

DIMENSION BID




PETRONAS






RESAK A-09 SAND CLEANOUT & ADD-PERFORATION

Revision: 0
Prepared for: Faizal Ali
Date Prepared: 30th Sept 2023
Well: A-09
Field: Resak
Operation Region: PMA
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

DESIGN VERIFICATION

<p>PREPARED BY DB CTS Field Engineer</p>	 <hr style="border: 0.5px solid black;"/> <p>Muhammad Ameerul Zaeem</p>	<p>30/9/2023 Date</p>
<p>REVIEWED BY DB CTS Technical Advisor</p>	 <hr style="border: 0.5px solid black;"/> <p>Kung Yee Han</p>	<p>13/10/2023 Date</p>
<p>APPROVED BY DB CTS Operation Manager</p>	 <hr style="border: 0.5px solid black;"/> <p>Aliff Amirul Adenan</p>	<p>13/10/2023 Date</p>
<p>APPROVED BY PCSB Resak Well Intervention Engineer</p>	<hr style="border: 0.5px solid black;"/> <p>Faizal Ali</p>	<hr style="border: 0.5px solid black;"/> <p>Date</p>
<p>APPROVED BY PCSB Technical Professional Well Intervention, PMA</p>	<hr style="border: 0.5px solid black;"/> <p>M Izwan B A Jalil</p>	<hr style="border: 0.5px solid black;"/> <p>Date</p>
<p>APPROVED BY PCSB Head of Cluster 1 Well Intervention, PMA</p>	<hr style="border: 0.5px solid black;"/> <p>Ahmad Hafizi B Ahmad Zaini</p>	<hr style="border: 0.5px solid black;"/> <p>Date</p>

Remark: Do not execute the procedures in this document if it is not fully approved and signed by all parties.


Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 2
----------------------------------	------------------------------	--------------------	---------------	--	----------

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

DISTRIBUTION LIST

No	Personnel	Company	Name	Email
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Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 3
----------------------------------	------------------------------	--------------------	---------------	--	----------

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

PERSONNEL CONTACT

Any means of following doubt / unusual parameters / Emergency, please contact Dimension Bid personnel in onshore immediately.

No	Name	Position	Company	Location	Contact No
1	Aliff Amirul Adenan	Operation Manager	DB	Kemaman	011 – 1225 7044
2	Mohd Khairul Ridhwan	Field Services Manager	DB	Kemaman	014 – 515 4452
3	Kung Yee Han	Technical Advisor	DB	Kemaman	011 – 612 05611

REVISION HISTORY

Rev. No	Section	Date	Revised By
0	All	30/09/2023	Muhd Ameerul Zaeem

ACRONYM

Acronym	Abbreviation
BHA	Bottom Hole Assembly
RIH	Run In Hole
POOH	Pull Out Of Hole
HUD	Hang Up Depth
TCC	Tubing Clearance Check
ZSO	Zone Shut Off
SCO	Sand Clean Out
TIT	Tubing Integrity Test
BOP	Blow Out Preventer
CT	Coil Tubing
ID	Internal Diameter
MDTHF	Measure Depth Tubing Head Flange

SSD	Sliding Side Door
P&A	Plug and Abandonment
MASTP	Maximum Allowable Surface Treating Pressure
STP	Surface Treating Pressure
EOT, MDFF	

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 4
----------------------------------	------------------------------	--------------------	---------------	--	----------


DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

TABLE OF CONTENT

..... 1

DESIGN VERIFICATION 2

DISTRIBUTION LIST 3

REVISION HISTORY 4

ACRONYM..... 4

TABLE OF CONTENT 5

OBJECTIVES 7

BACKGROUND 7

WELL DATA 7

OPERATION SUMMARY 8

WELL DIAGRAM 9

WELL 3D PLOT 10

TREATMENT VOLUME..... 11

COILED TUBING STRING INFORMATION..... 12

CT STRING FATIGUE (Jason 683330) 12

CT STRING # 683330 LATEST PIPE MANAGEMENT 13

PROCESS FLOW DIAGRAM..... 14

SAFETY OPERATIONAL PROCEDURES 15

HEALTH, SAFETY & ENVIRONMENT 16

EQUIPMENT RIG UP PROCEDURE 17

EQUIPMENT PRESSURE TESTING PROCEDURE 19

OPERATIONAL PROCEDURE..... 20

SLICKLINE OPERATION..... 20

COILED TUBING OPERATION – RUN#1 Sand Cleanout until PBTD at depth 3,551m-MDDF 21

COILED TUBING OPERATION – RUN#2 GRCCCL c/w 2-7/8” Dummy Gun..... 29

COILED TUBING OPERATION – RUN#3 ADD PERFORATION GUN 1..... 31

COILED TUBING OPERATION – RUN#4 ADD PERFORATION GUN 2..... 33

COILED TUBING OPERATION – CONTINGENCY UNLOADING 34


APPENDIX I – BOTTOM HOLE ASSEMBLY SCHEMATIC..... 36

APPENDIX II – ORPHEUS SIMULATIONS & CIRCA SIMULATION 41


APPENDIX IV – EMERGENCY PROCEDURE 54

EMERGENCY BOP OPERATIONS..... 54

LEAK IN COILED TUBING AT SURFACE 55

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

LEAK IN COILED TUBING BELOW SURFACE.....	55
LEAK IN SURFACE PRESSURE CONTROL EQUIPMENT	56
COILED TUBING RUNS AWAY INTO WELL	57
COILED TUBING COLLAPSED AT SURFACE.....	58
COILED TUBING BREAKS AT SURFACE	59
BUCKLED TUBING.....	59
COILED TUBING STUCK IN HOLE PROCEDURES.....	61
STUCK CT COIL RECOVERY PROCESS.....	63
APPENDIX V – DECISION TREE (Bullheading#1 & Run#1 SCO).....	64
DECISION TREE (Run#2-4).....	65
DECISION TREE (Contingency Unloading).....	66

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

OBJECTIVES

The objective of this job is:

1. To perform CT sand cleanout until PBSD at depth 3551m-MDDF.
2. To perform add-perf at future zone J20.3 at depth interval 3504 - 3510 m-MDDF.


BACKGROUND

Resak A-09 is a single string gas producer. Latest HUD record is at depth 3461m-MDDF via slickline.

WELL DATA

Input Parameter	Parameter Value
Field	Resak A-09
Max. Deviation (degrees)	70.4 Deg @ 1,060.6m-MDDF
Min. Restriction (inch)	3.725" @ 3108.4 m-MDDF
Tubing Specification	4-1/2" Chrome Completion Tubing & Liner
Type of Fluid & Density	-
Top of Fluid	TBA
J10.3 Reservoir Pressure	2600psi (as of 2014)
Current Well Status	Flowing
Fracture Gradient	0.7 psi/ft (assumed)
CO2 Content	12 -25%
H2S Content	4 -30 ppmv
Mercury Content	3970ppb (as of 2022)

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 7
----------------------------------	------------------------------	--------------------	---------------	--	----------

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

OPERATION SUMMARY

<i>Item</i>	<i>Job Description</i>	<i>Remark</i>
A	Slickline	1. Close SSD#2 prior bullheading operation
B	Bullheading Operation	1. Bullheading#1: To pump Lost Circulation Material System temporarily plug the J10.3 formation prior sand cleanout
C	Coiled Tubing Operation	2. Run#1: Sand Cleanout until PBTD at depth 3551m-MDDF 3. Run#2: GRCCL with Dummy 2-7/8" Gun 4. Run#3: Add-perforation using 2-7/8" Gun 5. Run#4: Add-perforation using 2-7/8" Gun 6. Contingency Run#1: Nitrogen Unloading
D	Slickline	1. Open SSD#2

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 8
----------------------------------	------------------------------	--------------------	---------------	--	----------

DIMENSION BID

DIMENSION BID COILED TUBING SERVICES

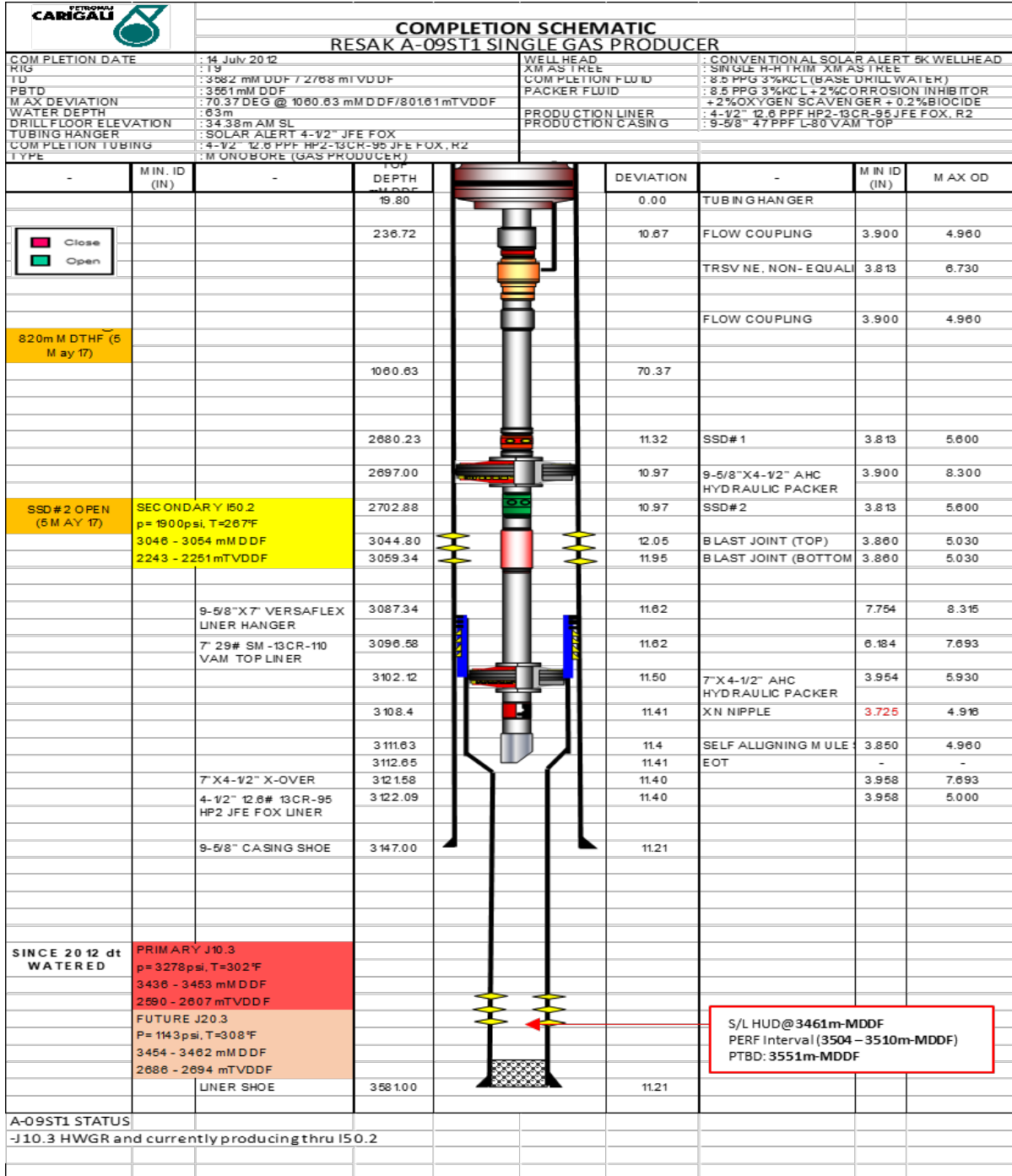
Resak A-09


SAND CLEANOUT & ADD-
PERFORATION



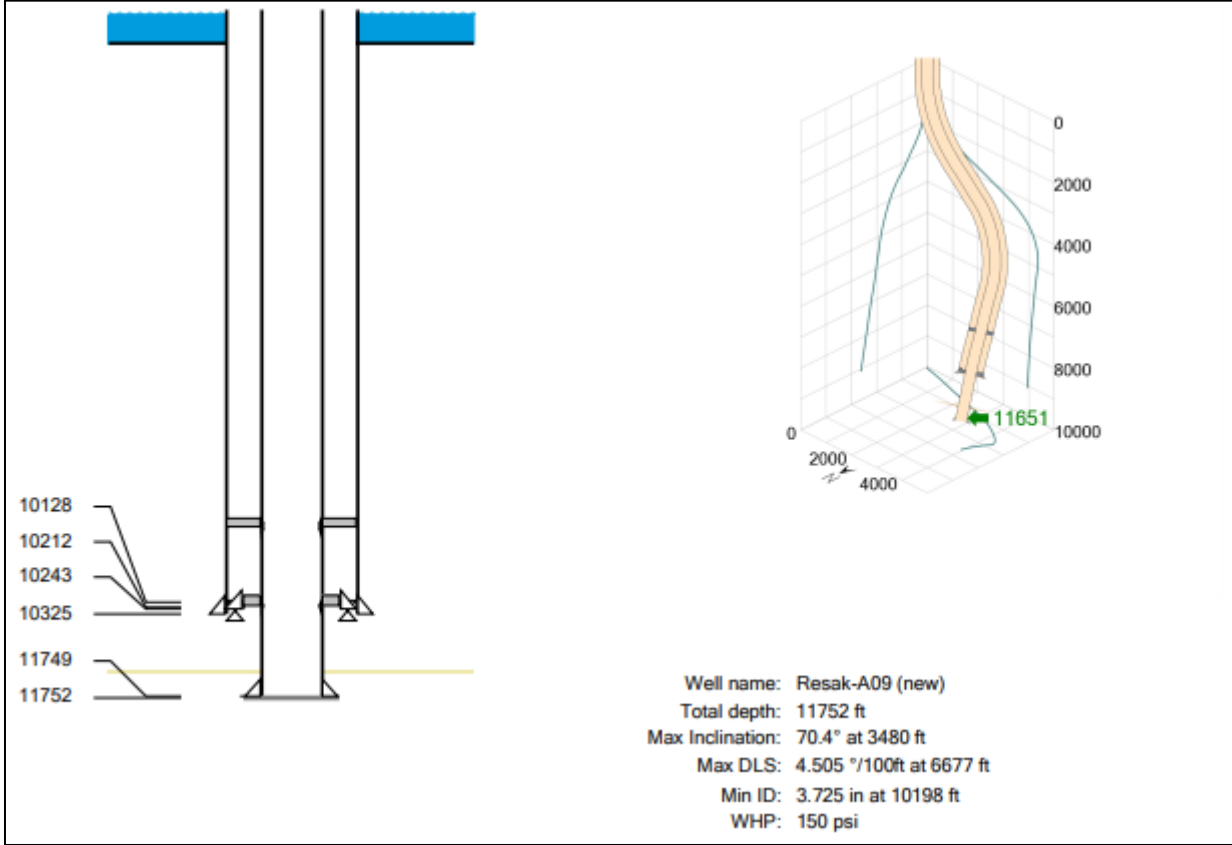
PETRONAS

WELL DIAGRAM




DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

WELL 3D PLOT



<i>Input Parameter</i>	<i>Parameter Value</i>
Field	Resak A-09
Max. Deviation (degrees)	70.4 Deg @ 1060.6m-MDDF
Min. Restriction (inch)	3.725" XN-Nipple

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD-PERFORATION	


TREATMENT VOLUME

Type	Tubing															Total Volume (bbls)
	External Pipe			Internal Pipe			Internal Pipe			Caps	From	To	From	To	Length	
	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)	Barrel/lin (ft)	m	m	ft	ft	ft	
THF to EOT	4 1/2	3.958	12.6							0.01522	34.38	3112.65	113	10213	10100	153.7
TOTAL															154	

Type	A-Annulus (PCP)															Total Volume (bbls)
	External Pipe			Internal Pipe			Internal Pipe			Caps	From	To	From	To	Length	
	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)	Barrel/lin (ft)	m	m	ft	ft	ft	
THF to 1st Packer	9 5/8	8.535	47	4 1/2	3.958	12.6				0.05109	34.38	2697.00	113	8849	8736	446.3
TOTAL															446	

Type	Wellbore Area on J10.3 & J20.3 Reservoir															Total Volume (bbls)
	External Pipe			Internal Pipe			Internal Pipe			Caps	From	To	From	To	Length	
	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)	Barrel/lin (ft)	m	m	ft	ft	ft	
2nd Packer#2 to EOT	7	6.366		4 1/2	3.958	12.6				0.01970	3102.12	3112.65	10178	10213	35	0.7
EOT to Top Perf J10.3 Zone	4 1/2	3.958	12.6						0.01522	3112.65	3436.00	10213	11274	1061	16.1	
Top Perf till Bottom Perf J10.3	4 1/2	3.958	12.6						0.01522	3436.00	3453.00	11274	11329	56	0.8	
Casing Section	4 1/2	3.958	12.6						0.01522	3453.00	3504.00	11329	11497	167	2.5	
Top Perf Till Bottom Perf J20.3	4 1/2	3.958	12.6						0.01522	3504.00	3510.00	11497	11516	20	0.3	
Bottom Perf J20.3 till PBTD	4 1/2	3.958	12.6						0.01522	3510.00	3551.00	11516	11651	135	2.0	
TOTAL															22.6	

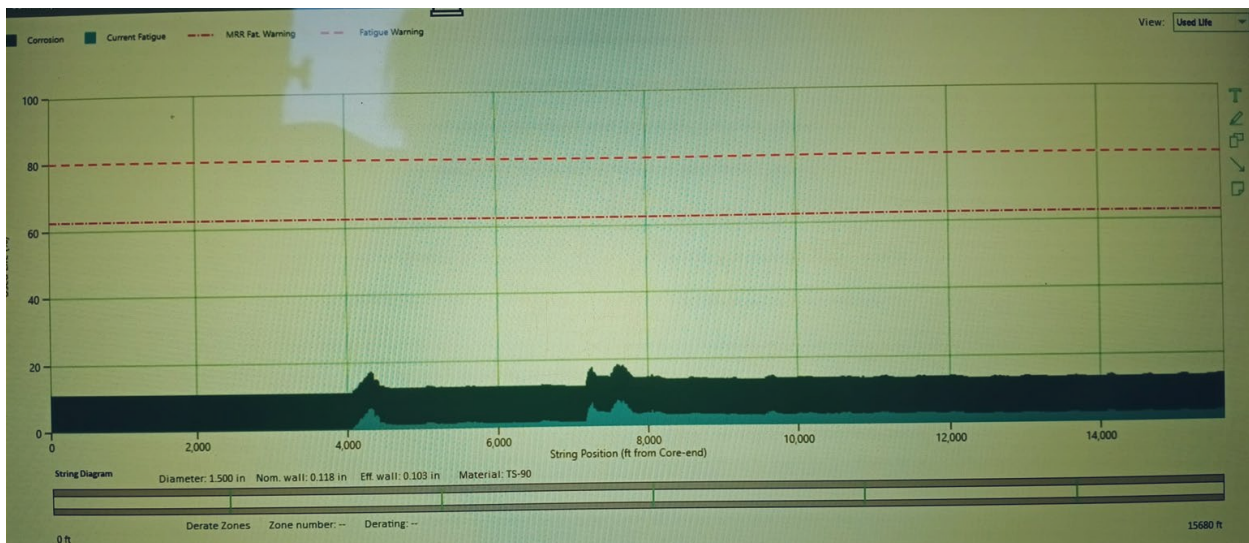
Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 11
----------------------------------	------------------------------	--------------------	---------------	--	-----------

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	


COILED TUBING STRING INFORMATION

<i>OD (in)</i>	<i>Spec</i>	<i>W/T (in)</i>	<i>ID (in)</i>	<i>Length (ft)</i>
1.5	Jason	0.118	1.264	15,680 ft
CT Volume: 24.34 bbls				

CT STRING FATIGUE (Jason 683330)



Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 12
----------------------------------	------------------------------	--------------------	---------------	--	-----------

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

CT STRING # 683330 LATEST PIPE MANAGEMENT

Based on above pipe management;

- Current CT Length is **15,680 ft.**
- Current String Used Life is **27.48 %.**
- Current Running Footage in Chrome Completion is 62,862 ft
- Current Total Running Footage is **124,824 ft.**

Based on Dimension Bid Standard Operating Procedure (SOP) of Pipe Management for Chrome Completion:

