


DIMENSION BID



DULANG A-12 CT MILLING & ADD PERFORATION ADDENDUM #6

Revision: 2
Prepared for: Ellisa Suzrin Shamsul
Date Prepared: 21th September 2024
Well: A-12
Field: Dulang A
Operation Region: PMA
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	DULANG A-12	CT MILLING & ADD PERF	

DESIGN VERIFICATION

PREPARED BY DB
CTS Field Engineer



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21/9/2024

Date

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Kung Yee Han

21/9/2024

Date

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21/9/2024

Date

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Ahmad Hafizi B Ahmad Zaini

Date

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

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OBJECTIVES

The objective of this addendum is to outline CT intervention procedures to;

- 1) Run GRCCCL with 2.2" Dummy Spend gun (Job step as per Main Job program, revise OD from 2" gun to 2.2" Spend gun)
- 2) Run Perforation as per main job program (remove pressure test DKCV during reverse deployment)
- 3) Run VJJB (Contingency after Dummy spend gun if confirm tag TOC shallower)
- 4) Run MultiJet Cleanout inside casing section
- 5) To revised BHA, from 1-11/16" MHA to 2-1/8" MHA
- 6) To revised ball size for perforation from 7/16" to 1/2 "

Well overview

Summary of CTU Run #6:

BHA able to pass through fish depth at depth 8,622.08 ft (2,627.8 m). However, during this run, after exit EOT at depth 8,786.5 ft (2,678 m), BHA tag shallower at depth 8,914ft (2,717m), 42 m above previous TOC at depth 2,759m. GRCCCL with dummy gun (Run#7) will be run to check the actual TOC depth inside the casing section. In the event, confirm the depth of top of cement is shallower, VJJB will be run to identify the fill material on top of HUD before decided to proceed with cleanout inside casing section.

NOTED: ALL DEPTH MENTION IN THIS PROGRAM IN MDDF

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WELL DIAGRAM

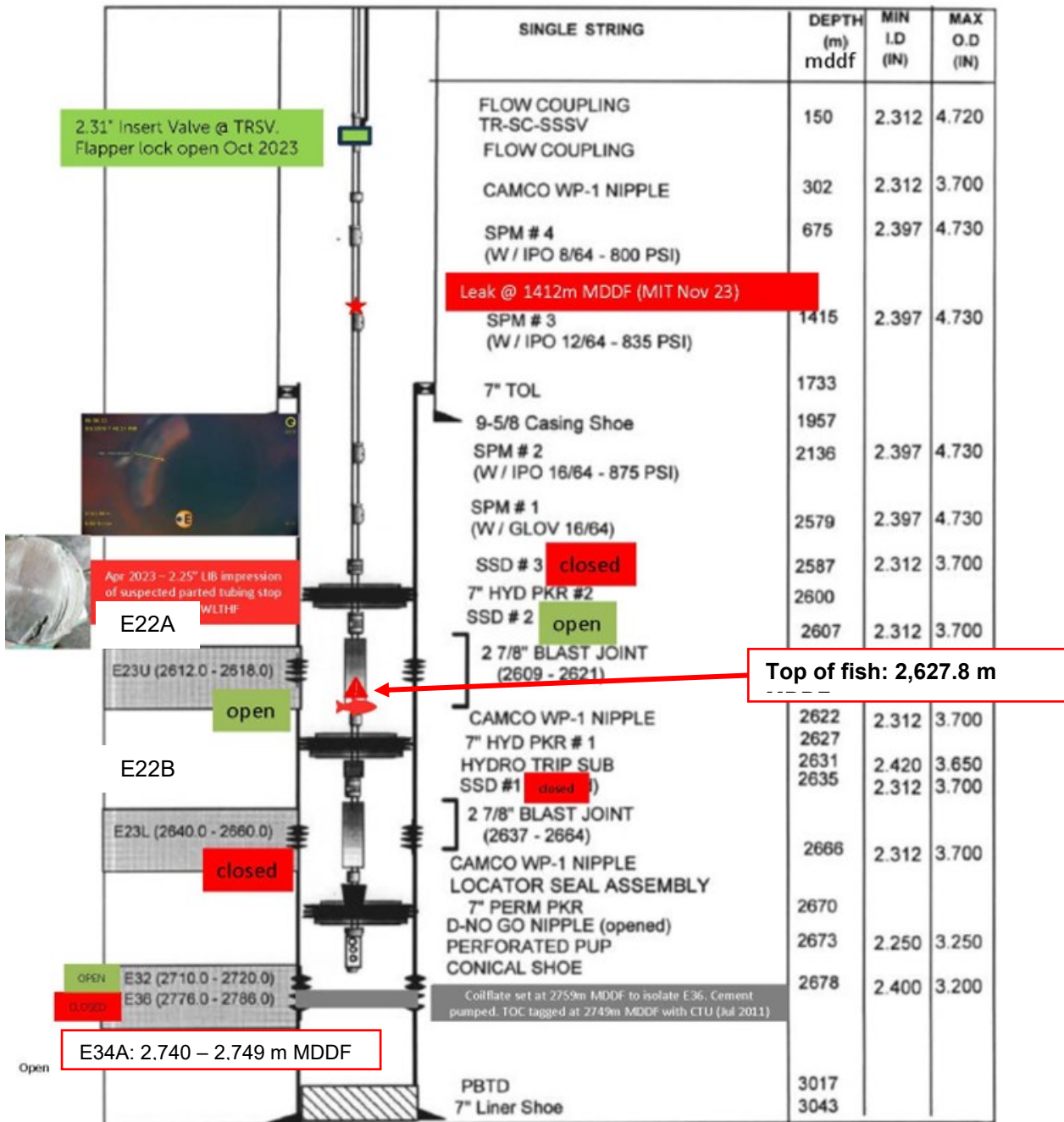
Latest Update: MAR 2023 by Pravin Nair

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FB – SE2

A-12ST1 WELL COMPLETION DIAGRAM SELECTIVE SINGLE OIL PRODUCER

Well No. : A-12ST1	Date : 22 January 2002
Location : Dul-A	All Depth in : m-MDDF
Wellhead: Cooper Cameron, 3-1/8", 3000 psi	RKB-THF : 11.635m
Tubing : 2 7/8", 6.4ppf, L-80, Vam Ace	Max Deviation : 73.88 @ 1567 m-MDDF



