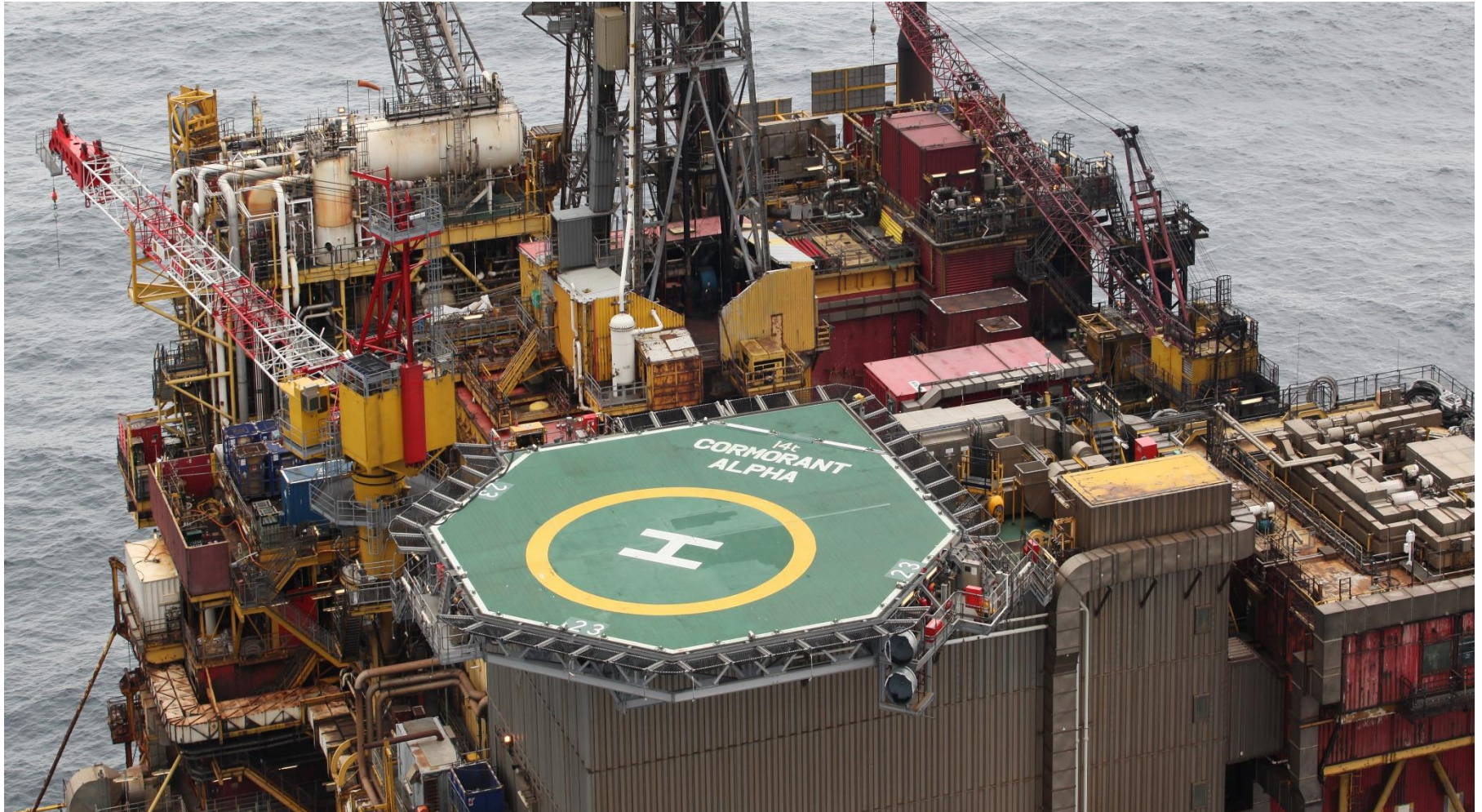


Pelican PU-P16S1 Abandonment Summary



Darren Bewick
Senior Completions & Interventions Engineer



Agenda



- Introduction to P16 & its challenges
- Access to reservoir
- Completion recovery
- Final abandonment status

Introduction to PU-P16S1

- Drilled from window at 9,735ft to TD at 12,858ft.
- 7" x 5 1/2" liner (inclination 42° to 4° to 26° to 19°). Shoe @ 12,845ft, hanger @ 9,546ft. Completion seals into liner PBR.
- In 2004 tubing to annulus communications.
- 2005. Rig Well Intervention found collapsed tubing @ 2578ft (3.6" x 5.3") over 20ft & tubing to casing contact by METT log. So casing may be collapsed. Base oil pumped & returns up annulus. 3.5" drift passed through to 9507ft (Venturi). Unable to determine if leak from collapsed tubing or seal stack
- 2005. Two inflow tests of the SCSSSV were performed which confirmed integrity of the tubing above the safety valve.
- Continued to flow well under a dispensation.
- 2009. Attempted injectivity tests, Up to MAASP of 2,400psi – no injectivity. Performed scale dissolver in tree Displaced 70/30 glycol mix – no injection. Displaced 2 x scale dissolver, gradually displaced treatment through perms. Flowed well. Displaced scale inhibitor into well.
- Continued to flow well under a dispensation until late 2010.
- 2012 under a review of well status, a prohibition notice was placed on the well.

