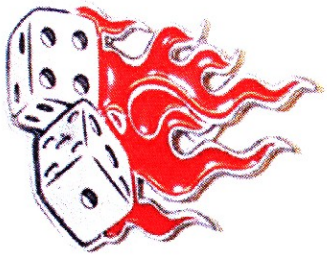
Santos

CASINO DEVELOPMENT



COMPLETION PROGRAMME
CASINO 5

CD 4000-P15-006

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Casino 5 Completion Programme			
REVIEW AND APPROVALS			
Name	**Position**	**Signature**	**Date**
Brett Darley	Manager – Drilling and Completions Offshore Australia (Approval)		20/6/5
Peter Dodd	Completions Team Leader (Approval)		20/6/05
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TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Scope

The Casino Completion Programme details the procedures and references required for the installation of the Casino 5 lower and upper completions. A summary of the scope of work covered by this document is as follows:

- Install lower completion comprising packer, tubing & sand screens in 8 ½" horizontal hole;
- Install upper completion and tubing hanger using landing string;
- Clean-up and flow well;
- Suspend.

Following completion of the work scope, Casino 5 will be suspended in readiness for tie-in and well commissioning.

1.2 Safety Framework

The systems which Santos will use during the Casino Drilling and Completions campaign are described in the Casino Drilling and Completions EHSMS; document number CD-4000-P03-003.

- The Hazard Identification Workshop Report details hazards identified specific to the upper completion programme. The Completions HAZID Recommendations Close Out Report provide details of the actions undertaken to reduce associated risk. Both documents should be reviewed by all Santos Offshore Supervisors prior to commencement of completions.
- All documents must be readily available to all personnel on the rig in both hard and soft format.

1.3 Document Structure

This document provides the overall procedures and references to complete the work scope given in Section 1.1. It does not include detailed instruction on the following:

- Subsea Tree Installation.
- BOP Stack Running and Retrieval.

These are provided in a separate document, Casino Development Installation & Retrieval Procedures for Subsea XT, BOP Installation CD-2200-P07-001 and must be read in conjunction with the Completion Programme where indicated.

1.4 Barrier Status

At the start of each section a barrier status table is provided. A Barrier Status table in the body of the programme indicates there has been a change to either the primary or secondary barrier. The barriers for all following activities will remain unchanged until the next Barrier Status table is observed within the body of the programme.

1.5 Santos Completions and Subsea Supervision

At any given time during the completions phase there maybe a Santos Drilling Supervisor, Santos Completions Supervisor and Santos Subsea Supervisor on board. The Santos Completions

Supervisors and Subsea Supervisors will be responsible for ensuring the lower and upper completion procedures are followed by all relevant parties. Both the Completions and Subsea Supervisors will report to the Senior Drilling Supervisor, who has ultimate responsibility over the operation.

Any queries should be addressed to the Completions Team Leader. Any changes to the work scope in this programme will be done in accordance with the Santos Drilling and Completions Change Control Procedure.

The Subsea Supervisor is responsible for ensuring all subsea components of the programme are completed as specified, including tree installation and testing, tubing hanger installation, landing string operations and debris cap installation.

The Completions Supervisor is responsible for ensuring all components of the programme are completed as specified.

When not directly involved in operations, the Subsea and Completions Supervisors will be undertaking equipment preparation for upcoming operations and assisting where required.

All pressure testing and valve functioning operations will be witnessed, signed-off and documented by either the Subsea or Completions Supervisor, dependent on the scope of work being performed.

Both the Completions and Subsea Supervisors will liaise with the Offshore Logistics Coordinator and Senior Drilling Supervisor for all material and personnel movements.

1.6 Preparation

Preparation details for specific equipment are provided immediately prior to each section of the programme. The Completions and Subsea Supervisors must review the equipment preparation (taking into account the lead time required) for each section of the programme prior to commencing completions operations.

It is the responsibility of the Completions and Subsea Supervisor to ensure all equipment preparation and personnel mobilisation is completed off rig critical path wherever possible.

1.7 Reporting and Record Management

The Subsea Supervisor is responsible for ensuring all relevant reporting requirements are fulfilled , including documentation submitted to the Completions Supervisor for inclusion in Daily Completions Reports and end of well filing.

The Completions Supervisor is responsible for ensuring reporting requirements are fulfilled, the submission of the Daily Report and compilation of documentation for end-of-well filing and well handover.

The Completions Supervisor is responsible for collating all documentation relating to the completions, including but not limited to:

- Final Subsea Tree and Downhole Schematic “as built”.
- Final Valve Status Schematic.
- Service Company Reports.
- Pressure Test Charts/Results.
- Tubing Make-Up Charts.

- Valve Operation Results.
- Tallies and Space-Out Schematics.
- Non-Conformances.
- Lessons Learnt/Recommendations.
- Toolstring Schematics.
- Well Handover.

It is the responsibility of the Santos Completions Supervisor to forward all collated documentation to the Casino Drilling and Completions Technical Assistant.

1.8 Management of Change

1.8.1 Significant Deviations and Amendments to the Completions Programme shall be approved in accordance with the Santos Drilling and Completions Change Control procedure. A sample Management of Change Form is included as an Appendix S.

1.8.2 Non-standard operations not covered in existing Santos, DOGC, or Service Company procedures will require an on-site risk assessment and a set of written procedures together with a JSA.

1.9 References

- Casino 5 Drilling and Completions Programme CD-4000-P15-002.
- Casino Development Installation & Retrieval Procedures for Subsea XT, BOP, CD-2200-P07-001.
- Expro Wireline Operations Manual.
- Casino Logistics Operations Plan CD-4000-A02-001.
- Cameron Operations and Maintenance Manual (OMM), SD-031548-01 to 03.
- Expro Landing String Operational Manual.
- Santos Deck Management Plan.
- Diamond Job Requests.
- Weatherford WCPS Casino-5 Operations Manual – Rev 3.
- Expro Well Test Planning Report.
- Casino Completions Manual, CD-4000-P15-003.

1.10 Abbreviations

AAV	Annular Access Valve
ACE	Axial Compliant Expansion Tool
ACIV	Annular Chemical Injection Valve
AMV	Annular Master Valve
AVV	Annular Vent Valve
AWV	Annular Wing Valve
AXT	AX Gasket Test and Isolation Valve
BOP	Blow Out Preventer
BOT	Baker Oil Tools
CSM	Cavity Seal Monitor and Isolation Valve
CIV	Chemical Injection Valve
CXOV	Chemical Crossover Valve
DC	Drill Collar
DP	Drill Pipe
DV	Drain Valve

DOGC	Diamond Offshore General Company
EBC	Expandable Bottom Connector
EHT	Emergency Hang Off Tool
ESD	Emergency Shutdown
ESS	Expandable Sand Screens
ETC	Expandable Top Connector
OMM	Field Service Manual
FWV	Flow Wing Valve
HPU	Hydraulic Power Unit
HUD	Hold Up Depth
HWDP	Heavy Weight Drill Pipe
ID	Internal Diameter
ITC	Internal Tree Cap
IWOCS	Installation and Work Over Control System
JSA	Job Safety Analysis
KWV	Kill Wing Valve
LBV	Lower Ball Valve
LC	Lower Completion
LCP	Lower Crown Plug
LIB	Lead Impression Block
LPR	Lower Pipe Rams
LS	Landing String
LV	Lubricator Valve
MAASP	Maximum Allowable Annulus Surface Pressure
MD	Measured Depth
MPR	Middle Pipe Rams
MV	Master Valve
OD	Outside Diameter
PBR	Polished Bore Receptacle
PCE	Pressure Control Equipment
PFD	Process Flow Diagram
PMV	Production Master Valve
POOH	Pull Out Of Hole
PWV	Production Wing Valve
RIH	Run In Hole
RT	Rotary Table
SIV	SSSV Isolation Valve
SSV	Surface Shutdown Valve
SSSV	Surface Control Sub-Surface Safety Valve
SSTT	Sub sea Test Tree (Expro)
SV	Swab Valve
TBC	To Be Confirmed
TCT	Tree Cap Test
TH	Tubing Hanger
THHT	Tubing Hanger Handling Tool
THRT	Tubing Hanger Running Tool
UBV	Upper Ball Valve
UC	Upper Completion
UCP	Upper Crown Plug
UPR	Upper Pipe Rams
WEG	Wireline Entry Guide
XOV	Crossover Valve
XT	Christmas Tree (Subsea)

2.0 WELL AND RESERVOIR DATA

Description	Data	
Well Name	Casino 5	
Well Type	Vertical Gas Development well	
Permit	VIC P44	
Drilling Contractor	DOGC	
Drilling Rig	Ocean Patriot	
Surface Location (Easting, Northing)	651 603mE, 5 704 471mN	
Water Depth (LAT)	70.8	m
RT Elevation (above LAT)	22.0	m
Description	**Primary Objective Waarre C sands**	
Total Depth	~1788	m (MD)
	~1788	m (TVDRT)
Formation Depth	1743	m (MD)
	1743	m (TVDRT)
Expected Porosity	~20	%
Expected Permeability	100 – 10,000	md
Maximum Deviation (degrees)	5	
Expected Gas Gravity	0.595	Air=1.0
Bottom Hole Temp	81	deg C @ 1753mTVD (1731m TVDSS)
	178	deg F
Bottom Hole Pressure	2828	psia @ 1753mTVD (1731m TVDSS)
Expected max. SITHP (well cleaned up)	2540	psi
H_2S	0	ppm
CO_2	0.8	%
Sand	None – Expandable Sand Screens in lower completion	
Hydrates	Possible	

3.0 WELL STATUS

All depths in this programme are referenced to m MD RT (metres measured depth relative to rotary Table) unless otherwise stated.

3.1 Pre – Completion Status Assumptions

This Completion Program is based on the following assumptions:

a) The Horizontal Subsea Tree, BOP's and riser system have been run.

b) 9 5/8" x 10 ¾" Casing has been run to 1730m with the crossover at 160m.

c) The 8 ½" hole has been drilled to TD.

d) The XT Bore Protector is installed.

3.2 Pre – Completion Status Review

The Completions Supervisor shall review the well status prior to completion operations. As a minimum, the following should be undertaken for the relevant well:

a) After drilling of the 8 ½" hole and consideration of factors such as metal captured by the ditch magnet and time taken to drill to TD, a decision will be made by the Completions Team Leader as to whether a casing wear log will be run to identify suitable locations for setting of the lower and upper completion production packers.

b) Checking the Daily Drilling Reports for the well to confirm the well status.

c) Confirm the kill fluid weight of drill-in fluid. Brine weight is to be 0.1 ppg less than when drilling.

d) Review the definitive directional survey well casing tallies and depth of the:

- 9 5/8" casing shoe
- 9 5/8" x 10 ¾" casing crossover
- 13Cr 9 5/8" casing.
- Final TD of the 8 ½" open hole.

e) Confirm the 9 5/8" and 10 ¾" casing test pressures from the Daily Drilling Reports and determine annulus pressure limits for casing and tubulars to be run.

f) Run the IWOCS umbilical offline and confirm communication of the SCM. Monitor the SCM throughout the operations.

g) Confirm the kill weight drill in fluid in the well has been conditioned thoroughly after TD of the well.

h) Check the well heading, vertical height and alignment of XT.

i) Confirm the rig BOP's have been configured as per the schematic in Appendix I1 and the 10 ¾" Middle Pipe Rams have been pressure tested to 4000psi at surface.

j) Confirm the BOP spaceout has been checked by functioning the rams during the drilling program.

k) Confirm RT to MSL measurement.

l) Take a representative sample of the drill-in fluid and determine the salinity, pH and chlorides. This will be used to aid in determining the well has fully cleaned up during well testing. See Appendix O for details of samples required.

m) Take a sample of the diesel on the rig and measure the SG.

n) Review tidal information for the forthcoming two weeks.

o) In conjunction with the Mud Engineer produce a pit management / fluids handling plan for pit cleaning and displacement of the cased hole to inhibited calcium chloride brine. The proposed set up of the pits in included in Appendix D2.

4.0 COMPLETION OUTLINE AND TIME ESTIMATE

All depths approximate, to be confirmed after TD of the well.