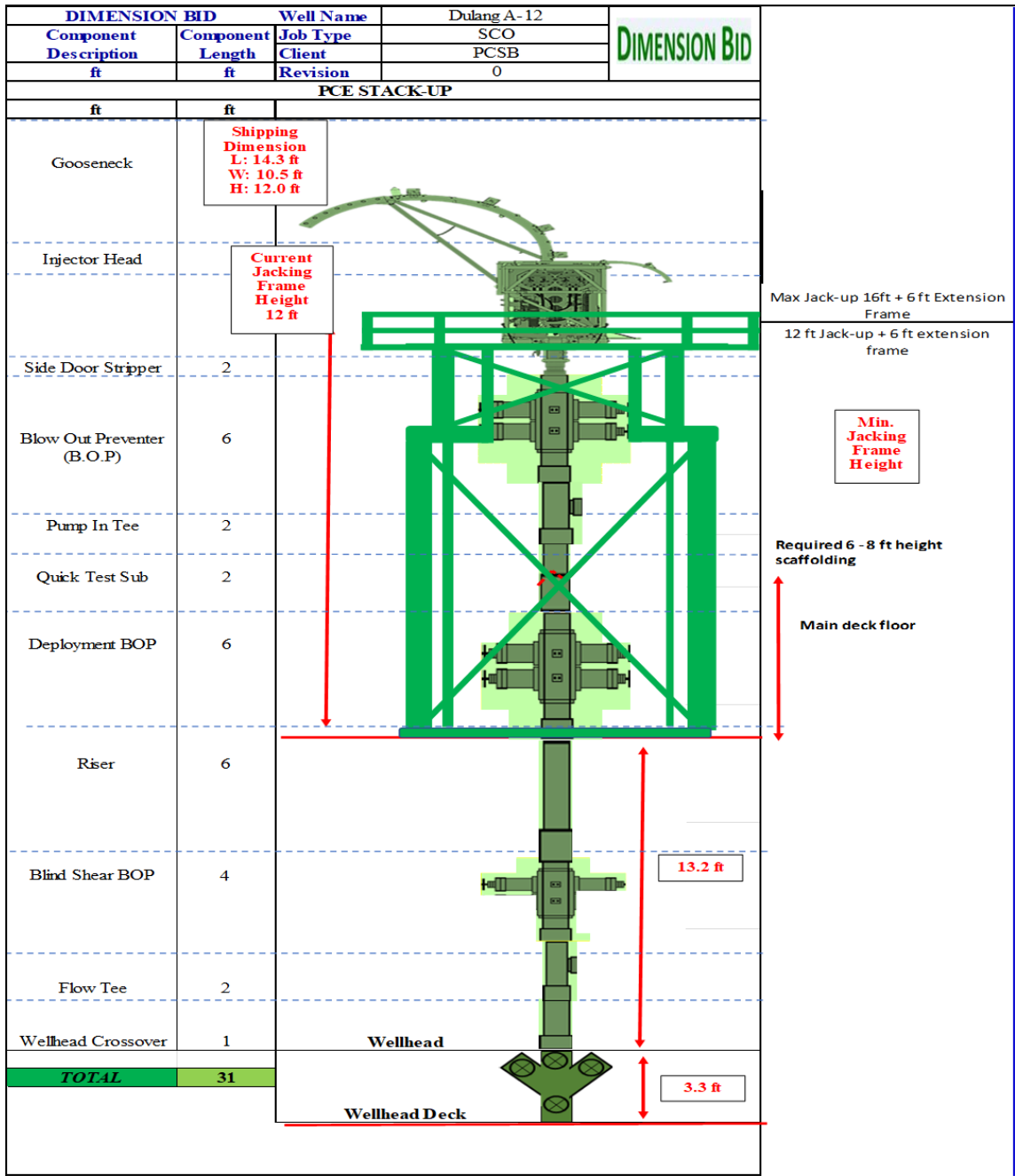
OPERATIONAL PROCEDURE


All depths specified below are in m-MDDF (RKB to THF is 11.635-m as per well diagram)

CT RUN#7: GRCCCL WITH 2.2" DUMMY SPEND GUN

Perforation Gun / BHA Pressure Deployment Rig up Procedure

1. Prepare for deployment rig up as per rig up procedure below:
 - 1.1. Please refer CT Stack up below:



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- 1.2. Rig-up treating line and flowback line to Flow tee at Wellhead area. (Contingency Kill well if required)
- 1.3. Connect CT connector, MHA and deployment Bar as per below schematic (**BHA# as per Appendix I**). Verify 1/2 " ball from UZMA can pass through 2-1/8" MHA & DKCV.

DIMENSION BID

BHA DIAGRAM #-

Client	Petronas Carigali
Field	Dulang B
Job Type	Fishing & Add perf
Job No.	

Well	A-12
Min Restriction	2.31"
BHP	
BHT	

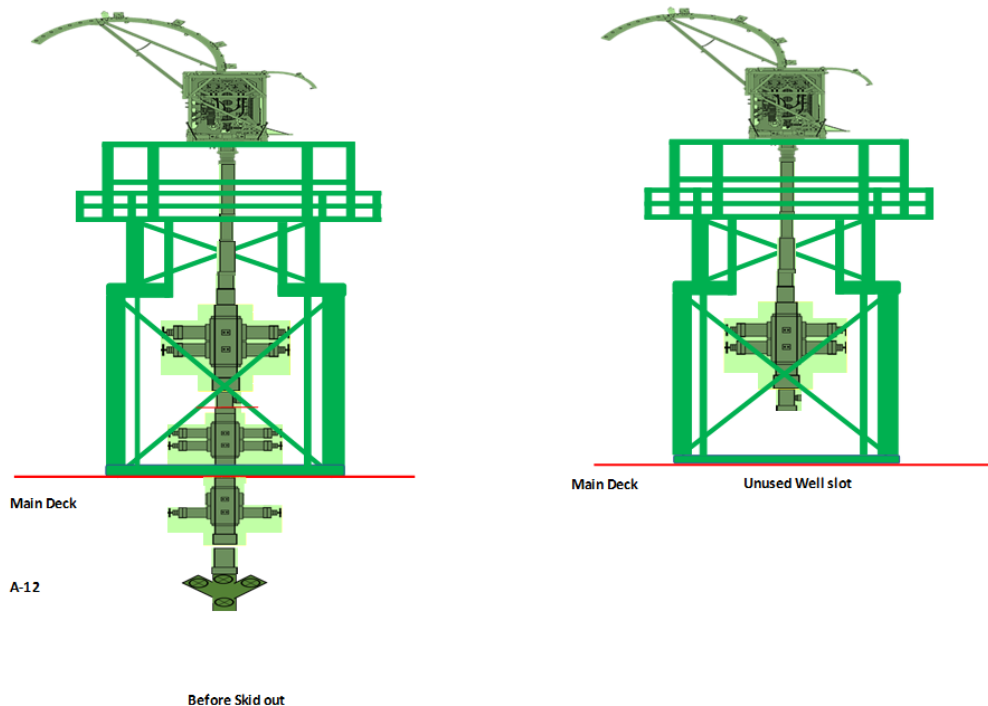
BHA DRAWING	DESCRIPTION	CONNECTION		ID	OD	TOOL LENGTH	CUMULATIVE LENGTH	WEIGHT
		UPHOLE	DOWNHOLE					
	Dimple CT Connector	1.5" CT	1.5" AMMT Pin		2.125	0.30	0.3	0.2
	2-1/8" MHA x Crossover (1.5 to 1.0 AMMT)	1.5" AMMT Box	1.0" AMMT Pin		2.125	3.30	3.6	6.5
	Deployment bar	1.0" AMMT Box	1.0" AMMT Pin		1.690	8.0	11.60	20.00
								TOTAL 26.70

NOTES: for GRCCCL Dummy Run use 5k burst disc rating, for perforation gun run use 6k burst disc rating

- 1.4. Pressure test CT PCE stack up / riser against the crown valve, low pressure (300 psi) and High pressure (3,000 psi) for 15 minutes each after stabilization. Record the pressure test.
- 1.5. Upon successful test, bleed off the pressure and test DFCV low- and high-pressure test for 15 minutes.
- 1.6. Once complete test DFCV, slowly RIH to place deployment bar across deployment BOP. Close Upper Pipe/Slip ram on deployment BOP.
- 1.7. Pressure test through Flow tee above the Wellhead crossover.
- 1.8. Fill-up the line and low pressure test the upper pipe/slip ram to 500 psi and hold for 5 minutes. Inspect the lines for leaks and observe for any pressure drop.
- 1.9. On successful low pressure test, increase pressure to 3,000 psi and hold for 15 minutes. Inspect the lines for leaks and observe for any pressure drop.


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- 1.10. Once confirm pressure holding good, first bleed off test pressure. Retract upper pipe/slip ram. Bleed off pressure.
- 1.11. Proceed to close lower pipe/slip ram, pressure test through Flow Tee above the Wellhead crossover.
- 1.12. Fill-up the line and low pressure test the upper pipe/slip ram to 500 psi and hold for 5 minutes. Inspect the lines for leaks and observe for any pressure drop.
- 1.13. On successful low pressure test, Increase pressure to 3,000 psi and hold for 15 minutes. Inspect the lines for leaks and observe for any pressure drop.
- 1.14. Once confirm pressure holding good, first bleed off test pressure. Retract lower pipe/slip ram.
- 1.15. Break the riser section until upper QTS connection and skid aside the IH, stripper, combi BOP and riser as per illustration below to another well slot.



