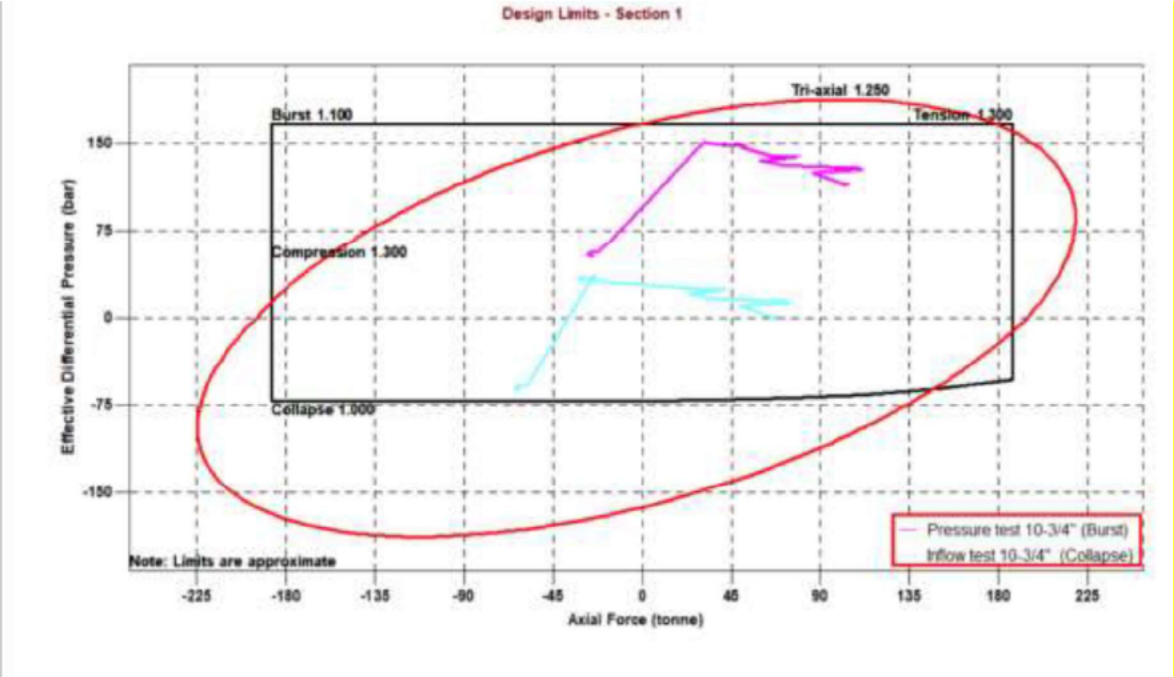
Custom loads- P-test			
Pore-P outside			
Brine inside - Pressure test	115	bar test pressure	
Depth (m TVD)	External	Internal	Delta p P-Test
0	0.0	115.0	115.0
1488	153.3	304.8	151.5
1488.1	248.2	304.8	56.6
1590	265.2	317.8	52.6





	Measured Depth (m)	Pressures (bar)	
		Internal	External
1	0.00	0.0000	0.0000
2	1540.00	189.8000	153.3000
3	1540.10	189.8000	248.2000
4	1642.00	202.8000	265.2000

	Measured Depth (m)	Pressures (bar)	
		Internal	External
1	0.00	115.0000	0.0000
2	1540.00	304.8000	153.3000
3	1540.10	304.8000	248.2000
4	1642.00	317.8000	265.2000