Step	Operation Description	Time (Hrs)
1	Function blind & 10 ¾"rams. Make up Expandable Sand Screens (ESS), 7 5/8" tubing & Lower Completion Packer Assembly.	3
2	RIH ESS on Drill pipe to 1785m & set/test packer and unlatch running tools. POOH running Tools	14
3	Make up ESS Expansion tool to SABS circulation tool. Make up DC's and HWDP. RIH the Expansion Tool / HWDP / DC's to top of the ESS on drill pipe.	8
4	Expand ESS (2 passes). POOH Expansion tool above the ESS, cycle open SABS and displace 9 5/8" casing to inhibited calcium chloride brine at 1685m. POOH expansion tools. Laydown HWDP & DC's	10
5	Scrape 9 5/8" casing and riser & jet BOP's	14
6	Retrieve bore protector & jet the XT / BOP's in brine.	1
7	Run upper completion tailpipe and packer and chemical cut sub.	2
8	RIH upper completion 7" 13Cr80 KSBear tubing to 1500m	9
9	Make up SSSV and test	2
10	RIH upper completion 7" 13Cr80 KSBear tubing to 1550m	0.5
11	Make up TH and terminate SSSV.	4
12	Install THRT/SSTT onto TH and function test.	4.5
13	RIH Completion on 9 5/8" New Vam landing string. Install LV. Install flowhead and rig up / test welltest lines and slickline PCE.	12
14	Land off completion and lock and test TH. Retrieve Isolation sleeve and run TH wireline short protection sleeve on slickline.	6
15	Displace approx. 200bbl diesel cushion for underbalance.	2
16	Run standing valve on slickline and set packer. Pressure test completion, retrieve standing valve	6
17	Perform pre flow checks. Clean up the well.	12
18	Retrieve TH wireline short protection sleeve from THRT.	2
19	Inflow test SSSV. Run and set lower plug on slickline in TH.	2
20	Unlatch THRT from TH. Rig down surface lines, slickline PCE and flowhead.	6
21	POOH THRT/SSTT laying down 9 5/8" land string and LV.	2
22	RIH and jet TH / XT. Run and set / test ITC (c/w upper plug) on THRT/SSTT. POOH.	6
23	Pull BOP's.	16
24	Run XT debris cap.	1
25	Pull anchors & move to next well	20

Total (Hrs)	165
Total (Days)	6.9

5.0 PREPARATION FOR COMPLETION INSTALLATION

5.1 General

a) This section is to be used in conjunction with the remaining sections of this program.

b) Hand tools must be tethered and the hole must be covered with the Santos supplied hole cover when any work is being carried out over the RT.

c) To minimise man riding operations use the cherry picker or supplied temporary work platforms.

d) The proposed completion schematic is given in Appendix A.

e) Make up torques and completion tubular information is included in Appendix E. Confirm make up torques with the Weatherford casing crew.

f) Details of the completion sub assemblies to be run in this well and the naming convention are included in Appendices F and G.

g) Ensure the pits and all surface lines are thoroughly cleaned prior to taking on the calcium chloride brine. The cleanliness of the pits must be verified by the Mud Engineer. Final verification of the pit cleanliness will be made by the Santos Completions Supervisor.

h) Calcium chloride to be handled as per the MSDS sheet.

i) The calcium brine will be pre-mixed and unfiltered. The weight must be adjusted on the rig to achieve the desired kill weight. Allow 24 hours settling time for the brine in the pits to allow settlement and removal of solids.

j) Prior to any slickline toolstrings being RIH, an as run schematic with all toolstring components, connection details, OD's and ID's is to be generated and signed off by the Expro Slickline Supervisor and Santos Completions Supervisor. An ID & OD Interface table is included in Appendix U.

k) The Santos Completions Supervisors to review the slickline fishing tools inventory is sufficient for the toolstrings in Appendix L.

5.2 Well Control During Completion Running

a) The Lower and Upper Completions will be run in a well with overbalance fluid for the primary barrier. A review of the well control precautions and actions should be undertaken for each stage of the completion program. Appendix R is included as a guide for each stage of running of the completion.

b) Ensure a sufficient volume of inhibited kill weight calcium chloride brine is available in case of seepage losses.

c) Displacements must be monitored and recorded by the driller and mud loggers throughout the completion operations. The trip tank should be monitored at all times to ensure tubing is self filling.

d) Well control crossover subs shall be available on the drill floor with one made up to the well control valve to suit the relevant tubing size during the current operation. The following xovers will have been shipped out to the rig:
   i. 3 x 4 ½" IF Box x 7" KS Bear Pin – for the Upper Completion
   ii. 2 x 4 ½" IF Box x 9 5/8" New Vam Pin – running the landing string.

e) A 9 5/8" DLT packer and storm valve must be available and will be used to hang the completion off in the 9 5/8" or 10 ¾" casing in an emergency situation. Refer to the Completions manual for the detailed procedure. Schlumberger cementer to provide supervision for setting.

f) The emergency hang off procedure on the 9 5/8" DLT packer for each stage of equipment across the BOP's is detailed in Appendix Q.

5.3 Spaceout of the Completion Assemblies.

- All depths to be confirmed by the Santos Completions Supervisor
- Refer to Appendix A for proposed completion schematic
- Completion is to be spaced out as follows:

5.3.1 Lower Completion

a) The Expandable Bottom Connector (LC01) approx. 3m from TD of the 8 ½" open hole (TBC after LWD interpretation).

b) 7 5/8" 13Cr blank pipe to approximately 10m outside of the 9 5/8" casing shoe.

c) Expandable Sand Screens completely across the Waarre C sand with the Expandable Top Connector (LC02) approx. 3m above the top of reservoir. The ETC can be placed at a shallow depth than this to aid spaceout, but criteria 5.3.1.b) must be adhered to.

d) The Lower Completion "EXP" packer (LC03) set mid way across the lowest 9 5/8" Chrome Casing Joint (include the 13Cr KSBear x Vam Top Xover joint) ~ 1,700m.

5.3.2 Upper Completion

a) The Wireline Entry Guide sub assembly, (UC01) approximately 15m above the top of the Lower Completion "EXP" packer.

b) The 4.625" QN nipple sub assembly (UC02) placed 1 x 7" 13Cr range 3 joint above the WEG (UC01) and 1 x 7" 13Cr range 3 joint below the Production Packer (UC03) and is in a deviation less than 60deg (limit for slickline operations).

c) Production packer assembly (UC03) set in the chrome casing (Estimated depth 1645m).

d) The chemical cut sub assembly (UC04) directly above the Production Packer assembly (UC03). There should be sufficient 9 5/8" 13Cr above the chemical cut sub to allow for a 2nd tailpipe assembly and production packer (UC03) to be run and set in 13Cr casing, should the completion string be retrieved because of a problem post setting of the primary production packer.

e) The SSSV assembly (UC05) set within the 10 ¾" casing, 50m below the mudline. The bottom of the TRSV must be above the 9 5/8" x 10 ¾" crossover (planned depth 160m).

5.3.3 Landing String

a) The coupling of the 9 5/8" L80 New Vam Range 3 landing joint on the bottom of the flowhead to be 6 to 8 m above the rig floor.

b) The LV a minimum of 6m below RT.

5.4 Sub Assemblies / Tubulars Preparation

a) All assemblies and tubulars in the Upper Completion are 13% Chrome and should be handled accordingly; Deck crews are to be briefed on the correct handling of chrome tubulars. Refer to the Casino Completions Manual for JFE KS Bear Connection data and Chrome Handling Procedures.

b) Each joint of 7" tubing has been drifted, laser measured and had its threads inspected onshore. The tubing will be shipped offshore in re-usable racks holding 9 joints with each joint numbered near the pin end and with tally details attached. The threads have been treated onshore with Rust Veto 51, a protective coating designed to prevent corrosion. All dope application will be done on the rig. Re-drift on the rig will only be required if damage to a tubular is suspected.

c) The 7 5/8" 13Cr FOX tubing joints have been prepared as per the 7" tubing, but have not been drifted. The 7 5/8" tubing will require drifting on the rig prior to running.

d) Expandable Sand Screens and sub assemblies to be tailed in to the rig floor.

e) Bestolife 72733 is to be used to dope any connections. The Rust Veto 51 must be wiped with a cloth from the pins and boxs just prior to make up. Bestolife 72733 is to be applied sparingly to the pin end and only the seal face of the box connection with a small brush at the rig floor. These operations are not to be conducted over the hole.

f) Racks will be positioned on deck such that all pin ends face Forward (i.e. pins away from the rig floor). Vertical posts must be wrapped in rubber or soft wrapping to protect chrome tubulars from hard impacts. Rubber matting will be laid at the rig floor end of the catwalk in preparation for handling tubulars. Matting or wood is only required at the top of the vee door.

g) When removing from the shipping racks ensure tubing is layered on wood or soft spacers for protection. Tubulars must have thread protectors fully installed before handling.

h) The completion sub assemblies have been made up and pressure tested onshore but must be inspected for damage. All completion subassemblies to be drifted, strapped, ID's and OD's checked, serial numbers recorded and numbered as per the running tally and cross referenced against their sub assembly sheets. All Sub Assemblies will have clearly marked lifting points.

i) All onboard pressure testing must be witnessed and signed off by the Completion Supervisor. Copies of tool calculations operating pressures, rupture disc, shear pin settings, drawings and space out calculations will be provided to the Completion Supervisor.

j) Power tongs to be dressed with low penetration dies for all tubing sizes (except 9 5/8" landing string).

k) No Subassembly handling will take place without the direct supervision of BOT, Weatherford or Halliburton engineers as appropriate.

l) Sub assemblies are to be "walked in" before using the make up tongs.

m) Visually check each sub assembly box connection to ensure that no low torque pressure test seal rings have been inadvertently left in place.

n) A Dog Collar is to be used on all tubulars until there is a string weight of >20,000lbs (approx. 210m).

o) All premium thread connections must be made up using the torque turn computer and recorded on the JAM unit. Copies of all make-ups are to be provided to the Completions Supervisor.

p) For any connection requiring more than 3 attempts to achieve the correct make up consult with the Completion Supervisor.

q) Lay out all tubing and completion subassemblies in order of running.

6.0 RUNNING THE EXPANDABLE SAND SCREEN (ESS) LOWER COMPLETION

Barrier Status

Location	Primary Barrier	Secondary Barrier
Well	Kill weight drill in fluid	BOP's

6.1 General

a) Completions Supervisor to generate a running tally. Space out of ESS and completion assemblies as per section 5.3. Confirm the space out with the Completions Team in the Perth office prior to commencing running of the lower completion.

b) 5" 19.5# S135 (2.75" ID, 2.625" drift) drillpipe with 4 ½" IF connections is to be used as the work string for riser cleaning and lower completion deployment.

c) No rotation can be used when running the ESS.

d) Review well control precautions / actions as per appendix R.

e) All pumping operations to use drill in fluid unless otherwise stated.

f) A maximum of 5000lbs set down weight can be placed on the ESS before packer setting.

g) Lift sub installation for ESS to be undertaken by only the Weatherford Technician

h) Only the Weatherford supplied micro grip wrench to be used on the ESS. No chain tongs to be used.

i) Slips to be set between the black bands marked on the ESS.

j) Flush box and pin connections of ESS with water prior to make up.

k) ESS connections to be stabbed and made up by the by Weatherford Technicians only.

l) Weatherford Technician to remain on the drill floor at all times for make up and running of the ESS to TD.

m) A dog collar to be used when making up all ESS & completion tubing connections.

n) Rig crew to watch ESS make up video prior to operations.

o) The number of 6 ½" Drill Collars and 5" HWDP for the ESS expansion will be determined after TD of the 12 ¼" hole section.

p) The Drill Collars and HWDP to be used in ESS expansion should be inspected for cleanliness and drifted to 2.6" minimum. Scale and debris could block the ESS expansion tools. Use HWDP and DC's recently used in drilling where possible.

q) Drift all drill pipe above the EXP packer to 2" minimum. EXP Packer setting ball is 1 ¾".

6.2 Make up ESS and Lower Completion EXP packer

6.2.1 Function the BOP shear rams and 10 ¾" rams to displace any solids from the cavities.
- To avoid potential damage to the rams, function the rams with no closing pressure. Increase the closing pressure on the rams to a minimum to enable the rams to close. Open the rams.

6.2.2 Conduct JSA – Running Lower Completion

6.2.3 Rig up 4 ½" drill pipe elevators and the Weatherford ESS handling gear dressed for 6" OD 13Cr ESS.

6.2.4 Pick up the guide shoe / Expandable Bottom Connector (EBC) sub assembly (LC01), set in the rotary using slips and a dog collar.

6.2.5 Make up and run the ESS as per running tally.

6.2.6 Rig up handling gear for 7 5/8", 29.7# 13Cr80 FOX tubing.

6.2.7 Make up the Expandable Top Connector sub assembly (LC02).

6.2.8 Make up and run 7 5/8", 29.7# 13Cr80 range 3 FOX tubing as per the running tally.

6.2.9 Check the tally by performing a count of the remaining 7 5/8" 13Cr80 tubing joints and ESS joints and pups left on deck.
- This check should be carried out by the Completions Supervisor.

6.2.10 Rig up 5" drill pipe elevators.

6.2.11 Conduct JSA – Make up and running lower completion EXP Packer.

6.2.12 Pick up the EXP packer sub assembly (LC03) and make up under the direction of the Weatherford Technician. Record static, pick-up and running string weights.
- Weatherford Technician to confirm the number of shear screws installed and the maximum required shear pressure.

6.2.13 RIH with drill pipe to the 9 5/8" casing shoe.
- Maximum running speed in 9 5/8" casing 10m/min.
- Be aware of potential hang up point at the XT, BOP's and 10 ¾" x 9 5/8" casing crossover.
- Set slips softly to avoid shocks to the packer.
- String NOT to be rotated with ESS/EXP packer installed.
- Ensure back up tongs are used when running in on drill pipe for the first 200m.
- Lock RT prior to RIH.

6.2.14 Record static, running and pick up weights prior to screens entering open hole section.
- Packer running speed inside 8 ½" open hole 6m/min.

6.2.15 Continue RIH to TD, running last stand of drill pipe compensated, in case of incorrect spaceout. Tag TD with no more than 5,000lbs. Pick up to space out packer at the required set depth ensuring the final packer movement is upwards and the rams can be shut for pressure testing of the packer.
- Record static, slack off and pick up weight of string on the Daily Drilling Report.
- Ensure there is adequate stick up to permit ball drop and cement unit connection.

- Count the remaining number of stands in the derrick to cross reference the running tally.
- Refer to spaceout criteria in Section 5.3

6.3 Setting the EXP Packer

- The setting procedure for the packer will be as per the Weatherford WCPS Casino-5 Operations Manual – Rev 3.
- Adequate stick up will be required prior to setting the packer, as it will be necessary to slack off to neutral during the setting procedure.
- The Weatherford Packer Specialist will be responsible for directing the packer setting operation.

6.3.1 Conduct JSA - Packer setting.

6.3.2 Break circulation to check line up and ensure there are no blockages in the string.
- Do not exceed 500psi.

6.3.3 Inspect and calliper the 1 ¾" brass ball, drop ball into tubing and pump from the cement unit at 2BPM or 500psi whichever is lower.
- Completions supervisor to witness ball calliper.

6.3.4 With ball on seat, apply 1,800psi using the cement unit down the drill pipe above the ball. Increase the pressure to 3,000psi and hold for 15 minutes to set the EXP packer. Bleed off to zero.
- A pressure of 3,600psi will shear release the running tools.