1.16. The BHA will be deployed in 2 separate sections as per below:

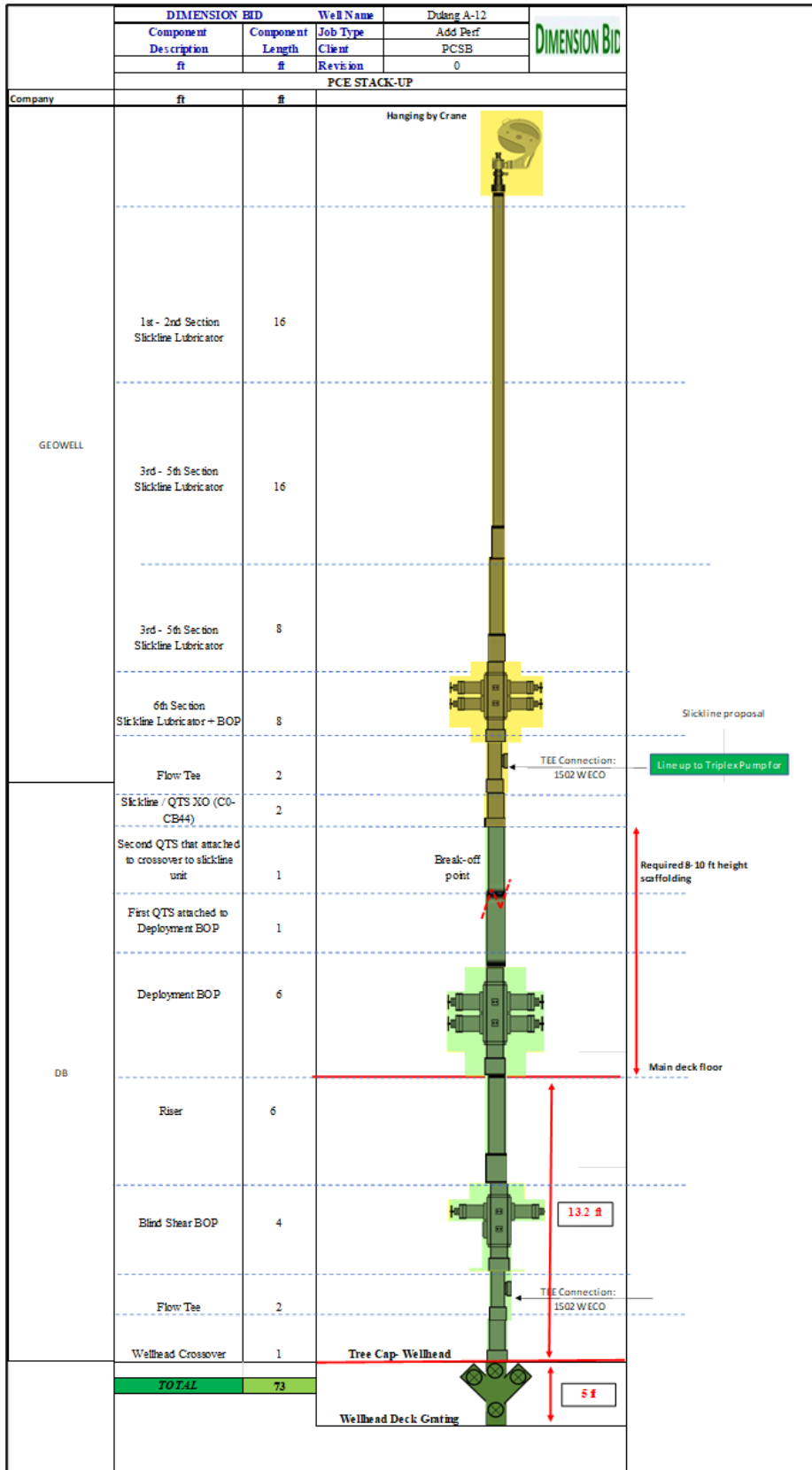
Section	Items	Description	BHA OD, Inch	Length, ft	Deploy by	
1 (First)	1	DB	Dimple End Connector	2.125	4.6	CT
	2	DB	CT MHA C/W Crossover at bottom	2.125		
2 (Second)	3	DB	Torque-Thru Deployment Connector / CARSAC High-Torque Connectors	1.687	39.03	Slickline
	4	DB	Dual-ball Kelly cock valve (DKCV)	1.687		
	5	DB	Deployment bar	1.5		
	6	UZMA	Crossover (CRP)	1.687		
	7	UZMA	CT Firing Head	1.687		
	8	UZMA	6m Dummy Gun	2.2		
	9	UZMA	Bullplug	2.00		

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	10	UZMA	GRCCL Tool	1.687		
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- 1.17. Slickline to prepare PCE stack for deploying section #2.
- 1.18. Slickline PCE stack will make up to top of lower QTS, CT deployment BOP as per below stack up diagram:

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1.19. Manually make up BHA on the platform main deck from Torque-Thru Deployment Connector / CARSAC High-Torque Connector until deployment bar.

- 1.20. Slickline to physically space out BHA beside PCE stack and mark/flag wire accordingly. This will serve as a visual guide during the next deployment procedure. The position of the 1.5" OD deployment bar, which is the main focus, should span across both the pipe and slip ram of the CT deployment BOP. RIH wireline thru PCE stack and connect to Torque-Thru Deployment Connector / CARSAC High-Torque Connector. POOH wireline and retrieve/swallow the attached BHA into the slickline lubricator. Lower BHA and cross reference vertically the deployment bar vs deployment BOP.
- 1.21. Close both Pipe/Slip ram and engage the deployment bar with the deployment BOP, slickline to overpull **800 lbs** (1.2 x 2nd Section BHA weight).
- 1.22. Box-down the PCE stack-up, Fill and pressure test the treating line with IW/TSW (subject to IW availability) to 500 psi and hold for 5 minutes. Inspect the lines for leaks and observe for any pressure drop.
- 1.23. Increase pressure to 3,000 psi and hold for 15 minutes. Inspect the lines for leaks and observe for any pressure drop.
- 1.24. On successful pressure test, first bleed off test pressure. Retract both Pipe/Slip ram on the deployment BOP, disconnect at QTS.
- 1.25. Make-up full BHA as per **2nd section CT BHA**. (POOH wireline and swallow piece by piece all 2nd Section BHA).
- 1.26. Lower the slickline PCE stack up and connect with Upper and Lower QTS section.
- 1.27. Pressure test QTS.
- 1.28. Confirm all wellhead valves are in open position via physical check. During the opening process, count the number of turns made by the wellhead valves and document this in the operation report. This record will serve as a reference for future operations.

CV Opening Turns	LMV Opening Turns

- 1.29. Record initial SITHP and all annulus pressure (PCP, ICP, SCP etc) in the Daily Operation Report (DOR).
- 1.30. RIH slickline and deploy BHA section #2. Earlier wire mark/flag to be used as guide to ensure the 1.5" OD deployment bar spans across both the pipe and slip ram of the CT deployment BOP.
- 1.31. On confirming deployment bar position, close pipe/slip ram of deployment bop and manually lock the ram. Observe for 15 minutes, any pressure builds up above the upper section of deployment BOP. Once confirm no pressure build, proceed for next step.
- 1.32. Perform light weight check by pulling the slickline cable to observe the weight increase to make sure that pipe slip ram is functioning good and holding.
- 1.33. Disconnect PCE stack at slickline crossover along with upper QTS. Rig a side slickline stack-up.
- 1.34. Skid in injector frame with IH and CT PCE stack-up to wellhead slot for Dulang A12.
- 1.35. Make up **Section 1- BHA to CT String**.
- 1.36. Lower section #1 BHA until it meets the 2nd BHA at the Torque-Thru Deployment Connector / CARSAC High-Torque Connector connection.
- 1.37. Make up and connect Section#1 and Section#2 BHA at Torque-Thru Deployment Connector / CARSAC High-Torque Connector.
- 1.38. Slowly open DKCV, ensure both valves at DKCV are opened before RIH. **If it is closed, unable to pump through CT.**
- 1.39. Box-down PCE stack-up, perform pressure test at QTS.
- 1.40. Unlock the manual lock of the CT deployment BOP and retract both upper & lower pipe/slip rams.
- 1.41. Flag CT String at surface and pick-up BHA until it tags the stripper, this will be the distance as reference for reverse deployment later after complete the job. Once tag Stripper, flag CT string

against and measure the distance between two flag depth. Reset depth to (A-B+C) for m MDDF as reference point. Record in the Daily report.

2. Start RIH to **2,717 m (or until 10 m above latest TOC depth)** while break circulation by pumping IW with 0.2 bpm and circulation pressure less than 500psi. Perform pull test every 1,000 ft.