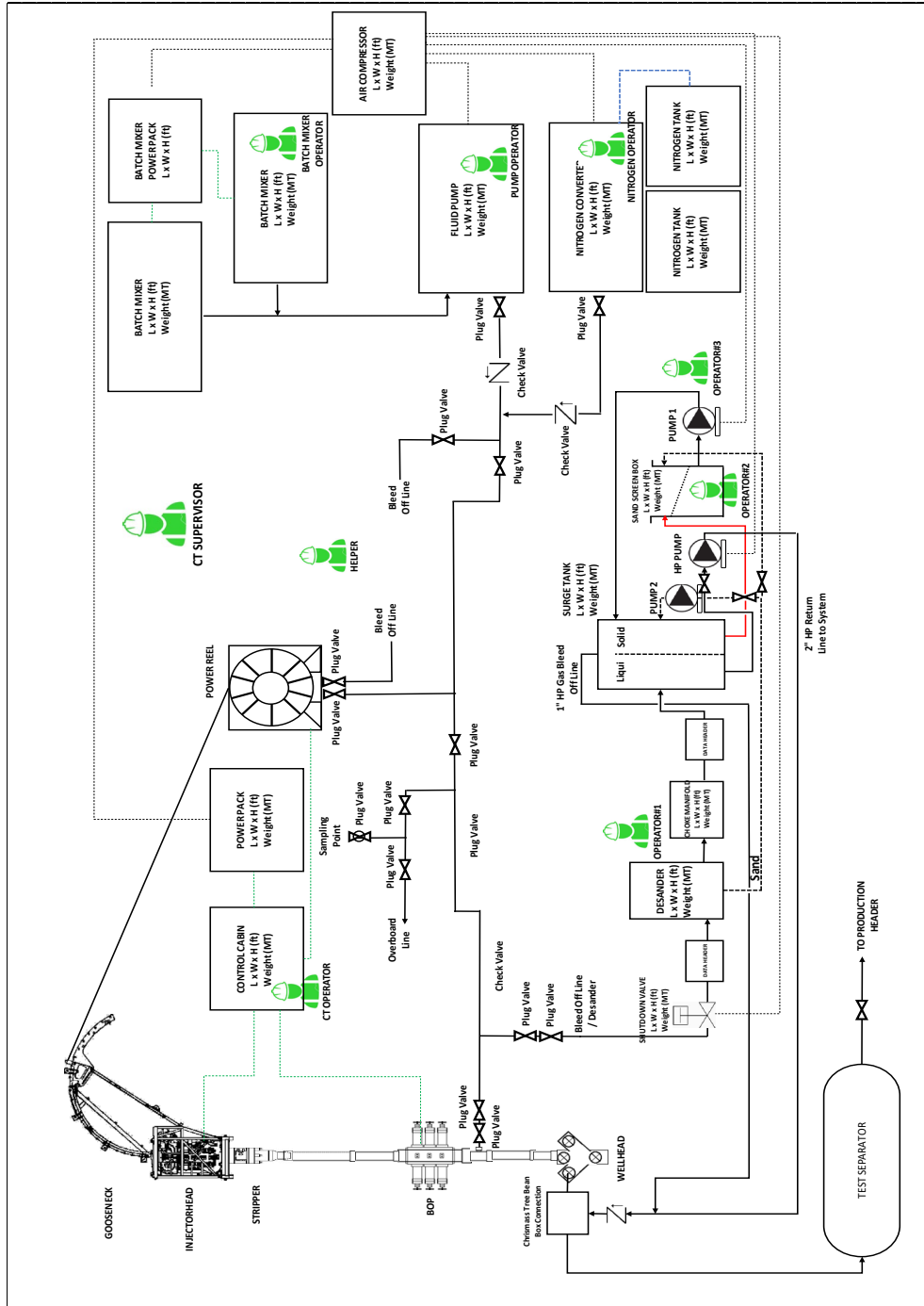
- Max Running Footage in Chrome Completion is **200,000 ft**


Based on Dimension Bid Standard Operating Procedure (SOP) of Pipe Management to junk the CT:

- **100%** of CT String Life reached
- Experienced two separate pinholes for the same CT String
- CT String exceed max working pressure

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 13
----------------------------------	------------------------------	--------------------	---------------	--	-----------

PROCESS FLOW DIAGRAM



DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

SAFETY OPERATIONAL PROCEDURES

Prior to commencement of the Coiled Tubing / Bull-heading operation, a pre-job meeting will be held. This should be attended by the following parties as a minimum:


OIM, WSS, Coiled Tubing Supervisor, Representatives of other service companies involved and others as necessary.

Safety meetings should be held at the start of every shift and risk assessments must be evaluated during this time. Tool box talks should be held immediately prior to the job execution.

Note: The safety meeting must be driven by DB Supervisor addressing the following topics as a minimum:

1. Muster point.
2. Take list of personnel on site (Head count)
3. All personnel should review and be familiar with escape routes and emergency procedures.
4. Describe the **job objective, fluids and volumes to be pumped, pressures expected** during the job, and others.
5. Review **Dimension Bid Operations Policy and Procedure Manual**.
 - 5.1. Ensure at all steps carried out during the operations comply with this Manual.
 - 5.2. Management of change **MUST** be applied any time there is a need to deviate from the steps contained this procedure.
 - 5.3. A document **MUST** be created describing each the step of the deviation. This document shall also include the deviation Risk Assessment and it **MUST** be approved and signed by PCSB – Head of Well Intervention and Dimension Bid Operations Manager.
6. Exercise stops work authority if unsafe condition occurs and assess situation with all team members, resume operation after mitigation plan is in place.
7. Personnel responsibilities throughout the job.
8. Spills, fire, blow out, unexpected well behaviour.
9. Emergency shower station and eye wash station location.
10. Trapped potential energy such as pressure or coiled tubing stiffness.
11. Prepare related Job Hazard Analysis (JHA) prior commencement of any work, get approval from Client Site Representative (CSR) and review it with all personnel involved as well as to review Risk Assessment.
12. Discuss the well H₂S, CO₂, Hg (Mercury) content (if applicable).
13. Adhere all **PCSB Zeto Rules** and other guidelines.
14. Take a physical count of inventory and make sure all required materials are available on site.
15. **Barricade** the work area and display the appropriate **warning sign**.
16. On chemical mixing and handling; all personnel involved shall hold **safety meeting** and review **Safety Data Sheet** (SDS).
 - 16.1. Personnel involve during chemical handling shall be briefed by DB Chemical Specialist onsite and extra precautions must be taken. All SDS must be available on site and reviewed prior chemical handling.
 - 16.2. All non-essential personnel shall stay away from mixing site.
 - 16.3. Use PPE including respirators, hard hats, eye protection and steel-toed boots.

Prepared By: M. Ameerul Zaem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 15
---------------------------------	------------------------------	--------------------	---------------	--	-----------


DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

- 16.4. Verify if there is any **dead Volume** in the mixing tanks and adjust volumes to account for non-usable volume in the blender / mix tank.
- 16.5. Consider wind direction and note all trip hazards in the mix / pumping area.
- 16.6. Prior to mixing chemicals, clean and verify the tank/batch mixer and lines are free of any debris and or contaminants.
- 16.7. In case of spill; wash the place where any chemical has been spilt with available spill kit.
- 16.8. Take care to prevent leakage due to ejection from valves, fittings, flanges, or other joints flexible chemical hoses and pumps. Never repair the equipment during transfer into mixing tank/container.
17. Take reading of Shut in / Flowing Tubing Head Pressure (SI/FTHP), Casing Head Pressure (CHP) and fluid sample (if available) prior to operation.
18. Check gas lift condition and capability with Site Operation Representative (SOR).
19. Ensure fitness prior to perform duties assigned.
20. Ensure all barriers are in place and followed.

HEALTH, SAFETY & ENVIRONMENT

1. Evaluate possible risks to arise during the job execution.
2. Evaluate risk assessment. Report any abnormal or insecure condition on site, taking into account all the steps or procedures to follow. Discuss with PCSB HSE coordinator, the execution or suspension of the job.
3. Review SDS of each product that will be used. Verify that all personnel on location handling toxic or corrosive products have the proper PPE.
4. Review the contingency plan for spills.
5. Do not vent / release any hydrocarbons from the well to atmosphere. Returns from the well should be handled safely by Flowback Company.
6. Prior to DB personnel walking on upper deck, DB Supervisor to inspect upper deck and ensure that the area it is in good condition (Gratings, Hatches, etc.)

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 16
----------------------------------	------------------------------	--------------------	---------------	--	-----------

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

EQUIPMENT RIG UP PROCEDURE


Conduct safety meeting with all personnel on location detailing the program, pressure limitations, and personnel responsibilities, well control emergency drill and safety precautions.

1. Spot the equipment accordingly to space availability, ensure reel position is aligned with the well.
2. Spot jacking frame at available space with sufficient height and crane capacity to rig up the injector head and gooseneck.
3. Rig up the 4" LP hoses from fluid storage tanks to batch mixer and single pump unit
4. Rig up 2" HP treating line as per DB Technical Standard from single pump unit and N2 converter unit to coiled tubing reel manifold. Include bleed off line on both lines as well.
5. Install correct wellhead crossover on the wellhead. Ensure well is fully secure and record the MV and CV turns.
6. Install Blowout Preventer (BOPs):
 - 6.1. Rig up Single BOP with necessary length of risers on top of the wellhead crossover.
 - 6.2. Rig up Combi BOP with flow tee above the risers
 - 6.3. Hook up BOP hoses and conduct function test for each ram.
7. Rig up 2" kill line from single pump unit line to BOP kill port
8. Rig up flow back line from flow tee to Choke manifold -> desander unit / production system
9. Spot injector head assembly with jacking frame on top of wellhead area. Ensure the gooseneck is aligned with the reel position
10. Inspect the chain and gripper block condition and ensure the alignment is correct
11. Rig up the following hydraulic hoses:
 - 11.1. From CT Power Pack to CT Control Cabin
 - 11.2. From CT Power Pack to CT Injector hose reel
 - 11.3. From CT Control Cabin to CT Reel
 - 11.4. From CT Control Cabin to CT BOPs
 - 11.5. From CT Power Pack to Jacking Frame
12. Perform EMC 1 for all equipment. Start up and run all equipment for few minutes.
13. Jack up CT control cabin.
14. Function test both BOP rams.

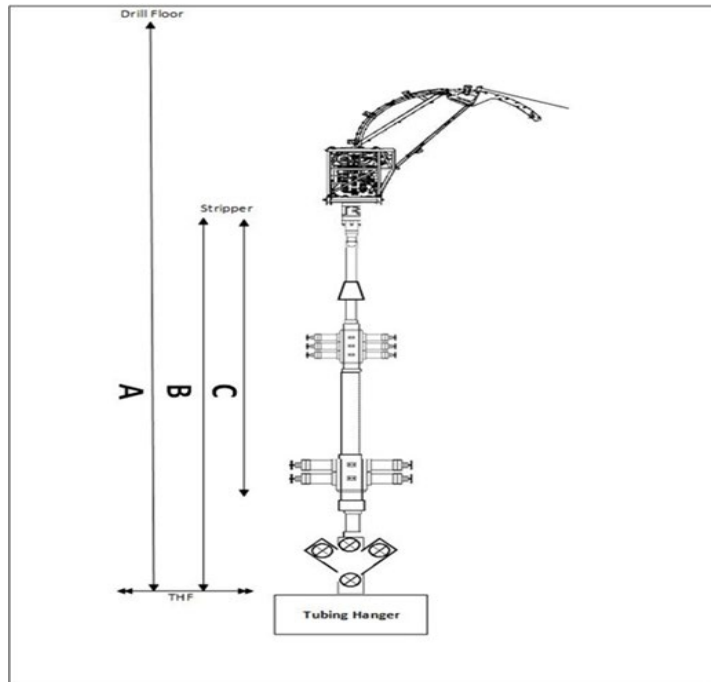
***Observe indicator pin to confirm that all rams are in good working condition.**
15. Install the stab-in-guide on the CT then stab the string into injector head.
16. Make up the CT connector and perform pull test at least 16,000 lbs as per DB SOP. This test to be recorded in OrionNet.

***Do not perform pull test more than 80% from CT Limit.**
17. Install pressure test plate onto the CT connector.
18. Circulate the string & flowback line with water until clean return is seen prior to proceed with pressure test CT Connector.
19. Pressure up the CT string to 5,000 psi gradually by 500 psi increment then hold for 10 minutes. Pressure test acceptance criteria:

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 17
----------------------------------	------------------------------	--------------------	---------------	--	-----------

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD-PERFORATION	

- 19.1. For low pressure at 300 psi:
Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 270 psi) over 5-minutes test interval after the pressure stabilizes.
- 19.2. For high pressure at 5,000 psi:
Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 4,500 psi) over the 15- minutes test interval after the pressure stabilizes
20. Open the needle valve to release the pressure slowly.
21. Make up the BHA onto the string as per BHA diagram provided.
22. Use the jacking frame to pick up the injector and risers then connect to the Combi BOP. Secure down the injector assembly with chains.
23. Measure the following length to set the CT depth:




Distance	Length (ft)
A: Tubing Hanger (THF) to RKB	
B: Tubing Hanger (THF) to Stripper	
C: BHA Length	

*The reference depth is at the tip of BHA

24. Pick up CT and tag the stripper to set CT depth based on this calculation "A-B+C".

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 18
----------------------------------	------------------------------	--------------------	---------------	--	-----------

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

EQUIPMENT PRESSURE TESTING PROCEDURE


Conduct safety meeting with all personnel on location detailing the program, pressure limitations, and personnel responsibilities; well control emergency drill and safety precautions. Refer the following procedure to pressure test BOP Body, Blind Ram, Surface Line and Wellhead connection.

1. Isolate the line to Coiled Tubing. Double confirm the valve is closed.
2. Fill and pressure test the treating line with water to 500 psi and hold for 5 minutes. Inspect the lines for leaks and observe for any pressure drop.
3. Increase pressure to 3,000 psi and hold for 10 minutes. Inspect the lines for leaks and observe for any pressure drop.
4. Fill the pressure control equipment and ensure air is vented from the system by leaving the blind ram and blind ram equalizing valves open.
5. Close blind ram and equalizing valve. Pressure up the surface lines, BOP body, blind rams and wellhead connection to 500 psi then increase gradually to 3000 psi through the kill line, hold for 10 minutes. Inspect the lines for leaks and observe for any pressure drop. PT acceptance criteria as per below:
 - 5.1. For low pressure at 500 psi:
Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 450 psi) over 5-minutes test interval after the pressure stabilizes.
 - 5.2. For high pressure at 3,000 psi:
Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 2,700 psi) over the 15- minutes test interval after the pressure stabilizes
6. Once test complete, open blind ram pressure equalizing port then bleed off any residual pressure and open the blind rams.

Conduct safety meeting with all personnel on location detailing the program, pressure limitations, and personnel responsibilities; well control emergency drill and safety precautions. Refer the following procedure to pressure test BOP Body, Blind Ram, Surface Line and Wellhead connection.

1. Fill up the CT string and stack up until leak can be seen at stripper.
2. Energize the stripper and begin pressure test the complete stack up (CT string, stripper, CT stack and risers) to 3,000 psi against Crown Valve, hold for 10 minutes.
3. Bleed off pressure inside CT to 0 psi to test the Double Flapper Check Valve to 1,500 psi and hold for 10 minutes. Do not apply pressure more than CT Collapse Pressure (1,500 psi).
4. Bleed off the pressure from BOP kill port side.
***Step 4-8 can be neglected if pipe ram has been pressure tested prior to the job.**
5. Place CT string across pipe ram then close the ram.
6. Open pipe ram equalizing valve then fill up the BOP slowly.
7. Close the equalizing valve and begin pressure test the pipe ram to 3,000 psi, hold for 10 minutes.
8. When the tests are complete, bleed off the pressure.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 19
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

OPERATIONAL PROCEDURE

SLICKLINE OPERATION


All depths specified below are in m-MDDF (**Drill floor to THF is 19.40m as per well schematic**)

1. Slickline to close SSD#2 run to ensure the tubing path is clear from obstruction and record the min ID of the tubing:

<i>Depth, .m-MDDF</i>	<i>Unit</i>
2702.88	

2. Once completed, rig down Slickline unit and handover well to CT operation.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 20
----------------------------------	------------------------------	--------------------	---------------	--	-----------

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

COILED TUBING OPERATION – RUN#1 Sand Cleanout until PBTD at depth 3,551m-MDDF

All depths specified below are in m-MDDF (Drill floor to THF is 19.40m as per well schematic)

Conduct safety meeting with all personnel on location detailing the program, pressure limitations, personnel responsibilities, emergency well control drill, and safety precautions.

10. Rig up coiled tubing unit and surface line on Resak-A platform as per conducted Site Visit Report:
 - 10.1. Review JHA and risk assessment with all personnel involve in the rig up operation. Please send a copy of JHA to Engineer in Charge.
 - 10.2. Lift up coiled tubing unit using crane and spot on platform.
 - 10.3. Rig up Coiled Tubing package and surface treating line.
 - 10.4. Rig up 2” kill line to BOP kill port.
 - 10.5. Rig up 2” flexible hose from pumping tee.
 - 10.6. Ensure pump volume, pump rate, N2 rate, circulating pressure, well head pressure, weight is synchronised with Orion-Net DAS.
 - 10.7. Perform CT string maintenance by;
 - 10.7.1. Pumping 5bbls of **7.5% HCl** followed by flushing and remove pickle fluid with fluid.
 - 10.7.2. Flush CT with turbine (lead) and foam pig (tail) to ensure clear possible debris inside CT string. Record CT tubing volume in treatment report;

<i>Pump Volume, bbls</i>	<i>Pump Rate, bpm</i>


- 10.8. Make up the **CT End Connector**.
- 10.9. Install the Pull and Pressure Test Sub.
- 10.10. Perform Pull Test on the CT End Connector **to 16,000 lbf** and record this in Orion-Net.

Note: Do not perform pull test more than 80% coil limit. Consult with town if require.
- 10.11. Perform Pressure Test on CT End Connector. Pumping Treated Sea Water (TSW) through the coiled tubing, apply low pressure test of **300 psi for 5 minutes** and high-pressure test of **5,000 psi for 15 minutes** after stabilization. Record the pressure test.
 - 10.11.1. For low pressure:

Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 270 psi) over 5-minutes test interval after the pressure stabilizes.
 - 10.11.2. For high pressure:

Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 4,500 psi) over the 15- minutes test interval after the pressure stabilizes.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 21
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

11. Prepare 100 bbls of Treated Sea Water, TSW as per recipe below:

Treated Sea Water (TSW)				100	BBL	Description
Seq.	Product	Concentration		Volume		
1	Sea Water	992	gptg	4,166	gal	Base Fluid
2	ACM H2S Clear 200	2	gptg	8	gal	CO2 & H2S Corrosion Inhibitor
3	ACM BACT 200	2	gptg	8	gal	Micro Biocide Control
4	ACM OXYFREE 100	2	gptg	8	gal	Oxygen Scavenger
5	MESB NE-Surf 200	2	gptg	8	gal	Non-Emulsifier Surfactant

Mixing Instruction:

1. Prepare sea water in the mixing tank.
2. Add ACM H2S Clear 200 & ACM OXYFREE 100 into the tank and circulate the mixture.
3. Add ACM BACT 200 & NE-Surf 200 into the tank and circulate the mixture until homogenous.

Note: The above recipe is for 100bbls of TSW. Please prepare another batch of TSW once needed.

12. Prepare 50bbls of D801 Cleanout Gel as per recipe below:

D801 Cleanout Gel				50	BBL	Description
Seq.	Product	Concentration		Volume		
1	Sea Water	992	gptg	2,083	gal	Base Fluid
2	D801 Gel	40.5	pptg	85	lbs	Gelling Agent

Mixing Instruction:

1. Prepare sea water in the mixing tank.
2. Add D801 Gel into the tank and circulate the mixture until homogenous.

Note: The above recipe is for 50bbls of D801 Gel. Please prepare another batch of D801Gel once needed.

13. Prepare 10bbls of drag reducer solution as per recipe below;

Treated Sea Water (3% Drag Reducer)				10	BBL	Description
Seq.	Product	Concentration		Volume		
1	Sea Water	968	gptg	406	gal	Base Fluid
2	IM Lube	32	gptg	13	gal	Drag Reducer

Mixing Instruction:

1. Prepare sea water in the mixing tank.
2. Add IM Lube into the tank and circulate the mixture at least 10 minutes until homogenous.


Note: The above recipe is for 10bbls of drag reducer solution. Please prepare another batch once needed.

14. Make up 2-1/8" Multi-Jet Nozzle tool as per **BHA#1: 2-1/8" Multi-Jet Nozzle** in **Appendix 1**.

15. Perform function test of the Multi-Jet Nozzle to determine at which pump rate and pressure of the tool. Record the data in the table below, do not exceed **5,000psi**.