6.3.5 Perform a overpull to a maximum of 15,000lbs above neutral weight to check the upper slips have set.

6.3.6 Set down a maximum of 15,000lbs below neutral weight to confirm lower slips set. Bring back to neutral weight.

6.3.7 Close the BOP pipe rams and pressure test the packer elements with 1000psi for 10 minutes from the cement unit. Bleed off to zero. Record on chart. Completions Supervisor to witness.
- Ensure Drill pipe is open to trip tank to monitor for returns.
- This test is to confirm that the packer element is set.

6.3.8 Open the BOP pipe rams and with running tools in neutral turn to the right 5 turns. Stop rotation and monitor for back torque. If no back torque experience continue to rotate to the right 15-20 turns to release the running tools from the packer, as directed by Weatherford Technician.

6.3.9 Pull back 5m to remove running tools from the EXP packer.

6.3.10 POOH with running tools. At surface Weatherford Technician to inspect the running tools for correct operation and confirm to the Completions Supervisor that the packer setting ball has been recovered.

6.4 ESS Expansion

- The Weatherford Technician will be responsible for directing the ESS expansion operation.
- Drill pipe, DC's and HWDP must be free from scale to prevent the ACE tool from becoming blocked.

6.4.1 Conduct JSA – make up of the ACE BHA.

6.4.2 Pick ACE tool assembly c/w 4 ½" IF xover and set in slips on the 5" drill pipe handling pup.

6.4.3 Make up a stand of 5" drill pipe to the ACE tool assembly.

6.4.4 Connect top drive to the BHA and pump through the tool to determine a flow rate for a back pressure of 1500psi (as determined from Weatherford charts), confirm the rollers activate and no leaks are observed.
- Ensure circulation ports below RT.
- Maximum pressure at ACE roller is 1900psi.

6.4.5 Cease pumping and allow pressure to bleed off. Manually retract the compliant rollers using a wooden hammer.

6.4.6 Remove the drill pipe stand.

6.4.7 RIH ACE tool making up the required number of joints of 6 ½" DC's.
- To be confirmed after TD of the well.

6.4.8 Continue to RIH ACE tool on the required number of joints of HWDP.
- To be confirmed after TD of the well.

6.4.9 Continue to RIH the ACE BHA on 5" drill pipe to 1670m approximately 30m above the top of the EXP packer.

6.4.10 Conduct JSA – Expanding of ESS.

6.4.11 Review weather conditions and review need for expansion with compensation with Weatherford Technician.
- Expansion should be carried out with no compensation if possible. With compensation it can be very difficult to keep a constant weight on the BHA.

6.4.12 RIH slowly as instructed by the Weatherford Technician and tag the ETC with minimal weight. Mark the pipe at RT and record the tide position.

6.4.13 Expand the ESS with the Retrievable Fixed Cone Pre-Expansion tool section of the ACE assembly by RIH at 3m/min, sitting down 30,000 – 40,000lbs. Tag the Expandable Bottom Connection (EBC). Mark the drill pipe.
- No rotation to be used with tools inside the ESS.
- An increase in the required weight may be seen at ESS connections.
- Podger tool bottoms out 0.3m above the EBC

6.4.14 Pull back the ACE tool 1 – 2m above the ETC looking for the original mark on the pipe.

6.4.15 Commence pumping at the same rate determined during the surface testing.

6.4.16 Once required flowrate has stabilised RIH at 1 – 2 m/min increasing to a maximum of 3m/min or as advised by the Weatherford Technician, setting down 10,000 – 15,000lbs at the ACE tool to fully expand the ESS.

- Expand each stand as far as possible. Stop pumping, pick up and set slips and make a connection. Allow circulation parameter to stabilise prior to continuing to expand the ESS.
- Maximum pressure at ACE roller is 1900psi.

6.4.17 Tag the EBC. Stop pumping and POOH at 10m/min to 5m above the top of the EXP packer, taking care passing through connectors and the ETC.

- Confirm depth with mark on drill pipe and check the tally.
- Podger tool bottoms out 0.3m above the EBC.

6.4.18 POOH with drill pipe, HWDP, DC's and ACE tool to surface.

- At surface Weatherford Technician to inspect the ACE tool for correct operation and report condition to Completions Supervisor.

7.0 CASING AND RISER CLEANING.

Barrier Status

Location	Primary Barrier	Secondary Barrier
Well	Kill Weight drill-in fluid	BOP's

7.1 Overview

a) Drift all drill pipe and assemblies above the SABS circulation tool to 2.6" minimum prior to RIH (SPS SABS ball OD is 2 ½").

b) Technical reference information for the SPS (Weatherford) cleanup tools is included in the Casino Completions Manual.

c) Well control precautions should be as per those used during drilling of the 8 ½" hole.

d) All pumping to be conducted with kill weight drill in fluid unless otherwise stated.

7.2 Casing Scraper & Riser Cleaning Assembly Space Out Notes

- Space out TBC by Completions Supervisor after running of the 9 5/8" casing.
- Scraping string diagram in Appendix B.

No	Description	Supplier	Approx Length / m
1	8 ½" Bit (nozzles removed from bit)	Santos	0.2
2	Bit sub & XO to 4 ½" IF	Diamond	2.0
3	5" Drill pipe	Diamond	10.0
4	9 5/8" Razor Back scraping tool (4 ½" IF)	SPS / Weatherford	2.5
5	5" Drill pipe	Diamond	Approx.1550
6	SABS Circulation tool (4 ½" IF)	SPS / Weatherford	1.5
7	5" Drill pipe	Diamond	30.0
8	Riser Brush Tool (4 ½" IF)	SPS / Weatherford	2.5
9	5" Drill pipe	Diamond	As required

- Scrape the 13Cr 9 5/8" casing from 1,562m to 1,655m.
- Check scraping depths align with the spaceout requirements for the Lower and Upper Completions in Section 5.3.
- The Riser Brush Tool to simultaneously brush the riser whilst casing scraping.
- The SABS tool one stand of drill pipe below the Riser Brush Tool.
- The Riser Brush Tool to go no closer than 3m above the Flex Joint.

7.3 Procedure

7.3.1 Make up casing scraper and riser cleaning assembly as per Section 7.2. RIH with scraping assembly on drill pipe. Break circulation every 500 m to clear the tools of debris.

- Maximum running speed with Razorback Casing scraper 45 m/min
- Maximum running speed with Riser Brush Tool 30 m/min
- DO NOT allow the Riser Brush Tool to tag the flex joint.
- All depths to be confirmed by the Santos Completions Supervisor.

7.3.2 Whilst RIH make 3 scraper passes of the 9 5/8" casing and the riser over the required depths as detailed in Section 7.2.

- Circulate with mud at maximum rate during the scraping whilst RIH.
- Rotate at a maximum of 60rpm.
- Brushing of the riser and casing scraping to take place simultaneously where possible.
- Keep the bit away from the lower completion packer.

7.3.3 With the bit at its deepest point after the scraper passes (approx 1670m), spaceout and function all the BOP rams and annulars (Except 10 ¾" & blind rams). Condition mud at maximum achievable rate.

- Take all returns over the shakers to monitor for scale / debris / cuttings.
- Circulate a minimum of 1.2 cased hole / riser volumes ~600 bbls or until no more debris is observed at the shakers.

7.3.4 Pick up to position the SABS tool just below the wellhead, drop the 2 3/8" ball and allow 5 mins for the ball to seat. Apply 900 psi to shear the tool closed to the bit. Jet the BOP and annular cavities with mud.

- Completions Supervisor to witness ball calliper and record shear pressures.
- Maximum rotation of 10 rpm during jetting.
- Maximum circulation of 18 bpm when jetting tool is across rams
- Maximum circulation of 8 bpm when jetting tool is across annulars.
- Boost the riser through the choke and kill lines.

7.3.5 Drop the 2 1/2" ball to the SABS tool and apply 2800 psi to shear the tool. Flow is now diverted to the bit. Circulate 1.25 riser volumes of mud (approx. 125bb) to lift debris that may have fallen into the well during the jetting.

- Completions Supervisor to witness ball calliper and record shear pressure.

7.3.6 RIH to position the Riser Brush Tool at its deepest depth (i.e. approx. 3m above the flex joint).

7.3.7 Conduct JSA – Handling calcium chloride brine.

7.3.8 Flush all surface lines with seawater.

7.3.9 Circulate a 50bbl viscousified surfactant brine pill chased with a minimum of 1.2 cased hole and riser volumes of inhibited kill weight calcium chloride brine (~600 bbl) or until clean calcium chloride returns are observed at maximum rate to displace the drill in fluid from the cased hole and riser. Flush the choke and kill lines with seawater whilst circulating out mud and then fill with inhibited calcium chloride brine. Ensure that all surface are clean and displaced to inhibited calcium chloride.

- Circulate at a maximum achievable rate.
- Rotate and reciprocate the string during this circulation.
- The recipe for the high viscous pill and inhibited calcium chloride is included in Appendix D1.

- Take clean calcium chloride brine returns to a clean pit (bypass the sand trap).
- Ensure shakers and return lines / trough are clean prior to taking any calcium chloride returns to the pits.
- Take mud returns to pits or dump as directed by the mud man.
- Dump the viscousfied brine pill.

Barrier Status

Location	Primary Barrier	Secondary Barrier
Well	Kill weight calcium chloride brine	BOP's

7.3.10 POOH to the Riser Brush Tool SABS tool and remove from string.

- Maximum speed POOH with Riser Brush Tool 30 m/min to prevent swabbing.

7.3.11 Continue POOH with scraper string.

- Maximum speed POOH 45 m/min to prevent swabbing.
- Inspect Riser Brush Tool and record any damaged or missing wire.
- Calliper casing scraper and note any signs of damage or metal loss. Record condition of casing scraper.

8.0 RETRIEVE XT BORE PROTECTOR

Barrier Status

Location	Primary Barrier	Secondary Barrier
Well	Kill weight calcium chloride brine	BOP's

8.1 Preparation

a) Ensure ROV is on depth with appropriate tooling for subsequent operations.

b) Pick up Cameron Bore Protector Running and Retrieval Tool to rig floor and make up a joint of drillpipe to the top. Make up a 10 ft drill pipe pup and the Cameron rubber nose jet sub to the bottom. Ensure centraliser fins are not fitted. Perform pre-operational checks as per Cameron OMM volume 2.

c) Reference Cameron OMM to determine bore protector location in tree profile.

d) If a good pipe ram mark was not established in the drilling phase after XT running then coat the 1st joint of 5" drill pipe with a coat of grease / paint. If using paint ensure a full joint is painted sufficient time in advance of operation in order to dry.

e) Jetting operations to be conducted with inhibited calcium chloride brine.

f) Review well control guidelines as per Appendix R.

8.2 Procedure

- XT valve status – all valves closed.

8.2.1 Conduct JSA – Pull Bore Protector.

8.2.2 Using ROV, open TCT, CSM and SIV needle valves on XT.

8.2.3 RIH Bore Protector Running and Retrieval Tool / rubber nosed jet sub assembly on drill pipe and latch bore protector as per Cameron OMM procedure.

8.2.4 If required cycle closed then open the relevant Pipe Rams to create marks on the greased / painted joint. Use full ram closing pressure. Record the state of tide.

8.2.5 Unseat bore protector from the XT with 25,000lb overpull as per Cameron OMM procedures. Jet XT & BOP ram and annular cavities with calcium chloride brine. Boost riser to lift debris. Pump down the TCT, SIV and CSM lines simultaneously while jetting to ensure the lines are not blocked.

8.2.6 When jetting is completed, close the TCT, CSM and SIV lines using the ROV.

8.2.7 POOH the Bore Protector Running and Retrieval Tool. Once above rotary table, install metal hole cover, rig down Running and Retrieval Tool and Bore Protector, measure marks left by BOP's on greased / painted joint. Record height of the ram marks from the bore protector retrieval tool. Determine the depth of ram mark.

- Strap dillpipe on POOH to confirm RT to XT datum.
- Inspect Drill Through Bore Protector for damage and report condition on Daily Completions report.

9.0 RUN UPPER COMPLETION

Barrier Status

Location	Primary Barrier	Secondary Barrier
Tubing	Kill weight calcium chloride brine	BOP
Annulus	Kill weight calcium chloride brine	BOP

9.1 General

a) Completions Supervisor to generate a running tally. Spaceout upper completion assemblies as per section 6.3. Highlight the potential points where the WEG may hang up on RIH, i.e. BOP's, XT and 10 ¾" x 9 5/8" xover. Confirm the spaceout with the Completions Team in the Perth office prior to commencing running of the lower completion

b) All Jam Nuts to be made up as per Jam Nut Installation Procedures in the Casino Completions Manual.

c) Review well guidelines as per Appendix R.

d) All pumping operations to use inhibited kill weight calcium chloride unless otherwise stated.

e) Refer to Appendix E for make up torque values.

9.2 Run Muleshoe and Tailpipe

9.2.1 Conduct JSA – Handling and Running Tubulars and Completion Assemblies.

9.2.2 Rig up Weatherford handling equipment and tongs dressed for 7" 29#, 13Cr80 KSBear tubing.

9.2.3 Pick up Wireline Entry Guide sub assembly (UC01) and set in rotary table with slips and a dog collar.

9.2.4 Make up to 1 joint of 7" 29 # 13Cr80 KSBear range 3 tubing.

9.2.5 Pick up and make up the 4.625" QN nipple sub assembly (UC02).

9.2.6 Make up to 1 joint of 7" 29# 13Cr80 KSBear range 3 tubing.

9.2.7 Pick up and make up the Halliburton Production Packer sub assembly (UC03).

- Maximum running speed for packer 1 minute per joint not including pulling and setting the slips.
- Confirm hydrostatic setting feature on the production packer has been disabled.

9.2.8 Pick up and make up the Chemical Cut sub assembly (UC04).

9.2.9 RIH with 7" 29# 13Cr80 KSBear range 3 tubing to the SSSV as per the tally.

- Be aware of the potential to surge reservoir when running packer.