Correlation Interval (m-MDDF)
2,600– 2,749 m (or latest TOC depth)

3. Once CT at depth to **10m above latest TOC**, 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


4. RIH slowly at 5 ft/min until 2,749 m or soft tag latest TOC.
5. Pick up CT to tension the CT 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

6. Flag CT at surface. This will be **Flag#1 (GRCL Bottom of Logging Depth)**. Record the following and include in daily report.

Flag Number	Colour
Flag#1	

7. Perform main pass correlation log from **2,749 m (or latest TOC) to 2,600 m** with speed of 10m/min or 30ft/min. Once reach at **2,600 m**, stop CT and allow tool to stationary for 5 minutes.
8. Repeat step 4 until 7 to repeat logging passes as per Uzma procedure.
9. After complete logging, begin POOH CT to surface: -
 - 9.1. Pump at minimum rate while POOH
 - 9.2. Maximum CT speed while POOH is 50ft/min.
 - 9.3. Slow down CT speed to 10ft/min 50ft before and after passing through completion accessories.
 - 9.4. Do not exceed CT operating limit (refer to CT Force simulation)

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Reverse Deployment Procedure

10. Once CT reaches at surface, **proceed to reverse deploy the dummy gun prior next run.**
 - 10.1. Once BHA tag stripper, RIH back **XX** ft (calculated previously during BHA tag before RIH), to position the deployment bar across the deployment BOP.
 - 10.2. Close the **UPPER** Pipe/Slip ram of the deployment BOP. Manually lock it.
 - 10.3. Observe if there any remaining pressure above the pipe/slip ram of CT deployment BOP. (for 5 minutes)
 - 10.4. Bleed the remaining pressure (if any) inside the riser through flowback line.
 - 10.5. Once confirmed no pressure build up thru the deployment BOP, activate and close **LOWER** section of pipe/slip ram of the CT deployment BOP.
 - 10.6. Observe if there any remaining pressure above the **LOWER** pipe/slip ram of CT deployment BOP. (for 5 minutes)
 - 10.7. Break the PCE at QTS and jack-up the JF.
 - 10.8. Flush the DKCV until clean water observe at bleed off point at DKCV. (In the event got trace of hydrocarbon at bleed off point, continue to flush until clean trace of water is observed at bleed off point. (in the event miss-fire, no indicator Gun fire, ensure return is establish first (active circulation sub) before proceed with step 10.9 & 10.10)
 - 10.9. **Close UPPER** DKCV, perform inflow test for 15 minutes. Upon successfully pressure test, bleed off the pressure through the bleed off point at DKCV.
 - 10.10. **Close the LOWER** DKCV, perform inflow test for 15 minutes. Upon successfully pressure test, bleed off the pressure through the bleed off point at DKCV.
 - 10.11. Secure the 2nd section BHA with C-Plate and disconnect at Torque-Thru Deployment Connector / CARSAC High-Torque Connector connection.
 - 10.12. Skid the JF aside along with the PCE above the QTS section.
 - 10.13. Rig-up back slickline lubricator 6 (section) with slickline PCE on top of the QTS connect through slickline crossover.
 - 10.14. Once rig-up, RIH slickline wire and connect at Torque-Thru Deployment Connector / CARSAC High-Torque Connector connection.
 - 10.15. Box down Slickline crossover and perform pressure test for the stack-up.
 - 10.16. Retract Pipe/Slip rams of the deployment BOP.
 - 10.17. POOH slickline wire until tag slickline stuffing box.
 - 10.18. Secure the well by close the crown and master valve. Bleed off remaining pressure inside lubricator.
 - 10.19. Break the QTS connection, and disconnect the 2nd section BHA.

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CT RUN#8 ADD PERF WITH 9M 2” GUN

11. Repeat **step 1** for live gun pressure deployment rig up procedure and make up the 2.00” 9 metre length gun.
12. The BHA will be in 2 sections (**BHA#2 as per Appendix I**):

Section	Items	Description	BHA OD, Inch	Length, ft	Deploy by	
1 (First)	1	DB	Dimple End Connector	2.125	4.6	CT
	2	DB	CT MHA C/W Crossover at bottom	2.125		
2 (Second)	3	DB	Torque-Thru Deployment Connector / CARSAC High-Torque Connectors	1.687	41.45	Slickline
	4	DB	Dual-ball Kelly cock valve	1.687		
	5	DB	Deployment bar	1.5		
	6	UZMA	Crossover (CRP)	1.687		
	7	UZMA	CT Firing Head	1.687		
	8	UZMA	9m Dummy Gun	2.00		
	9	UZMA	Bullplug	2.00		

13. CT start RIH to **2,749 m MDDF or latest TOC depth** while break circulation by pumping IW with 0.2 bpm and circulation pressure less than 500psi. Slowly pickup tool to ensure CT is in tension, stop BHA at Flag#1 (Bottom perforation correlation flag depth). Perform pull test every 1,000 ft.
14. Using Perforation Correlation Sheet at Appendix “A”, Together with Client Site Representative (CSR), Uzma engineer to perform step by step space out calculation with based on BHA measurement and Depth offset agreed by (Client & Uzma Office). Space out calculation will position gun “top shot” to the respective perforation interval.


Note:

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

15. Once the gun space out is determined and agreed by both parties, Uzma engineer gives instruction to CT Supervisor to position the gun accordingly.
16. Calculate the amount of CT need to be moved to place the gun top shot at top perforation interval:

Firing Sequence Perforation Gun Run#

17. Conduct toolbox talk and safety meeting with crew involved in operation.

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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.

- 18. Initiate drop ball sequence at CT Launcher with assist of CT Supervisor.
- 19. Perform circulation at 0.3 BPM. Pump Operator to ensure CT pressure is less than 1,000psi. Keep pumping until the ball is passing gooseneck.
- 20. Once indication of ball passing gooseneck is monitored, lower down pump circulation to 0.2 BPM. This is to ensure a clear indication of ball seated at firing head is observed.
- 21. Keep pumping until the ball reaches the firing head piston. Once the ball has seated at the firing head, fluid circulation will stop, and coil pressure will increase slowly.

Note:

1 - 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.

2 - 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 guns firing. The minimum pressure AND volume must be reached before a determination can be made that the guns have fired.

3 - If having difficulty and no indication of ball seat, perform circulation at high rate (> 0.3 BPM) and high pressure (> 1,000 psi). Attempt to pressure up the CT and increase the tubing pressure to a maximum firing head actuating pressure until see pressure drop and circulation regained. Monitor WHP and weight indicator for indication of gun firing.

- 22. 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 pressurizes tubing to 2500 psi, increase coil pressure gradually and observed for pressure drop and circulation established.
- b) If there is still no indication, increase tubing pressure until it reaches max coil pressure. (CT Supervisor to Advise) and observe any pressure drop and circulation is established.

- 23. 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). POOH the CT with the BHA to 100ft or 30m above the perforated interval to avoid sticking (depending on well condition).
- 24. POOH CT once receiving CSR approval.

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25. Continue to POOH until gun is 70m or 200ft below sea level, hold safety meeting with crew involved in operation.

Note:

- a) Always treat the guns as live guns.
- b) Clear all personnel from BOP and Xmas tree area.
- c) Only Uzma Engineer and dedicated CT operator to work on retrieving guns.

26. Tag Stripper and close X-mas tree. Proceed reverse deployment process as per step 10.

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

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CT RUN# (CONTINGENCY): VJJB RUN

27. Make up 2.063” Venturi Junk Basket Tool as per **BHA#3: 2.063” Venturi Junk Basket BHA** in Appendix 1.
Note: Take the below measurement and record in the DOR.
28. Perform function test of the Venturi Junk Basket to determine pump rate & pressure parameter for the tool. Record the data in the table below, do not exceed 5,000 psi circulating pressure.