MD (ft)	TD (ft)	DIAGRAM	DESCRIPTION	ID (in)	OD (in)	DRIFT (in)	LENGTH (ft)	COMMENTS
583	583		TOP OF 18-3/4" HOUSING	4.75	18.6			
586	586		TUBING HANGER CAMERON DUAL C/W 4-3/4" AF AND 1-7/8" AF HANGER PROFILES	1.875				
			SECONDARY BORE					
591	591		ANNULUS TRSSSV HALLIBURTON CP-1 C/W 1.875 X PROFILE S/N SHCP-18	1.875	4.004			
592	592		SEALED					
603	603		ANNULUS WEG	1.76	2.626			
2473	2483		TRSSSV HALLIBURTON SP-2 C/W 4.625" RQ PROFILE S/N SHSP-106	4.625	8.213			
2578	2585		HUD 4.35" SCALE CATCHER (SLICKLINE DEPTH)					*** COLLAPSED TUBING ***
2605	2605		USIT LOG INDICATES TUBING COLLAPSED (E LINE DEPTH)					
			CASING CROSSOVER 10-3/4" X 9-5/8"					
3758	3756		SPM 5-1/2" CAMCO 3/16" R-20 UNLOADING VALVE, C/W RM LATCH (PORT DEPTH)	4.591	7.76			SPM VALVE SERIAL NUMBERS
								VALVE TYPE SERIAL NUMBER
								1 UNLOADING BNG2477
								2 UNLOADING SQ03321
								3 UNLOADING BNG2476
								4 ORIFICE BNG5127
6129	5954		SPM 5-1/2" CAMCO 1/4" N-17R UNLOADING VALVE, C/W RM LATCH (PORT DEPTH)	4.618	7.778			
7805	7400		SPM 5-1/2" CAMCO 5/16" R-20 UNLOADING VALVE, C/W RM LATCH (PORT DEPTH)	4.616	7.774			
8860	8206		SPM 5-1/2" CAMCO 3/8" O-21R ORIFICE VALVE, C/W RM LATCH (PORT DEPTH)	4.617	7.78			
8920	8251		WATERCUT GAUGE MANIREL WOOD GROUP	885				
9459	8853		TOP OF CEMENT					
9508			HUD 3.5" DRIFT TO VENTURI (SLICKLINE DEPTH)					
9511	8688		FLOW METER GAUGE MANUAL 5-1/2" WOOD GROUP C/W 0.817" NOZZLE INSTALLED	4.19	7.965			
9546	8717		TOP OF LINER					
9564	8725		LINER TOP SEAL ASSEMBLY BAKER (DEPTH TO G-22 LOCATOR) C/W DEBRIS BARRIER, 6	4.856	7.175			
			SETS OF V/RYTE AND MOLYGLASS SEALS					
9630	8777		MULESHOE 5-1/2"	4.892	5.9			
			LINER 7" VAM TOP HT 29 LB/FT 13% Cr L80	6.184	7.644			
9735	8853		TOP OF WINDOW					
9751	8865		BOTTOM OF WINDOW					
9782	8888		LINER CROSSOVER 7" X 5-1/2"					
9858	8946		TOP OF CEMENT					
12370	11288		PIP TAG OF PUP JOINT					
12690	11585		LANDING COLLAR 5-1/2"					
12845	11744		LINER SHOE 5-1/2"					
12858	11744		TD					