9.2.10 Remove the diverter bag from the RT.

9.3 Make Up Tubing Retrievable Sub Surface Safety Valve (SSSV)

- Only NAS 6 cleaned HW525 control fluid to be used for SSSV control lines, pump and all fittings flushed with filtered. Flush with only the BOT supplied chemical injection pump, gauge manifold and hoses. This equipment is to be dedicated for use with the SSSV.
- An inventory of SSSV clamps on the rig must be made and verified by the Completions Supervisor prior to operations commencing
- Locate SSSV spooler on rig floor. Spool out sufficient control line and connect dedicated test pump and chart recorder. Flush through line with clean filtered HW525.
- Volumes of control line fluid measured operating a 7" SSSV on deck may differ from volumes recorded in the vertical.
- Use the Santos supplied hole cover for control line make up and make up of the cross coupling clamps.

9.3.1 Conduct JSA – Make up and running of the SSSV sub assembly & rigging up SSSV sheave.

9.3.2 Rig up SSSV sheave.

9.3.3 Pick up and make up SSSV sub assembly (UC05).
- Ensure SSSV port is blanked.

9.3.4 RIH and make up one joint of 7" 13Cr KSBEAR range 3 tubing above the SSSV.
- SSSV is closed, beware of surging.

9.3.5 Pull back the SSSV above the RT and make up the control line.
- BOT to terminate control line jam nut fitting to SSSV body as per JAM nut make up procedure.

9.3.6 Perform 7,500psi Control Chamber Pressure Test via the control line reel – hold for 15 mins. Bleed off. Completion Supervisor to file the Chart.

9.3.7 Bleed down pressure and cycle valve open and closed two times, recording opening and closing pressures via the BOT gauge manifold. Record volume of fluid returns via Bleed Port on manifold on each closing cycle. Compare volumes to those recorded during Sub Assembly make up onshore.

9.3.8 Pressure Control Line to 5,000 psi, lock in at the hub mounted manifold.
- Locked pressure is to maintain the SSSV in the open position whilst RIH.
- SSSV will close if differential pressure between control line and tubing falls below 2,000 psi.

9.3.9 RIH as per tally with 7" 13Cr KSBear range 3 tubing, installing control line clamps at each tubing connection.
- Baker Technician to torque up clamps.
- SSSV hold open pressure to be regularly monitored during RIH.

9.3.10 Check the tally by performing a count of the remaining 7" 13Cr tubing joints / pups left on deck and the number of control line clamps remaining.
- This check must be carried out by the Completions Supervisor.

10.0 INSTALL TUBING HANGER

Barrier Status

Location	Primary Barrier	Secondary Barrier
Tubing	Kill weight calcium chloride brine	BOP
Annulus	Kill weight calcium chloride brine	BOP

10.1 Preparation

a) Identify the Tubing Hanger (TH) system equipment on rig. Refer to Cameron Scope of Supply.

b) Record serial numbers of the parts to be installed:

i. Tubing Hanger (including isolation sleeve);

ii. 6.7" wireline plug;

iii. 7.0" wireline plug / ITC

c) Prepare Tubing Hanger and install THHTT as per Cameron OMM.

d) Carry out a full inspection of the TH, 6.7" and 7.0" wireline plugs and internal tree cap including seal areas.

e) Ensure Isolation Sleeve is pre-installed in TH and the THHTT (Tubing Hanger Handling and Test Tool) is pre installed on top of the TH.

f) Deck pressure test the TH, THHTT, isolation sleeve and tubing pup to 5,000 psi for 10 minutes.

g) Remove the x 4 TH spacers and install the split landing bowls to the TH on deck.

h) Review well control guidelines as per Appendix R.

10.2 Install Tubing Hanger

10.2.1 Conduct JSA – Running Tubing Hanger.

10.2.2 Change handling gear to 5" Drillpipe Elevators

10.2.3 Pick up Tubing Hanger sub assembly (UC06) c/w the THHTT to the rig floor.

10.2.4 Make up the TH to the string.

- The THHTT is rated to 500,000lbs with no pressure in the tubing

10.2.5 Make up a well control valve to the top of the THHTT. Record pick up, running and static weights.

10.2.6 Raise string to bring bottom of TH to working height and set in slips.

10.2.7 Install 2 x lifting eyes into side of helix, remove helix securing pins and lower helix to the RT.

10.2.8 Attach SSSV test line to port #B on the THHTT. Flush through until clean fluid exits from below the TH. Confirm the port is correct.

- Only NAS 6 cleaned HW525 control fluid to be used for SSSV control lines, pump and all fittings flushed with filtered. Flush with only the BOT supplied chemical injection pump, gauge manifold and hoses. This equipment is to be dedicated for use with the SSSV.

10.2.9 Terminate SSSV line to port #B as per JAM Nut Installation Procedures (in the Casino Completions Manual).

- Bleed off pressure locked in lines prior to commencing termination.
- Use the JAM Nut seating fixture to swage down the ferrules.
- BOT Engineer to undertake JAM Nut connection operations.

10.2.10 BOT to perform two SSSV function tests (Flapper Open & Close), recording volume returns (consistent results required with previous tests).

10.2.11 Pressure test the SSSV line to 7,500 psi for 15 minutes. Bleed off. Record and provide chart to Completion Supervisor. Bleed off control line pressure after test.

- SSSV will remain closed until make up of the THRT. Beware of surge when moving the string.

10.2.12 Carefully re-attach the helix to the TH, ensure the lifting eyes are removed.

10.2.13 Confirm orientation of TH Helix lies approximately 45 degrees port of forward in relation to rig heading.

- Keyway on TH is 180 deg out of alignment with the TH production bore.
- Key in XT faces forward when compared to the rig heading.
- If orientation exceeds 60 degrees port of forward, slowly rotate entire completion string in a clockwise direction to gain correct orientation.
- Refer to Appendix H for the orientation schematic.

10.2.14 Land off the TH / split landing bowl directly onto the rotary table master bushing.

10.2.15 Remove the well control valve. Unlatch the THHTT from the TH as per the Cameron OMM and lay down. Cover the bore of the TH.

11.0 MAKE UP AND RUN THRT/SSTT AND LANDING STRING

11.1 Preparation of THRT/SSTT

The following preparation should be conducted offline prior to completion running if possible.

a) Identify all Expro Landing String System equipment on rig and check all equipment referring to Scope Of Supply drawing.

b) The LS IWOCS umbilical reel and both HPUs shall be located on the forward/starboard deck (refer to Deck Management Plan).

c) Connect appropriate rig clean air supplies to the two control panels and the umbilical reel. Spool out some umbilical to check that reeler is functioning correctly.

d) Conduct JSA – installing umbilical. Install cable sock on umbilical. Spool out umbilical and install over sheave and tie off tail to main umbilical. Pick up sheave and umbilical to derrick and secure. Continue to spool out umbilical routing it suitably within the derrick down to the drillfloor.

e) Position THRT/SSTT assembly on the forward deck near the catwalk (refer to Deck Management Plan).

f) Connect the HPUs to reel jumper(s).

g) Flush and pressure test all umbilical lines as per Expro Landing String Operational Manual.

h) Connect hydraulic pigtails of umbilical to THRT/SSTT.

i) Carry out Landing String pre-running preparations in accordance with Expro procedures. These should include as a minimum:

- Pressure test hydraulic functions under Cameron supervision to check that the umbilical to THRT/SSTT connections are leak tight.
- Verify that the THRT is connected to the SSTT correctly.
- Function testing and drift of all valves to the THRT to 7.300” with the Santos supplied drift (Largest OD tool [TH wireline short protection sleeve] to be run through the SSTT to the THRT is 7.26” OD. Min ID of SSTT is 7.375” which corresponds to the UBV/LBV. THRT has a restriction of 7.040”). The TH wireline short protection sleeve is set above the minimum restriction of the THRT.
- Pressure test all SSTT valves.
- Leave all SSTT valves: UBV and LBV in OPEN position

j) Carry out THRT pre-running preparations in accordance with Cameron OMM. These should include as a minimum:

- Test, flush and purge all THRT functions and verify component movement as appropriate.
- Pump through SSSV line until clean fluid is returned. Take sample and verify cleanliness NAS 6 using the Cameron test kit.
- Ensure THRT LATCH ASSIST port on top of the SSTT is left unplugged/OPEN to atmosphere, situated on the slick joint above 10 ¾” ram facing downwards.

11.2 Connect THRT/SSTT to the TH. RIH Completion on Landing String

- Ensure landing string space-out has been completed and approved by both Completions and Subsea Supervisors. Spaceout landing string assemblies as per section 6.3. Confirm the spaceout with the Completions Team in the Perth office prior to commencing running of the landing string.
- The Driller will be the focal point for all operations. Radio communication will be established prior to any spooling operations commencing.
- The SSTT and LV will have been drifted to 7.300" on the rig prior to running.
- The THRT/SSTT will have had LS IWOCS umbilical previously fitted and tested.
- Ensure umbilical lines are functioned through the appropriate panels prior to making up the THRT/SSTT.
- Drift all 9 5/8" 47# L80 New Vam tubing and pups to 8.525".

11.2.1 Conduct JSA - picking up THRT/SSTT from deck to drillfloor. Refer to Expro Landing String Operational Manual.

11.2.2 Rig up elevators suitable for 9 5/8" New Vam landing string.

11.2.3 Cameron / Expro to verify THRT test cap / SSTT are correctly latched prior to picking up. Disconnect the HPU to reel jumper(s).

11.2.4 Pick up THRT/SSTT with the LS IWOCS connected and lift to rig floor, spooling the umbilical accordingly.

11.2.5 Attach 9 5/8" elevators to handling sub and slowly pick up until the THRT/SSTT is at 45 degrees. At this point, the lower assembly should be held back by a tugger to stabilise the assembly, thus preventing it from swinging through the V-door.

11.2.6 Continue to pick up until THRT/SSTT is vertical, spooling the umbilical accordingly.

- Spool out enough umbilical to allow the THRT/SSTT to be connected to the TH. Check that the umbilical routing is free from snag points and that there are no excessive bending or tensile loads.

11.2.7 Set the TH in the locked position by setting down 25,000lbs on the lock actuator sleeve using the THRT/SSTT.

- Install the Cameron re-enforced cover on the TH prior to locking.
- The TH must be in the locked position for installation of the THRT as the weight of the THRT / SSTT is insufficient to lock the TH.

11.2.8 Connect the HPUs to reel jumper(s).

11.2.9 Lower the THRT/SSTT to drill floor and remove THRT test cap under Cameron supervision.

11.2.10 Pick up the THRT/SSTT and prepare for latching to the TH as per the Cameron OMM.

11.2.11 Align the key on the THRT with the TH slot and lower and latch into TH as per the Cameron OMM.

11.2.12 Function THRT LATCH and observe piston movement.

11.2.13 Test the THRT to TH interface connection by pressuring up VENT/TEST RETURN to 5000 psi for 5 minutes.

11.2.14 Test the SSSV control line through the LS IWOCS to the TH to 5000psi for a 5 minute confidence test. Maintain 5000psi running in hole.
- SSSV will close if differential pressure between control line and tubing falls below 2,000 psi

11.2.15 Perform Unlock function on TH as per the Cameron OMM.

11.2.16 Install 2 x shear pin assemblies into side of TH actuator ring while ring is in UNLOCKED position.

11.2.17 Ensure SOFT LANDING SUPPLY pressure is set to 3000 psi, as per Cameron OMM

11.2.18 Prior to RIH, ensure that the following lines are pressurised as per Cameron OMM and Expro Landing String Operational Manuals. Lock in pressures at reel and continuously monitor during deployment:
- THRT LATCH
- TH UNLOCK
- SSSV
- TH SOFT LAND
- VENT/TEST RETURN
- LATCH ASSIST
- UBV OPEN
- LBV OPEN
- SSTT RELATCH

11.2.19 Bleed down line pressures at HPU, disconnect deck jumper from reel.

11.2.20 Pick up string and carefully rig down the TH Split landing bowl taking care not to damage TH seals and TH running circuit ring.
- THRT is rated for 725,00lbs string weight.

11.2.21 Confirm TH running circuit ring is spaced out correctly (using one of the 4x spacers to gauge the length)

11.2.22 Install 3x shear pins in side of TH running circuit ring.

11.2.23 Rig up 20” split bowls & slips.

11.2.24 RIH THRT/SSTT, spooling out the umbilical accordingly. Remove lifting clamps.
- Take care of stainless lines when running THRT/SSTT through RT.

11.2.25 Set slips across SSTT handling sub and make up first joint of 9 5/8” landing string.

11.2.26 Secure umbilical to 9-5/8” tubing using fibre glass tape.

11.2.27 RIH 9 5/8” landing string as per tally to LV, securing umbilical every full joint coupling.
- Monitor SOFT LANDING pressure gauge while RIH, if pressure raises by 1000 psi, the THRT outer sleeve is experiencing 47,000lbs drag indicating the completion is becoming stuck or hung up inside the riser.
- Monitor SSSV on RIH.

11.2.28 Pick up and install Lubricator Valve as per the tally. Install umbilical and function as per the Expro Landing String Operational Manual.

11.2.29 Continue RIH as per tally until the TH is approximately 8 metres above the tubing hanger land out point.

- Monitor the umbilical line pressure integrity at the LS IWOCS reel while RIH.
- Ensure the Annular BOP's are fully open.
- Check that the riser angle is within DOGC criteria before entering flex joint. Make adjustments as necessary.