Flow Rates (bpm)	Pressure (psi)	Remark
0.3		
0.5		
0.7		
0.8		
0.9		
1.0		

29. Repeat **step 7 to 13** in CT Run#1.
30. Start RIH CT without pumping until **10 m above latest top of dish depth**.
- 30.1. RG Tool Specialist to be available inside Control Cabin all the time during operation.
- 30.2. Refer to CT Tubing Force simulation (Orpheus modelling), refer **Appendix III**.
- 30.3. Maximum CT speed RIH is **30-50 ft/min**.
- 30.4. Closely observe weight indicator in control cabin while RIH.
- 30.5. Conduct pull test minimum of every 300m (1,000ft) interval, 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.**
- 30.6. Slow down CT speed to 10 ft/min before and after passing through completion accessories.
- 30.7. Observe return all the times. Flowback crew to monitor & record all return from time to time in Field Data Report.
- 30.8. Do not exceed operating safety limits **5,000 psi**.
- 30.9. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.
- 30.10. At all time, while RIH, the injector torque control shall be set at the minimum pressure required to move the CT at specified speed.
31. Once CT reached at **10 m above top of suspected HUD**, stop CT and conduct pull test of 10m/30ft and record the pulling weight both static and dynamic in the DOR as per table below.

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

32. Increase pump rate gradually until 1 bpm and monitor circulating pressure.
33. Once observe stable circulating pressure, continue RIH at 1 ft/min until **1 ft above top HUD**.
34. Stop BHA 1 ft above top of fish & continue pumping at 1 bpm while monitor circulating pressure.
35. Once pressure has increased to 4,000 psi or is constant for 30 minutes, pick up BHA 30ft above top of HUD and observe for 20 minutes.
- 35.1. If circulating pressure drop, repeat **step 16 to 19**.
- 35.2. If circulating pressure constant, stop pump and POOH to surface
- 35.3. If circulating pressure reached maximum 4000 psi, stop pump and POOH to surface
36. POOH CT to surface.
37. Once CT on surface, close well and bleed off pressure in CT and stack up. Tool Specialist to open the junk basket and send photo of the debris recovered to town. Consult with town on whether require to proceed with Casing cleanout.

CT RUN# (CONTINGENCY): MULTIJET CLEANOUT

38. Make up 1.69" MultiJET Nozzle tool as per BHA#4: 1.69" MultiJET Nozzle BHA in Appendix 1.

Note: Take the below measurement and record in the DOR.

39. Perform function test of the MultiJET Nozzle to determine the associated circulating pressure vs. pump rate. Record the data in the table below, do not exceed 5,000psi circulating pressure.

Flow Rates (bpm)	Pressure (psi)	Remark
0.3		
0.5		
0.7		
0.8		
0.9		
1.0		
1.1		
1.2		
1.3		

40. Repeat step 7 to 13 in CT Run#1.

41. Start RIH BHA while pumping IW at idle rate until at EOT depth **2,678 m / 8,786.5 ft.**

41.1. Refer to CT Tubing Force simulation (Orpheus modelling) at Appendix III.

41.2. Conduct pull test for every 300m (1,000ft) interval, 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.](#)

41.3. Pump drag reducer solution, 2 bbls as lubricant every 1,000 ft interval (if encounter dragging)

41.4. Maximum CT RIH speed is **30-50 ft/min/ 9-10m/min.**

41.5. Slow down CT speed to **10 ft/min/ 10m/min**, 50 ft / 15m before and after passing through completion accessories.

41.6. Observe and record return (if any and in what form)

41.7. Do not exceed operating safety limits **5,000 psi (Circulating pressure).**


41.8. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.

41.9. At all time, while RIH, the injector torque control shall be set at the minimum pressure required to move the CT at specified speed.

42. Once BHA reaches 10m above EOT, stop CT and conduct pull test (minimum of 10m/30ft) and record the pulling weight both static and dynamic. (If encounter early HUD, Pick-up BHA and record the weight parameter).

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

43. Attempt to establish circulation while varying pump rates and choke sizes, this will be reference at which rate and choke, able to establish the circulation without nitrified condition. (if still no surface return,

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	DULANG A-12	CT MILLING & ADD PERF	

consider worst case scenario where there is no column of water inside production tubing, fill up at least 1.5 x CT string /Production tubing annulus volume before reattempting to establish return with varying rates + choke sizes). Once establish, perform losses rate test.

44. After establishing surface returns without nitrifying, switch to pumping 0.9 bpm 300 scfm. After establishing surface returns, slowly increase liquid injection rate until maximum circulation pressure allowable (4,600 psi). This will be the nitrified rate reference for penetration into sand HUD with established surface return at surface. Once establish, perform losses rate test.


Notes:

- **For gas rate minimum at 300 scfm, increase gas rate if require maximum up to 4,600 psi circulation pressure.**
- **On establishing constant surface return, 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 there is a change in choke size.**
- **Continuously record return volume during cleanout operation. (Record inside improved FDR)**
 - 1.1.1. In the event of lost return, kindly refer to the step below for reference:
 - 1.1.1.1. Check surface flowback back pressure. Must be less than WHP
 - 1.1.1.2. Wait till system stabilizes
 - 1.1.1.3. Check gas lift injection
 - Is it on?
 - Injection pressure > Wellbore pressure?
 - 1.1.1.4. Manipulate choke size
 - 1.1.2. If still no return at surface, pick-up BHA to a shallower depth. Pick up in regulated interval while attempting to establish return. (Proposed to depth where returns were previously obtained).
 - 1.1.3. If unable to establish return at surface, consult town. (Provide the details of THP, choke size and circulation pressure).
 - 1.1.4. After return establish, RIH to perform cleanout.
 - 1.1.5. At all times, monitor and record the return (a pattern if there is), THP and debris sample at surface. (Take note if there any THP drop during penetration).
 - 1.1.6. **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.**
 - 1.1.7. **Pump 5 bbls gel to lift the suspected debris to surface.**
 - 1.1.8. **CBU at least 2x Annulus volume at that depth.**
 - 1.1.9. **After confirm there's no longer debris at that depth, proceed penetration.**
 - 1.1.10. **In the event unable to penetrate due to hard solid, slowly increase jetting rate until maximum allowable during penetration (ensure the return always establish at surface). After complete 1 cycle penetration, follow rate suggest by CIRCA to lift up the debris.**

Note: Every 10m/30ft penetration, sweep with 5 bbls of Gel & wiper trip 10m above previous HUD before continue penetrate in casing section.

No.	Stage	Fluid	Liquid Rate	Total Liquid	N2 Rate (if require)	CT Speed	Duration	Depth	Remarks
			BPM	BBL	SCF/M	ft/min	Minute	m	

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	DULANG A-12	CT MILLING & ADD PERF	

1	CT at 10m above EOT	IW	0.9	0.0	300	0	0	2,678 m (EOT)	Establish return on surface
2	RIH to HUD and Penetrate HUD/Fill	IW	0.9 – 1.2	36	300	1	30	HUD + 10m	Monitor return & CT weight on surface
3	Circulate	D801 Gel	0.9	6	300	0	5	Stationary CT	Provide suspension to the fill and lift to surface
Wiper Trip 10m above previous HUD									
4	RIH to last HUD and Penetrate HUD/Fill	IW	0.9 – 1.2	36	300	1	30	HUD + 10m	Monitor return & CT weight on surface
5	Circulate	D801 Gel	0.9	6	300	0	5	Stationary CT	Provide suspension to the fill and lift to surface
Wiper Trip 10m above previous HUD									
6	Hole Cleaning (Circulate)	D801 Gel	0.9 – 1.2	60	300	0	60	Stationary CT at 2,759 m	Hole cleaning stage. 1.0x CT/Tubing Annulus Volume
7	Bottoms Up (Circulate)	IW	0.9	0.0	300	0	49 Hrs	Stationary CT at 2,759 m	Hole Cleaning stage. As per Circa Simulation
8	POOH	IW	1.2	362	0	30		To Surface	Monitor return on surface

45. Once CT reach 2,759 m, circulate 60 bbls of Gel and perform bottoms up with Nitrified TIW (0.9 bpm & 300 scf/min) for 49 hours at depth 2,759 m as per CIRCA Simulation. Flag #1 CT at surface at depth 2,759 m.

Note: Perform pull test of CT at depth for every 30 minutes. Always monitor weight parameter.