Minimum Safety Factors

	Depth (MD) (m)	OD/Weight/Grade	Connection	Minimum Safety Factor (Abs)			
				Burst	Collapse	Axial	Triaxial
1	0	10 3/4", 55.500 ppf, K-55	N/A	1.59 CL	3.76 CL	N/A	1.94 CL
2	25			1.59 CL	—	N/A	1.92 CL
3	25			1.59 CL	—	N/A	1.93 CL
4	398			1.47 CL	—	N/A	1.86 CL
5	500			1.44 CL	—	N/A	1.76 CL
6	500			1.44 CL	—	N/A	1.75 CL
7	575			1.42 CL	—	N/A	1.74 CL
8	575			1.42 CL	—	N/A	1.77 CL
9	650			1.40 CL	—	N/A	1.80 CL
10	650			1.35 CL	—	N/A	1.73 CL
11	1025			1.32 CL	—	N/A	1.60 CL
12	1025			1.32 CL	—	N/A	1.64 CL
13	1325			1.25 CL	—	N/A	1.51 CL
14	1325			1.25 CL	—	N/A	1.52 CL
15	1425			1.23 CL	—	N/A	1.46 CL
16	1425			1.23 CL	—	N/A	1.49 CL
17	1540			1.21 CL	—	N/A	1.46 CL
18	1540			1.59 CL	+ 100.00 CL	N/A	1.88 CL
19	1540			3.24 CL	1.23 CL	N/A	3.56 CL
20	1550			3.26 CL	1.23 CL	N/A	3.56 CL
21	1550			3.26 CL	1.23 CL	N/A	3.47 CL
22	1625			3.44 CL	1.17 CL	N/A	3.61 CL
23	1642			3.49 CL	1.15 CL	N/A	3.71 CL
24							
25	CL	Custom Loads					

8.13. Well Survey List

DIRECTIONAL CALCULATIONS - RADIUS OF CURVATURE METHOD

WELL NAME: TR-5

Magnetic Declination at this location is 2.76° E (1982)