Minimum safe abandonment depth

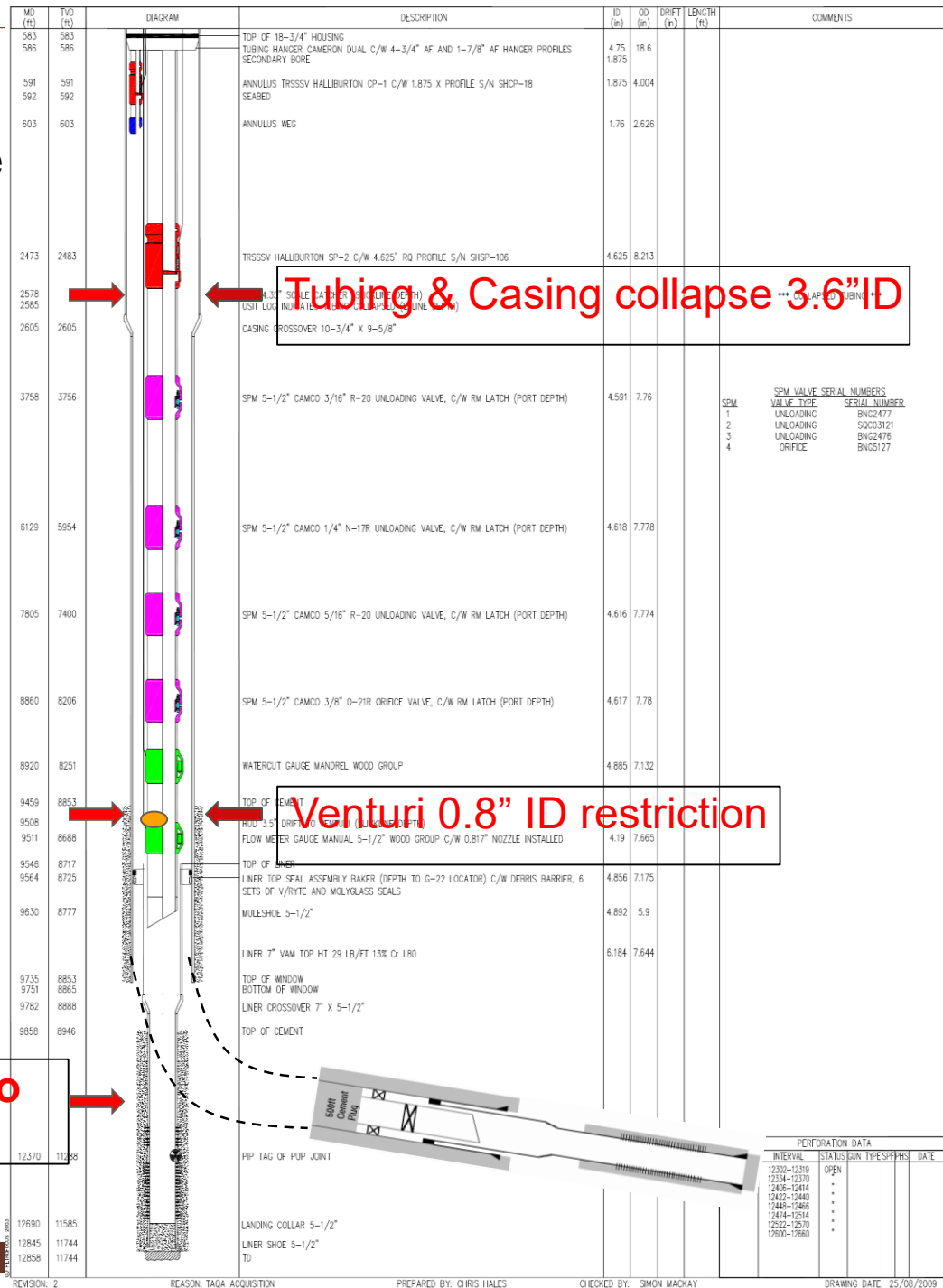
SPM Cement Plug

PERFORMANCE DATA			
INTERVAL	STATUS	IN TYPE	DATE
12300-12319	OPEN		
12319-12370	*		
12370-12410	*		
12410-12440	*		
12440-12465	*		
12465-12490	*		
12490-12514	*		
12514-12570	*		
12570-12600	*		

PU-P16S1 – Well ISSUES

- Original well bore isolation can not be classed as primary barrier for permanent abandonment therefore need two barriers above 9-5/8" shoe.
- Tubing to Annuli communication
- Potential scale denying access
- Potential issues in the recovery of damaged tubing.
- Would also need to 'open up' the 10-3/4" casing to get tubing out if collapsed.
- Bottom line is that the well needed a base to safely carry out operations to place abandonment plugs due to the potential issues with tubing & casing collapse.

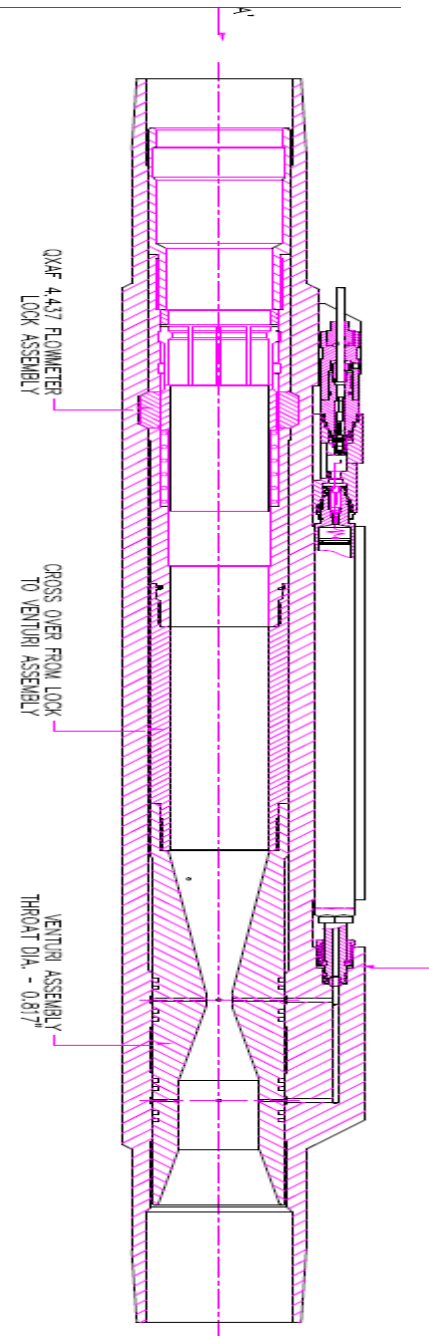
We need to get access to here



Lower Tubing Restriction

- Tubing restriction preventing access to reservoir
 - Flowmeter Gauge / Mandrel set at 9,511ft.
 - **0.817" ID through Venturi, (About the size of a 20p piece).**
 - Lock is not anti rotational so whole assembly would spin whilst milling however some resistance would be given by the dogs in the profile and the two sets of o-rings on the venturi mandrel.
 - Run on QXAF Uniset Lock Mandrel, body **OD 4.477"**.
 - Tubing Restriction **3.6" ID**.

NOTE: -MATERIAL 17-4 PH CONDITION H1150+1150 HARDNESS 29-33 Rc
MIN YIELD 105,000 PSI TO NACE MR-01 75(LATEST REV).



Lower Tubing Restriction- Tractor Milling Trials



- 4.437" QXAF Lock c/w venturi mandrel did not exist so a duplicate for the Tractor Milling trials had to be manufactured.
- Test Fixture had to be manufactured.
- Anti rotation sleeve designed and manufactured from lessons learned during onshore tractor milling trials.