Flag Number	Colour
Flag#1	

46. Continue to POOH CT to surface at 30 ft/min while pumping at 1.1 bpm.

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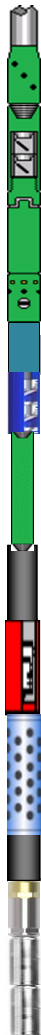
APPENDIX 1

BHA#1: GRCCCL C/W DUMMY SPEND GUN BHA

DIMENSION BID

BHA DIAGRAM #1 -GRCCCL C/W DUMMY SPEND GUN BHA

Client	Petronas Carigali	Well	A-12
Field	Dulang A	Min Restriction	2.25
Job Type	CT Milling & Add Perf	BHP	
Job No.		BHT	

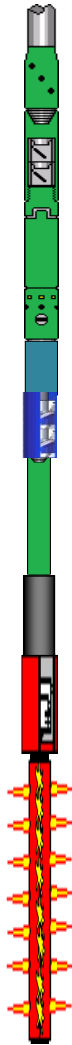
BHA DRAWING	DESCRIPTION	CONNECTION		ID	OD	TOOL LENGTH	CUMULATIVE LENGTH	WEIGHT
		UPHOLE	DOWNHOLE					
	Dimple CT Connector	1.5" CT	1.5" AMMT Pin		2.125	0.30	0.30	2.0
	2-1/8" MHA x Crossover (1.5 to 1.0 AMMT)	1.5" AMMT Box	1.0" AMMT Pin		2.125	3.30	3.60	6.5
	Disconnect drop ball 0.75" Circulating drop ball 0.625" Burst Disc 5,000 psi							
	Carsac	1.0" AMMT Box	1.0" AMMT Pin		1.69	1.60	5.20	1.0
	Dual Ball Kelly Cock Valve	1.0" AMMT Box	1.0" AMMT Pin		1.69	1.60	6.80	2.0
	1.5" Deployment Bar 6 ft length	1.0" AMMT Box	1.0" AMMT Pin		1.50	6.00	12.80	20.0
	UZMA Crossover (CRP)	1.0" AMMT Box	1.275" - 12 TPI Box ACME		1.69	0.33	13.13	
	UZMA CT Firing Head *Firing Drop Ball: 7/16"	1.275" - 12 TPI Stub ACME	1.275" - 12 TPI Box ACME		1.69	0.67	13.80	
	2 ea 3m X 2" 6SPF Gun + Top Sub (Spend GUN)	1.275" - 12 TPI Stub ACME	1.687" - 8 TPI Box ACME		2.20	22.40	36.20	
	UZMA Bullplug	1.687" - 8 TPI Stub ACME	1.687" - 8 TPI Stub ACME		2.00	0.26	36.46	
UZMA GRCCCL Tool	1.687" - 8 TPI Stub ACME			1.69	6.17	42.63		
						BHA LENGTH	42.63	
						MAXIMUM OD	2.20	
						MINIMUM ID		
						WEIGHT		


BHA#2: PERF GUN BHA

DIMENSION BID
BHA DIAGRAM #2 - PERF GUN 9M BHA

Client	Petronas Carigali
Field	Dulang A
Job Type	CT Milling & Add Perf
Job No.	

Well	A-12
Min Restriction	2.25
BHP	
BHT	

BHA DRAWING	DESCRIPTION	CONNECTION		ID	OD	TOOL LENGTH	CUMULATIVE LENGTH	WEIGHT
		UPHOLE	DOWNHOLE					
	Dimple CT Connector	1.5" CT	1.5" AMMT Pin		2.125	0.30	0.30	2.0
	2-1/8" MHA x Crossover (1.5 to 1.0 AMMT) Disconnect drop ball 0.75" Circulating drop ball 0.625" Burst Disc 6,000 psi	1.5" AMMT Box	1.0" AMMT Pin		2.125	3.30	3.60	6.5
	Carsac	1.0" AMMT Box	1.0" AMMT Pin		1.69	1.60	5.20	1.0
	Dual Ball Kelly Cock Valve	1.0" AMMT Box	1.0" AMMT Pin		1.69	1.60	6.80	2.0
	1.5" Deployment Bar 6 ft length	1.0" AMMT Box	1.0" AMMT Pin		1.50	6.00	12.80	20.0
	UZMA Crossover (CRP)	1.0" AMMT Box	1.275" - 12 TPI Box ACME		1.69	0.33	13.13	
	UZMA CT Firing Head *Firing Drop Ball: 7/16"	1.275" - 12 TPI Stub ACME	1.275" - 12 TPI Box ACME		1.69	0.67	13.80	
	3m X 2" 6SPF Gun + Top Sub	1.275" - 12 TPI Stub ACME	1.687" - 8 TPI Box ACME		2.00	11.24	25.04	
	6m X 2" 6SPF Gun + Tandem Sub	1.275" - 12 TPI Stub ACME	1.687" - 8 TPI Box ACME		2.00	19.80	44.84	
UZMA Bullplug	1.687" - 8 TPI Stub ACME			2.00	0.21	45.05		
BHA LENGTH						45.05		
MAXIMUM OD						2.125		
MINIMUM ID								


DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG A-12	CT MILLING & ADD PERF	

BHA#3: VJJB


DIMENSION BID

BHA DIAGRAM # -2.063" VENTURI JUNK BASKET BHA

Client	Petronas Carigali	Well	A-12
Field	Dulang A	Min Restriction	2.25
Job Type	CT Milling & Add Perf	BHP	
Job No.		BHT	

BHA DRAWING	DESCRIPTION	CONNECTION		ID INCH	OD INCH	TOOL LENGTH FT	CUMULATIVE LENGTH FT
		UPHOLE	DOWNHOLE				
	Dimple CT Connector	1.5" CT	1.5" AMMT Pin		2.125	0.30	0.30
	2-1/8" MHA Disconnect drop ball 0.75" Circulating drop ball 0.625" Burst Disc 5,000 psi	1.5" AMMT Box	1.5" AMMT Pin		1.690	2.30	2.60
	Crossover	1.5" AMMT Box	1.5" AMMT Box		2.125	0.70	0.7
	2.063" Venturi Junk Basket Included 4 ft Extension	1.5" AMMT Pin			2.063	7.3	7.95
						BHA LENGTH	7.95
						MAXIMUM OD	2.125
						MINIMUM ID	

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG A-12	CT MILLING & ADD PERF	

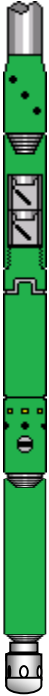
BHA#4: MULTIJET CLEANOUT

DIMENSION BID

BHA DIAGRAM #- MULTIJET NOZZLE

Client	Petronas Carigali
Field	Dulang B
Job Type	Fishing & Add perf
Job No.	

Well	A-12
Min Restriction	2.31"
BHP	
BHT	

BHA DRAWING	DESCRIPTION	CONNECTION		ID INCH	OD INCH	TOOL LENGTH FT	CUMULATIVE LENGTH FT
		UPHOLE	DOWNHOLE				
	Dimple CT Connector	1.5" CT	1.5" AMMT Pin		2.125	0.30	0.30
	2-1/8" MHA Disconnect drop ball 0.75" Circulating drop ball 0.625" Burst Disc 5,000 psi	1.5" AMMT Box	1.5" AMMT Pin		2.125	2.30	2.60
	8 ft Straight Bar	1.5" AMMT Box	1.5" AMMT Pin		2.125	8.0	10.60
	MultiJet Nozzle	1.5" AMMT Box			2.125	1.00	11.60

BHA LENGTH	11.60
MAXIMUM OD	2.125
MINIMUM ID	2.125

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APPENDIX 2 – CIRCA SIMULATION

Ctran Summary

SUMMARY OF HOLE CLEANING RESULTS

Initial Condition:

% of fill interval occupied by solids before cleanout ...	75.0 %
Top of fill	2716.99 m
Deepest Circulation point	2758.99 m
Bottom of fill	2758.99 m
Initial Volume of Solids.....	4.1 bbl
Initial Mass of Solids.....	2084.9 lb
Solids type:	Mud Residue/Formation Fines
Fluid Description:	Nitrified Water

Penetration Hole Cleaning Mode:

Penetration rate.....	1.0 ft/min
Penetration time.....	2.30 hr
Solids volume in the well after penetration	4.1 bbl
Solids mass in the well after penetration	2084.9 lb