Flow rates (bpm)	Nitrogen (scfm)	Pressure (psi)	Remark
0.3	400		
0.5	400		
0.6	400		
0.7	400		
0.8	400		
0.9	400		
1.0	400		
1.1	400		
1.2	400		
1.3	400		


Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 22
----------------------------------	------------------------------	--------------------	---------------	--	-----------

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD-PERFORATION	

16. Pick up coiled tubing and tag the stripper with the BHA.
17. Make up the Injector Head and Stripper to the stack up.
18. Coiled tubing stack up pressure test against Wellhead Swab valve. Pumping Treated Sea Water (TSW) through the coiled tubing, apply low pressure test of **300 psi for 5 minutes** and high-pressure test of **3,000 psi for 15 minutes** after stabilization. Record the pressure test. Record test on a chart. Upon successful pressure test, bleed off pressure via Pump-In Sub.
 - 18.1. For low pressure:
Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 270 psi) over 5-minutes test interval after the pressure stabilizes.
 - 18.2. For high pressure:
Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 2,700 psi) over the 15- minutes test interval after the pressure stabilizes.
19. Pressure test the BHA Check Valve. With **3,000 psi** in the coiled tubing stack up, bleed off the stack up pressure to **1,500 psi** via pump-in sub; and bleed off pressure in the coiled tubing to zero (0) psi via reel manifold.
 - 19.1. Acceptance criteria: **Pressure drop is less than 10% (above 1,350 psi) over the 15- minute test interval after the pressure stabilizes.** Observe for any pressure changes in the stack up. If the BHA check valve is not holding, proceed to replace the MHA; do not run-in hole with leaking check valve; repeat steps 8.2 and 9.
20. Upon successful test, bleed off the pressure in the coiled tubing stack up to zero through the pump-in sub.
21. Zero both depth counters at reference point.
22. Confirm all wellhead and BOP valves are in open position via physical check.
 - 22.1. Prior to opening the wellhead valve pressure up above master valves to a pressure equal to the expected shut-in wellhead pressure.
 - 22.2. Count wellhead valves turns while opening and record it the treatment report for reference in future.
 - 22.3. Manipulate surface valve to the following position:

Valve	Position
Reel Manifold	OPEN
Flow Cross Return Valve (Cetco lines)	OPEN
Wing Valve	CLOSE
23. Start running in hole CT tubing to **3,451m-MDDF (10m above slickline HUD)** while pumping **Treated Sea Water** at 0.3BPM.
 - 23.1. Refer to CT Tubing Force simulation (Orpheus modelling), refer Appendix III.
 - 23.2. Conduct pull test for every 300m (1,000ft), use CT Fatigue graph as reference. **Ensure the CT Fatigue graph is available at location before RIH. Record RIH, Hanging and POOH weight in treatment report.**
 - 23.3. **Pump 2 bbls of drag reducer solution for every 1000ft.**
 - 23.4. Maximum CT speed running in hole is **30-50 ft/min.**
 - 23.5. Slow down CT speed to **10 ft/min**, 50 ft before and after passing through completion accessories.
 - 23.6. Closely observe weight indicator in control cabin while running in hole.
 - 23.7. Observe return all the times.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 23
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD-PERFORATION	

- 23.8. Regularly inform WSS on job status at all times.
- 23.9. Do not exceed operating safety limits **5,000 psi**.
- 23.10. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.
- 23.11. At all time, while run-in hole, the injector torque control shall be set at the minimum pressure required to move the Coiled Tubing at specified speed.
- 24. Once CT reach **3,451m-MDDF (10m above slickline HUD)**, conduct pull test of 10m/30ft with pumping rate 0.3BPM and record the pulling weight both static and dynamic (**IMPORTANT**).


Depth, ft	RIH weight, lbf	Static weight, lbf	Pick up weight, lbf

- 25. If CT encounter HUD inside tubing, **flag CT on surface** and record in report as reference point, pick up CT back to 10m above HUD.
- 26. Start to introduce nitrified TSW (**1.1BPM, 400SCFM**). Proceed as per table **36.3**. (Skip to step 37 if no HUD inside liner till 3,551m-MDDF)

Note: Pump rate can be increase to max 1.3bpm or until reach maximum circulating pressure of 5,000 psi.

- 27. After establish constant return at surface, divert the flow into surge tank for 15 – 30 minutes, record the volume inside the surge tank to calculate losses rate into reservoir. **Repeat this step every time change in choke size. (due to several reason such as high and low THP)**
- 28. Continuously record return volume during cleanout operation. (**Record inside improved FDR**)
- 29. For the event of lost return, kindly refer to the step below for reference:
 - 29.1. Check surface flowback back pressure. Must be less than WHP
 - 29.2. Wait till system stabilizes
 - 29.3. Manipulate choke size
 - 29.4. If still no return at surface, pick-up BHA by stages to establish return. (Proposed to depth where returns were previously obtained.
 - 29.5. If no return establishes at surface, consult town. (Provide the details of THP, choke size and circulation pressure).
 - 29.6. After return establish, RIH to perform cleanout.
 - 29.7. At all times, monitor the return pattern, THP and debris sample at surface. (Take note if there any THP drop during penetration).
 - 29.8. If no debris recover at surface while penetrating HUD with fluid return, stop penetration and circulate with Gel and CBU until debris recover at surface.
 - 29.8.1. Pump 5 bbls gel to lift the suspected debris to surface.
 - 29.8.2. CBU at least 2x Annulus volume at that depth.
 - 29.8.3. After confirm there's no longer debris at that depth, proceed penetration.
- 30. Start to slowly penetrate into HUD. Increase penetration speed if necessary (max penetration speed recommended +/- 5ft/min) Circulate 5bbls of D801 gel after each penetration of 10m/30ft bite
 - 30.1. **IF** no return is observed on surface, continue to fill up tubing (while stop N2) with 1.5 Tubing Volume of TSW. Monitor pressure on CHP if there are any build ups and fluid return observe on tubing and casing (Tubing communicate with A-Annulus).
 - 30.1.1. **IF** no pressure built up in CHP and returns established at surface, proceed with Step 30.3.
 - 30.1.2. **IF** no constant return is observed on surface after exceeding **1.5 tubing volume** of TSW with a pressure build up on CHP, continue fill up until return observe on PCP and return establish at tubing.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 24
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD-PERFORATION	

30.2. **IF** no constant return is observed on surface, introduce nitrogen at pumping rate (300 – 400 scf/min).

30.2.1. Monitor THP and well condition while establishing return.

30.2.2. Upon establishing constant return, proceed with penetrate the HUD.


Perform wiper trip for every 10m/30ft interval cleanout (from cleanout depth until initial depth) while pumping 5bbls of D801 Gel.

30.3. Continue penetrate HUD as per below table until **3,551m-MDDF**.

Note: After two penetration and wiper trip to previous HUD, wait until gel reaches surface before continuing with the cleanout operation. Take the sample of recovered gel.

No.	Stage	Fluid	Liquid Rate	Total Liquid	N2 Rate	CT Speed	Duration	Depth	Remarks
			BPM	BBL	SCF/M	ft/min	Minute	m	
1	CT at 10m above HUD	TSW	1.1	0.0	400	0	0	10m above HUD	Establish return on surface
2	RIH to HUD and Penetrate HUD/Fill	TSW	1.1	7.2	400	5	6.6	HUD + 10m	Monitor return & CT weight on surface
3	Circulate	D801 Gel	1.1	5.0	400	0	4.5		Provide suspension to the fill and lift to surface
Pull Test to 1 st HUD at 3461m-MDDF									
4	RIH to last HUD and Penetrate HUD/Fill	TSW	1.1	7.2	400	5	6.6	HUD + 10m	Monitor return & CT weight on surface
5	Circulate	D801 Gel	1.1	5.0	400	0	4.5		Provide suspension to the fill and lift to surface.
Pull Test to previous HUD for each penetration. Wait until gel reached to surface before proceed with next penetration.									
Repeat above step until reached 3551m-MDDF (PBSD)									
6	POOH to 2,707m	TSW	1.1	118	400	26	107	2707m-MDDF	POOH to 2707m-MDDF

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 25
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

7	At depth 2707m-MDDF	D801	1.1	157	400	0	143	2707m-MDDF	Pump 1tbg volume of D801 gel
7	Bottoms Up 38 Hrs (Circulate)	TSW	1.1	2508	400	0	2280	Stationary CT at 2,707m MDDF	CBU for 38 Hrs
Once completed CBU and clear return is established, POOH to surface									

31. Once CT reach at depth **3,551m-MDDF**, flag CT string at surface.

Flag Number	Colour
Flag#1	

32. Do not apply set down more than **1,000lbf** (downhole force)

33. Pick-up CT to depth **2,707m-MDDF** with CT speed of **26ft/min** while maintaining **1.1BPM & 400scfm** of nitrified TSW.

34. At **2,707m-MDDF**, pump 1 tubing volume of D801 gel and displace with nitrified TSW (**1.1BPM & 400scfm**) for **38 hours as per CIRCA simulation**.

34.1. In the event of loss circulation, e.g; pump/converter issues, rectify and resume pumping as per latest schedule given (CIRCA analysis)


34.2. Ensure to monitor all the parameter (Circulating Pressure, Pump Rate, N2 Rate, THP, Weight) while CBU.

35. If CT encountered hard obstruction, proceed to pick up CT 10m above the obstruction and circulate at least 1.5x bottom up with TSW until clear return is observe on surface before proceed with the following steps.

35.1. RIH and slack off CT not exceeding 1,000 lbf downhole, on top of the obstruction and attempt to jet and remove the obstruction. If no success proceeds to mix **10 bbls of 15% HCl acid and Neutralization Fluid** as per the following recipe:

15% HCl (Main Treatment)				10	BBL	Description
Seq.	Product	Concentration		Volume		
1	Sea Water	419	gptg	176	gals	Base Fluid
2	ACM CORR 400	4	gptg	2	gals	Acid Corrosion Inhibitor
3	MESB NE 200	4	gptg	2	gals	Non-Emulsifier
4	ACM Surf 210	3	gptg	1	gals	Surfactant
5	Ammonium Chloride	417	pptg	175	lbs	Clay Stabilizer
6	ACM Iron 300	25	pptg	11	lbs	Iron Sequestering
7	ACM Iron 200	15	gptg	6	gals	Iron Control
8	33% HCl	419	gptg	176	gals	Raw Acid
9	MESB MS 300	100	gptg	42	gals	Mutual Solvent
Mixing Instruction:						
1. Fill up tank with sea water.						
2. Add additives as per above sequence.						
3. Agitate until mixture is homogenous.						

Prepared By: M. Ameerul Zaem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 26
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	


Neutralization Fluid				10	BBL	Description
Seq.	Product	Concentration		Volume		
1	Sea Water	976	Gptg	410	gal	Base fluid
2	Soda Ash	500	pptg	210	lbs	Neutralization fluid

Mixing Instruction:

1. Prepare sea water in the mixing tank.
2. Mix soda ash into tank and agitate until mixture is homogenous.

- 35.2. Upon completion mixing 15% HCl acid, proceed to jet 5 bbls of 15% HCl on top of the obstruction while attempt to pass through the obstruction.
- 35.3. If no success during jetting HCl acid, proceed to spot another 5 bbls of 15% HCl on top of obstruction and pick up CT at least **550m** above the obstruction depth to soak the acid for 2 hours. After completed soaking, proceed to RIH to pass through the obstruction while pumping nitrified TSW.
- 35.4. If unable to penetrate, repeat step 35.2-35.3
- 35.5. If still unsuccessful in clearing the HUD, consult town, flag CT string on surface and POOH to
- 35.6. surface. (**Wait on town instruction prior to POOH**)
- 35.7. During circulation, if acid return observes on surface return line, inject soda ash using chemical injection pump on the surface return line to neutralize the acid.
36. Once completed 38 hrs of CBU with clear return is observed at surface, POOH CT with tripping speed **5ft/min** while pumping nitrified TSW **0.8BPM, 300scfm**. Ensure continuous return on surface is observed.
 - 36.1. Refer to CIRCA recommended tripping speed in appendix.
 - 36.2. Slow down CT speed to 10ft/min 50ft before and after passing through completion accessories.
37. Once CT on surface, close well and bleed off pressure in CT and stack up.
38. Prepare for next GRCCCL c/w dummy 2-7/8" Gun.


Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 27
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD-PERFORATION	

Time Planner for Sand Cleanout Operation

Client: PCSB		Baker Hughes (M) Sdn Bhd										BBLs GAL N2	
Well: A09		Time Planner										3,547.9 #####	
Field: Resak													
Job: SCO		Total Time 65:16 hh:mm											
Date: 9/5/2023													
No.	Stage	Fluid Used	Time, hh:mm			Fluids		Tripping			Totals		
			Start	End	Stage	BPM	SCFM	From	To	ft/min	BBLs	GAL N2	
1	CT RIH to 10m above HUD at 3451	FLUID 1 - SW	4:00	17:44	13:44	0.3	0	0	11,323	5.0	247.4	0	
2	Increase pump rate to establish return on surface prior penetrate HUD at 3461m MDDF	FLUID 2 - Nitrified	17:44	17:59	0:15	1.1	400	11,323	11,323		16.5	64	
3	RIH and Start Penetrate HUD 10m/30ft	FLUID 2 - Nitrified	17:59	18:12	0:12	1.1	400	11,323	11,385	5.0	13.6	53	
4	Circulate 5bbls Gel	FLUID 3 - Gel	18:12	18:16	0:04	1.1	400	11,385	11,385	0.0	5.0	20	
5	Wiper Trip to previous HUD	FLUID 2 - Nitrified	18:16	18:22	0:06	1.1	400	11,385	11,355	5.0	6.6	26	
6	RIH HUD + 10m	FLUID 2 - Nitrified	18:22	18:34	0:12	1.1	400	11,355	11,415	5.0	13.2	52	
7	Circulate 5bbls Gel	FLUID 3 - Gel	18:34	18:39	0:04	1.1	400	11,415	11,415	0.0	5.0	20	
8	Wiper Trip to previous HUD	FLUID 2 - Nitrified	18:39	18:45	0:06	1.1	400	11,415	11,385	5.0	6.6	26	
9	RIH HUD + 10m	FLUID 2 - Nitrified	18:45	18:57	0:12	1.1	400	11,385	11,445	5.0	13.2	52	
10	Circulate 5bbls Gel	FLUID 3 - Gel	18:57	19:01	0:04	1.1	400	11,445	11,445	0.0	5.0	20	
11	Wiper Trip to previous HUD	FLUID 2 - Nitrified	19:01	19:07	0:06	1.1	400	11,445	11,415	5.0	6.6	26	
12	RIH HUD + 10m	FLUID 2 - Nitrified	19:07	19:19	0:12	1.1	400	11,415	11,475	5.0	13.2	52	
13	Circulate 5bbls Gel	FLUID 3 - Gel	19:19	19:24	0:04	1.1	400	11,475	11,475	0.0	5.0	20	
14	Wiper Trip to previous HUD	FLUID 2 - Nitrified	19:24	19:30	0:06	1.1	400	11,475	11,445	5.0	6.6	26	
15	RIH HUD + 10m	FLUID 2 - Nitrified	19:30	19:42	0:12	1.1	400	11,445	11,505	5.0	13.2	52	
16	Circulate 5bbls Gel	FLUID 3 - Gel	19:42	19:46	0:04	1.1	400	11,505	11,505	0.0	5.0	20	
17	Wiper Trip to previous HUD	FLUID 2 - Nitrified	19:46	19:52	0:06	1.1	400	11,505	11,475	5.0	6.6	26	
18	RIH HUD + 10m	FLUID 2 - Nitrified	19:52	20:04	0:12	1.1	400	11,475	11,535	5.0	13.2	52	
19	Circulate 5bbls Gel	FLUID 3 - Gel	20:04	20:09	0:04	1.1	400	11,535	11,535	0.0	5.0	20	
20	Wiper Trip to previous HUD	FLUID 2 - Nitrified	20:09	20:15	0:06	1.1	400	11,535	11,505	5.0	6.6	26	
21	RIH HUD + 10m	FLUID 2 - Nitrified	20:15	20:27	0:12	1.1	400	11,505	11,565	5.0	13.2	52	
22	Circulate 5bbls Gel	FLUID 3 - Gel	20:27	20:31	0:04	1.1	400	11,565	11,565	0.0	5.0	20	
23	Wiper Trip to previous HUD	FLUID 2 - Nitrified	20:31	20:37	0:06	1.1	400	11,565	11,535	5.0	6.6	26	
24	RIH HUD + 10m	FLUID 2 - Nitrified	20:37	20:49	0:12	1.1	400	11,535	11,595	5.0	13.2	52	
25	Circulate 5bbls Gel	FLUID 3 - Gel	20:49	20:54	0:04	1.1	400	11,595	11,595	0.0	5.0	20	
26	Wiper Trip to previous HUD	FLUID 2 - Nitrified	20:54	21:00	0:06	1.1	400	11,595	11,565	5.0	6.6	26	
27	RIH HUD + 10m	FLUID 2 - Nitrified	21:00	21:12	0:12	1.1	400	11,565	11,625	5.0	13.2	52	
28	Circulate 5bbls Gel	FLUID 3 - Gel	21:12	21:16	0:04	1.1	400	11,625	11,625	0.0	5.0	20	
29	Wiper Trip to previous HUD	FLUID 2 - Nitrified	21:16	21:22	0:06	1.1	400	11,625	11,595	5.0	6.6	26	
30	RIH HUD + 10m	FLUID 2 - Nitrified	21:22	21:33	0:11	1.1	400	11,595	11,650	5.0	12.1	47	
31	Circulate 5bbls Gel	FLUID 3 - Gel	21:33	21:38	0:04	1.1	400	11,650	11,650	0.0	5.0	20	
32	Pick-up CT to 2707m-MDDF	FLUID 2 - Nitrified	21:38	23:24	1:46	1.1	400	11,650	8,882	26.0	117.1	457	
33	Pump D801 gel	FLUID 2 - Nitrified	23:24	1:47	2:22	1.1	400	8,882	8,882	0.0	157.0	613	
34	Pump TSW	FLUID 2 - Nitrified	1:47	9:22	7:34	1.1	400	8,882	8,882	0.0	500.0	1,953	
35	Pump TSW	FLUID 2 - Nitrified	9:22	16:56	7:34	1.1	400	8,882	8,882	0.0	500.0	1,953	
36	Pump TSW	FLUID 2 - Nitrified	16:56	0:31	7:34	1.1	400	8,882	8,882	0.0	500.0	1,953	
37	Pump TSW	FLUID 2 - Nitrified	0:31	8:05	7:34	1.1	400	8,882	8,882	0.0	500.0	1,953	
38	Pump TSW	FLUID 2 - Nitrified	8:05	15:40	7:34	1.1	400	8,882	8,882	0.0	500.0	1,953	
39	POOH to surface	FLUID 2 - Nitrified	15:40	21:16	5:36	0.8	300	8,882	0	5.0	269.1	1,084	

Prepared By: M. Ameerul Zaem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 28
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

COILED TUBING OPERATION – RUN#2 GRCCCL c/w 2-7/8” Dummy Gun

39. Make up **BHA#2: GRCCCL c/w 2-7/8” Dummy Gun Tool** in Appendix I and follow as per Uzma procedure.
- 39.1. Prior making up bottomhole assembly, note on the following: -
- 39.1.1. Ensure to change to Motor Head Assembly Burst Disk to **6000psi** before proceed with this run.
- 39.1.2. **Drift 0.5” phenolic ball** through MHA to ensure it is able to pass through flapper check valve.

Note: Ensure 0.5” ball has been tested drifted through MHA, witnessed by WSS to confirm that it can pass through smoothly to the required ball seat in setting tool.

40. Drift **0.5”** OD ball through the 1.5” coiled string and break circulate until the ball comes out below CT. This is to ensure the ball can pass through Gooseneck prior to actuate the firing head. Record the following details below.

Pump Volume, bbls	Pump Rate, bpm

41. Repeat step 20 till 28 in Run#1 prior making up GRCCCL tool and open the well.
42. Start RIH to **3,551m-MDDF** while circulating TSW at 0.25BPM - 0.3BPM and circulation pressure less than 500psi.

Correlation Interval (m-MDDF)
3,450– 3,551m-MDDF

43. Once CT at depth to **3,551m-MDDF**, stop CT and conduct pull test of 5m. Record the pulling weight both static and dynamic (**IMPORTANT**).

Depth, ft	RIH weight, lbf	Static weight, lbf	Pick up weight, lbf


44. Pick up CT to depth **3,510m-MDDF** and allow the tool to remain stationary about 5 minutes. Record the depth and static weight. (**Uzma rep to advise if need to simulate drop ball and pumping sequence**).

Depth, ft	Static weight, lbf

45. Flag CT at surface. This will be **Flag#2 (GRCCCL Bottom of Logging Depth)**. Record the following and include in daily report.