Lower Tubing Restriction- Mill bits tried during trials

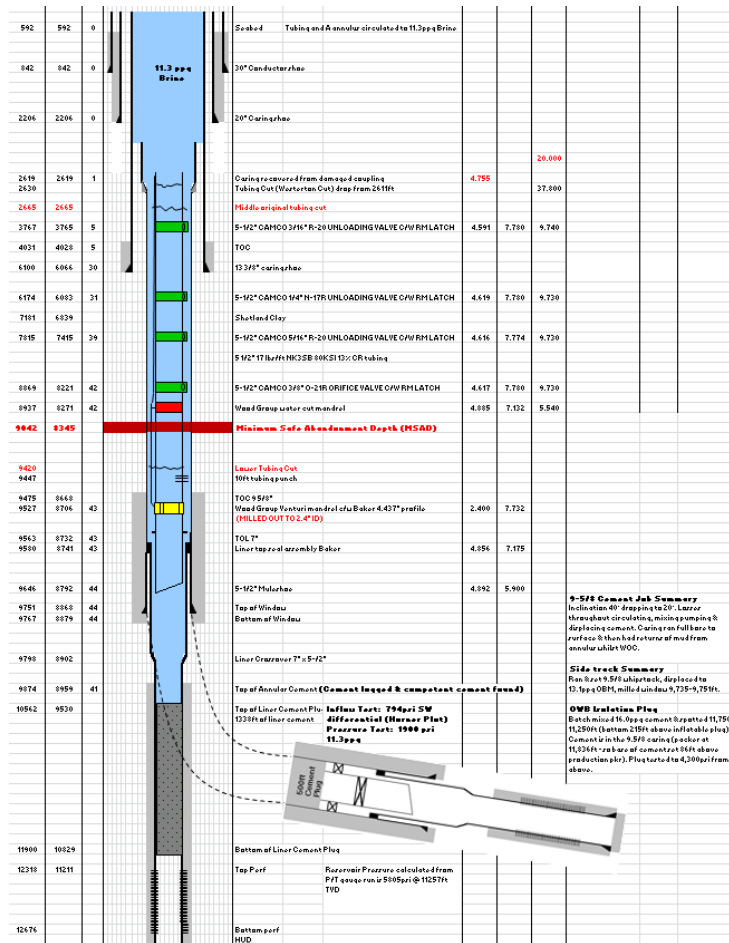
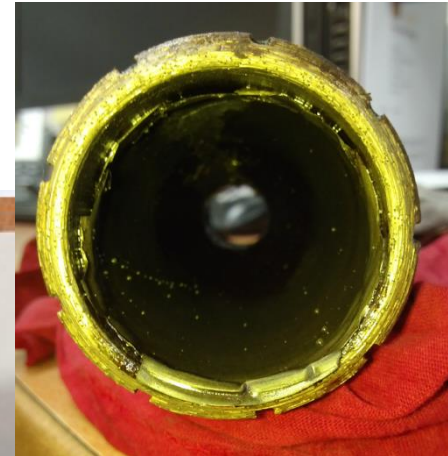


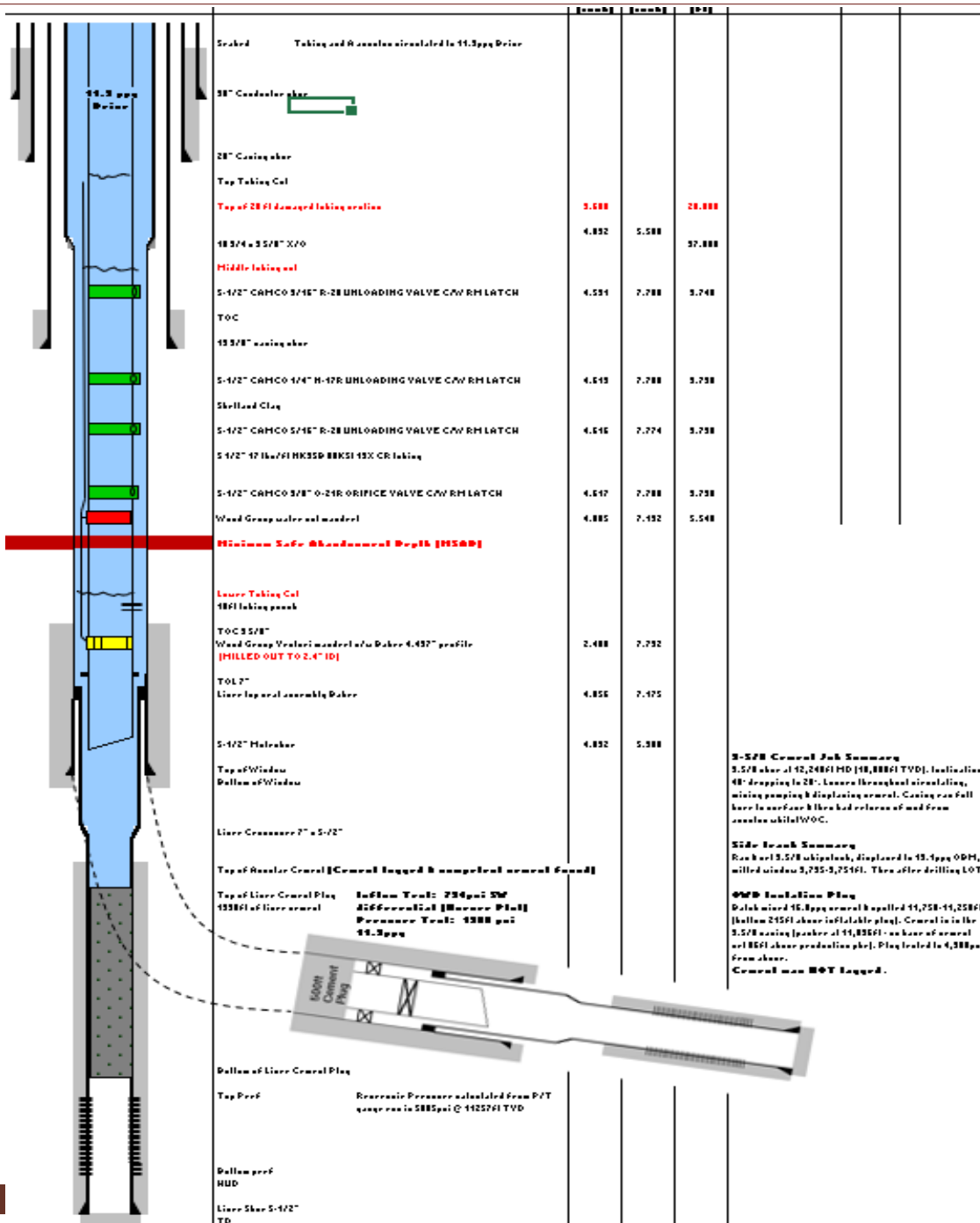
- CT could not be used for milling as assembly rotated.
- Cementing up assembly ruled out due to need to keep hole to allow bull heading if no access was achieved.