MEASURED DEPTH m ODF	Measured Depth m CHH	HOLE ANGLE DEGREES	AZIMUTH			AZIMUTH DEG N=0, E=90 S=180, W=270	HOLE ANGLE RADIANS	AZIMUTH RADIANS	DISPLACEMENT NORTH/SOUTH m	DISPLACEMENT EAST/WEST m	TVD m ODF	TVD For Graph m BCHH	DOGLEG SEVERITY deg/10m	VERTICAL SECTION m
						Y-axis								X-axis
0	0	0.00	N	333,82	E	333,8	0,00000	5,82626	0,00	0,00	0,00	0,0	0	0,00
25	17,45	0,30	N	333,82	E	333,8	0,00524	5,82626	0,06	-0,03	25,00	17,4	0,12	-0,07
75	67,45	0,10	N	346,26	E	346,3	0,00175	6,04338	0,22	-0,09	75,00	67,45	0,04	-0,24
100	92,45	0,20	N	266,62	E	266,6	0,00349	4,65340	0,26	-0,14	100,00	92,45	0,08	-0,29
125	117,45	0,20	N	269,98	E	270,0	0,00349	4,71204	0,26	-0,22	125,00	117,45	0,00	-0,34
150	142,45	0,40	N	325,34	E	325,3	0,00698	5,67825	0,31	-0,34	150,00	142,45	0,13	-0,46
175	167,45	0,50	N	359,50	E	359,5	0,00873	6,27446	0,50	-0,39	175,00	167,45	0,11	-0,64
200	192,45	0,50	N	55,66	E	55,7	0,00873	0,97145	0,46	-0,41	200,00	192,45	0,19	-0,62
225	217,45	0,20	N	69,98	E	70,0	0,00349	1,22138	0,53	-0,28	225,00	217,45	0,12	-0,60
275	267,45	0,20	N	345,10	E	345,1	0,00349	6,02313	0,49	-0,30	275,00	267,45	0,05	-0,57
300	292,45	0,10	N	319,26	E	319,3	0,00175	5,57214	0,55	-0,33	300,00	292,45	0,05	-0,64
325	317,45	0,20	N	326,42	E	326,4	0,00349	5,69710	0,60	-0,37	325,00	317,45	0,04	-0,70
350	342,45	0,30	N	29,74	E	29,7	0,00524	0,51906	0,58	-0,37	350,00	342,45	0,11	-0,69
375	367,45	0,20	N	27,89	E	27,9	0,00349	0,48677	0,67	-0,32	375,00	367,45	0,04	-0,74
400	392,45	0,40	N	127,05	E	127,1	0,00698	2,21744	0,70	-0,20	400,00	392,45	0,19	-0,73
425	417,45	0,30	N	74,37	E	74,4	0,00524	1,29800	0,67	-0,06	424,99	417,44	0,13	-0,67
450	442,45	2,20	N	119,01	E	119,0	0,03840	2,07712	0,61	0,47	449,99	442,44	0,80	-0,77
475	467,45	4,10	N	134,49	E	134,5	0,07156	2,34729	-0,21	1,57	474,95	467,40	0,83	-1,58
500	492,45	6,80	N	139,65	E	139,7	0,11868	2,43735	-1,95	3,18	499,83	492,28	1,10	-3,73
525	517,45	9,70	N	137,81	E	137,8	0,16930	2,40524	-4,64	5,55	524,57	517,02	1,16	-7,24
550	542,45	12,80	N	139,97	E	140,0	0,22340	2,44294	-8,32	8,76	549,09	541,54	1,25	-12,08
575	567,45	15,60	N	136,13	E	136,1	0,27227	2,37592	-12,88	12,85	573,32	565,77	1,18	-18,20
600	592,45	18,00	N	136,29	E	136,3	0,31416	2,37871	-18,09	17,85	597,25	589,70	0,96	-25,42
625	617,45	19,80	N	137,45	E	137,5	0,34558	2,39896	-24,00	23,39	620,91	613,36	0,74	-33,51
650	642,45	20,20	N	138,61	E	138,6	0,35256	2,41920	-30,36	29,11	644,40	636,85	0,23	-42,06
675	667,45	20,50	N	137,77	E	137,8	0,35779	2,40454	-36,84	34,90	667,84	660,29	0,17	-50,75
700	692,45	21,00	N	137,41	E	137,4	0,36652	2,39826	-43,38	40,88	691,22	683,67	0,21	-59,61
725	717,45	21,10	N	137,89	E	137,9	0,36826	2,40663	-50,02	46,93	714,55	707,00	0,08	-68,58
750	742,45	21,40	N	138,05	E	138,1	0,37350	2,40943	-56,75	52,99	737,85	730,30	0,12	-77,64
775	767,45	21,60	N	138,21	E	138,2	0,37699	2,41222	-63,57	59,11	761,11	753,56	0,08	-86,80
800	792,45	21,80	N	141,37	E	141,4	0,38048	2,46737	-70,63	65,08	784,34	776,79	0,47	-96,04
825	817,45	22,00	N	138,53	E	138,5	0,38397	2,41780	-77,77	71,07	807,53	799,98	0,43	-105,35
850	842,45	21,80	N	138,77	E	138,8	0,38048	2,42199	-84,77	77,24	830,73	823,18	0,09	-114,68
875	867,45	21,40	N	139,01	E	139,0	0,37350	2,42618	-91,70	83,29	853,97	846,42	0,16	-123,88
900	892,45	21,30	N	139,52	E	139,5	0,37176	2,43508	-98,60	89,23	877,26	869,71	0,08	-132,97
925	917,45	20,90	N	140,49	E	140,5	0,36477	2,45201	-105,49	95,01	900,58	893,03	0,21	-141,97
950	942,45	20,80	N	140,45	E	140,5	0,36303	2,45131	-112,35	100,67	923,94	916,39	0,04	-150,86