Flag Number	Colour
Flag#2	

46. RIH back to perform main pass correlation log from **3,551m-MDDF to 3,450m-MDDF** with speed of 10m/min or 30ft/min. Once reach at **3,450m-MDDF**, stop CT and allow tool to stationary for 5 minutes.
47. Repeat logging passes **as per Uzma procedure**.
48. After complete logging, begin POOH CT to surface: -

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

- 48.1. Pump at minimum rate while POOH
- 48.2. Maximum CT speed while POOH is 50ft/min.
- 48.3. Slow down CT speed to 10ft/min 50ft before and after passing through completion accessories.
- 48.4. Do not exceed CT operating limit (refer to CT Force simulation)
- 49. Once CT reaches at surface:
 - 49.1. Proceed for perforation run.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 30
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

COILED TUBING OPERATION – RUN#3 ADD PERFORATION GUN 1

50. Conduct tool box talk and safety meeting with crew involve in the operation.

Note:

- a) Uzma engineers to highlight explosive safety precaution and hazards involve during the perforation run.
- b) Uzma engineer to double check with Company man, CTU operator on the agreed pumping rate & pressure during circulation break.
- c) All parties to ensure only relevant personnel to be around gun make up area to avoid line of fire.

51. Under supervision of CSR, Uzma Engineer to measure:

- a. Top of CTU connection to top shot
- b. Top of CTU connection to gun bottom shot
- c. Top of CTU connection to bottom nose

52. Lower down gun into CT Riser and repeat same step until all gun is connected. Lift CTU injector head and position injector head.

53. Lower down CT BHA and make up gun connection to Uzma CT Firing head and rest CT BHA

54. **Pressure test PCE quick test sub connection by following CT Pressure Test SOP.**

55. Pickup CT and tag stripper to Zero depth. Uzma engineers to take note CT depth, tool weight and record time.

56. RIH with speed according to CT policy and results of CT simulation software for this well. Monitor the readings of Coiled Tubing depth system.

Perforation Run#1 Interval (m-MDDF)
3,504 – 3510.00 m-MDDF

57. While the RIH, CT Supervisor will do circulation and all necessary pull test for every 1000ft.

Note:

DB to ensure break circulation is perform at minimal pumping rate of 0.25 BPM and to ensure circulation pressure is not exceeding 500psi.

58. RIH to **3550.0m MDDF**. Slowly pickup tool to **3510.0 m MDDF** and ensure CT is in tension, stop winch at White marked CT (Perforation correlation flag depth-WHITE).

59. Using Perforation Correlation Sheet at Appendix "A", Together with Client Site Representative (CSR), Uzma engineer to perform step by step space out calculation with base on BHA measurement and Depth offset agreed by (Client & Uzma Office). Space out calculation will position gun "top shop" to the respective perforation interval.


Note:

In the event of discrepancy or non-agreement situation at offshore, any further step must be put on hold until further verification and approval is given by town.

60. Once gun space out is determined and agree by both parties. Uzma engineers to give instruction to CT Supervisor to position the gun accordingly.

61. Calculate the amount of cable need to be move to place the gun top shot at top perforation interval:

Prepared By: M. Ameerul Zaem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 31
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

Firing Sequence Perforation Gun#1

62. Conduct tool box talk and safety meeting with crew involve in operation

Note:

- a) Uzma engineer to brief pump man and CTU Operator on the pumping requirement to fire the gun
- b) Uzma Engineer to record CT weight & pressure before firing sequence

- 63. Initiate drop ball sequence at CT Launcher witnessed by WSS.
- 64. Perform circulation at **0.5 BPM**. Pump Operator to ensure coil pressure is less than **1000psi**. Keep pumping until ball is passing goose neck.
- 65. Once indication of ball passing goose neck is monitored, lower down pump circulation to **0.25 BPM**. This is to ensure a clear indication of ball seated at firing head is observe.
- 66. Keep pumping until ball reach firing head piston. Once ball has seated at the firing head, fluid circulation will stop and coil pressure will increase slowly.

Note:

CTU operator confirm to minimum volume of liquid that will be required to be pumped to place the ball at the firing head has been reached.

Depending on well geometry, deployment method and fluids used; the pressure profile may be misleading. Observation of a pressure increase, and pressure drop should not necessarily be interpreted as the guns firing. The minimum pressure AND volume must be reached before a determination can be made that the guns have fired


67. Pump operator to continue pumping at same rate until firing head initiation pressure is reached.

Note:

Don't stop the pump and continue with the same flow rate until shear pins sheared. At this time monitor indications that guns are fired.

- a) If no indication of gun fire after pressurize tubing to 2500 psi, increase coil pressure gradually and observed for pressure drop and circulation established.
- b) If still no indication, increase tubing pressure until to max coil pressure. (CT Supervisor to Advise) and observe any pressure drop and circulation is established.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 32
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

68. Upon confirmation guns are fired, Uzma Engineer to announce that guns fired after receiving positive indications (drop of pressure, CT vibration, tension / weight changes and return of CT circulation)
69. CT Supervisor to POOH after receiving CSR approval.
70. Continue to POOH until gun is 70m or 200ft below sea level, hold safety meeting with crew involved in operation.

Note:

- a) **Always assume that guns are not fired.**
- b) **Clear all personnel from BOP and Xmas tree area.**
- c) **Only Uzma Engineer and dedicated CT operator to work on retrieving guns.**

71. Tag Stripper and close X-mas tree. Bleed off any trap pressure before disconnecting riser.


Uzma Engineer to verify gun condition before giving approval to break gun connection and lay down gun

COILED TUBING OPERATION – RUN#4 ADD PERFORATION GUN 2

<i>Perforation Run#1 Interval (m-MDDF)</i>
3,504 – 3510.00 m-MDDF

72. Repeat step from 50 to 61 for live gun rig up and perform add perforation.
73. Repeat job execution steps in run#3.
74. Once completed, handover the well to slickline to open SSD#2.
75. CT to standby for contingency unloading.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 33
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	


COILED TUBING OPERATION – CONTINGENCY UNLOADING

76. In the event well unable to flow after the add-perforation, proceed for well unloading to create 500psi underbalanced condition.
77. This contingency run is made in case the well is still unable to flow after add perforation J20.3
78. Make up 2-1/8" Upward Jetting Nozzle tool as per **BHA#5: 2-1/8" Upward Jetting Nozzle** in **Appendix I**.
79. Repeat step in CT Run#1 procedure prior opening the well.
80. **Ensure to purge the CT until it is dry before RIH.**
81. Start running in hole CT tubing to the first circulation point depth at **2400m-MDDF while pumping nitrogen at 300scf/min.**
 - 81.1. Refer to CT Tubing Force simulation (Orpheus modelling), refer Appendix III.
 - 81.2. Conduct pull test as per for every 300m (1,000ft), use CT Fatigue graph as reference. **Ensure the CT Fatigue graph is available at location before RIH. Record RIH, Hanging and POOH weight in treatment report.**
 - 81.3. Maximum CT speed running in hole is **30-50 ft/min.**
 - 81.4. Slow down CT speed to **10 ft/min**, 50 ft before and after passing through completion accessories.
 - 81.5. Closely observe weight indicator in control cabin while running in hole.
 - 81.6. Observe return all the times.
 - 81.7. Do not exceed operating safety limits **5,000 psi.**
 - 81.8. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.
 - 81.9. At all time, while RIH, the injector torque control shall be set at the minimum pressure required to move the Coiled Tubing at specified speed.
82. At **2400m-MDDF**, stop CT and conduct pull test of 10m/30ft and record the pulling weight both static and dynamic (**IMPORTANT**).

<i>Depth, ft</i>	<i>RIH weight, lbf</i>	<i>Static weight, lbf</i>	<i>Pick up weight, lbf</i>

83. Upon completion pull test, start pumping nitrogen with 300 scf/min for 30 minutes while monitoring the returns on surface.
 - 83.1. If fluid is observed at surface at a good flow rate, continue lifting until all fluid is recovered.
 - 83.2. Constantly monitor & record the return from the well and THP. Periodically take fluid sample and verify the salinity.
 - 83.3. If there is no fluid return at surface, continue pumping nitrogen and RIH to the next depth as per table below:

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 34
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

No.	Stage	N2 Rate	Total N2	Duration	Coiled Tubing					Total Footage (ft)
		SCFM	SCF	Minute	ft/min	From (ft)	From (m)	To (ft)	To (m)	
1	RIH	300	10500	35	30	0	0	1050	320	1050
2	Pull Test	300	750	3	20	1050	320	1000	305	50
3	RIH	300	10500	35	30	1000	305	2050	625	1050
4	Pull Test	300	5325	18	20	2050	625	2405	733	355
6	RIH	300	5950	20	30	2405	733	3000	914	595
7	Pull test	300	750	3	20	3000	914	2950	899	50
9	RIH	300	10000	33	30	2950	899	3950	1204	1000
10	Pull test	300	750	3	20	3950	1204	3900	1189	50
12	RIH	300	10000	33	30	3900	1189	4900	1493	1000
13	Pull test	300	750	3	20	4900	1493	4850	1478	50
15	RIH	300	10000	33	30	4850	1478	5850	1783	1000
16	Pull test	300	750	3	20	5850	1783	5800	1768	50
18	RIH	300	10000	33	30	5800	1768	6800	2073	1000
19	Pull test	300	750	3	20	6800	2073	6750	2057	50
21	RIH	300	11500	38	30	6750	2057	7900	2408	1150
22	Pull test	300	390	1	20	7900	2408	7874	2400	26
23	Circulation*	300	9000	30	30	7874	2400	7874	2400	0
24	RIH	300	10000	33	30	7874	2400	8874	2705	1000
25	Pull test	300	500	2	30	8874	2705	8824	2689	50
26	Circulation	300	9000	30	30	8824	2689	8824	2689	0
27	RIH	300	10000	33	30	8824	2689	9824	2994	1000
28	Pull test	300	500	2	30	9824	2994	9774	2979	50
29	Circulation	300	9000	30	30	9774	2979	9774	2979	0
30	RIH	300	7760	26	30	9774	2979	10550	3215	776
31	Pull test	300	530	2	30	10550	3215	10497	3199	53
32	Circulation	300	9000	30	30	10497	3199	10497	3199	0
42	POOH	300	104970	350	30	10497	3199	0	0	10497

Total N2, SCF	258,925	15 hrs
Total N2, Gal	2,781	
Priming, gal	900	
Total N2, Gal (including 3% losses)	3,791	

84. Please note the maximum depth of circulation is at **3,199m-MDDF**.
85. Stop pumping N2 once get continuous gas return on surface.
86. If oil return at surface and the well able to flow without N2 lifting for 1 hours, proceed POOH to surface.
 - 86.1. In the event that after unloading the well was unsuccessful, consult town for further assistance whether to repeat nitrogen unloading.
87. Upon well commencing to flow satisfactorily, POOH CT to surface.
 - 87.1. Pump N2 at minimum permissible rate while POOH. Do not exceed 5,000 psi pumping pressure.
 - 87.2. Maximum CT speed while POOH is 50ft/min.
 - 87.3. Slow down CT speed to 10ft/min 50ft before and after passing through completion accessories.
 - 87.4. Do not exceed CT Operating Limit.
88. Once CT on surface, close well, bleed off pressure in CT and stack up and handover well to PCSB.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 35
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD-PERFORATION	

APPENDIX I – BOTTOM HOLE ASSEMBLY SCHEMATIC


DIMENSION BID

BHA DIAGRAM #1 - 2.125" Multi-Jet Nozzle

Client	Petronas Carigali	Well	A-09
Field	Resak A-09	Min Restriction	3.725"
Job Type	SCO	BHP	
Job No.		BHT	

BHA DRAWING	DESCRIPTION	CONNECTION		ID	OD	TOOL LENGTH	CUMULATIVE LENGTH
		UPHOLE	DOWNHOLE				
	External Dimple CT Connector	1.5" CT	1.5 AMMT		2.125	0.60	0.6
	MHA Disconnect drop ball 3/4" Shear pressure 5,456 psi	1.5 AMMT Box	1.5 AMMT		2.125	2.5	3.1
	Circulating drop ball 5/8" Shear pressure 2,520 psi Burst Disc 5000 psi						
	5 ft Straight Bar	1.5 AMMT Box	1.5 AMMT		2.125	5.0	8.1
	3ft Straight Bar	1.5 AMMT Box	1.5 AMMT		2.125	3.0	11.1
Multi-Jet Nozzle	1.5 AMMT Box				2.125	1.0	12.1

BHA LENGTH	12.10
MAXIMUM OD	2.125"
MINIMUM ID	


DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	




BHA DIAGRAM #2 GRCCCL c/w Dummy Gun

Client	Petronas Carigali
Field	Resak A-09
Job Type	SCO
Job No.	

Well	A-09
Min Restriction	3.725"
BHP	
BHT	

BHA DRAWING	DESCRIPTION	CONNECTION		ID INCH	OD INCH	TOOL LENGTH FT	CUMULATIVE LENGTH FT
		UPHOLE	DOWNHOLE				
	External Dimple CT Connector	1.5" CT	1.5" AMMT PIN		2.125	0.6	0.6
	2 1/8 MHA Disconnect drop ball 3/4" Shear pressure 5,456 psi	1.5" AMMT BOX	1.5" AMMT PIN		2.125	2.5	3.1
	Circulating drop ball 5/8" Shear pressure 2,520 psi Burst Disc 6,000 psi						
	Crossver	1.5 AMMT BOX	1.0 AMMT PIN		2.125	0.5	3.60
	Cross Over (CRP)	1.0 AMMT BOX	1.275" - 12 TPI BOX ACME		1.69	0.33	3.93
	Uzma Firing Head (Drop 0.5")	1.275" - 12 TPI STUB ACME	1.275" - 12 TPI BOX ACME		1.69	0.67	4.60
	2-7/8" 10ft Spent Gun	1.275" - 12 TPI STUB ACME	1.687" - 8 TPI BOX ACME		2.900	11.24	15.84
Bull Plug SR	1.687" - 8 TPI STUB ACME	1.687" - 8 TPI STUB ACME		2.875	0.26	16.10	
1.69" GRCCCL Tool	1.687" - 8 TPI STUB ACME	Nil		1.690	6.17	22.27	
						BHA LENGTH	22.27
						MAXIMUM OD	2.900
						MINIMUM ID	

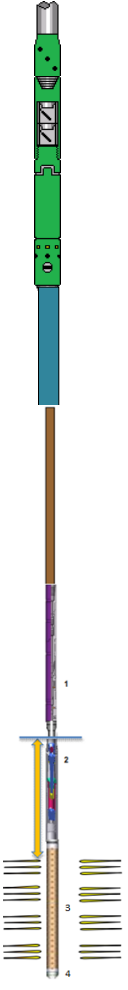
DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD-PERFORATION	

DIMENSION BID
WELL INTERVENTION | PERFORATION SERVICES


BHA DIAGRAM #3 PERF GUN#1 6m)

Client	Petronas Carigali
Field	Resak A-09
Job Type	SCO
Job No.	

Well	A-09
Min Restriction	3.725"
BHP	
BHT	

BHA DRAWING	DESCRIPTION	CONNECTION		ID	OD	TOOL LENGTH	CUMULATIVE LENGTH
		UPHOLE	DOWNHOLE				
	External Dimple CT Connector	1.5" CT	1.5" AMMT PIN		2.125	0.6	0.6
	2 1/8 MHA Disconnect drop ball 3/4" Shear pressure 5,456 psi	1.5" AMMT BOX	1.5" AMMT PIN		2.125	2.5	3.1
	Circulating drop ball 5/8" Shear pressure 2,520 psi Burst Disc 6,000 psi						
	Crossver	1.5 AMMT BOX	1.0 AMMT PIN		2.13	0.5	3.60
	Cross Over (CRP)	1.0 AMMT BOX	1.275" - 12 TPI BOX ACME		1.69	0.33	3.93
	Uzma Firing Head (Drop 0.5")	1.275" - 12 TPI STUB ACME	1.275" - 12 TPI BOX ACME		1.69	0.67	4.60
	2-7/8" 6SPF 11ft Gun + Top Sub	1.275" - 12 TPI STUB ACME	1.687" - 8 TPI BOX ACME		2.88	11.24	15.84
	2-7/8" 6SPF 11ft Gun + Tandem Sub	1.275" - 12 TPI STUB ACME	1.687" - 8 TPI BOX ACME		2.88	11.24	27.08
Bull Plug	1.687" - 8 TPI STUB ACME	NIL		2.88	0.21	27.29	

BHA LENGTH	27.29
MAXIMUM OD	2.875
MINIMUM ID	

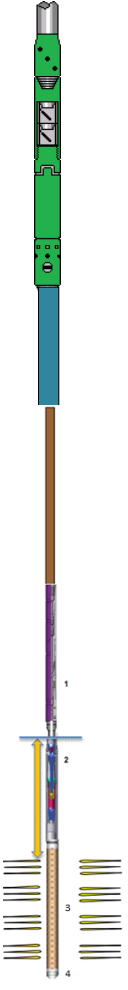
DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD-PERFORATION	

DIMENSION BID
WELL INTERVENTION | PERFORATION SERVICES


BHA DIAGRAM #4 PERF GUN#2 6m)

Client	Petronas Carigali
Field	Resak A-09
Job Type	SCO
Job No.	

Well	A-09
Min Restriction	3.725"
BHP	
BHT	

BHA DRAWING	DESCRIPTION	CONNECTION		ID	OD	TOOL LENGTH	CUMULATIVE LENGTH
		UPHOLE	DOWNHOLE				
	External Dimple CT Connector	1.5" CT	1.5" AMMT PIN		2.125	0.6	0.6
	2 1/8 MHA Disconnect drop ball 3/4" Shear pressure 5,456 psi	1.5" AMMT BOX	1.5" AMMT PIN		2.125	2.5	3.1
	Circulating drop ball 5/8" Shear pressure 2,520 psi Burst Disc 6,000 psi						
	Crossver	1.5 AMMT BOX	1.0 AMMT PIN		2.13	0.5	3.60
	Cross Over (CRP)	1.0 AMMT BOX	1.275" - 12 TPI BOX ACME		1.69	0.33	3.93
	Uzma Firing Head (Drop 0.5")	1.275" - 12 TPI STUB ACME	1.275" - 12 TPI BOX ACME		1.69	0.67	4.60
	2-7/8" 6SPF 11ft Gun + Top Sub	1.275" - 12 TPI STUB ACME	1.687" - 8 TPI BOX ACME		2.88	11.24	15.84
	2-7/8" 6SPF 11ft Gun + Tandem Sub	1.275" - 12 TPI STUB ACME	1.687" - 8 TPI BOX ACME		2.88	11.24	27.08
Bull Plug	1.687" - 8 TPI STUB ACME	NIL		2.88	0.21	27.29	


BHA LENGTH	27.29
MAXIMUM OD	2.875
MINIMUM ID	

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD-PERFORATION	



BHA DIAGRAM #5-2-1/8" Upward jetting Nozzle

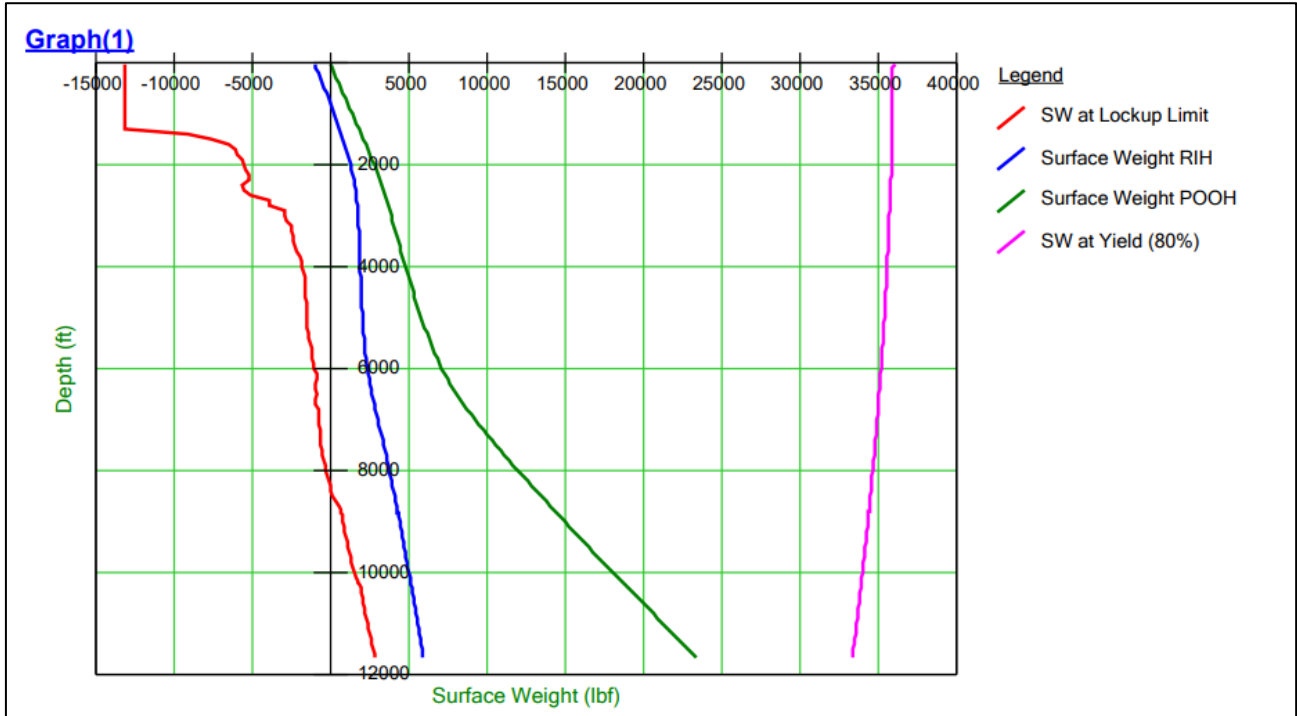
Client	Petronas Carigali	Well	A-09
Field	Resak A-09	Min Restriction	3.725"
Job Type	SCO	BHP	
Job No.		BHT	