Lower Tubing Restriction- Offshore Tractor Milling



- Nine runs in total (Inc setting anti rotation sleeve)
- Three miss runs
- Three milling runs giving a total effective milling time of 64 hours

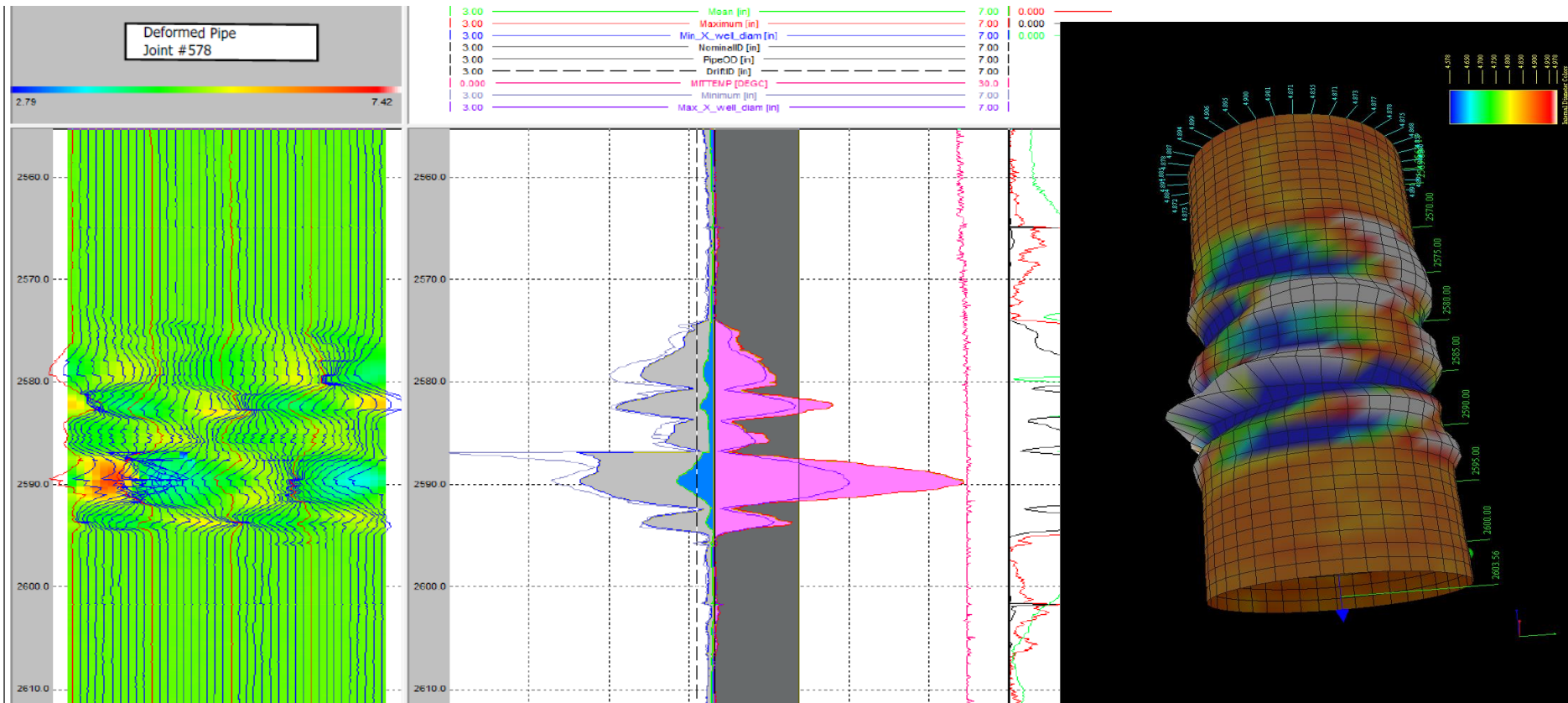




Cut tubing in three places:-

- One deep
- One below damaged section
- One above damaged section

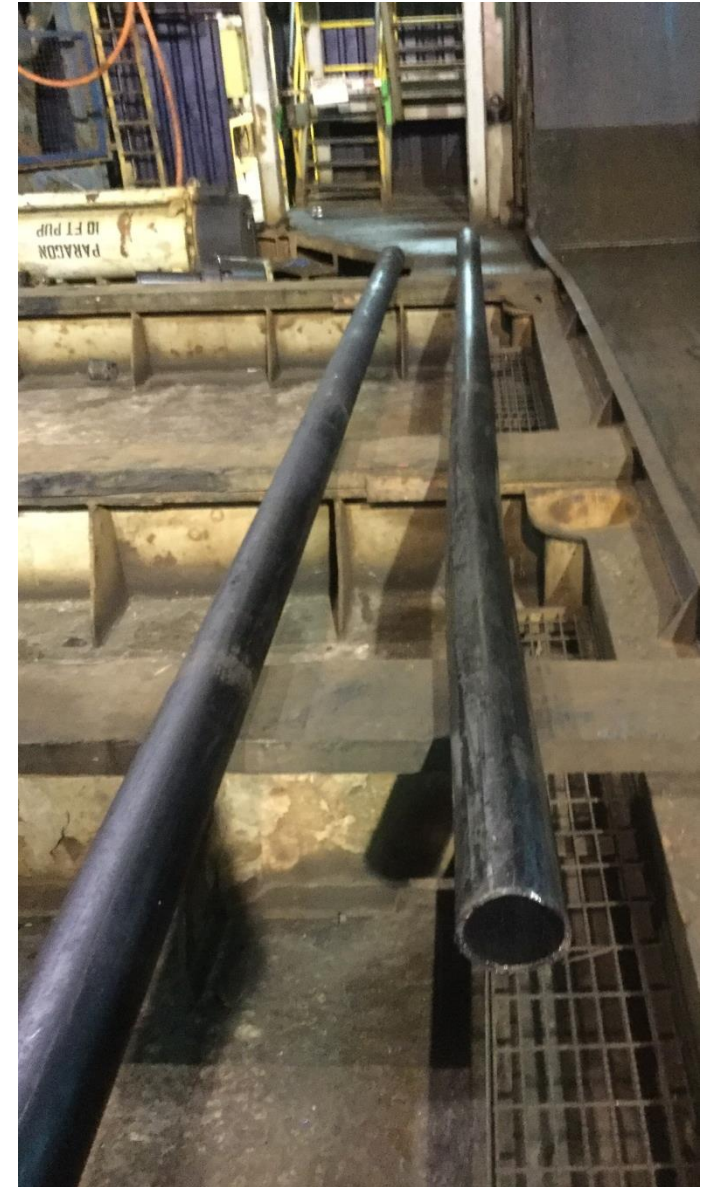
Tubing restriction calliper results