Circulation Hole Cleaning Mode:

Hole circulation time	48.90 hr
Solids volume in the well after circulation.....	1.3 bbl
Solids mass in the well after circulation.....	684.9 lb

Wiper Trip Hole Cleaning Mode:

Wiper Trip Scheme:	User Specified rate, Tomado not
Wiper trip time	1.52 hr
Solids volume in the well after wiper trip	1.3 bbl
Solids mass in the well after wiper trip	684.9 lb

Volume of Fluids Pumped During Penetration, Circulation & Wiper Trip:

Gas volume	948832.7 scf
Liquid Volume	2846.5 bbl
Penetration, Circulation & Wiper Trip time	52.71 hr

Flow Summary

SUMMARY OF FLOW RESULTS

Produced Fluids

Pressure known at:
Production Mode:
Fluid Composition:

Perforations
No Production
Oil and Gas

Circulated Fluids

Fluid Composition:
Liquid:
Solids:
Gas:
Circulation Point:
HHP Required :

Nitrified Water
0.90 *bbl/min*
0.00 *bbl/min*
300.0 *scf/min*
2759.00 *m*
43.10 *KW*

COMPLETION:

Wellhead Pressure.....	86.9 <i>psi g</i>
Hydrostatic pressure loss.....	865.3 <i>psi</i>
Friction pressure loss.....	588.6 <i>psi</i>
Kinetic pressure loss.....	0.3 <i>psi</i>
Restriction pressure loss.....	0.9 <i>psi</i>
Equivalent Circulation Density[ECD]...	6.32 <i>lb/gal (US)</i>

Perforation Pressure.....	1542.0 <i>psi g</i>
Hydrostatic pressure loss.....	150.8 <i>psi</i>
Friction pressure loss.....	1.0 <i>psi</i>
Kinetic pressure loss.....	-0.1 <i>psi</i>

Bottom Hole Pressure.....	1693.8 <i>psi g</i>
---------------------------	---------------------

FROM CIRCULATION POINT TO WELLHEAD:

Liquid transit time.....	21 <i>min</i>
Gas transit time.....	16 <i>min</i>
Annular volume.....	41.5 <i>bbl</i>
Volume below circulation point.....	36.7 <i>bbl</i>

Total liquid volume.....	59.3 bbl
Total gas volume.....	18.9 bbl
(Surface equivalent).....	5416.9 scf

WORKSTRING:

Liquid:	1296.0 bbl/day
Gas:	0.43 MMscf/day
Pressure at reel rotating joint.....	2606.8 psi g
Friction pressure loss on reel.....	980.6 psi

Pressure inside WS at Gooseneck.....	1626.2 psi g
Hydrostatic pressure loss.....	-1222.4 psi
Friction pressure loss.....	1091.7 psi
Equivalent Circulation Density[ECD]...	0.56 lb/gal (US)

BHA total pressure loss	194.2 psi
BHA Hydrostatic loss	-0.3 psi
BHA Friction loss	0.3 psi
Nozzle	194.2 psi

Circulation Point pressure	1562.8 psi g
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FROM REEL ROTATING JOINT TO CIRCULATION POINT:

Liquid transit time.....	14 min
Gas transit time.....	15 min
Displacement Volume.....	19.8 bbl
Internal Volume.....	20.3 bbl
Internal liquid volume.....	12.9 bbl
Internal gas volume.....	7.4 bbl
(Surface equivalent).....	4488.2 scf

Length of Workstring on reel.....	1311.91 m
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Flow State

Measured Depth[Flow] <i>m</i>	Temperature	Completion Pressure	Workstring Pressure	Concentric Pressure	Completion Liquid Velocity <i>ft/min</i>	Workstring Liquid Velocity <i>ft/min</i>	Concentric Liquid Velocity <i>ft/min</i>
0.0	86.0	86.9	1626.2	0.0	1953	1050	0
15.9	87.5	103.4	1631.1	0.0	1726	1050	0
42.7	89.9	129.0	1639.3	0.0	1479	1051	0
69.5	92.4	152.7	1647.5	0.0	1317	1052	0
96.4	94.8	175.4	1655.6	0.0	1200	1054	0
123.2	97.2	197.4	1663.5	0.0	1111	1056	0
150.0	99.6	218.9	1671.1	0.0	1246	1060	0
165.4	101.0	231.2	1675.3	0.0	1004	1063	0
192.2	103.3	252.1	1682.4	0.0	952	1065	0
219.0	105.7	272.8	1689.5	0.0	908	1067	0
245.8	108.0	293.3	1696.3	0.0	869	1070	0
272.7	110.3	313.6	1702.8	0.0	836	1074	0
299.5	112.5	333.7	1708.8	0.0	807	1078	0
326.3	114.7	353.6	1714.4	0.0	781	1082	0
353.1	116.8	373.4	1719.6	0.0	758	1085	0
380.0	119.0	393.0	1724.4	0.0	738	1088	0
406.8	121.0	412.5	1728.9	0.0	719	1090	0
433.6	123.1	431.9	1733.3	0.0	702	1093	0
460.4	125.1	451.1	1737.1	0.0	687	1096	0
487.2	127.1	469.9	1740.2	0.0	673	1099	0
514.1	128.9	488.4	1742.7	0.0	660	1102	0
540.9	130.7	506.4	1744.4	0.0	648	1104	0
567.7	132.4	523.9	1745.3	0.0	638	1105	0

Flow State (continued)

Measured Depth[Flow] <i>m</i>	Temperature	Completion Pressure	Workstring Pressure	Concentric Pressure	Completion Liquid Velocity <i>ft/min</i>	Workstring Liquid Velocity <i>ft/min</i>	Concentric Liquid Velocity <i>ft/min</i>
594.5	134.0	540.9	1745.3	0.0	628	1105	0
621.4	135.6	557.5	1744.7	0.0	619	1104	0
648.2	137.1	574.1	1744.0	0.0	611	1105	0
675.0	138.7	590.7	1743.3	0.0	639	1107	0
690.8	139.6	600.6	1742.9	0.0	598	1107	0
717.6	141.1	617.2	1742.0	0.0	591	1109	0
744.4	142.7	633.9	1741.1	0.0	584	1110	0
771.3	144.2	650.4	1740.0	0.0	577	1110	0
798.1	145.7	666.8	1738.7	0.0	571	1111	0
824.9	147.2	683.4	1737.4	0.0	565	1113	0
851.7	148.7	700.2	1736.3	0.0	559	1115	0
878.6	150.2	716.9	1735.1	0.0	554	1116	0
905.4	151.7	733.6	1733.7	0.0	549	1117	0
932.2	153.2	750.0	1740.2	0.0	544	947	0
959.0	154.6	766.0	1746.1	0.0	539	948	0
985.8	155.9	781.6	1751.4	0.0	535	948	0
1012.7	157.2	796.8	1756.2	0.0	531	949	0
1039.5	158.5	811.7	1760.5	0.0	527	949	0
1066.3	159.7	826.3	1764.4	0.0	523	950	0
1093.1	160.8	840.4	1767.6	0.0	520	950	0
1120.0	161.9	854.1	1770.3	0.0	516	951	0
1146.8	162.9	867.3	1772.4	0.0	513	951	0
1173.6	163.9	880.0	1773.7	0.0	511	951	0

Flow State (continued)