12.0 RUN FLOWHEAD

12.1 Preparation

a) A Range 3 9 5/8" New Vam joint, 9 5/8" New Vam saver sub, swivel and xover (9 5/8" New Vam x stub acme) will have been pre-installed on the Flowhead on the deck. Hand make-up saver sub to bottom of joint. Final make-up of the saver pup to the full joint shall be done in mouse hole prior to flowhead installation. Mark connection on saver pup "HAND TIGHT ONLY".

b) Paint vertical line from swivel body through lower flowhead crossover and onto the 9 5/8" landing joint.

c) The ROV should be launched during Flowhead rig up operations so as to be ready for landing off the completion.

d) The XT IWOCS umbilical, flying stabplate (with parking plate) is to be rigged up through the cutter offline.

e) Install Coflexip hose to standpipe prior to Flowhead installation.

f) Function and pressure test Flowhead on deck in accordance with Expro Landing String Operational Manual and make-up 10-3/4" elevators to Flowhead. Pressure tests are to consist of low, high and then final low pressure. Install test cap on top of Flowhead.

g) Ensure suitable fittings and hoses are available (DOGC Supply) to use the air supply to the link tilt bag for the slickline air winch. To be rigged up when topdrive at the RT.

h) Prior to picking up Flowhead to the rig floor ensure the MV and SV are open and FWV locked open with the cap. Note all flowhead valve positions.

i) Ensure the Rig Floor Completion Valve Status Schematic (Appendix J) is on the rig floor and used from this point onwards. The Driller will be the focal point for all valve operations in agreement with the Completions and Subsea Supervisor.

j) Confirm status of XT valves with Subsea Supervisor and note on Rig Floor Completion Valve Status Schematic.

12.2 Make Up Flowhead and Slickline Pressure Control Equipment

- As per Casino Drilling and Completions HAZID in January 2005, the decision to rig up slickline PCE after landing off may be made by rig personnel based on an assessment of weather conditions at the time of the installation.

Barrier Status

Location	Primary Barrier	Secondary Barrier
Tubing	Kill weight calcium chloride brine	BOP
Annulus	Kill weight calcium chloride brine	BOP

12.2.1 Conduct JSA – Rig up bails and lifting Flowhead – Refer to Expro Landing String Operational Manual.

12.2.2 Install the Expro top drive sub and Expro slickline air tugger to the top drive and function test.

- Slickline air tugger will be connected to the top drive air supply.

12.2.3 Changeout the 15ft bails for 22ft bails.

12.2.4 Connect 45 ft bails by shackling to the 22 ft bails.

12.2.5 Pick up Flowhead over wind wall to rig floor. Whilst horizontal install hydraulic control lines to flowhead (if line length allows) and remove test caps and top blanking sub.

- Ensure lifting bridle will clear derrick "A frame" as Flowhead must lift above wind wall level to enter drill floor.
- The Flowhead is an unbalanced load, beware of Flowhead flipping over when transferring load to the blocks.

12.2.6 Install the no cross coupling on the top of the 9 5/8" New Vam tubing ready for flowhead makeup.

12.2.7 Pick up the flowhead to the vertical position. Make up the saver pup and the flowhead landing joint to the landing string.

- Pin end of landing joint must be tied off to more than 1 tag line to control movement during this operation.
- Monitor the painted line on the swivel to ensure no connections back out.

12.2.8 Connect the Coflexip onto FWV of the Flowhead.

12.2.9 Connect the kill hose to the check valve on the KWV of the Flowhead. Line up the cement unit via the KWV for pressure testing.

12.2.10 Rig up remainder of Flowhead hydraulic control lines as required.

- The FWV will be controlled by the Well test ESD panel; the SV, MV and KWV will be controlled by the Expro Flowhead control panel.

12.2.11 Confirm MV, KWV, FWV, SSV and well test choke manifold are open.

12.2.12 Close the SV. Rig up the slickline PCE. Refer to schematic in Appendix K.

- Ensure the lubricator needle valve is open (This is not the DV's).
- This step may be carried out after the string has been landed.

12.2.13 Record the pick up and set down and static weights of the completion.

12.2.14 Spool out enough landing string umbilical on the deck to allow land off of the completion. Reconnect the deck jumpers (with hydraulic stabplate) to the reel.

12.2.15 Tag open welltest surge tank isolation valve.

- This valve to remain tagged open for the remainder of the program to prevent over pressurisation of the drain line which is rated to 500psi.

12.2.16 Close the LV. Open SV. Ensure slickline lubricator DV's are closed. Flush across Flowhead from cement unit with seawater. Close the well test choke manifold and the lubricator needle valve and pressure test the Flowhead, slickline equipment, Coflexip, landing string and kill line to 5,000 psi for 10 minutes. Bleed pressure to 0 psi via the well test choke. Leave the welltest choke open.

- Drain hose downstream of DV's is only rated to 500psi. DV's must be closed and welltest surge tank isolation valve must be tagged open.

12.2.17 Ensure welltest choke manifold is open. Close the SV. Open the LV.

- Ensure the completion string is open to the well test package when landing off the completion to prevent a hydraulic lock.
- SV is closed to catch wireline tools in the event they become loose and fall.

13.0 LAND OFF AND TEST TUBING HANGER AND XT

13.1 Preparation

a) Prior to landing out tubing hanger, Subsea Supervisor is to instruct the Driller and other relevant personnel on the emergency shutdown and emergency disconnect procedures as per the Expro Landing String Operational Manual. This is to be repeated for all new relevant personnel as job progresses.

b) The cement unit must have sufficient personnel on board for 24 hour continuous operations.

c) Flowhead control panel valve positions will be tagged during all slickline operations.

13.2 Land off Tubing Hanger

Barrier Status

Location	Primary Barrier	Secondary Barrier
Tubing	Kill weight calcium chloride brine	BOP
Annulus	Kill weight calcium chloride brine	BOP

13.2.1 Using XT IWOCS, open the PMV, XOV, AAV and AMV. Confirm with ROV.

13.2.2 Pressure the CSM line to approx. 500psi. Using ROV, open CSM needle valve and flush through the line to prove communication. Keep line vented after flushing.

13.2.3 Engage rig compensators.

13.2.4 Confirm that Flowhead valves are open to the surface test package and the well test choke manifold to prevent a hydraulic lock when landing off.

13.2.5 Cameron Engineer to be present for the following operation, Lower TH and land off a maximum of 30,000lbs on the soft landing sleeve in the XT.

- Record string weights before and after land off.
- Do not exceed 30,000lbs on the soft landing sleeve.
- Monitor the string rotation to verify the TH has landed properly. Rotation should be clockwise the angle relating approximately to the alignment made at the rig floor.
- Observe for premature loss of weight in the event the Lower Completion Packer is tagged due to incorrect space out.

13.2.6 Pressure the SIV line to approx. 500psi. Using ROV, open SIV needle valve and flush through line for 10 minutes to prove communication and clear debris from the landing shoulder. Cycle the SIV twice during the flushing. Leave SIV open.

13.2.7 Adjust THRT/SSTT pressures to landing values as per the Cameron OMM.

13.2.8 Open the TH Soft Land from the LS IWOCS and vent for 5 minutes (or until no returns from TH soft land seen) to allow soft land sleeve to retract.

13.2.9 Increase total set down weight to 100,000lbs maximum for a further 5 minutes (or until no returns from TH soft land seen).

13.2.10 Set down full downhole completion weight.

13.2.11 Close the AMV and AAV (confirm with ROV), leaving PMV and XOV open.

13.2.12 Confirm with Cameron and Expro personnel that the THRT latch functions are pressured to 5,000 psi ready for pressure below the lower annular.

13.2.13 Close the lower annular round the annular slick joint and apply 1500 psi from the cement unit line below the closed rams until returns from TH soft land have ceased. Monitor CSM line.

- This pressure will apply the additional force required to fully set the TH seals (225,000lbs required). 1500 psi equates to an additional 138,000 lbs.

13.2.14 Lock TH as per Cameron OMM.

13.2.15 Open the lower annular and perform a 50,000 lbs overpull above downhole completion weight.

13.2.16 Set down completion weight less 25,000 lbs to keep SSTT in tension. Install Expro rotary bushing inserts.

- Maintain this tension throughout the remainder of the completion operation.
- Check compensator position - should be set around mid stroke and travel due to tide and heave monitored closely.

13.2.17 Confirm with Cameron and Expro personnel that the THRT latch functions are pressured to 5,000psi ready for pressure below the lower annular and 10 ¾" rams.

- Ensure THRT Latch pressure exceeds applied annulus pressure to prevent unlatching.

13.2.18 Close the lower annular round the annular slick joint and pressure test to 200psi for 5 minutes and 3,000 psi for 10 minutes from the cement unit line below the closed annular. Monitor the CSM line. Open the lower annular.

13.2.19 Open AAV (confirm with ROV).

13.2.20 Close the 10 ¾" pipe rams round the 10 ¾" slick joint with minimal closing pressure (to prevent damage if slick joint spaceout is incorrect). Once 10 ¾" closure volumes are confirmed, increase to full closing pressure. Monitor CSM at surface. Monitor the pressure down stream of the PWV (PPTT2). Apply 200psi / 10 minutes from cement unit via. the choke/kill line below the closed MPR's and increase to 4,000psi for 10 minutes. Record on chart then bleed off to 0 psi. This tests the following:

- BOP seal round slick joint
- TH production bore seals from production side.
- AMV from above.
- Upper TH seal from above.
- The PWV from the production side.

- Steps 13.2.18 and 13.2.20 satisfy the Petroleum (Submerged Land) Act Schedule BOP test requirements. There is no requirement to test the 5", blind, variable pipe rams, or the upper annular as they can no longer be used from this point onwards.

13.3 Test Tubing Hanger and XT

- Once landed off the pressure in the SSSV control line must not exceed 6,500psi due to the limit of the control system rating of the XT.

13.3.1 Using XT IWOCS, with CSM needle valve open and vented, confirm the SSSV operates by opening with 6,500psi control line pressure and then close by bleeding off the control line pressure to 0psi. Re-open the SSSV and pressure test the control line via the open SIV to 6,500 psi for 15 mins chart record test. Leave pressure on control line to keep SSSV open.

- BOT Engineer to confirm that the SSSV opens.
- Control line pressure needs to be 2,000 psi above tubing pressure in order for SSSV to stay open.

Barrier Status

Location	Primary Barrier	Secondary Barrier
Tubing	Kill weight calcium chloride brine	Flowhead
Annulus	Kill weight calcium chloride brine	10 ¾" rams

13.3.2 Close the MV and open the SV. Break out the lubricator at the in situ test sub. Make up the toolstring as per Toolstring "a" in Appendix L. Open the MV. RIH slickline and retrieve the TH Isolation Sleeve to surface. At surface close the MV. Open the lubricator needle valve (not DV's). Break slickline lubricator at the 13" Bowen connection, remove inspect toolstring (check toolstring length).

- The toolstring on the next slickline run TH wireline short protection sleeve is not able to drift the Cromar sub.

13.3.3 Make up toolstring as per Toolstring "b" Appendix L. Pressure test above the MV from the cement unit to 3,500psi for 5 minutes with seawater. Bleed off pressure to 0psi via the welltest choke manifold. Open the MV. RIH and install the TH wireline short protection sleeve in the THRT.

- The TH isolation sleeve seals around the production bore. The TH wireline short protection sleeve does not.
- The pressure test of the lubricator at this stage only to 3,500psi as the 13" Bowen connection will be broken to remove the protection sleeve running tools.
- Drain hose downstream of DV's is only rated to 500psi. DV's must be closed and welltest surge tank isolation valve must be tagged open.

13.3.4 POOH slickline to surface. Close the MV. Open the needle valve (not DV's). Break slickline lubricator at the 13" Bowen connection, remove and inspect toolstring. Make up the Standing Valve Toolstring as per Toolstring "c" in Appendix L. Open SV and pressure test above the MV from the cement unit to 5000psi for 10 minutes with seawater.

- Drain hose downstream of DV's is only rated to 500psi. DV's must be closed and welltest surge tank isolation valve must be tagged open.

13.3.5 Close the PMV and open AMV (ROV to confirm). XOV and AAV remain open.

14.0 DISPLACE TO DIESEL AND SET PRODUCTION PACKER

14.1 Preparation

a) The Completion Supervisor and Halliburton Technician shall be present at the cement unit when diesel pumping is initiated. The Halliburton Technician shall remain throughout pumping operations.

b) A pressure vs. volume pumped graph must be prepared in advance to allow careful monitoring during diesel displacement. Plan to displace diesel 75m (9bbl) above the chemical cut sub. Do not over-displace. Appendix M uses estimated values and is included as a guide.

c) Test function of rig choke. The rig choke to be lined up to the annulus, should be left fully open and monitored on trip tank.

d) Confirm SG of diesel on the rig.

e) Confirm bunker connection on deck has been isolated Port and STBD and that connection is monitored during the displacement.

f) Confirm that diesel volumes will be monitored carefully to ensure an over displacement of diesel does not occur. Diesel must not be displaced to the chemical cut sub under any circumstance.

- Confirm an inline flow meter is available.
- Confirm volumes can be monitored at the pits.

14.2 Displace Tubing to Diesel

Barrier Status – Completion Set With 9 5/8" Lower Landing String

Location	Primary Barrier	Secondary Barrier
Tubing	Kill weight calcium chloride brine	Flowhead & surface welltest lines
Annulus	Kill weight calcium chloride brine	10 ¾" rams

14.2.1 Conduct JSA – Diesel Displacement.
- Ensure potential for well control issues are discussed
- Ensure communication between cement unit and drill floor is discussed and understood.

14.2.2 Confirm the SSSV is open with 6,500 psi control line

14.2.3 Flush across flowhead to the welltest choke manifold with seawater from the cement unit to fill the surface lines. Close in at the welltest choke manifold when returns are seen and stop pumping.

14.2.4 Ensure the SV and well test choke manifold are closed.

14.2.5 Using ROV, close CSM needle valve on XT.

14.2.6 Review valve status prior to pumping Diesel. Confirm with ROV where appropriate:
- XOV, AAV, AMV open.
- PMV, PWV, AWV closed.