- Two additional tubing cuts (5 in total) required to fish damaged tubing section.
- One with a blade cutter (above coupling) and one with a power cutter (mid damage)

Completion Tubing Fish #1 Recovered 2538-2601 ft

- Bent and Ovalled
- 55 ft Gauge Line recovered on separate run



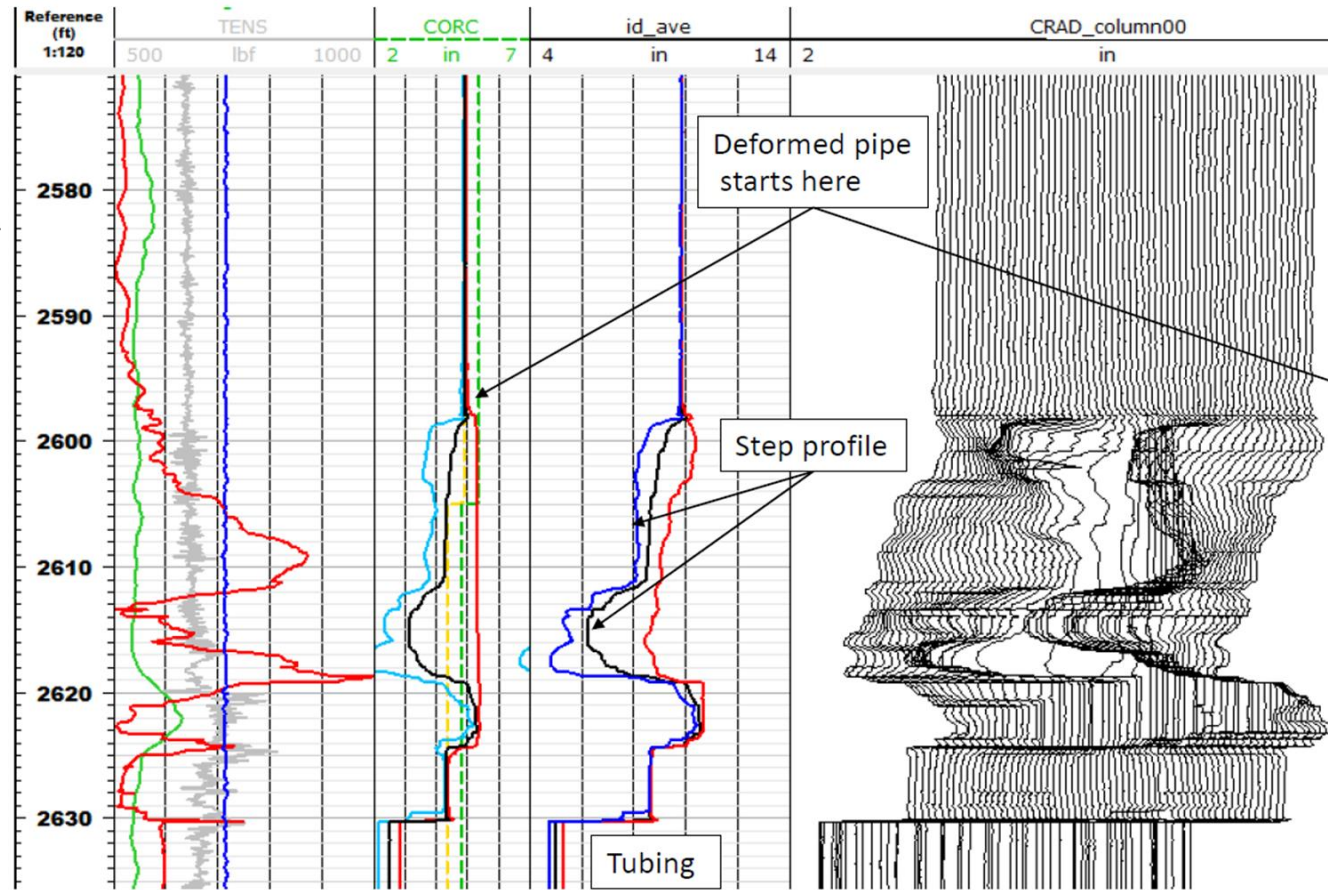
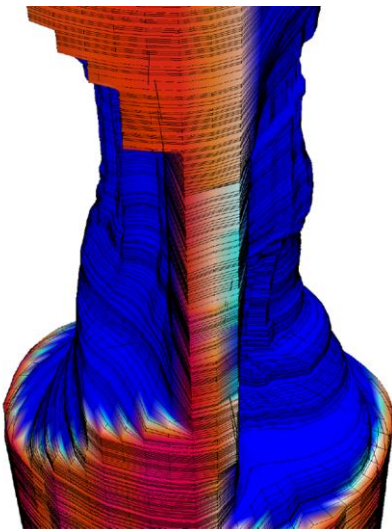
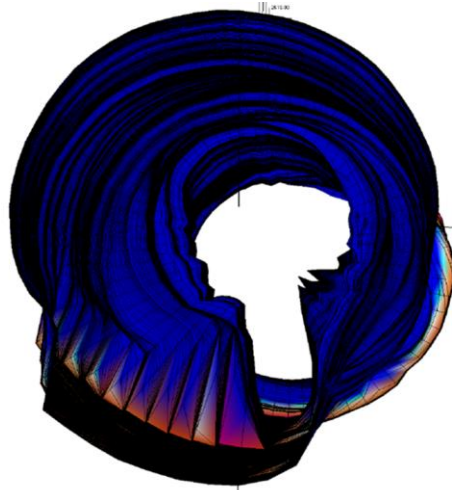
Completion Tubing Fish #2 Recovered 2601-2611 ft