BHA DRAWING	DESCRIPTION	CONNECTION		ID INCH	OD INCH	TOOL LENGTH FT	CUMULATIVE LENGTH FT
		UPHOLE	DOWNHOLE				
	External Dimple CT	1.5" CT	1.5" AMMT PIN		2.125	0.6	0.6
	MHA Disconnect drop ball 3/4" Shear pressure 5,456 psi	1.5" AMMT BOX	1.5" AMMT PIN		2.125	2.5	3.1
	Circulating drop ball 5/8" Shear pressure 2,520 psi Burst Disc 5000 psi						
	5 ft Straight Bar	1.5" AMMT BOX	1.5" AMMT PIN		2.125	5.0	8.1
	3 ft Straight Bar	1.5" AMMT BOX	1.5" AMMT PIN		2.125	3.0	11.10
	UpwardJet Nozzle	1.5" AMMT BOX			2.125	0.8	11.9

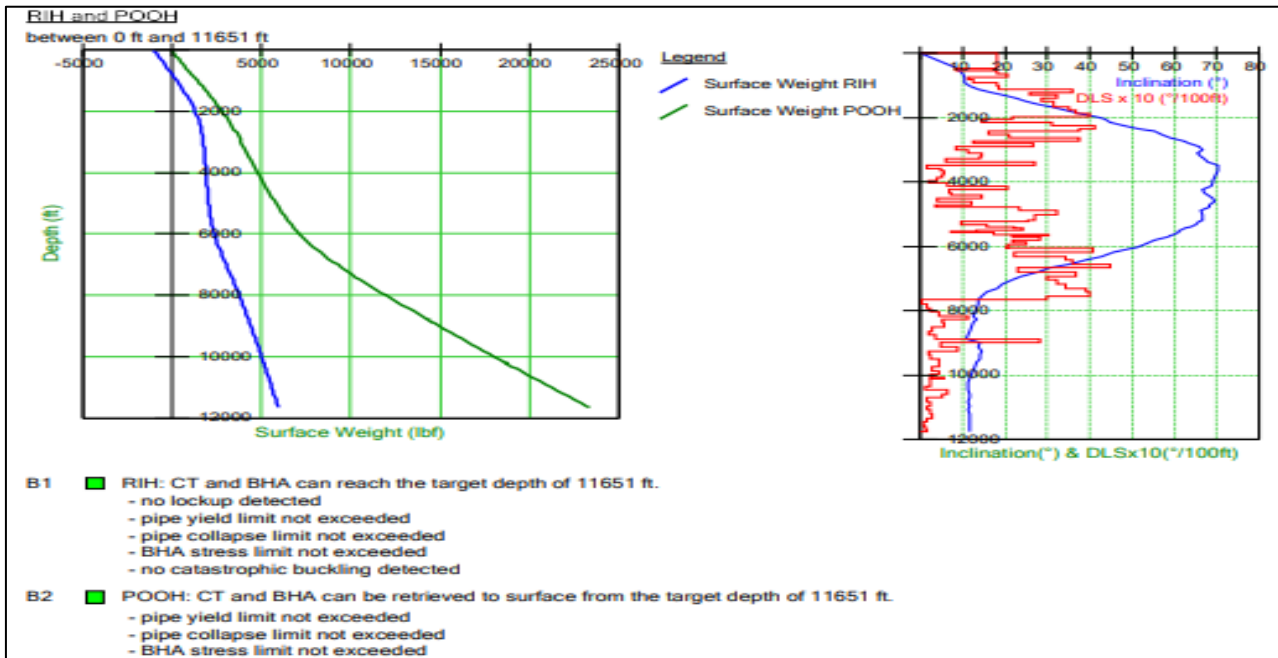
BHA LENGTH	11.90
MAXIMUM OD	2.125
MINIMUM ID	

**APPENDIX II – ORPHEUS SIMULATIONS & CIRCA SIMULATION
LONG STRING**

TUBING FORCE ANALYSIS (1st Run – 1.1BPM, 400scf/min)



RIH & POOH WEIGHT



DIMENSION BID

DIMENSION BID COILED TUBING SERVICES

Resak A-09

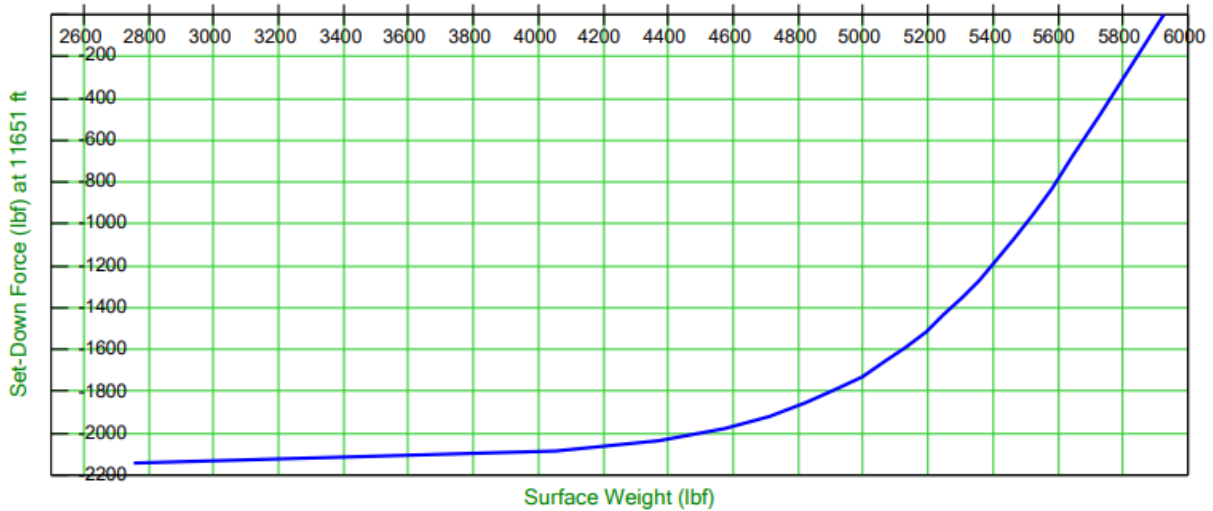
SAND CLEANOUT & ADD-
PERFORATION



PETRONAS

MAXIMUM STRING SET DOWN LIMIT

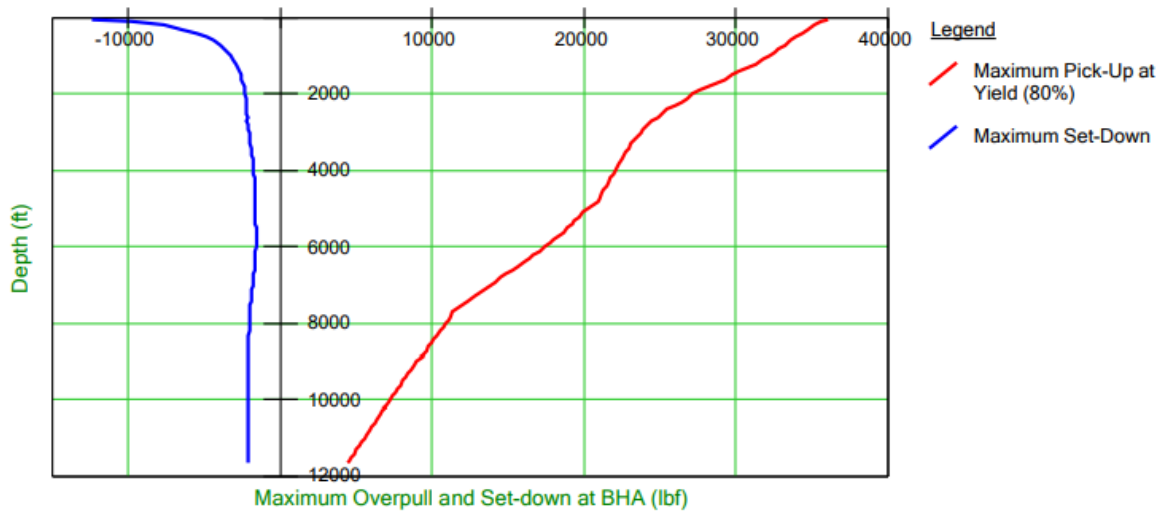
MD3 ■ The available set-down force at 11651 ft is -2142 lbf at the end of the string.
The weight indicator reading will be 2816 lbf on surface.
The minimum available set-down force is -1601 lbf at 5800 ft.



MAXIMUM STRING PICK UP LIMIT

Calculations at 11651 ft

MD1 ■ The available pick-up at 11651 ft based on 80% of yield strength is 4453 lbf.
The weight indicator reading will then be 33353 lbf.



DIMENSION BID

DIMENSION BID COILED TUBING SERVICES

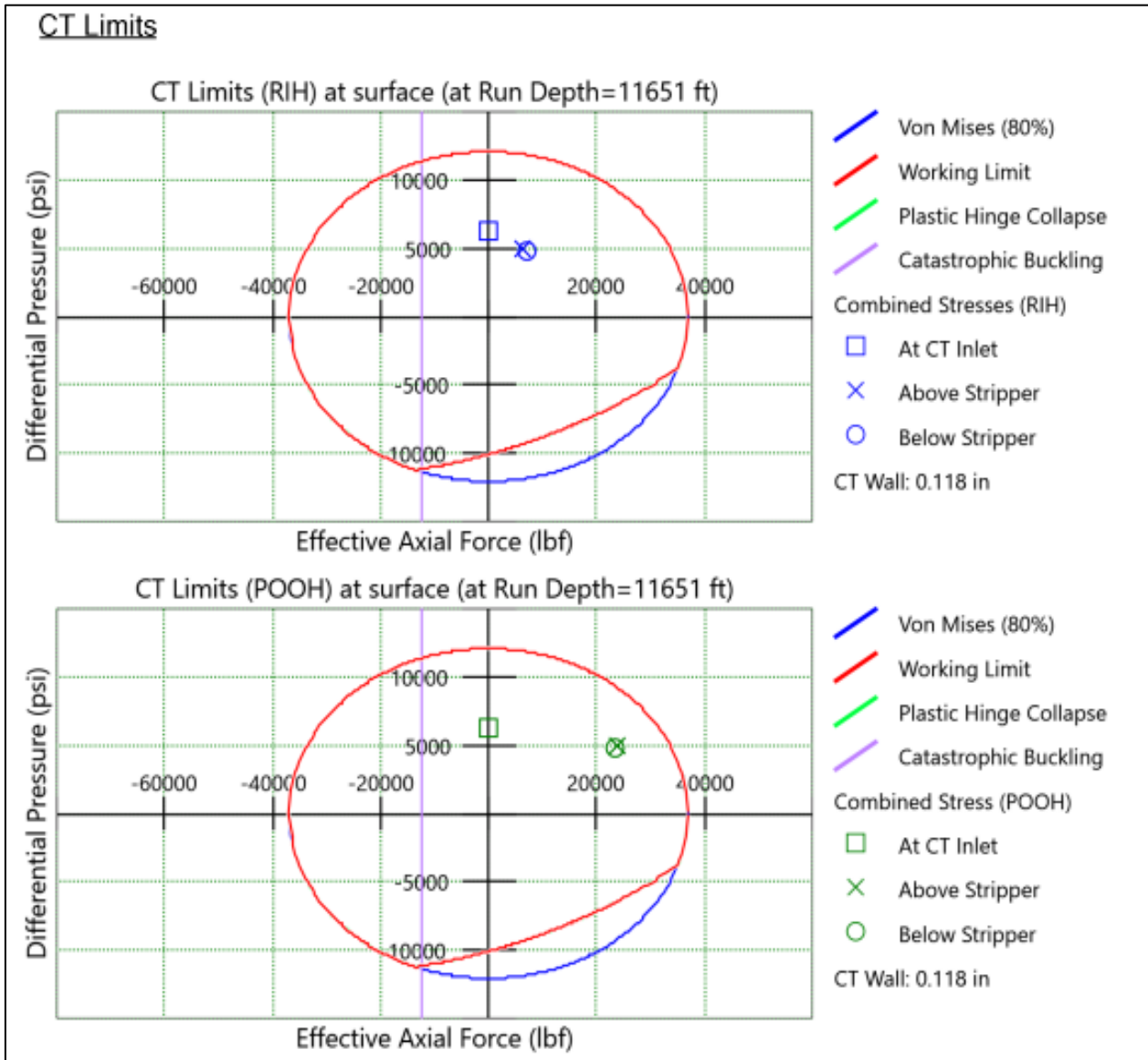
Resak A-09


SAND CLEANOUT & ADD-
PERFORATION



PETRONAS

STRING LIMIT



DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

SUMMARY OF TUBING FORCE SENSITIVITY ANALYSIS (FRICTION COEFFICIENT)

Friction Factor	Depth (m)	Lock-up Limit (lbf)	RIH Weight (lbf)	POOH Weight (lbf)	Max Pulling Weight at 80% Yield Limit
0.3	500	-6327	956	2332	35859
	1,000	-2552	1793	4275	35678
	1,500	-1527	2024	6046	35400
	2,000	-927	2698	8885	35040
	2,500	-117	3881	13880	34596
	3,000	1386	4911	19727	34051
	3,551.2	2817	5926	26632	33359
0.5	500	-5276	844	2465	35862
	1,000	-3219	1316	4891	35673
	1,500	-2978	1022	7597	35398
	2,000	-2185	1426	12356	35041
	2,500	-348	2541	21300	34594
	3,000	1224	3307	32475	34059
	3,551.2	2317	3955	46119	33360
0.74	400	-4544	449	2060	35897
	800	-4633	964	4458	35768
	1,200	-3391	37	7186	35571
	1,600	-4228	-1455	11311	35336
	1,634.3	-1651	-2942	11766	35318

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 44
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DIMENSION BID

DIMENSION BID COILED TUBING SERVICES

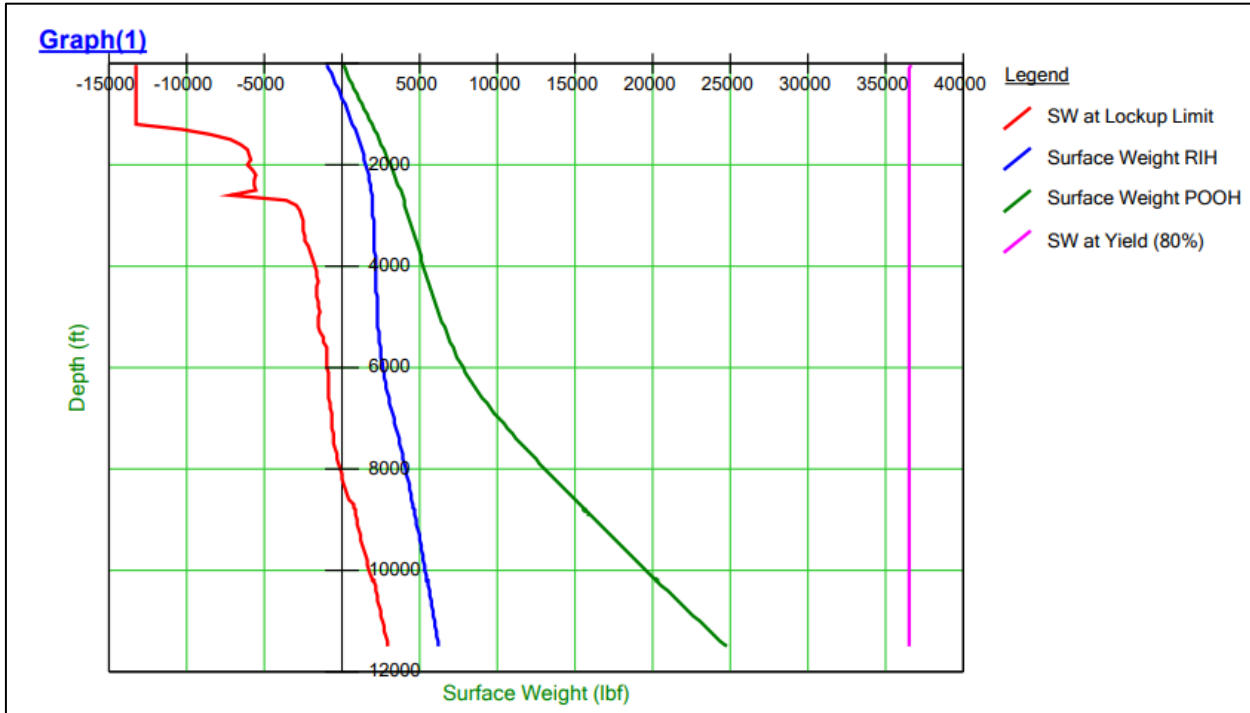
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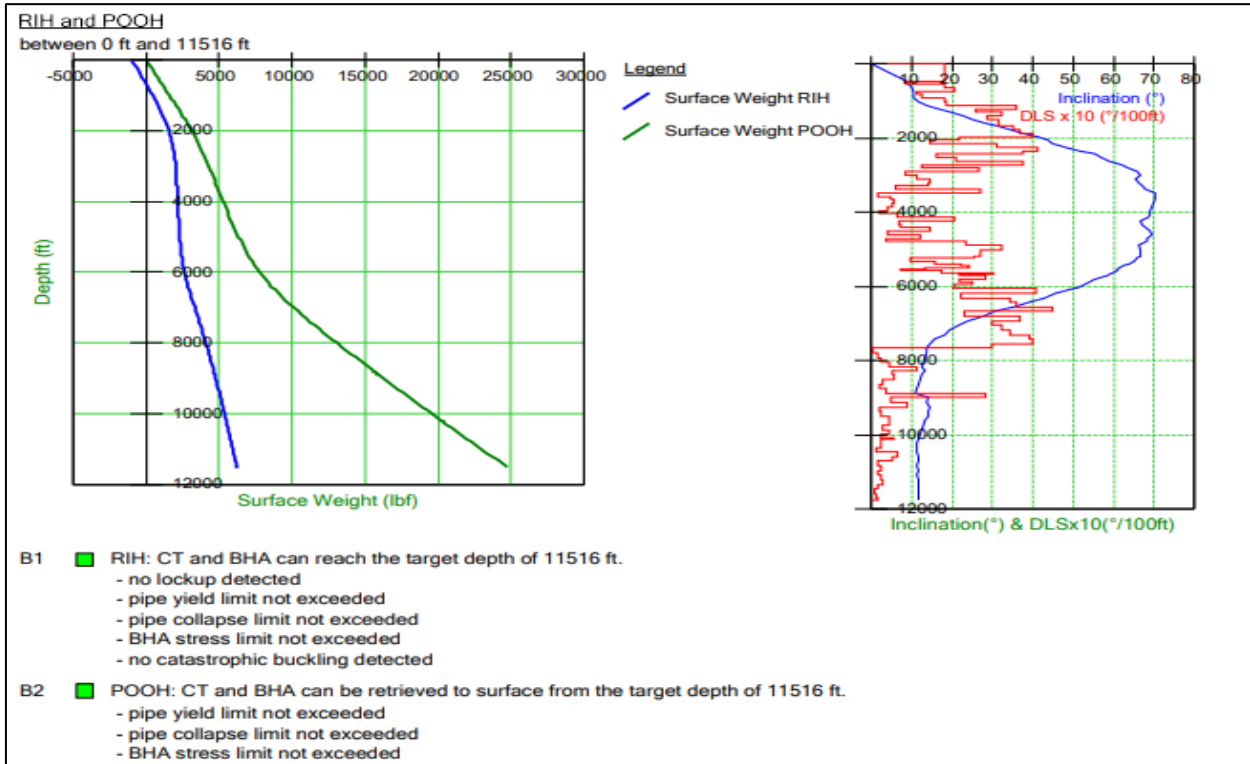



PETRONAS

TUBING FORCE ANALYSIS (3rd Gun – 0.5BPM)