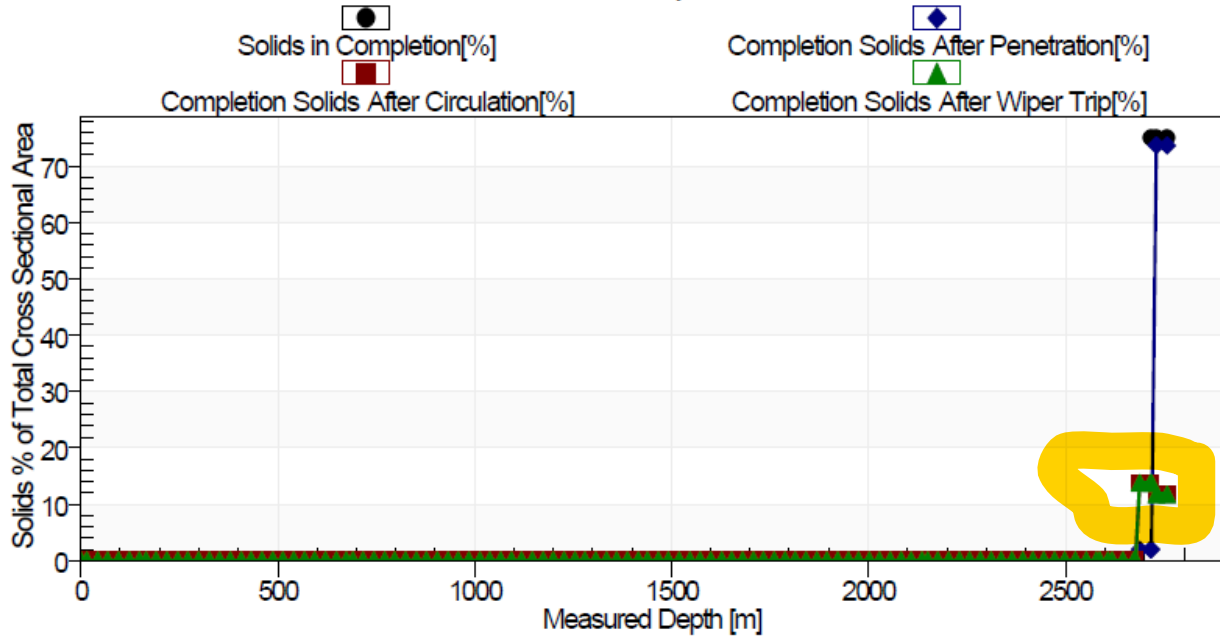
Measured Depth[Flow] <i>m</i>	Temperature	Completion Pressure	Workstring Pressure	Concentric Pressure	Completion Liquid Velocity <i>ft/min</i>	Workstring Liquid Velocity <i>ft/min</i>	Concentric Liquid Velocity <i>ft/min</i>
1814.1	182.6	1150.2	1762.5	0.0	464	966	0
1841.0	183.5	1162.1	1762.7	0.0	463	967	0
1867.8	184.3	1174.1	1762.9	0.0	461	967	0
1894.6	185.2	1186.2	1763.3	0.0	460	968	0
1921.4	186.1	1198.3	1763.6	0.0	458	968	0
1948.2	186.9	1210.1	1763.7	0.0	457	969	0
1975.1	187.7	1221.9	1763.6	0.0	455	970	0
2001.9	188.6	1233.6	1763.4	0.0	454	970	0
2028.7	189.3	1245.0	1762.9	0.0	453	971	0
2055.5	190.1	1256.2	1762.3	0.0	451	971	0
2082.4	190.9	1267.3	1761.4	0.0	450	972	0
2109.2	191.6	1278.2	1760.4	0.0	449	972	0
2136.0	192.3	1289.2	1759.4	0.0	475	973	0
2149.8	192.7	1294.9	1758.9	0.0	447	974	0
2176.7	193.5	1305.9	1757.9	0.0	446	974	0
2203.5	194.2	1316.9	1757.0	0.0	445	975	0
2230.3	195.0	1328.1	1756.2	0.0	444	976	0
2257.1	195.7	1338.8	1754.9	0.0	443	976	0
2284.0	196.4	1349.8	1753.8	0.0	442	977	0
2310.8	197.2	1361.6	1753.8	0.0	441	978	0
2337.6	198.1	1374.0	1754.3	0.0	440	978	0
2364.4	199.0	1386.1	1754.4	0.0	439	979	0
2391.2	199.8	1397.9	1754.3	0.0	438	979	0

Flow State (continued)

Measured Depth[Flow] <i>m</i>	Temperature	Completion Pressure	Workstring Pressure	Concentric Pressure	Completion Liquid Velocity <i>ft/min</i>	Workstring Liquid Velocity <i>ft/min</i>	Concentric Liquid Velocity <i>ft/min</i>
2418.1	200.6	1409.9	1754.3	0.0	436	980	0
2444.9	201.5	1421.8	1754.2	0.0	435	981	0
2471.7	202.3	1433.8	1754.2	0.0	434	981	0
2498.5	203.1	1445.6	1754.1	0.0	433	982	0
2525.4	204.0	1457.7	1754.2	0.0	433	982	0
2552.2	204.8	1469.8	1754.3	0.0	432	983	0
2579.0	205.7	1481.9	1754.5	0.0	457	983	0
2587.0	205.9	1485.7	1754.6	0.0	516	984	0
2607.0	206.6	1494.8	1754.7	0.0	515	984	0
2619.4	206.9	1500.4	1754.6	0.0	429	984	0
2646.2	207.7	1512.0	1754.2	0.0	428	985	0
2673.0	208.6	1524.1	1754.2	0.0	564	985	0
2678.0	208.7	1526.7	1754.3	0.0	427	986	0
2688.2	209.1	1531.0	1754.6	0.0	32	986	0
2715.0	210.0	1542.0	1755.4	0.0	32	986	0
2717.0	210.1	1542.8	1755.4	0.0	51	986	0
2731.3	210.6	1549.4	1755.8	0.0	184	987	0
2758.1	211.5	1562.4	1757.0	0.0	183	987	0
2758.4	211.5	1562.5	1757.0	0.0	183	987	0
2758.7	211.5	1562.7	1757.1	0.0	183	987	0
2759.0	211.5	1562.8	1757.1	0.0	183	9988	0
2774.8	212.1	1571.3	0.0	0.0	0	0	0
2801.6	213.0	1585.1	0.0	0.0	0	0	0

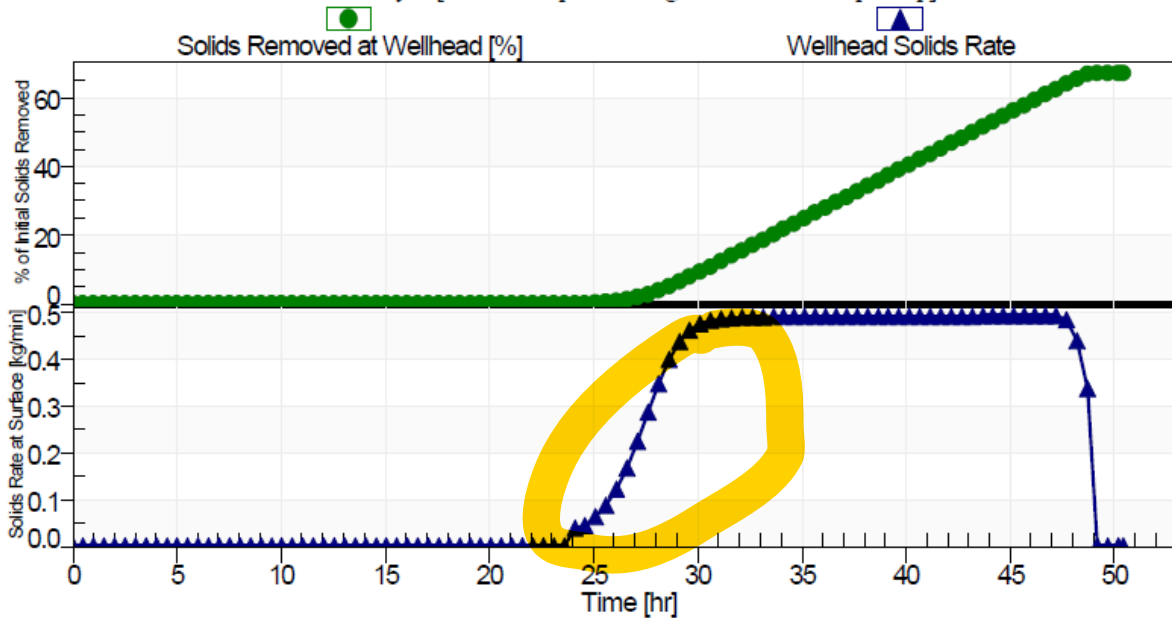
Solids Bulk Cross Sectional Area

CTran Analysis



Solids Removal after Penetration to Target Depth

CTran Analysis [Transient response during Circulation and Wiper Trip]



Tripping Speed to be used while Pulling Out of Hole
CTran Analysis