- Ovalled and Split (3 ft from lower end). 5 ft Gauge Line recovered



10-3/4" casing collapse 5.26" id



- 3 sizes of casing swages tried from 8-1/8" down to 6-3/8"
- Only 8ft of 20ft damaged section opened up



Damaged Casing Recovery

Step 1: Starting Point

- Damaged Tubing recovered from 2611ft
- Restriction in 10-3/4" Casing from 2595ft
- Casing restriction 5.26" Min ID
- Expected length of damaged casing is 20ft
- Tubing cuts at 2616ft, 2665ft & 9420ft
- HUD 3.5" 2623ft inside 5-1/2" tubing

Step 2: Cut Casing

Hazards:

- Making cut on first attempt
- Damage to 13-3/8"

DEPTH AHBDF	DEPTH TVBDF	INC Deg	SCHEMATIC	DESCRIPTION
592	592	0		Seabed Tubing and A annulus circulated to 11.3ppg Brine
842	842	0		30" Conductor shoe
2206	2206	0		20" Casing shoe
2595	2595			Start of Casing ID restriction
2611	2611			5-1/2" Tubing recovered from 2611ft (damaged section)
2616	2616			5-1/2" Tubing Cut (Westerton Cut)
2619	2619	1		Damaged Casing (10-3/4" x 9-5/8" x/o)
2665	2665			Middle tubing cut
3767	3765	5		5-1/2" CAMCO 3/16" R-20 UNLOADING VALVE C/W RM LATCH
4031	4028	5		TOC
6100	6066	30		13 3/8" casing shoe

DEPTH AHBDF	DEPTH TVBDF	INC Deg	SCHEMATIC	DESCRIPTION
592	592	0		Seabed Tubing and A annulus circulated to 11.3ppg Brine
842	842	0		30" Conductor shoe
2206	2206	0		20" Casing shoe
2595	2595			Start of Casing ID restriction
2611	2611			5-1/2" Tubing recovered from 2611ft (damaged section)
2616	2616			5-1/2" Tubing Cut (Westerton Cut)
2619	2619	1		Damaged Casing (10-3/4" x 9-5/8" x/o)
2665	2665			Middle tubing cut
3767	3765	5		5-1/2" CAMCO 3/16" R-20 UNLOADING VALVE C/W RM LATCH
4031	4028	5		TOC
6100	6066	30		13 3/8" casing shoe



Step 3: Circulate Annulus Contents

Hazards:

- Large volume of slops created and fluids required with limited handling capacity
- Ability to lift out annulus contents

AHBDF	DEPTH TVBDF	INC Deg	SCHEMATIC	DESCRIPTION
592	592	0		Seabed Tubing and A annulus circulated to 11.3ppg Brine
842	842	0		30" Conductor shoe
2206	2206	0		20" Casing shoe
2595	2595			10-3/4" Casing cut
2595	2595			Start of Casing ID restriction
2611	2611			5-1/2" Tubing recovered from 2611ft (damaged section)
2616	2616			5-1/2" Tubing Cut (Westerton Cut)
2619	2619	1		Damaged Casing (10-3/4" x 9-5/8" x/o)
2665	2665			10 3/4 x 9 5/8" X/O
3767	3765	5		Middle tubing cut
4031	4028	5		5-1/2" CAMCO 3/16" R-20 UNLOADING VALVE C/W RM LATCH
6100	6066	30		TOC
				13 3/8" casing shoe