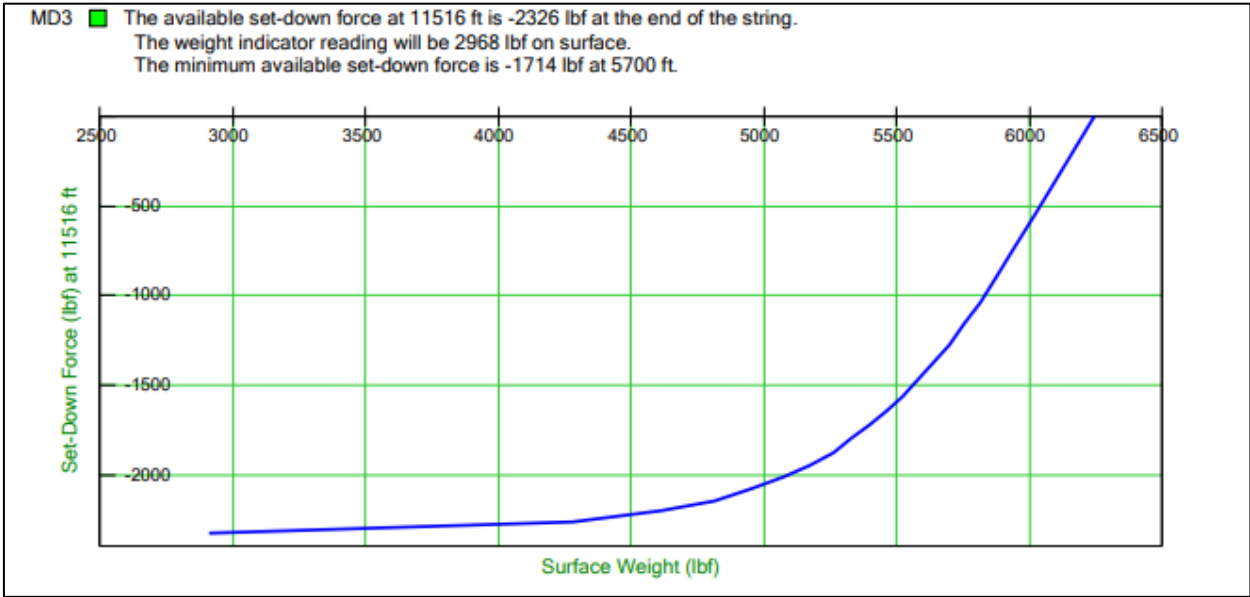


RIH & POOH WEIGHT

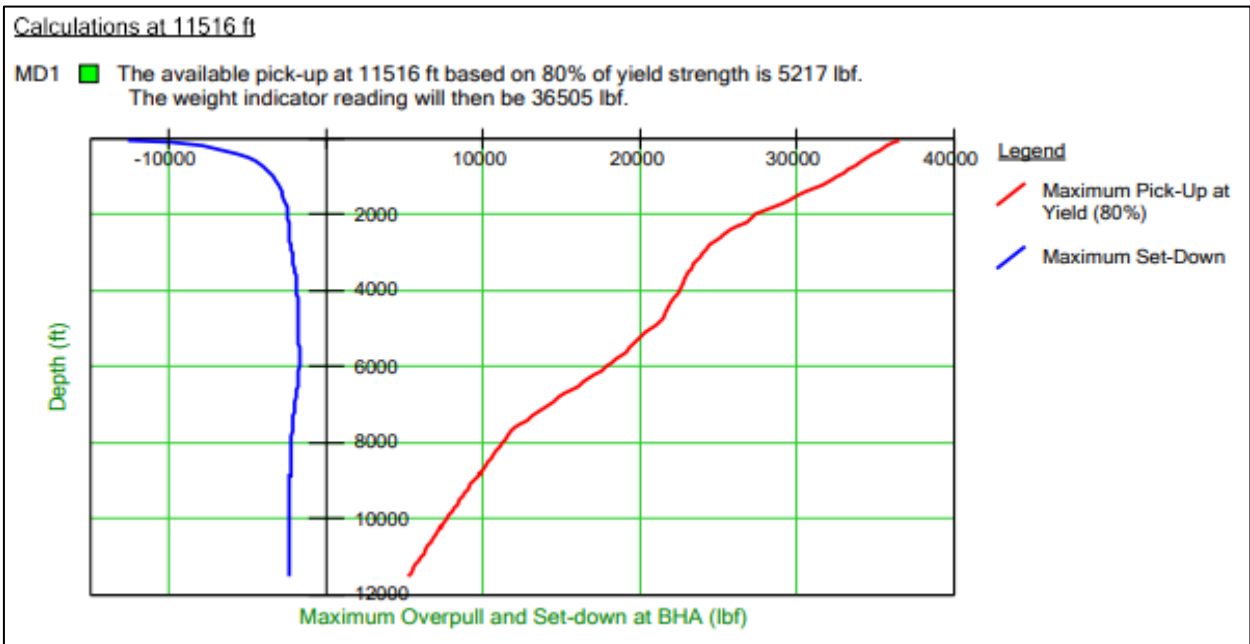


DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD-PERFORATION	

MAXIMUM STRING SET DOWN LIMIT



MAXIMUM STRING PICK UP LIMIT



DIMENSION BID

DIMENSION BID COILED TUBING SERVICES

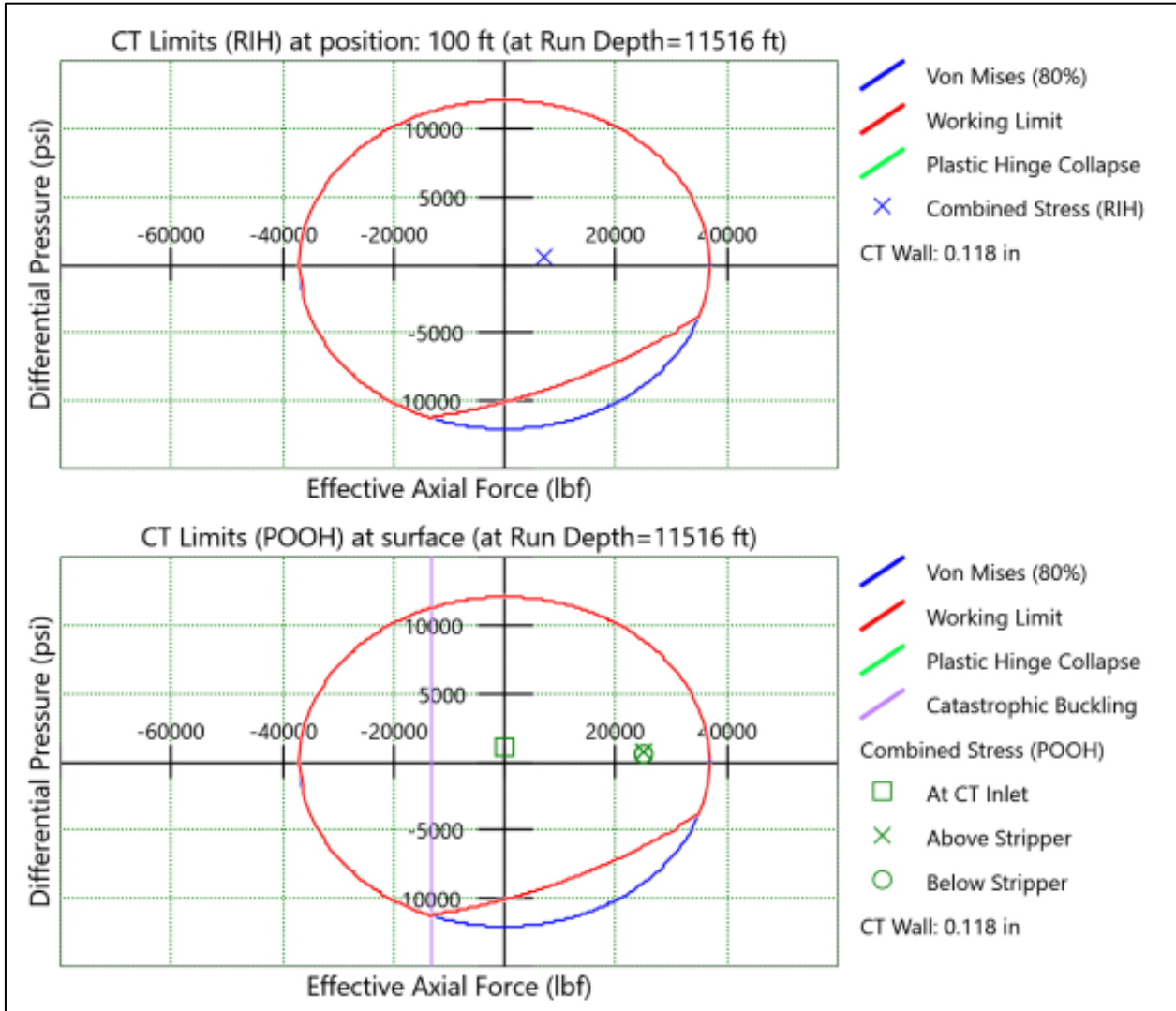
Resak A-09

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PERFORATION



PETRONAS

STRING LIMIT



CIRCA SIMULATION (1.1BPM, 400scfm)

Project: Resak SCO	Field-Well:	Resak A09
<u>Ctran Summary</u>		
SUMMARY OF HOLE CLEANING RESULTS		
Initial Condition:		
% Variable Fill has been specified, see the Solids Area Graph for details.		
Highest completion point with fill		0.00 m
Deepest Circulation point		2706.99 m
Bottom of fill		3551.01 m
Initial Volume of Solids.....		4.5 bbl
Initial Mass of Solids.....		2302.5 lb
Solids type:	Mud Residue/Formation Fines	
Fluid Description:	Nitrified Water	
Circulation Hole Cleaning Mode:		
Hole circulation time		38.00 hr
Solids volume in the well after circulation.....		1.2 bbl
Solids mass in the well after circulation.....		606.0 lb
Volume of Fluids Pumped During Circulation:		
Gas volume		911966.9 scf
Liquid Volume		2507.9 bbl
Circulation time		38.00 hr
Circulation results at point of Maximum Solids Head:		
BHA Depth		2706.99 m
Elapsed time		0.0000 hr
Wellhead Pressure		127.9 psi g
Additional Head created by Solids.....		70.9 psi

DIMENSION BID

DIMENSION BID COILED TUBING SERVICES

Resak A-09

SAND CLEANOUT & ADD-
PERFORATION



PETRONAS

Flow Summary

SUMMARY OF FLOW RESULTS

Produced Fluids

Pressure known at:

Production Mode:

Fluid Composition:

Perforations

No Production

Gas Only

Circulated Fluids

Fluid Composition:

Liquid:

Solids:

Gas:

Circulation Point:

HHP Required :

Nitrified Water

1.10 bbl/min

0.00 bbl/min

400.0 scf/min

2707.00 m

98.26 HP

COMPLETION:

Wellhead Pressure.....

127.9 psi g

Hydrostatic pressure loss.....

2436.5 psi

Friction pressure loss.....

35.7 psi

Kinetic pressure loss.....

-0.2 psi

Equivalent Circulation Density(ECD)...

5.51 lb/gal (US)

Perforation Pressure.....

2600.0 psi g

Hydrostatic pressure loss.....

175.2 psi

Bottom Hole Pressure.....

2775.2 psi g

FROM CIRCULATION POINT TO WELLHEAD:

Liquid transit time.....

50 min

Gas transit time.....

29 min

Annular volume.....

115.7 bbl

Volume below circulation point.....

43.6 bbl

Total liquid volume.....

103.0 bbl

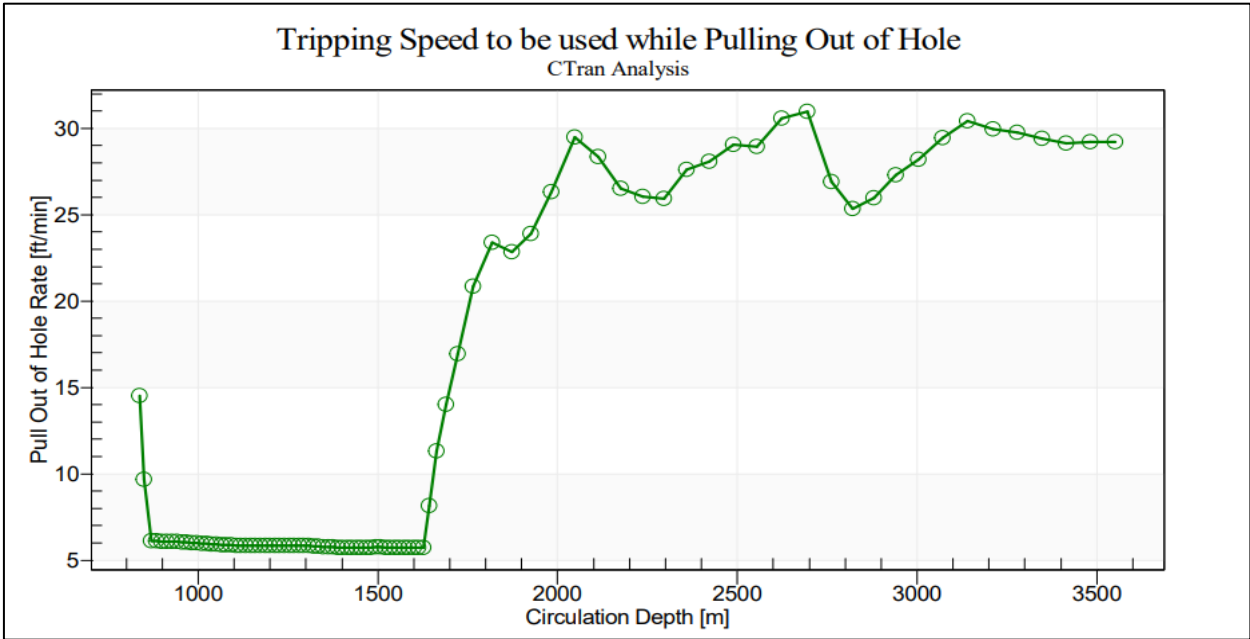
Total gas volume.....

56.3 bbl

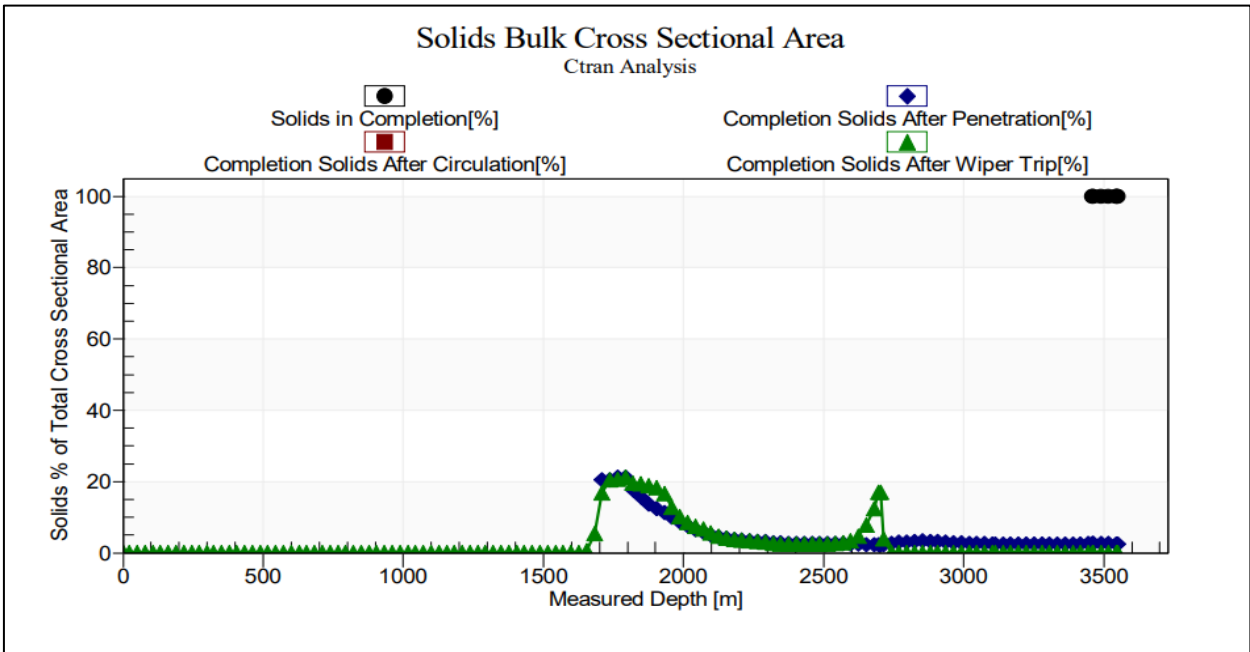
(Surface equivalent).....

11915.9 scf

RECOMMENDED TRIPPING SPEED

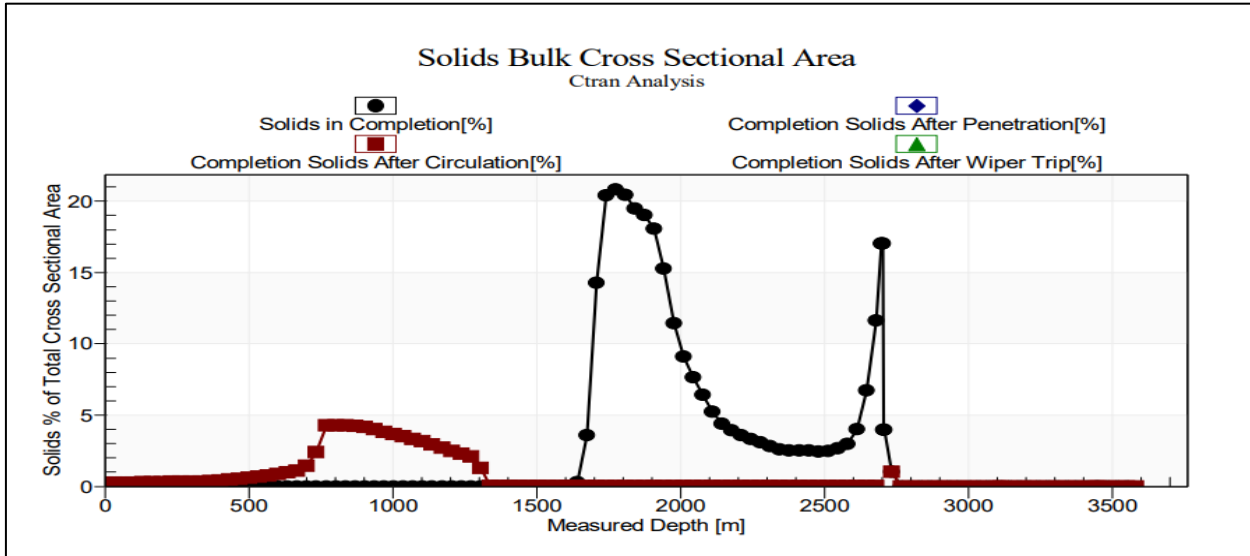


SOLID REMOVAL BEFORE 38HRS CBU

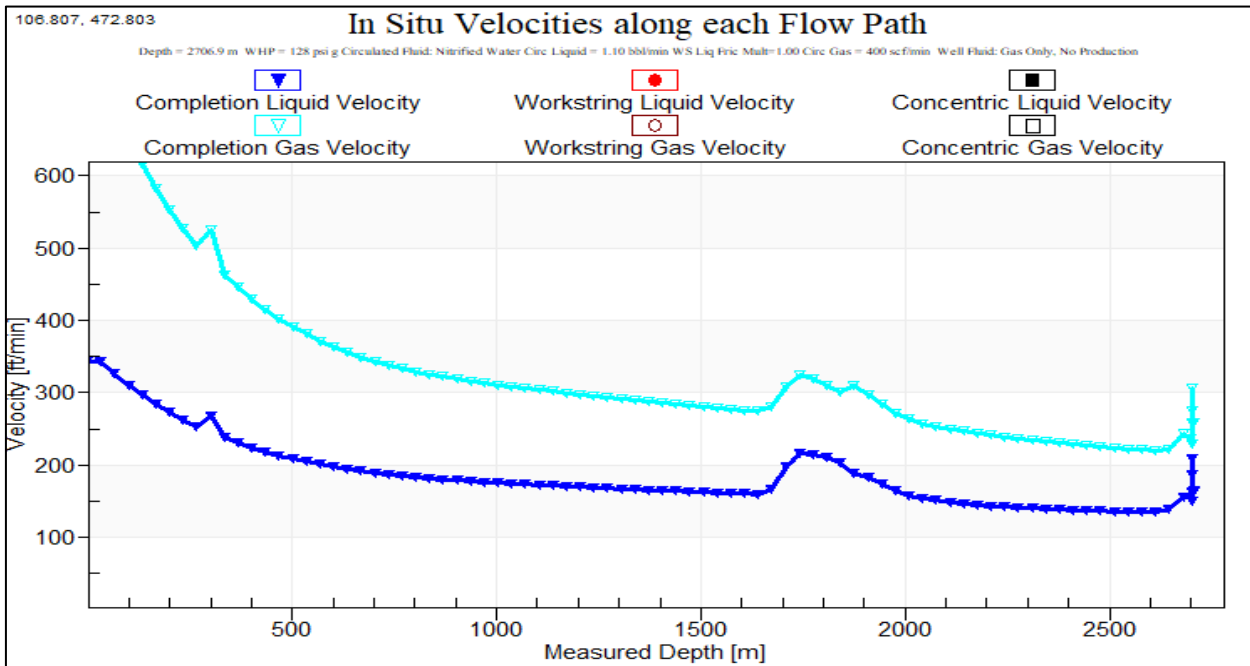





SOLID REMOVAL AFTER 38HRS CBU



ANNULAR VELOCITY GRAPH



DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD-PERFORATION	

COILCADE SIMULATION

Description	Parameter
Pump rate	1.1bpm
Nitrogen Rate	300scf/min
Coil Tubing Size	1.5"
Cleanout Interval	3436m MDDF to 3551m MDDF
Penetration Rate	10fpm
Total Operation Time	2295 min
Total Solid to Surface	100 %
Gas Lift Injection Rate	N/A