- SIV needle valve open.
- TCT, CSM needle valves closed.
- SSTT – LBV, UBV, LV open.
- SV and welltest choke manifold closed.
- FWV Open
- Slickline Lubricator Drain Valves Closed.
- SSV, MV and KWV open.
- Confirm the SSTT chemical injection valve is locked in.
- 10 ¾" rams closed.
- SSSV Open with 6,500 psi SIV control line pressure.
- Confirm annulus is lined up to the rig choke and the rig choke is fully open.

14.2.7 Break circulation to confirm correct valve line up from the cement unit to the Flowhead, down the tubing taking returns from the rig choke. Pump Diesel down tubing (forward circulation) to position the interface 75m (approx 9bbl) above the chemical cut sub (approx 200bbl) taking returns via the rig choke/kill line to the pits. Chase with 3 - 5 bbls drill water to clear surface lines of Diesel.

- The formation is open and care must be take not to bullhead. Ensure returns to the pits throughout the procedure.
- Break slowly and slowly increase to ½ BPM while carefully monitoring the back pressure on the tubing. This is to minimise the possibility of prematurely setting the packer.
- Pump rate may be slowly increased to a maximum of 3 bpm as directed by Halliburton Technician to ensure that packer elements do not swab off.
- Rig choke must be lined up to annulus and be fully open during pumping. Do not hold back pressure on annulus.
- Contingent chemical cut can only be performed in water based fluid.
- Note volumes recovered in pits and cross reference with volumes recorded at cement unit and pressure vs. volume graph.

14.2.8 Record final SITHP after circulating diesel on Rig Floor Valve Status Sheet. Determine the underbalance pressure that will be in place after setting of the packer.

- SITHP will reduce after packer setting due to loss of the U-Tube for the annulus.
- Once circulation has ceased, hold a positive pressure on the tubing to prevent the diesel from U-tubing.

14.3 Set Production Packer

14.3.1 Hold JSA for slickline operations.

14.3.2 Close MV. Open SV. Bleed off pressure via well test choke manifold. When pressure is 0psi, drain lubricator using DV's. Close SV. Close DV's.

- Drain hose downstream of DV's is only rated to 500psi. DV's must be closed and welltest surge tank isolation valve must be tagged open.
- Max expected SITHP prior to setting the packer = 900psi (equivalent U-tube pressure)
- Completions Supervisor to supply an installed completion schematic and tally to the Slickline Supervisor.

14.3.3 Open SV. Equalise and open MV using seawater. Close KWV.

14.3.4 RIH with slickline and install the standing valve in the 4.625" QN landing nipple in tail pipe beneath the packer.

- Record slickline depth tide corrected.

14.3.5 POOH with slickline. Close MV. Open KWV. Bleed off pressure via the welltest choke manifold. When pressure is 0psi, drain lubricator using DV's. Close SV. Close DV's.
- Bleed hose downstream of DV's is only rated to 500psi.
- Monitor volumes to ensure MV not leaking.

14.3.6 Breakout lubricator, inspect and make up the standing valve retrieval toolstring as per toolstring "d" in Appendix L. Pressure test the Cromar sub to 5,000psi.

14.3.7 Open MV. Confirm control line opening pressure on SIV line is maintained at 6500psi (at least 2,000 psi above the maximum tubing head pressure).

14.3.8 Line up to pressure test the tubing via cement unit. Open annulus to atmosphere and monitor returns. Pressure up to 1,200psi above locked in THP (approx. 2,100 psi at surface) and test tubing integrity for 10 mins.
- Confirm with Halliburton Technician that the differential used for tubing test will not set the packer.
- packer setting process commences at 1860psi & is completed at 2500 psi differential pressure at the packer setting depth).
- Drain hose downstream of DV's is only rated to 500psi. DV's must be closed and welltest surge tank isolation valve must be tagged open.

14.3.9 If the tubing integrity test is good, increase the pressure to 4,000psi (surface pressure) as per the Halliburton Technician instructions and set packer and hold for 10 minutes. Chart record this test.
- SSSV control line pressure must be maintained at 6,500psi (at least 2,000 psi above tubing pressure) to keep SSSV open. 6,500psi must not be exceeded due to the rating of the XT control system.
- This tests the tubing and the PMV from the production side.

14.3.10 Close the SSSV by bleeding off the control line to 0psi.
- BOT Engineer to confirm that the SSSV has closed.

14.3.11 Inflow test the SSSV for 10 minutes by bleeding pressure in tubing using the welltest choke manifold to 1,500psi. Record this test on a chart.

14.3.12 Pressure above SSSV using seawater to 3750psi. Open SSSV by pressuring up the SSSV control line to 6,500psi.
- The tubing pressure will increase when the SSSV opens
- BOT Engineer to confirm that the SSSV has opened.

14.3.13 Bleed back tubing pressure from the welltest choke manifold to 100psi above the expected underbalance pressure to leave a slight overbalance on the standing valve.
- Expected underbalance pressure approximately 675psi.
- The standing valve will allow flow from below.

14.3.14 Close KWV. Reduce the SSSV control line pressure to 5,000psi
- 5,000 psi SSSV control line pressure will be sufficient to keep the SSSV open for the remainder of the programme.

14.3.15 Close the XOV (ROV to confirm).

14.3.16 Open the PMV (ROV to confirm).

14.3.17 Pressure test annulus between Halliburton packer and TH to 3,500psi psi for 10 minutes by pumping seawater down the choke/kill line from the cement unit. Do not bleed off annulus pressure at end of test.
- Record this test on a chart.
- Monitor SITHP for any abnormal trend, standing valve is still installed.
- This tests the annulus, the packer from above, the TH from below and the XOV from the annulus side.

14.3.18 Close the AAV (ROV to confirm) and inflow test the AAV by bleeding off pressure from cement unit to 250psi.

14.3.19 Hold inflow test for 10 minutes and record on chart. Equalise pressure across the AAV and open AAV. (ROV to confirm).

14.3.20 Close the AMV (ROV to confirm) and inflow test the AMV by bleeding off pressure from cement unit to 250psi.

14.3.21 Hold inflow test for 10 minutes and record on chart. Equalise pressure across the AMV and open AMV. (ROV to confirm).

14.3.22 Bleed pressure from annulus to 100psi via the rig choke/kill line. Close the PMV (ROV to confirm).
- This pressure will be used to monitor the annulus during the welltest.

14.3.23 Close the MV. Open KWV. Bleed pressure from welltest choke to 0psi. Open the SV. Equalise above the MV with seawater and open MV.

14.3.24 Close KWV. RIH with slickline and retrieve standing valve.

14.3.25 POOH with slickline. Close MV. Open KWV. Bleed off pressure via the welltest choke manifold. When pressure is 0psi, drain lubricator using DV's. Close SV. Close DV's.
- Bleed hose downstream of DV's is only rated to 500psi.
- Monitor volumes to ensure MV not leaking.

14.3.26 Make up TH wireline short protection sleeve recovery toolstring as per Toolstring "e" in Appendix L. Pressure test Cromar sub to 5000psi.
- Clamp slickline for welltest with tools above SV.
- Ensure the surge tank valve downstream of the drain hose / DV's is tagged OPEN to prevent over pressurisation of the drain line.

14.3.27 Close KWV.

14.3.28 Confirm the CSM is closed using the ROV.

Barrier Status – Completion displaced to diesel, standing valve retrieved

Location	Primary Barrier	Secondary Barrier
Tubing	Flowhead & surface welltest lines	SSTT
Annulus	Upper Completion Packer	Kill weight calcium chloride brine

14.3.29 Confirm valve status on Cameron subsea tree:

- PWV, AWV, PMV and XOV closed;
- AAV and AMV open.
- TCT and CSM needle valves closed.
- SIV needle valve open with SSSV control line pressured to 5,000 psi.

15.0 WELL CLEAN UP AND TEST

15.1 Objectives

a) Clean up well to a BS&W that is constant or not measurable.

b) Determine the well productivity.

c) Determine Radon concentration of the Waarre C gas.

d) Prove the effectiveness of the sand face completion design.

15.2 Expected Flow Schedule

Flow Period	Duration	Maximum rate
Clean Up	Approx 6 hours	45 MMSFCD

15.3 Pre-Flow Checks

The Santos Completions Supervisor is to sign off the Pre-Flow Checklist in the Casino Completions Manual, which at a minimum must confirm the following:

a) Rig up of surface equipment in accordance with the approved PFD and layout drawing (Appendix P1 & P2). Pressure test all well test equipment as specified in the Completions Manual.

b) Review the location of the well test specific fire fighting equipment in the Well Test Fire and Escape Plan (in Casino Completions Manual). The OIM, Drilling Supervisor and Completions Supervisor to sign off on final fire fighting equipment locations.

c) As far as practicable, locate hydrocarbon containing vessels and equipment within designated deluge well test area. Any hydrocarbon containing vessels outside of the deluge area must be considered when reviewing the location of firefighting equipment.

d) In conjunction with the Well Test and Fire Escape Plan, check the escape routes in and around the well test area are adequate and confirm the following:

   i. Two escape routes present – primary and secondary.

   ii. Where practicable, width of escape routes 0.9 m wide (primary) and 0.8 m (secondary).

   iii. Escape routes are clearly marked and adequately illuminated.

   iv. As much as practicable, escape routes are free from obstructions. Wherever possible, use steps over pipework.

   v. There are no ‘dead ends’ greater than 7 m in length.

   vi. Where connected, stairways are used to join the primary escape route at different elevation.

   vii. Where connected, ladders are used to join the secondary escape route at different elevation.

e) Confirm all rupture discs and PSV’s settings are as per the approved PFD.

f) Confirm the visible beacon is installed in well test area as per Well Test Fire and Escape Plan.

g) Ensure portable gas detector is available and used for hydrocarbon leak detection.

h) Ensure heat shields are installed on key rig equipment. Consult with the rig management to confirm placement of the heat shields.

i) Notify all authorities as per the Completions Manual. Include local emergency services as flare may be visible from shore.

j) Production of well hydrocarbons may only commence at night for the first time with prior approval from the Rig Management, Santos Operations Superintendent and the Santos Drilling and Completions Manager. Subsequent flow periods may be recommenced at night at the discretion of the Drilling Supervisor and the OIM.

k) Prior to opening the well, the Drilling Supervisor, Completion Supervisor and OIM will inspect all surface lines and well testing equipment and confirm that all equipment is installed as per the approved PFD. This should be done well in advance to allow any corrections to be made.

l) Function all ESD stations. OIM, Drilling Supervisor and the Completions Supervisor to witness.

m) Conduct well test specific emergency drill prior to commencing well test.

n) Zero/trace H2S has been detected during previous Casino production tests and H2S is not expected during the Casino 5 clean up. As a precaution, an electronic H2S sensor shall continuously monitor for the presence of H2S in the test area. Once reservoir fluids are detected at surface, H2S and CO2 sniffer tube measurements must be made immediately and repeated every 15 minutes for the first hour. Once stable H2S readings have been established the measurement interval may be increased to 30 minutes. In the event that H2S levels equivalent to 10 ppm in atmosphere are detected, the situation will be assessed and the well may be shut in with a view to terminate testing operations.

o) Radio communications shall be tested in advance of flowing operations. Establish communication protocol and ensure it understood by all involved in the operations.

p) Confirm compressors, burner ignition system and water curtain are operating. Ensure contingent rig pump and power is available.

q) Confirm rig firewater pumps and well test area deluge system operational.

r) Ensure there are sufficient additives to mix kill weight fluid in the event of an unplanned well kill.

s) Make an announcement over the PA that flaring operations are about to commence

t) Pressure shall be bled from the annulus via. the rig choke / rig choke line. Annulus pressure to be maintained between 100 - 1000 psi. Monitor trend for volumes returned. Contingency tubing leak procedures are detailed in the Completions Manual.

u) Data acquisition frequency is set up and functioning as per Appendix N.

v) Take representative samples of the drill in fluid and completion brine and measure salinity/chlorides/pH.

w) Ensure separator and surge tank have been purged with nitrogen.

x) Inspect separator for sand prior to and after flowing.

15.4 Flow Well to Clean Up

- Refer to Table in Section 2.0 for Well and Reservoir data.

Barrier Status

Location	Primary Barrier	Secondary Barrier
Tubing	Flowhead & surface welltest lines	SSTT
Annulus	Upper Completion Packer	Kill weight calcium chloride brine

15.4.1 Conduct JSA – Well Test Operations

15.4.2 Open the well gradually on the adjustable choke flowing to the surge tank.

- Initial under-balance is expected to be ~675 psi
- The Santos Reservoir Engineer shall advise Completions Supervisor of choke sizes and durations.
- Retain at least 20 bbls of diesel in the Surge tank for later use to light gas flare. (Consult with Expro Well Test Supervisor).
- Monitor the temperature of surface equipment with laser thermometer, throughout the flow. Record temperature measurements.
- Steam exchanger will be bypassed until the water/diesel interface is reached to minimise cooling of the steam exchanger before gas to surface.

15.4.3 Increase choke gradually under instruction from the Santos Completion Supervisor.

15.4.4 Divert flow to the burner when conditions permit, consult with Expro Well Test Supervisor. Continue burning as long as there is no fall out of diesel. Redirect flow to the surge tank if necessary.

- Change to the gas flare once the produced fluid is mainly gas. This must be carried out in consultation with the Santos Completion Supervisor and the Expro Well Test Supervisor.

15.4.5 Continue to increase the choke size gradually under the direction of the Santos Completions Supervisor, allowing the well to stabilise after each increment.

- Bring well up to a maximum rate within 2 – 3 hours to prevent filter cake hardening on the sand screens.
- Petrotech Technician is responsible for all samples. All samples to be recorded on the sampling log (to be generated by Petrotech).
- Commence methanol injection upstream of the choke manifold prior to gas reaching surface. Continue injecting until directed by Santos Completion Supervisor
- Monitor for indications of sand production and H2S.
- Maintain annulus pressure between 100 – 1000psi. Record annulus bleed off details.
- Monitor BS&W readings to establish when the well has cleaned up.
- Sample as per Appendix O.
- If the Completions Supervisor deems liquids production manageable the well can be diverted to the separator prior to the clean up specification being reached to allow for sampling to commence.