975	967,45	20,60	N	141,16	E	141,2	0,35954	2,46371	-119,20	106,26	947,33	939,78	0,13	-159,69
1000	992,45	20,30	N	140,41	E	140,4	0,35430	2,45062	-125,97	111,78	970,75	963,20	0,16	-168,41
1025	1017,45	19,60	N	133,64	E	133,6	0,34208	2,33246	-132,21	117,59	994,25	986,70	0,96	-176,94
1050	1042,45	18,90	N	129,89	E	129,9	0,32987	2,26701	-137,70	123,74	1017,86	1010,31	0,57	-185,12
1075	1067,45	18,80	N	129,13	E	129,1	0,32812	2,25374	-142,83	129,97	1041,51	1033,96	0,11	-193,12
1100	1092,45	18,90	N	130,46	E	130,5	0,32987	2,27696	-148,00	136,18	1065,17	1057,62	0,18	-201,12
1125	1117,45	19,00	N	130,88	E	130,9	0,33161	2,28429	-153,30	142,33	1088,82	1081,27	0,07	-209,18
1150	1142,45	19,30	N	132,30	E	132,3	0,33685	2,30907	-158,74	148,47	1112,44	1104,89	0,22	-217,35
1175	1167,45	19,10	N	134,72	E	134,7	0,33336	2,35131	-164,40	154,43	1136,04	1128,49	0,33	-225,56
1200	1192,45	19,10	N	135,56	E	135,6	0,33336	2,36597	-170,20	160,20	1159,67	1152,12	0,11	-233,73
1225	1217,45	19,10	N	136,81	E	136,8	0,33336	2,38778	-176,10	165,86	1183,29	1175,74	0,16	-241,91
1250	1242,45	19,10	N	138,08	E	138,1	0,33336	2,40995	-182,13	171,40	1206,92	1199,37	0,17	-250,09
1275	1267,45	18,90	N	138,50	E	138,5	0,32987	2,41728	-188,20	176,81	1230,55	1223,00	0,10	-258,23
1300	1292,45	17,90	N	139,76	E	139,8	0,31241	2,43927	-194,17	181,97	1254,28	1246,73	0,43	-266,11
1325	1317,45	16,40	N	140,02	E	140,0	0,28623	2,44381	-199,81	186,72	1278,16	1270,61	0,60	-273,47
1350	1342,45	15,00	N	140,28	E	140,3	0,26180	2,44835	-205,00	191,06	1302,23	1294,68	0,56	-280,23
1375	1367,45	14,80	N	140,54	E	140,5	0,25831	2,45289	-209,95	195,16	1326,39	1318,84	0,08	-286,65
1400	1392,45	13,60	N	139,80	E	139,8	0,23736	2,43997	-214,66	199,08	1350,62	1343,07	0,49	-292,77
1425	1417,45	11,70	N	139,83	E	139,8	0,20420	2,44049	-218,85	202,62	1375,02	1367,47	0,76	-298,24
1450	1442,45	10,60	N	138,61	E	138,6	0,18500	2,41920	-222,51	205,77	1399,54	1391,99	0,45	-303,07
1475	1467,45	9,50	N	139,87	E	139,9	0,16581	2,44119	-225,81	208,62	1424,16	1416,61	0,45	-307,43
1500	1492,45	8,10	N	140,13	E	140,1	0,14137	2,44573	-228,74	211,08	1448,87	1441,32	0,56	-311,25
1525	1517,45	6,70	N	142,39	E	142,4	0,11694	2,48517	-231,25	213,09	1473,66	1466,11	0,57	-314,46
1550	1542,45	6,00	N	144,56	E	144,6	0,10472	2,52305	-233,47	214,74	1498,50	1490,95	0,30	-317,21
1575	1567,45	5,00	N	142,64	E	142,6	0,08727	2,48954	-235,40	216,16	1523,39	1515,84	0,41	-319,59
1600	1592,45	4,20	N	141,72	E	141,7	0,07330	2,47348	-236,99	217,39	1548,31	1540,76	0,32	-321,59
1625	1617,45	3,50	N	140,80	E	140,8	0,06109	2,45742	-238,30	218,44	1573,25	1565,70	0,28	-323,27
1650	1642,45	3,10	N	141,20	E	141,2	0,05411	2,46440	-239,41	219,35	1598,21	1590,66	0,16	-324,70
1660	1652,45	2,80	N	142,81	E	142,8	0,04887	2,49250	-239,82	219,66	1608,20	1600,65	0,31	-325,22
1675	1667,45	2,50	N	144,74	E	144,7	0,04363	2,52613	-240,36	220,07	1623,18	1615,63	0,21	-325,91
1700	1692,45	2,10	N	140,35	E	140,3	0,03665	2,44949	-241,18	220,68	1648,16	1640,61	0,17	-326,91
1725	1717,45	1,70	N	143,11	E	143,1	0,02967	2,49768	-241,83	221,20	1673,15	1665,60	0,16	-327,73
1750	1742,45	1,30	N	139,57	E	139,6	0,02269	2,43590	-242,34	221,61	1698,14	1690,59	0,16	-328,38
1775	1767,45	0,90	N	141,33	E	141,3	0,01571	2,46663	-242,71	221,91	1723,13	1715,58	0,16	-328,86
1800	1792,45	0,50	N	144,70	E	144,7	0,00873	2,52551	-242,95	222,10	1748,13	1740,58	0,16	-329,17
1825	1817,45	0,10	N	141,76	E	141,8	0,00175	2,47412	-243,06	222,17	1773,13	1765,58	0,16	-329,30
1850	1842,45	0,00	N	141,65	E	141,7	0,00000	2,47232	-243,07	222,19	1798,13	1790,58	0,04	-329,32