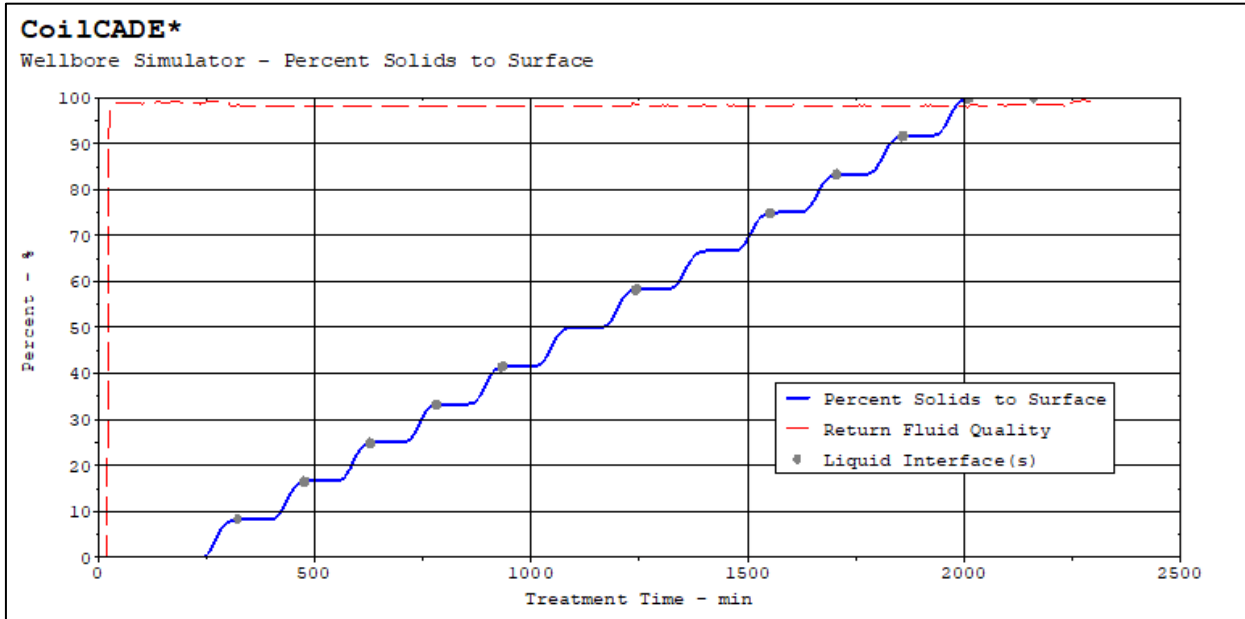
PUMP SCHEDULE STAGES

	Time min	Total Time min	CT Speed ft/min	Final CT MD m	Liq Index	Liq Pump Rate bbl/min	Liq Vol bbl	Gas Index	Gas Pump Rate scf/min	Gas Volume scf	Wellhead Pressure psi
RIH	223.5	223.5	50.0	3405.5	1.0	0.5	111.7	3.0	300.0	67037.8	0.0
RIH	9.8	233.2	10.2	3436.0	1.0	1.1	10.7	3.0	300.0	2930.2	0.0
Pentr Fill	3.0	236.3	10.2	3445.5	1.0	1.1	3.3	3.0	300.0	913.3	0.0
Circulate	149.4	2062.1	0.0	3550.0	2.0	1.1	164.3	3.0	300.0	44808.6	0.0
POOH	167.3	2229.4	-50.0	999.8	1.0	1.1	184.1	3.0	300.0	50200.1	0.0
POOH	65.6	2295.0	-50.0	0.0	1.0	0.5	32.8	3.0	300.0	19681.8	0.0

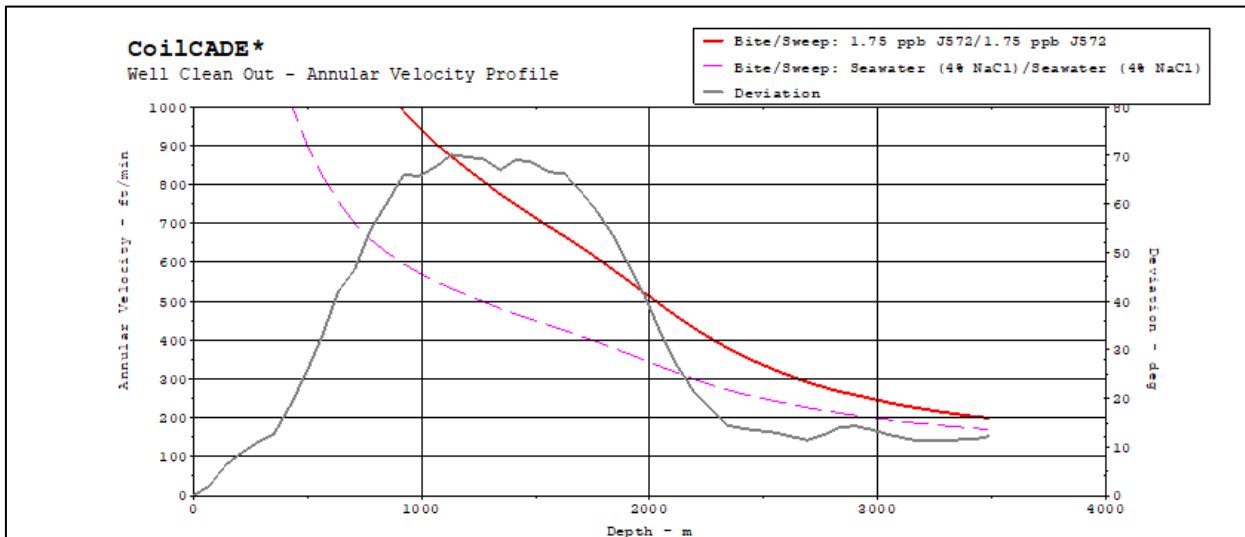
Begin repetition sequence from stage = 3
End repetition sequence at stage = 4
Number of stage sequence repetitions = 12
Liq Index 1 : Seawater
Liq Index 2 : 1.75 ppg Gel




SOLID REMOVAL GRAPH



ANNULAR VELOCITY GRAPH



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	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

APPENDIX IV – EMERGENCY PROCEDURE EMERGENCY BOP OPERATIONS

In the event of an emergency arising and the well having to be secured, the following steps should be taken:

1. Stop Coiled Tubing movement, close the Slip and Pipe rams and slack off string weight to ensure slips are holding. If time permits, review all options with the client representative. (Ensure that rams with guides are activated first to avoid damaging the Coiled Tubing).

Note: The decision to proceed past the above step should normally be made after consultation with the client representative unless there is an immediate and serious danger to personnel and/or equipment and the client representative is not immediately available to be involved in the decision.

2. Stop pumping.
3. Close the upper Shear Seal rams to cut the Coiled Tubing.
4. Set up to circulate well to kill fluid through the Coiled Tubing remaining in the well.
5. Make arrangements necessary to fish the Coiled Tubing from the BOP.

Note: When actuating any ram in the BOP system, the corresponding manual lock should be closed behind it to prevent accidental release in the event of total loss of hydraulic power. The force required to close the rams manually against pressure cannot be supplied by turning in the locks. Use of a pipe wrench, cheater bars or snipes will damage the internal workings of the ram actuators. Some form of hydraulic power is required to operate the actuators. This pressure can be supplied via a hand pump or a hydraulic pump from any other piece of equipment on location, including a fluid pumper.


Actuating the BOP System Hydraulic Controls

1. Remove locks on control panel
2. Move the control lever to the desired position.
3. Push the BOP activate button supplying pressure to the circuit.
4. Observe the pressure drop in the hydraulic circuit and subsequent pressuring back up to system pressure as ram opens or closes completely.
5. Observe the ram indicator pins to verify the operation of the ram.
6. Close in the manual locks if required. (Flag system to indicate position of rams.)

The connections below the coiled tubing BOP must be all flanged. Should one of these connections start leaking, the following steps should be taken in consultation with the client representative:

1. Call local alert and ensure all personnel are removed from the wellhead area.
2. Notify the client representative of the problem and determine the best method to make the area safe.
3. If the leak is minor, it may be possible to continue to pull the coiled tubing to surface. Assess the scenario and consider all the risks associated then proceed to pull the coiled tubing to surface. Once at surface, close available valves below the leak point.
4. If the leak is more severe, initiate a well kill through the well kill line and continue to pull the coiled tubing to surface.
5. If the leak is catastrophic, run the coiled tubing to HUD; pick up sufficient so that after the coiled tubing is cut at surface by CT BOP shear; the top of the coiled tubing falls below the X-mass Tree. Once the end of the coiled tubing is off bottom, proceed to cut the cut the coiled tubing with the

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 54
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

shear RAM then close the available valves below the leak point. A well kill operation can be started through the kill line if requested by the client representative.

LEAK IN COILED TUBING AT SURFACE

In the event of a leak in the Coiled Tubing occurring at surface, the following steps should be taken:

1. Call local alert and ensure all personnel are removed from the operational area. In particular make sure all personnel remain clear of the area between the Injector Head and the Coiled Tubing reel.
2. If the leak is small or a pinhole leak, POOH and position the leak on the lower part of the Coiled Tubing reel as soon as possible. Be careful when area of leak is bent onto the reel as failure may occur. Make arrangements to have a water hose present to wash away any fluid from the reel which may be hazardous. Make arrangements to start pumping water through the Coiled Tubing reel. Depressurize reel as much as conditions allow without exceeding collapse limitations of Coiled Tubing.
3. Notify client representative of problem and determine best method to make area safe. If leak is minor and water can be displaced to leak, continue to POOH and change reel.
4. If leak is considered to be too serious to displace to water and POOH, or serious and uncontrolled leakage of hydrocarbon or hazardous materials prevents this, (i.e. check valves not holding, lost BHA, parted Coiled Tubing) set the Coiled Tubing slips and pipe rams. Activate the upper Shear Seal rams on either the triple or quad BOP and manually lock in place.
5. Depressurize the Coiled Tubing reel and flush through the reel. If hydrocarbons are present in the reel, displace the reel with water and empty the contents to specified safe disposal area.

LEAK IN COILED TUBING BELOW SURFACE


If a leak occurs in the Coiled Tubing below the Stuffing Box during down hole operations (usually indicated by a drop in pump pressure or loss of string weight), suspend Coiled Tubing operations and alert the client representative.

Note:

If indications are that the BHA has been lost in hole then revert to section 0.

1. Once the client representative has been alerted, clear all personnel from the immediate area of the Coiled Tubing around the Injector Head and between the Injector Head and the Coiled Tubing reel.
2. Displace the Coiled Tubing to water and commence to POOH at not more than 20 ft per minute (5 meters/min). Ensure at all times that all personnel are clear of the immediate area as the possibility exists to pull the Coiled Tubing out of the Stuffing Box. Continue pumping water at a slow rate through the Coiled Tubing.
3. When the leak in the Coiled Tubing appears above the Stuffing Box, stop the injector and hold the leaking section of Coiled Tubing between the chains and the Stuffing Box.
4. Inspect leak. If leak is minor continue to POOH.
5. If leak is major, or Coiled Tubing is actually severed or well bore fluids are escaping through the Coiled Tubing, continue as per Section 09.2.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 55
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

LEAK IN SURFACE PRESSURE CONTROL EQUIPMENT

Stuffing Box

1. **Stop** Coiled Tubing movement and close both sets of pipe rams to seal Coiled Tubing annulus. Set manual lock.
2. On semi submersible operations this will be a set of pipe rams and pipe/slip rams.
3. Notify Client representative.
4. Ensure the injector is in neutral and that the brake is engaged.
5. Bleed off pressure above pipe rams
6. Set reel brake. On Semi Submersible jobs the Coiled Tubing should be clamped at the level wind and Coiled Tubing run out of hole until enough slack between the injector and reel is obtained to cope with the heave from the rig, prior to setting reel brake.
7. Bleed off closing pressure on Stuffing Box. Open side doors and apply pressure to retract piston. Replace packer elements and then re-apply pressure to Stuffing Box. Close side doors.

Note: 3" side door Stuffing Boxes first bleed off closing pressure. Remove hoses from pack and retract piston and connect to open and close on side door. Open door and replace packer element. Close door, bleed off pressure and connect to pack and retract piston.

8. Slowly open both equalizing valve on pipe rams and check that stripper is holding pressure.
9. If stripper is holding pressure, undo manual locks and open pipe rams or pipe slip rams. When using pipe/slip rams the depth that they were set on the Coiled Tubing must be recorded. Release reel brake and continue operations.


Surface Leaks Other Than Stuffing Box

1. If leak is minor and a relatively short length of Coiled Tubing is in the hole and the Shear Seal safety head is **below the leak**:
2. Call local alert and notify the client representative.
3. Clear all non-essential personnel away from the area
4. Continue POOH and monitor situation closely
5. Hook up kill line to BOP and pump water slowly down annulus.

Note: Avoid collapse situation

1. Close swab valve and Shear Seal once Coiled Tubing is in riser and repair leak
2. Perform reinstatement test on surface equipment after leak has been repaired
3. If Coiled Tubing is in the well to a considerable depth and leak is considered serious:
4. Call local alert and notify Client representative.
5. Ensure all non-essential personnel are removed from the area.
6. Ensure that Coiled Tubing is sufficiently off bottom so that when the Shear Seal safety head is activated the pipe will drop below the Xmas tree manual master valve. If the Coiled Tubing is stuck down hole, pull to 80% of operating limit before activating Shear Seal BOP, thus allowing the Coiled Tubing to drop below the Xmas tree manual master valve. If the Coiled Tubing is attached to a fish, packer etc pull to 80% of operating limit (if possible) or maximum weight possible before activating Shear Seal BOP, thus allowing the Coiled Tubing to drop below the Xmas tree manual master valve. **If at all possible**, the decision to cut the Coiled Tubing and activate the system will be taken by the Client representative in charge of the operation. This may not always be possible. If the

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 56
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

situation is extremely dangerous and requires a fast decision, the Supervisor in charge will take this decision.

7. Close the Shear Seal rams in the safety head to cut the pipe and allow it to drop. (If the safety head has separate shear and blind rams, close the shear rams to cut the pipe, pull up the Coiled Tubing and close the blind rams).
8. Close the swab valve on the Xmas tree.
9. Close the master valve on the Xmas tree
10. Repair leak and pressure test riser.
11. Plan for fishing operations.

Rotating Joint Leak

Eliminate the potential for reel movement by securing the reel with turnbuckles and set reel brake. On Semi-Submersible jobs the Coiled Tubing should be clamped at the level wind and Coiled Tubing run out of hole until enough slack between the injector and reel is obtained to cope with the heave from the rig. Close the reel isolation valve inside the reel and repair or replace the rotating joint as required. Re-test and resume operations.

COILED TUBING RUNS AWAY INTO WELL


If the inside chain tension system on the Injector Head should fail for any reason, and Coiled Tubing is pulled into the well under its own weight with no control, the procedure should be as per the following:

1. Call a local alert.
2. Attempt to speed the injector up to match the speed of the descending Coiled Tubing.
3. Increase inside chain tension to increase friction on Coiled Tubing.
4. Increase stripper pressure to exert more friction on Coiled Tubing.
5. If these actions fail to make any difference, reduce injector hydraulic pressure to zero.
6. In the event that there is insufficient Coiled Tubing on the reel to reach bottom close Coiled Tubing slips. This action may damage or break the Coiled Tubing. This is the preferred option to using the pipe rams as these will become damaged and a primary well control system will be lost.
7. If the Coiled Tubing is not too far off bottom it may be practical to let it fall to bottom then investigate the causes and repair. This can only be done if there is sufficient Coiled Tubing on the reel to reach bottom.

Note: Coiled Tubing may helix when hitting bottom making it difficult to pull into tail pipe.

8. Once Coiled Tubing has been controlled, examine Injector Head for damage including chains and POOH.
9. The Coiled Tubing run away may be caused by the injector becoming overloaded with the weight of the Coiled Tubing and fluid in the Coiled Tubing. This situation should not occur if proper pre job planning is done. Correct selection of Injector Head or ensuring Coiled Tubing is full of Nitrogen would prevent this situation from occurring.
10. If a run away situation occurs, reduce the injector hydraulic pressure to zero. This may cause the safety brake in the motors to actuate and counter balance valves to close, stopping the injector.
11. Under certain circumstances if the run away Coiled Tubing is at a speed above the critical speed, the back pressure created by the circulating hydraulic fluid may prevent the injector motor brakes from actuating. If this situation occurs, select the pull mode for the injector and increase system hydraulic pressure until the Coiled Tubing comes to a standstill.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 57
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

COILED TUBING IS PULLED OUT OF STUFFING BOX

This situation is most likely to occur when the Coiled Tubing is being pulled into the riser section. If the BHA is lost including the End Connector there will be no external upset to prevent the Coiled Tubing from passing through the Stuffing Box. If this situation occurs, stop injector before Coiled Tubing passes through the chains and shut in Shear Seal rams on upper BOP's.

If it is thought that the BHA may be lost while down hole, stop the Coiled Tubing at 300ft from surface. Slowly close in the swab valve counting the number of turns. If the Coiled Tubing is still deemed to be across the wellhead, POOH the Coiled Tubing no more than the distance between the top of the wellhead and the top of the Coiled Tubing BOP's. Repeat this step until the swab valve can be fully shut. Once the swab valve is shut, bleed off the pressure in riser.

COILED TUBING COLLAPSED AT SURFACE


Collapsed Coiled Tubing at surface will be obvious by escape of well bore fluids from the Stuffing Box, as the strippers will no longer seal round the deformed pipe. In addition to this the collapsed pipe will not allow the Injector Head to grip the Coiled Tubing due to its change in shape. Usually collapsed Coiled Tubing will not pull through the bottom brass bushings on the Stuffing Box.

1. If POOH, immediately run Coiled Tubing back in well a sufficient distance to make sure round pipe is in contact with the Stuffing Box.
2. Call alert and notify client representative.
3. Ensure that all non-essential personnel are cleared from the immediate area.
4. Immediately reduce well head pressure by all safe means possible; either flow well through choke at a higher rate or stop annular fluid injection if reverse circulating.
5. Increase Coiled Tubing internal pressure by circulating.
6. Once pressure conditions inside and outside the Coiled Tubing have been optimized, a decision can be taken on how to proceed. If it is not possible to position uncollapsed pipe across the stripper rubbers, i.e. well contents are escaping from stripper rubbers:
7. Call alert and notify client representative.
8. Close pipe rams in an effort to reduce flow of fluid/gas around Coiled Tubing.

Note: If it is not possible to control the well, the slips will have to be set, and the Coiled Tubing cut using the Shear Seal rams.

9. Arrange for clamps to be fitted to Coiled Tubing above Injector Head.
10. Remove all non-essential personnel from immediate area
11. Under authority from client representative, kill well.
12. Release pressure from Stuffing Box and remove bushings.
13. Open pipe rams.
14. Attempt to pull Coiled Tubing from the well using the Injector Head.
15. Cut Coiled Tubing at the gooseneck and use the rig or a crane to pull the Coiled Tubing through the injector. Re-clamp the Coiled Tubing above the Injector Head and cut off in thirty foot sections (or as appropriate to the crane or rig)
16. Continue pulling and cutting Coiled Tubing until the Coiled Tubing pulled to surface can be pulled by the Injector Head.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 58
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

17. Once Coiled Tubing in good condition (i.e. not collapsed) is at surface, set Coiled Tubing slips and pipe rams and make up roll-on connector to Coiled Tubing on reel.

18. Continue POOH.

If the leak is too serious and cannot be controlled and well fluids are escaping, continue as per Section 9.2.