15.4.6 Flow the well until it has cleaned up. Criteria for the well being cleaned up are:

1. At least three consecutive BS&W measurements that are within +/- 2% of baseline BS&W eg. Baseline BS&W = 3%; acceptable BS&W range = 1% to 5%.
2. Stable THP i.e. <10psi / 5min change over 2 hr period at constant rate.
3. Stable gas rate.
4. If measurable, a WGR<1 bbls/MMscf
5. Water salinity/chlorides/pH that are not representative of the drilling mud/completion brine.

If criteria 1) to 4) have been satisfied but criteria 5) has not been met, the clean-up period will be terminated. The Santos Reservoir Engineer will advise the baseline BS&W measurement and when the well has cleaned up.

15.4.7 Once stable flow conditions are experienced and the well has cleaned up finish taking the samples as per Appendix O.

- Santos Completions Supervisor will ensure that a fixed choke size is installed prior to the end of the clean up.
- The Santos Reservoir Engineer will specify the choke size for the main flow.
- Sampling will be.

15.4.8 Shut in well at well test choke manifold.

- Expected SITHP = 2,500psi.
- Following completion of clean up, inspect separator for any sand. Report results on the well testing log of events and the Daily Completions Report.

16.0 WELL SUSPENSION

- All pumping operations to be conducted with 50/50 water/glycol mix unless otherwise stated.

16.1 Inflow Test SSSV and Recover the Wireline Short Protection Sleeve

16.1.1 Confirm valve status on subsea tree: AAV and AMV open; PMV, PWV, XOV & AWV closed.

16.1.2 Conduct JSA – Well Suspension.

16.1.3 Isolate welltest Lo-pilots. Record SITHP on the Rig Floor Completion Valve Status Board.

16.1.4 Close SSSV by bleeding the control line pressure to 0psi.
- The SSSV will remain closed for the remainder of the programme.

16.1.5 Bleed tubing pressure above the SSSV to 100 psi through the well test choke manifold. Inflow test the SSSV for 15 minutes. Bleed tubing pressure to 0 psi above the SSSV.
- Submit chart to Completions Supervisor.

16.1.6 Open KWV. Pump approx. 26bbl of 50/ 50 water / glycol mix from the cement unit to fill the tubing and landing string above the SSSV.
- Ensure pumping pressure is below that required to pump through the SSSV.
- The water/glycol mix will act as the suspension fluid on top of the SSSV.

16.1.7 Open the SV. With the welltest choke manifold open, RIH slickline, latch and pull the TH wireline short protection sleeve from the THRT. POOH to surface.

16.1.8 Close the MV. Close the SV. Confirm pressure is 0psi through needle valve. Break lubricator at the 13” Bowen connector, inspect and recover TH wireline short protection sleeve.

16.1.9 Close AMV (Confirm with ROV).

16.1.10 Open XOV and PMV (Confirm with ROV).

16.2 Install Lower Tubing Hanger Plug

16.2.1 Make 6.7” wireline plug toolstring as per Toolstring “f” in Appendix L. Open the SV and pressure test above MV to 5,000psi for 10 minutes.
- The 6.7” wireline plug is not able to drift the slickline 5” BOP’s.
- Do not add dummy spacer.

16.2.2 RIH the 6.7” wireline plug to the TH. Pressure up to 3000psi and set the plug as per the Cameron OMM. Release the running tool from the 6.7” wireline plug. Bleed off pressure to 0psi. Leave the welltest choke manifold open.

16.2.3 POOH with slickline. Close MV. Close SV. Open DV’s. Break out lubricator at Cromar sub, remove and inspect toolstring. Close DV’s.
- Confirm to Completions Supervisor that the Tell Tail is functioned

16.2.4 Open MV. Pressure test plug to 5,000 psi for 10 mins from above. Bleed off to 0psi.

16.2.5 Pressure tubing below 6.7" wireline plug from choke / kill lines (via AAV, XOV and PMV) to 1000psi for 10 minutes using the cement unit. Record on chart recorder.

- Completions Supervisor to verify test pressure upon confirmation of SSSV set depth
- Combined test and pumping pressure to be maintained safely below shut in wellhead pressure to avoid opening SSSV.
- Monitor tubing pressure from the welltest choke manifold.

16.2.6 Close the PMV and XOV (Confirm with the ROV).

16.2.7 Open AMV. Bleed off any annulus pressure via choke/kill lines and confirm annulus pressure is zero. Close AMV (confirm with ROV).

Barrier Status - After Setting Lower Tubing Hanger Crown Plug

Location	Primary Barrier	Secondary Barrier
Tubing	Lower Crown Plug	SSTT
Annulus	Upper Completion Packer	Kill weight calcium chloride brine

16.2.8 If weather conditions permit the slickline pressure control equipment and surface lines can be rigged down from the flowhead at this point.

16.3 Recover Landing String

16.3.1 Conduct JSA – Retrieve landing string

16.3.2 Retract the 10 ¾" BOP pipe rams. Remove Expro rotary bushing inserts.

Barrier Status

Location	Primary Barrier	Secondary Barrier
Tubing	Lower Crown Plug	BOP
Annulus	Upper Completion Packer	Kill weight calcium chloride brine

16.3.3 Set down to put the THRT at neutral weight. Unlatch the THRT as per the Cameron OMM and pick up to 5 m above TH.

- U tubing will occur due to the difference in liquid weights between the tubing and riser annulus.

16.3.4 Rig up 20" bowls and set 9 5/8" tubing in slips.

16.3.5 Flush surface lines including Flowhead and slickline pressure control equipment to the test package with sea water chased with drill water. Expro Test Supervisor to advise when flushing is complete.

- Expro will have have previously flushed the surface lines with separator gas.
- Do not flush separator vessel with water.

16.3.6 Perform JSA rig down slickline PCE and flowhead lines.

16.3.7 Rig down slickline pressure control equipment and the welltest surface lines from the flowhead

16.3.8 Perform JSA – break out and lay down flowhead.

16.3.9 Break out the Flowhead below saver pup. Break out, but do not remove saver pup from the flowhead landing joint. Lay out flowhead assembly.
- Use extreme caution when breaking out the flowhead.

16.3.10 Layout the 45ft bails, slickline winch and top drive sub.
- The 22ft bails can be replaced with the 15ft bails at this point or later offline.

16.3.11 POOH THRT/SSTT to surface, laying down 9 5/8" joints landing string. Install THRT protective cap and rack back THRT/SSTT in derrick
- Ensure all 9 5/8" landing string is doped on POOH and thread protectors are installed.
- THRT/SSTT will be needed for ITC running.
- Report any missing rope or tape from the landing string.

16.4 Running ITC

a) Verify the 7.0" wireline plug has been installed and pressure tested in ITC before running.

b) The BOP space out with relation to the THRT/SSTT and ITC is detailed in Appendix I2.

16.4.1 Apply 600psi above TCT. Open TCT with the ROV and flush from XT IWOCS. Do not vent the line after flushing.

16.4.2 RIH Cameron Internal Jetting Tool on drill pipe. Forward circulate with seawater to jet ITC profile above Tubing Hanger as per the Cameron OMM. Flush through the TCT at the same time as jetting.
- Max set down 30,000lb
- Max pressure at jetting head 800psi.
- Move jetting tool slowly up and down during jetting.
- Boost the riser with seawater.

16.4.3 POOH Internal Jetting Tool. Inspect contents of junk basket and report on Daily Drilling Report.

16.4.4 Pick up the ITC to the rig floor using the THHTT. Remove the THHTT.

16.4.5 Set the ITC in the locked position by setting down 25,000lbs on the lock actuator sleeve using the THRT.
- Install the Cameron re-enforced cover on the TH prior to locking.
- The ITC must be in the locked position for installation of the THRT as the weight of the THRT / SSTT is insufficient to lock the ITC.

16.4.6 Prepare and function the THRT/SSTT as per the Cameron OMM and the Expro Landing String Operational Manual.

16.4.7 Make up the THRT to the ITC as per the Cameron OMM.

16.4.8 RIH with the ITC on 9 5/8" landing string attaching the umbilical at every connection.
- Fill landing string with seawater on RIH.

16.4.9 Open the AMV (confirm with ROV). Ensure AAV is open. Flush TCT to remove potential debris. Keep TCT vented.
- Confirm annulus pressure is zero prior to opening AMV.

16.4.10 Tag tree with 5000lbs. Slack off all running string weight.
- Monitor returns from TCT line during the setting process.

16.4.11 Confirm with Cameron and Expro personnel that the THRT latch functions are pressured to 5,000psi ready for pressure below the lower annular to prevent unlatch of the SSTT.

16.4.12 Close the annular around the annular slick joint. Pressure up from the cement unit in small increments to 3,000psi as per the Cameron OMM. Pressure above the ITC / wireline plug to 3,000psi for 10 minutes to set the ITC plug.
- Monitor TCT for any returns.
- 5,000psi may be required below the annular should the ITC fail to seat with 3,000psi.

16.4.13 Lock the ITC as per the Cameron OMM. Open the annular and perform a 60,000lb overpull to confirm lock down.

16.4.14 Close the AMV and AAV (confirm with ROV).

16.4.15 Pressure test cavity between the ITC / 7.0" wireline plug and the 6.7" wireline plug to 5,000 psi for 10 minutes via the TCT and record on a chart recorder. Bleed pressure to zero.

16.4.16 Using ROV close the TCT.

16.4.17 Set THRT in neutral and unlatch the THRT from ITC and POOH.

16.5 Recover Rig BOP's / Run Spool Tree Debris Cap

- Disconnect XT IWOCS stab plate and electrical stabs from the XT and park on the BOP parking plate.
- Prior to running install biocide sticks in the spool tree debris cap through the 1 ½" NPT pipe plug on the side.
- Grease the J slot in the spool tree debris cap running tool with water resistant grease.
- No corrosion inhibitor will be pumped into the spool tree debris cap.

16.5.1 Conduct a JSA – Pulling riser and BOP's.

16.5.2 Pull the rig riser and rig BOP's as per document CD-220-P07-001.
- Ensure a lightweight debris cap is installed on the top of the XT with the ROV as soon as possible after unlatching of the BOP's from the XT.

16.5.3 Conduct a JSA – Running of the spool tree debris cap.
- ROV should be launched to monitor running of the spool tree debris cap.

16.5.4 Skid the rig over the well centre. Inspect Top of XT and ITC with the ROV.

16.5.5 Make up the spool tree debris cap running tool to 5" drill pipe.

16.5.6 Stab the Debris Cap Running Tool into the Debris Cap and make up with right hand rotation to engage the debris cap pins into the running tool J-slot.

16.5.7 Run Debris Cap / Running Tool below the rotary table and install the two arm utility guide frame to the drill pipe.

16.5.8 Run Debris Cap as per the Cameron OMM.

- Remove the lightweight debris cap with the ROV just before landing the spool tree debris cap.

16.5.9 Land Debris Cap onto the XT with minimal set down weight.

16.5.10 Verify lockdown with a maximum overpull of 5,000lb.

16.5.11 Set minimal weight down and rotate approximately 20 degrees to the left to release the running tool from the Debris Cap.

16.5.12 POOH with the running tool. Remove the two arm utility guide frame. Remove the running tool.

16.5.13 Conduct the final ROV survey as per the Cameron OMM.

16.5.14 Pull anchors and move the rig to the next location.

17.0 APPENDICES

APPENDIX A CASINO 5 PROPOSED COMPLETION SCHEMATIC

DOWNHOLE WELL STATUS | FIELD: Casino | PLATFORM: Subsea Completion | BLOCK: | WELL: Casino 5

Santos

WELL TYPE:	GAS PRODUCER	FLUID WT:	10.22	MAX DOGLEG:	@
FIRST COMPLETED:		RTE:		MAX DEVIATION:	@
WORKOVER DATE:		SWAB:		MINIMUM ID:	@
WORKOVER NO.:		KOP:		AV PAY ANGLE:	
ANNULUS FLUID:	CaCl Brine	HUD:		REF LOG:	

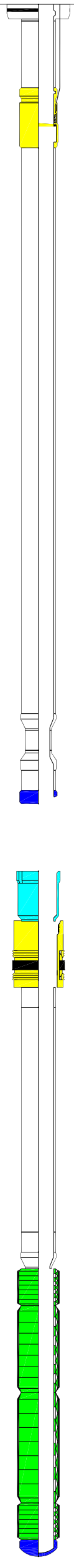
DESCRIPTION	MAKER	TYPE	SIZE & PRESSURE
Horizontal Spool Tree	Cameron		5" x 2" 5,000psi
Wellhead	Cameron	STM 15 Drill Through	18 3/4" 10,000psi
TUBING SPOOL			
TUBING HANGER			

TUBING DATA

SIZE	WEIGHT	GRADE	CONN.	JNTS	TOP MD	BTM MD	BTM TVD
9 5/8"	43.5	L80	Vam Top			92	
7"	29	13 Cr 80	KS Bear			1700	
6 5/8"	24	13 Cr 80	KS Bear			1780	