DEPTH AHBDF	DEPTH TVBDF	INC Deg	SCHEMATIC	DESCRIPTION
592	592	0		Seabed Tubing and A annulus circulated to 11.3ppg Brine
842	842	0		30" Conductor shoe
2206	2206	0		20" Casing shoe
2595	2595			10-3/4" Casing cut
2595	2595			Start of Casing ID restriction
2611	2611			5-1/2" Tubing recovered from 2611ft (damaged section)
2616	2616			5-1/2" Tubing Cut (Westerton Cut)
2619	2619	1		Damaged Casing (10-3/4" x 9-5/8" x/o)
2665	2665			10 3/4 x 9 5/8" X/O
3767	3765	5		Middle tubing cut
4031	4028	5		5-1/2" CAMCO 3/16" R-20 UNLOADING VALVE C/W RM LATCH
6100	6066	30		TOC
				13 3/8" casing shoe

Step 4: Recover Casing

Hazards:

- Additional length of casing recovered
- Damage or restrictions within the 13-3/8" casing



Step 5: Mill Damaged Production Casing

Hazards:

- Ability to mill damaged casing
- Milling 13-3/8" casing
- Swarf handling

DEPTH AHBDF	DEPTH TVBDF	INC Deg	SCHEMATIC	DESCRIPTION
592	592	0		Seabed Tubing and A annulus circulated to 11.3ppg Brine
842	842	0		30" Conductor shoe
2206	2206	0		20" Casing shoe
2595	2595			10-3/4" Casing cut
2595	2595			Start of Casing ID restriction
2611	2611			5-1/2" Tubing recovered from 2611ft (damaged section)
2616	2616			5-1/2" Tubing Cut (Westerton Cut)
2619	2619	1		Damaged Casing (10-3/4" x 9-5/8" x/o)
2619	2619	1		10 3/4 x 9 5/8" X/O
2665	2665			Middle tubing cut
3767	3765	5		5-1/2" CAMCO 3/16" R-20 UNLOADING VALVE C/W RM LATCH
4031	4028	5		TOC
6100	6066	30		13 3/8" casing shoe

DEPTH AHBDF	DEPTH TVBDF	INC Deg	SCHEMATIC	DESCRIPTION
592	592	0		Seabed Tubing and A annulus circulated to 11.3ppg Brine
842	842	0		30" Conductor shoe
2206	2206	0		20" Casing shoe
2595	2595			10-3/4" Casing cut
2595	2595			Start of Casing ID restriction
2611	2611			5-1/2" Tubing recovered from 2611ft (damaged section)
2616	2616			5-1/2" Tubing Cut (Westerton Cut)
2619	2619	1		Damaged Casing (10-3/4" x 9-5/8" x/o)
2619	2619	1		10 3/4 x 9 5/8" X/O
2665	2665			Middle tubing cut
3767	3765	5		5-1/2" CAMCO 3/16" R-20 UNLOADING VALVE C/W RM LATCH
4031	4028	5		TOC
6100	6066	30		13 3/8" casing shoe

Step 6: Mill Damaged Production Casing & Tubing to below damaged area

Hazards:

- Ability to mill casing and tubing concurrently
- Tubing rotating
- Swarf handling



DEPTH AHBDF	DEPTH TVBDF	INC Deg	SCHEMATIC	DESCRIPTION
592	592	0		Seabed Tubing and A annulus circulated to 11.3ppg Brine
842	842	0		30" Conductor shoe
2206	2206	0		20" Casing shoe
2595				10-3/4" Casing cut
2595	2595			Start of Casing ID restriction
2611	2611			5-1/2" Tubing recovered from 2611ft (damaged section)
2616	2616			5-1/2" Tubing Cut (Westerton Cut)
2619	2619	1		Damaged Casing (10-3/4" x 9-5/8" x/o)
				10 3/4 x 9 5/8" X/O
2665	2665			Middle tubing cut
3767	3765	5		5-1/2" CAMCO 3/16" R-20 UNLOADING VALVE C/W RM LATCH
4031	4028	5		TOC
6100	6066	30		13 3/8" casing shoe
6174	6083	31		5-1/2" CAMCO 1/4" N-17R UNLOADING VALVE C/W RM LATCH
7181	6839			Shetland Clay
7815	7415	39		5-1/2" CAMCO 5/16" R-20 UNLOADING VALVE C/W RM LATCH
				5 1/2" 17 lbs/ft NK3SB 80KSI 13% CR tubing
8869	8221	42		5-1/2" CAMCO 3/8" O-21R ORIFICE VALVE C/W RM LATCH
8937	8271	42		Wood Group water cut mandrel
9042	8345			Minimum Safe Abandonment Depth (MSAD)
9420				Lower Tubing Cut
9447				10ft tubing punch
9475	8668			TOC 9 5/8"
9527	8706	43		Wood Group Venturi mandrel c/w Baker 4.437" profile (MILLED OUT TO 2.4" ID)
9563	8732	43		TOL 7"
9580	8741	43		Liner top seal assembly Baker

Step 7: Recover Remaining Tubing

Hazards:

- Re-engaging tubing
- Production casing damage more extensive than tubing damage with further restrictions

Recovered Casing



Final abandonment status.