COILED TUBING BREAKS AT SURFACE

If Coiled Tubing breaks at surface into two separate sections:

1. Stop the injector and set the slips.
2. Stop pumping operations.
3. Call alert and notify client representative. Ensure all non-essential personnel are cleared from the area and that the area is secure.
4. Secure Coiled Tubing reel.
5. If the reel capacity is insufficient to hold all of the Coiled Tubing remaining in the well due to uneven spooling resulting from the Coiled Tubing failure, it may be necessary to obtain another reel with sufficient capacity to hold the Coiled Tubing remaining in the well.
6. After consulting with client representative, remove damaged section of Coiled Tubing and insert in line roll-on connector and continue to POOH.
7. If this course of action is considered inappropriate or dangerous due to well conditions or condition of Coiled Tubing still in the well, continue as per Section 0.

BUCKLED TUBING

Should the Coiled Tubing hit an obstruction down hole while RIH with the thrust pressure set too high or running speed too fast, the Coiled Tubing will buckle in a 'Z' shape (plastically hinged).

Coiled Tubing being run inside Coiled Tubing and through small ID BOP's/lubricators will normally buckle between the Stuffing Box and the chains.

Coiled Tubing being run through casing or open hole will normally break below the BOP, usually somewhere around the largest ID.

- The Coiled Tubing will generally buckle several times.
- This type of failure is a little more difficult to detect.


If the Coiled Tubing is being run into casing and a large amount of weight is lost suddenly, there is a very good possibility that the Coiled Tubing is buckled somewhere down hole. Indications of this could be:

- An increase in pump pressure as fluid or gas is now being pushed through an additional restriction created by a hinge.
- A decrease in pump pressure as the Coiled Tubing may have broken removing a restriction such as a BHA.
- A loss of string weight due to the Coiled Tubing breaking and falling off.
- An increase in string weight while pulling out of the hole as the buckled portion of Coiled Tubing creates additional drag or needs to be straightened to get through a restricted ID.

In the event Coiled Tubing buckling is suspected, the Coiled Tubing movement should be stopped and the pump pressure kept within operating limits allowing the situation to be analyzed and determine the correct action to be taken for existing conditions.

If there is an increase in pump pressure or an increase in string weight:

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 59
----------------------------------	------------------------------	--------------------	---------------	--	-----------

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

1. Stop the pumps and pick up slowly.
2. POOH slowly (10 to 20 feet per minute) watching the weight indicator carefully.
3. If the Coiled Tubing is buckled close to surface, the buckled Coiled Tubing will pull into the bottom of the Stuffing Box and stop.
4. Close and lock the slip and pipe rams.
5. If the ram indicators show that the rams are not completely closed, there may be more than one piece of Coiled Tubing inside the BOP. In this event, open the rams and try to put undamaged Coiled Tubing across the pipe and slip rams.
6. Make arrangements to kill the well and retrieve the remaining Coiled Tubing from the well.
7. If the buckled Coiled Tubing is down hole and cannot be pulled free, consult the client representative as he may want the Coiled Tubing left at TD prior to being hung off in the slip and Coiled Tubing rams.
8. Arrangements should be made to run Coiled Tubing cutter on wireline to retrieve the Coiled Tubing above stuck point.


If there is a decrease in pump pressure or a loss of string weight:

1. It must be assumed that the Coiled Tubing has parted somewhere down hole.
2. Calculate from the remaining string weight approximately how much Coiled Tubing is left in the well.
3. Stop the pumps and POOH slowly.
4. Should the Coiled Tubing come out of the Stuffing Box, the blind rams should also be closed in.

If the Coiled Tubing is buckled above the Stuffing Box, the following steps should be taken:

1. Stop the injector as quickly as possible.
2. Close the slip and pipe rams and manually lock them.
3. If the down hole check valves are holding, bleed the pressure in the Coiled Tubing down to zero and monitor for 15 minutes for pressure build up.
4. Consider at this stage whether to kill the well.
5. Use a hacksaw to start the cut until you are sure there is no trapped pressure in the Coiled Tubing.
6. Cut the Coiled Tubing
7. Remove as much of the buckled Coiled Tubing as possible leaving any undamaged Coiled Tubing showing above the Stuffing Box intact so that it may be rejoined later.
8. Bleed the pressure from above the Coiled Tubing rams and undo the connection below the injector.
9. Slowly raise the injector until it is clear of the damaged Coiled Tubing.
10. Cut away any damaged Coiled Tubing, dress the Coiled Tubing and install an inline connector.
11. Run some fresh Coiled Tubing down through the injector until it is just out of the Stuffing Box.
12. Lower the injector until immediately over the pipe sticking out of the BOP.
13. Attach the pipe to the inline connection attached to the pipe sticking up out of BOP.
14. Pump off the inside chain tension and rotate the chains slowly in the OOH direction, while lowering the injector until the connection below the injector can be fastened.
15. Pump up the inside chain tension and pull weight equal to the weight of the Coiled Tubing suspended below the slips plus 2,000 lbf for friction or CERBERUS prediction, whichever is greatest.

Prepared By: M. Ameerul Zaem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 60
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

16. Equalize the pressure across the Coiled Tubing rams.
17. Unlock the pipe and slip rams.
18. Open the slip and pipe rams and POOH.
19. If the down hole check valves do not hold then the Coiled Tubing will have to be cut.

COILED TUBING STUCK IN HOLE PROCEDURES

There are various scenarios by which Coiled Tubing can be deemed as a stuck in hole situation. The following procedures are to be used as generic guidelines prior to the compilation of a signed off chemical cutting program applicable to the current situation.

In the event of being stuck in hole, several factors would have to be taken into consideration, the first of which would be whether the Coiled Tubing is stuck in hole on a platform, or a semi-submersible, as the procedures to be followed may vary greatly between the two options.

Other factors to be considered are:

- Type of well, i.e. flowing oil or gas well, water injector etc.
- The type of BHA being used, i.e. perforating guns, milling assembly, plug etc.
- The type of operation being carried out when the Coiled Tubing became stuck.

In all of the above cases, the Coiled Tubing would be defined as being “stuck” when the pipe cannot be retrieved from the well bore without the pipe exceeding its 80% minimum yield rating, or without exceeding 80% stress of the weak link release rating. The lower of these two factors should always be used when attempting large pulls.


Regardless of the specifics involved, the following procedures should be adopted:

1. Inform the client representative of the situation.
2. Inform the Onshore Engineer.
3. From the information available, and taking into account the well conditions, try to determine the reason for the pipe/BHA being stuck.
4. Attempt to pull free by applying a steady pull to a maximum of 80% of the Coiled Tubing yield. If in doubt as to what this figure is, consult Engineering Department before proceeding.
5. When applying the maximum pull, hold the maximum value for a minimum of 10 minutes and observe the trend (if any) on the weight indicator and chart. Measure the amount of pipe extension that is required when this pull is applied. The figure can be used to determine where the Coiled Tubing is stuck. As a rule of thumb, the depth that the pipe is held at will be the extension of the Coiled Tubing (in feet) when pulled to 80% of yield divided by 0.002. This can be determined using CERBERUS.

The following are options that may be appropriate depending on the particular circumstances:

1. If possible, flow the well, or increase well flow in an effort to remove debris in the well bore that may be holding the Coiled Tubing/BHA. Maintain maximum circulation through the Coiled Tubing at the same time. This is particularly relevant if well cleanout or drilling operations have been performed.
2. Circulate acid across the BHA in an attempt to remove any acid soluble material that may be holding the Coiled Tubing.
3. Pump fluid down the backside of the Coiled Tubing to the formation in an attempt to dislodge debris from around the BHA. Potential Coiled Tubing collapse must be considered if engineering this scenario.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 61
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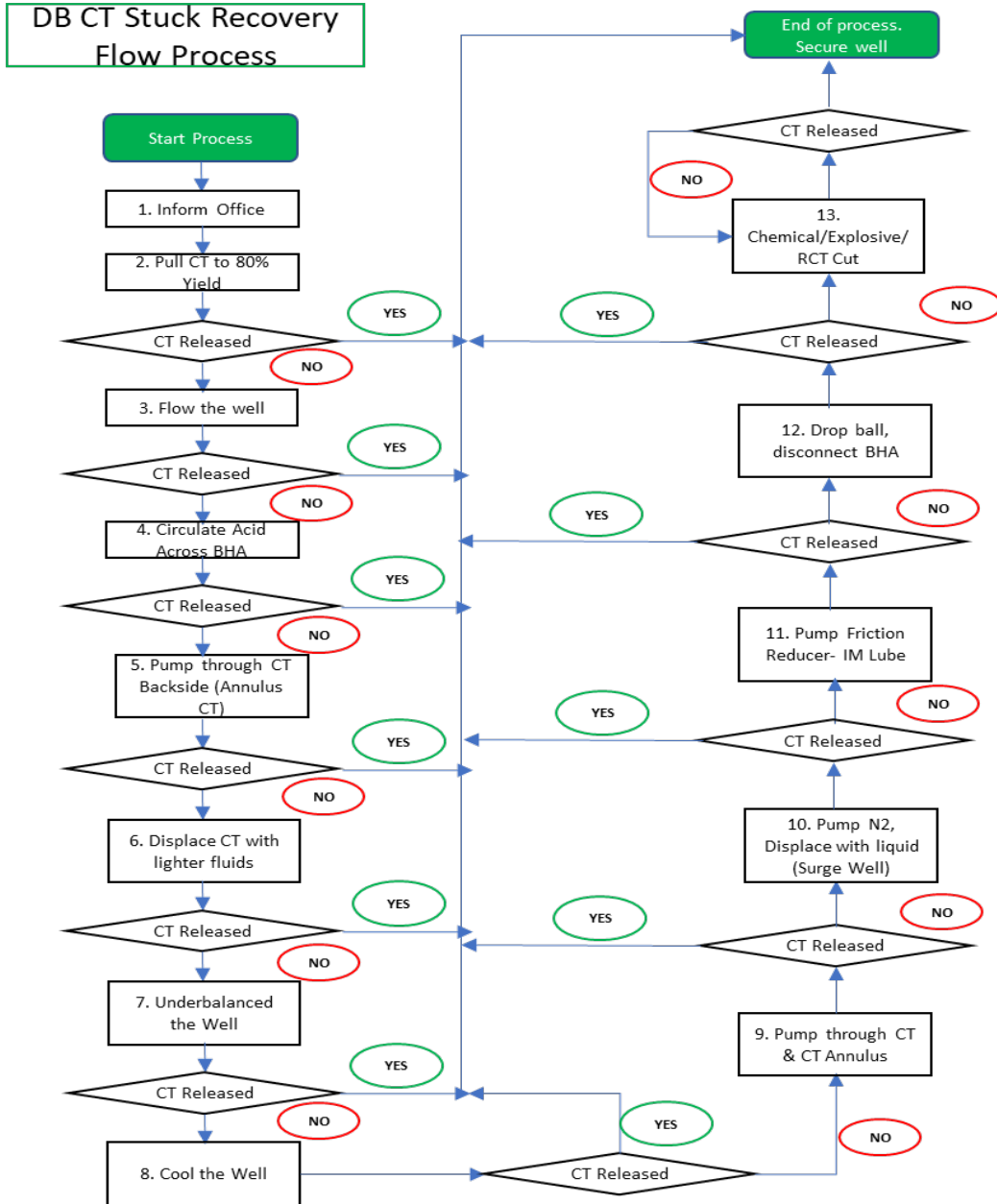
DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	Resak A-09	SAND CLEANOUT & ADD- PERFORATION	

4. Displace Coiled Tubing contents to a lighter fluid (base oil) or gas (Nitrogen) to increase buoyancy and allow greater end force to be applied at BHA.
5. Underbalance the well in the case of differentially stuck Coiled Tubing.
6. Cool the well if the Coiled Tubing is helically stuck in corkscrewed Production Tubing.
7. Pump down the Coiled Tubing / completion annulus to try and move the source of hold-up.
8. Displace slugs of Nitrogen with water to create a surge effect at the BHA.
9. Pump friction reducer, IM Lube in seawater at 2-3% by volume, down the Coiled Tubing and into the well. Ideally, one well volume will be pumped.
10. After consultation with the client representative and the on call Engineer, activate the emergency disconnect mechanism in the BHA to allow the Coiled Tubing to be released. The release mechanism should only be implemented after all avenues have been explored.
11. When attempting maximum pull, do not work the Coiled Tubing violently across the gooseneck by frequent intervals.
12. The amount of cycles across the gooseneck must be logged, and if in doubt of the Coiled Tubing fatigue condition, the Engineer must be consulted and the cycles entered into the CERBERUS FATIGUE program, to determine the amount of cycles left available.

After consultation with the client representative, kill the well and commence preparations for chemical cutting operations.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 30/9/2023	Rev. Rev.0	Controlled Document DB-CT-MSF-23012	Pg. 62
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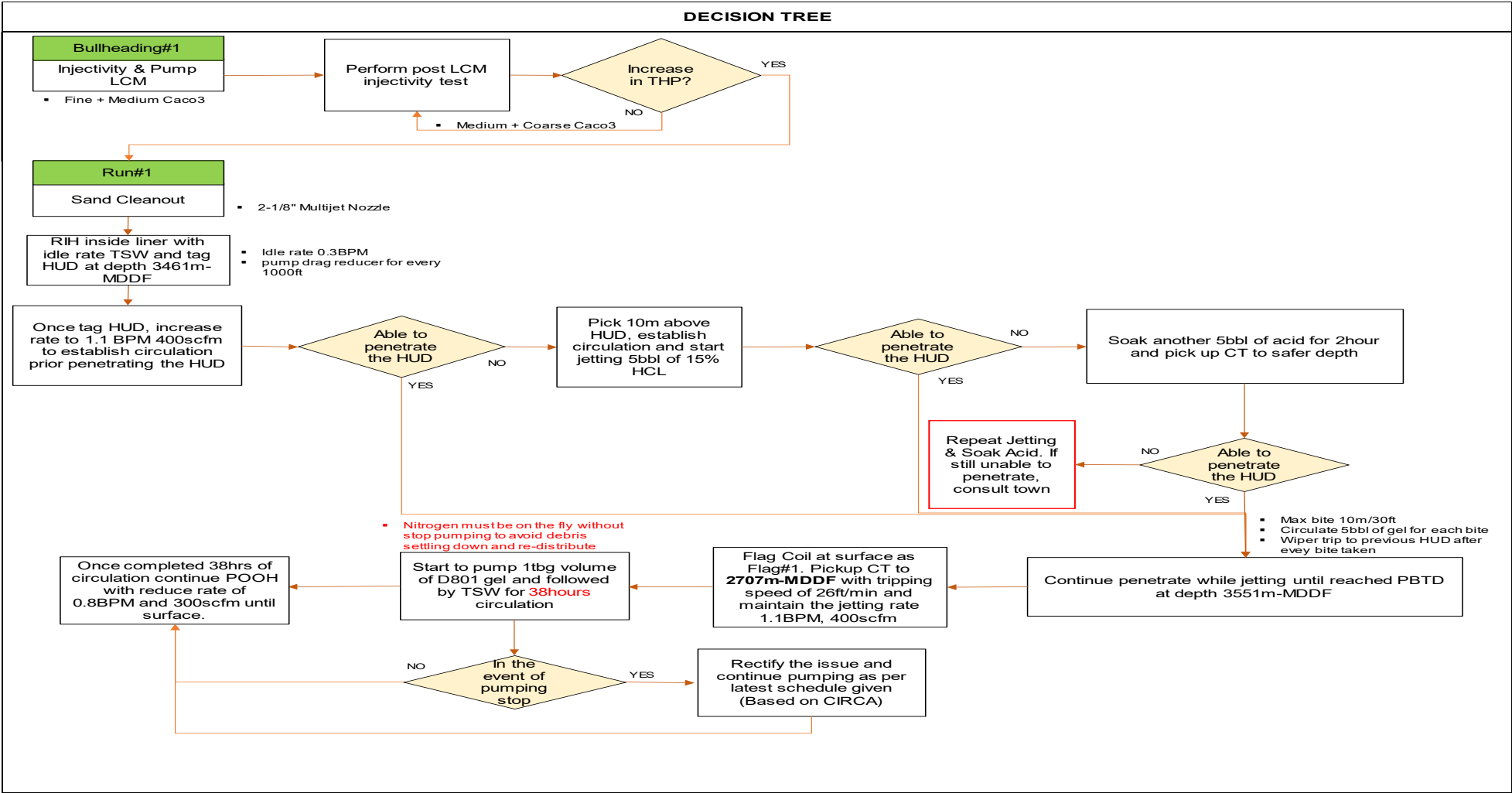
STUCK CT COIL RECOVERY PROCESS



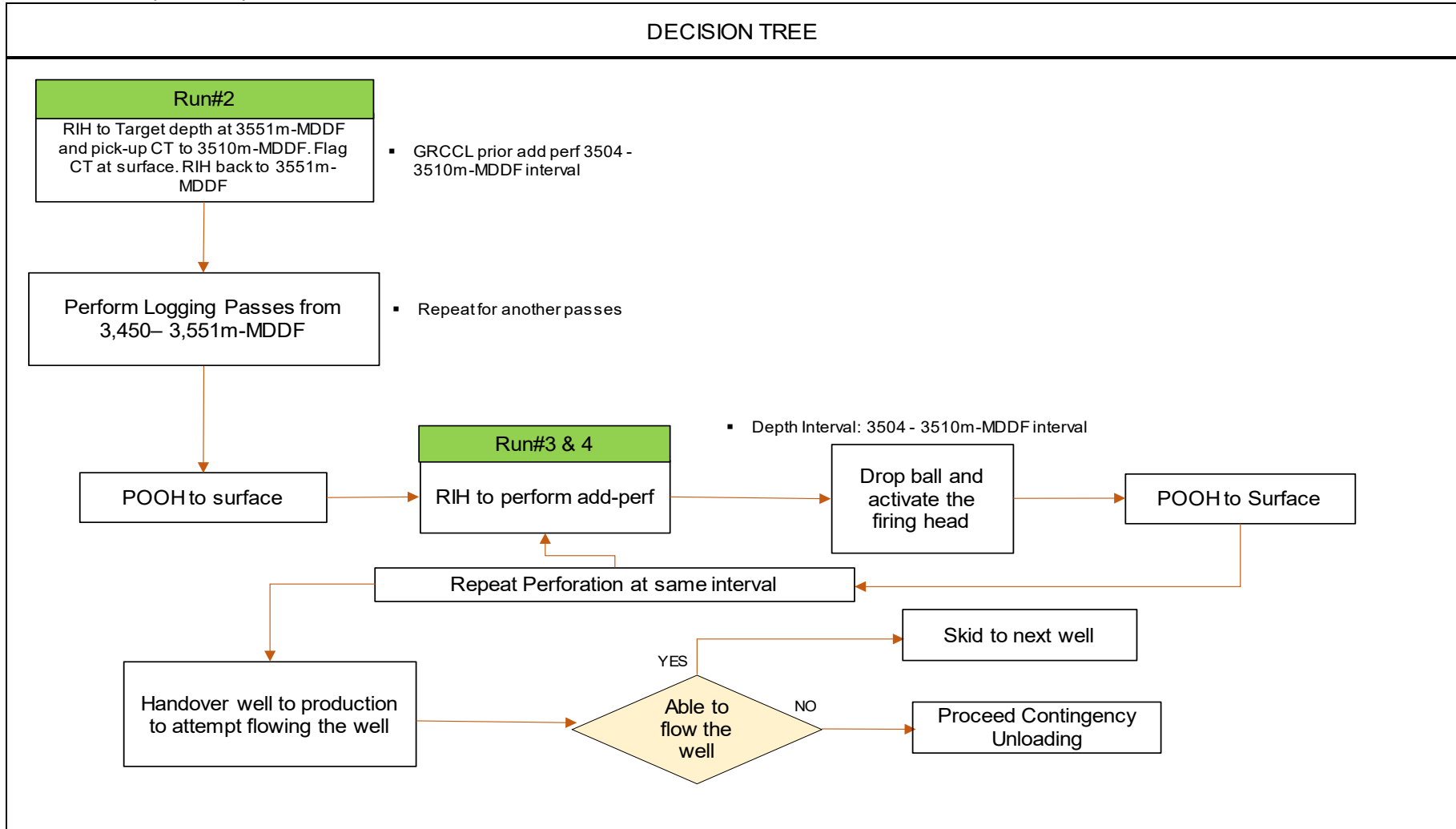
Precautionary Steps to avoid Stuck while Cleanout in Dual string Completion:

- 1) To monitor pressure trending all the times during operation and record for any abnormalities. If there is continue pressure increasing trend during cleanout, proceed to pick up coil to the previous pull test depth and perform flow rate test.
- 2) In the event of coil entangle on the Long string, proceed to pick up coil and simulate pumping lost prime scenario to create vibration and tip of coil wobble to release from entanglement.

APPENDIX V – DECISION TREE (Bullheading#1 & Run#1 SCO)



DECISION TREE (Run#2-4)



DECISION TREE (Contingency Unloading)