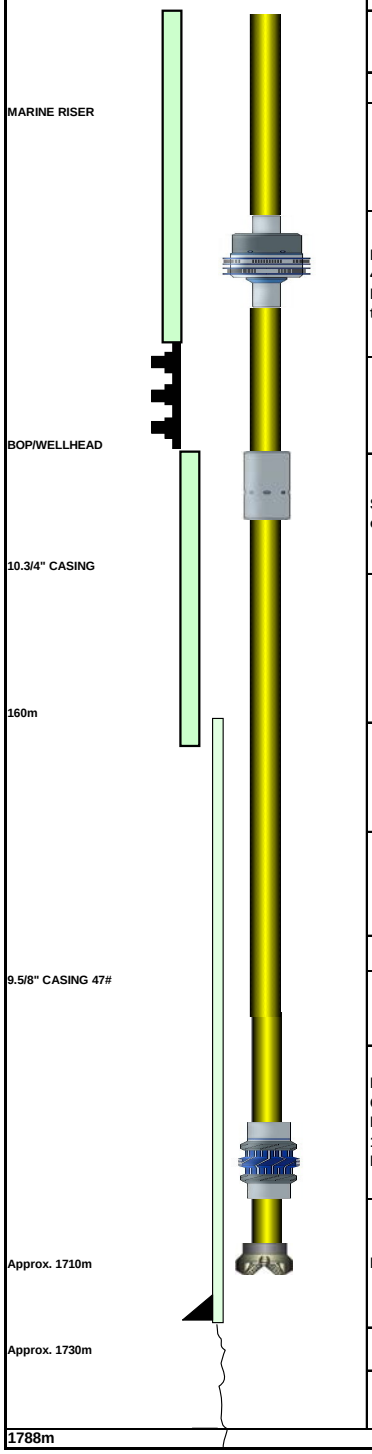
CASING & LINER DATA

SIZE	WEIGHT	GRADE	CONN.	JNTS	TOP MD	BTM MD	BTM TVD
10 3/4"	55.5	L80	Vam Top	8		160	
9 5/8"	47	13 Cr 80	Vam Top	120		1600	
9 5/8"	47	13 Cr 80	KS Bear	8		1720	

MD (m)	TVD (m)	DIAGRAM	DESCRIPTION	ID (in)	OD (in)	DRIFT (in)	LENGTH (m)	OTHER INFO	COMMENTS
			Tubing Hanger 7" Cameron 13 Cr 80	6.184"		6.059"			
			Tubing 7" KSBEAR 29 LB/FT 13 Cr 80	6.059"	7.656"	6.059"			
			SSSV 5.875" BRQ Nipple						
			Tubing 7" KSBEAR 29 LB/FT 13 Cr 80	6.059"	7.656"	6.059"			
			Crossover 7" x 5 1/2" 13 Cr 80	4.892"	7.656"	4.767"	2.48m		
			Chemical Cut Sub 5 1/2" 17 LB/FT 13 Cr 80	4.892"	5.500"	4.767"	7.00m		
			Crossover 5 1/2" x 7" 17 LB/FT 13 Cr 80	4.892"	7.658"	4.767"	1.79m		
			Tubing 7" KSBEAR 29 LB/FT 13 Cr 80	6.184"	7.656"	6.059"			
			Wireline Entry Guide 7"						
			PBR 9 5/8" Weatherford 47 LB/FT 13 Cr 80	7.622"	8.374"		1.93m		
			Packer 9 5/8" Weatherford EXP 13 Cr 80	6.949	8.380"	6.750"	1.261m		
			Pup Joint 7 5/8" Fox 29.7 LB/FT 13 Cr 80	6.875"	7.625"	6.750"	1.509m		
			Tubing 7 5/8" Fox 29.7 LB/FT 13 Cr 80	6.875"	7.625"	6.750"			
			Pup Joint 7 5/8" 29.7 LB/FT 13 Cr 80	7.012"	7.625"	6.750"	1.483m		
			Crossover 7 5/8" Fox x Vam 29.7 LB/FT 13 Cr 80	7.012"	8.017"	6.750"	0.380m		
			Expandable Top Connector 5 1/2" Weatherford 316 SL	4.795"	8.196"		1.007m		
			Expandable Sand Screens 150 micron 5 1/2" 316 SL	5.921"	7.390"	5.796"			
			Expandable Sand Screens 150 micron 5 1/2" 316 SL	5.921"	7.390"	5.796"			
			Expandable Bottom Connector 5 1/2" 316 SL	4.83"	6.063"	4.705"	2.981m		
			Bull Nose 5 1/2" 13 Cr 80	N/A	6.065"		0.40m		

REVISION: Rev 0 | REASON: Issued for construction | PREPARED BY: Paul Nardone | CHECKED BY: Peter Dodd | DRAWING DATE: 02 Mar 05

APPENDIX B CASING AND RISER SCRAPER SCHEMATIC



WELL BORE CLEAN-UP SCHEMATIC RUN1

CUSTOMER:	SANTOS	PREPARED BY:	
RIG/LOCATION:	AUSTRALIA	CHECKED BY:	
WELL NUMBER:	CASINO 5	DATE:	
ENQUIRY NUMBER:	SANTOS 001/005	REVISION:	

DESCRIPTION	OD (in)	ID (in)	Approx. Tool Length (m)
RBT103 - Riser Brush Tool for 20" ID riser 4.1/2" IF Box up x Pin down RIH / POOH speed 90 fpm - Max 60 RPM (space out no closer than 3m above lower flex joint)	Stabilizer - 16" Bristle - 20.25"	Nominal - 2.812 Drift - 2.75"	2.5m
Single Action Bypass Sub w/ 4.1/2" IF Box Pin Conns (space out below wellhead when RBT is 3m above lower flex joint)	6.50"	2.25"	1.2m
RB101 9.5/8" Razor Back® Tool for 43 - 53.5# casing Connections 4.1/2 IF Box up x Pin down Max Rotating Speed 80 RPM 15,000lb max compression at tool when rotating RIH / POOH speed 150 fpm	Stabilizer - 8.374" Lantern - 9.00"	Nominal - 2.812 Drift - 2.75"	2.3m
Bit and Bit Sub. 1 x joint drillpipe			

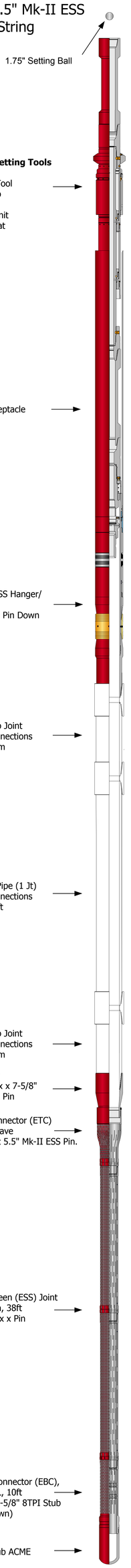
APPENDIX C SANDFACE COMPLETION EQUIPMENT SCHEMATIC

ESS Sandface Completion Schematic

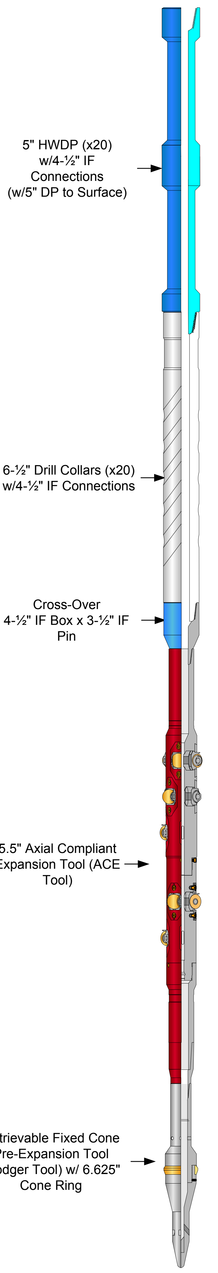
Well-Casino-5

EXP ESS Hanger/Packer w/5.5" Mk-II ESS
Plus ESS Expansion String

Weatherford®



ESS Expansion String



This drawing is a representaion only and NOT to scale

APPENDIX D1 COMPLETION FLUIDS

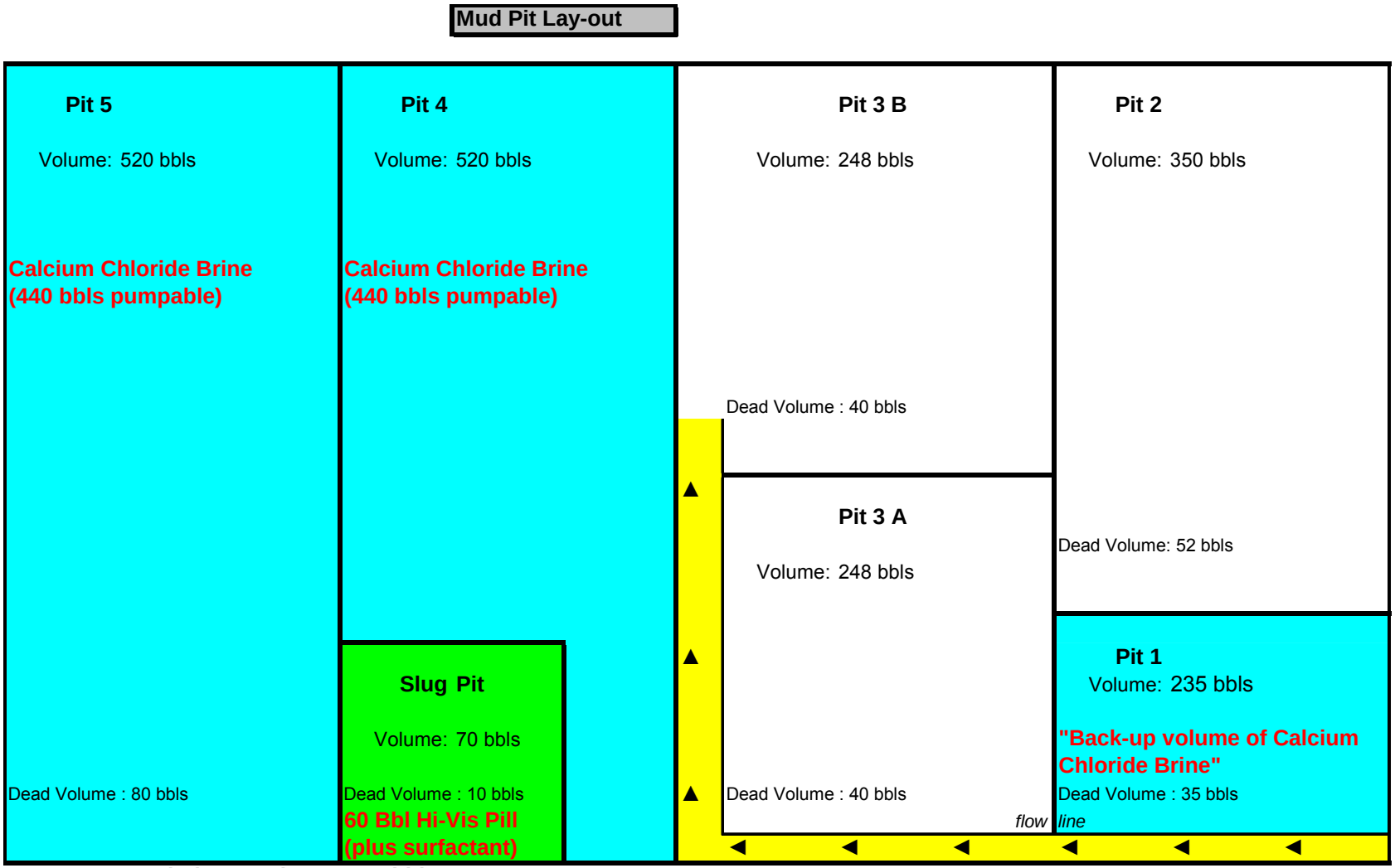
Completion Brine

Product	Function	Unit Size	Conc ppb	Quantity required (per well)
Calcium Chloride - (74 - 77% Purity)	Weighted Brine for Well Control	Bbl	10.3 ppg	1,000 bbls
			(1.22 sg)	
Safe-Cor	Calcium Tolerant Corrosion Inhibitor	55 gal drum	1 drum / 100bbls	8 drums
Safe-Cide	Calcium Tolerant Biocide	25 kg can	1 can / 300 bbls	3 cans
Dirt Magnet	Solvent/Surfactant - flocculates solids from brine	55 gal dm	2% v/v	12 drums

Hi-Vis Surfactant Pill

Product	Function	Unit Size	Conc ppb	Quantity required (per well)
Hi-Vis Surfactant Pill	Seperation of DIF from Brine - clean casing	bbl		50 bbl
Safe-Vis E	Polymer base viscosifier - Calcium Tolerant	5 gal can	I gal per bbl	1 can
Safe-Surf WN	Surfactant - cleans wall cake from casing, pipe etc	55 gal can	5 % v/v	2 drums

APPENDIX D2 PIT LAYOUT - CHANGE FROM DRILLING MUD TO CALCIUM CHLORIDE



Total Pit Capacity = 2,191 bbls

SCE Pit Capacity = 191 bbls

APPENDIX E COMPLETION TUBING INFORMATION & MAKE UP DATA

Size mm (inches)	Weight Kg/m (lb/ft)	Grade	Connection	I D (inches)	Drift (inches)
9 5/8”	47#	L80	NEW VAM	8.681”	8.525”
7”	29#	13Cr80	KSBEAR	6.184”	6.059”
7 5/8”	29.7#	13Cr80	FOX	6.875”	6.750”

Make Up Data

Tubing	Min. torque (lbf ft)	Optimum torque (lbf ft)	Max. torque (lbf ft)	Make-up Loss mm (inches)
9 5/8” 47# NEW VAM L80	13,050	14,450	15,850	140.84 (5.545”)
7” 29# KSBear (13Cr80)	12,150	13,500	14,850	127.76 (5.030)
7 5/8” 29.7# FOX (13Cr80)	10,900	11,720	12,540	133.10 (5.240)

APPENDIX F COMPLETION ASSEMBLY IDENTIFICATION

Lower Completion Assembly Naming Convention

ITEM	DESCRIPTION
LC	Lower Completion
LC**01**	Order to run in hole: Assembly 01 is first in the hole
LC01-**01**	Individual identifier

Planned Upper Completion Specific Numbering

Running Number	Identification	Description	Completion number
1	LC-01	Expandable Bottom Connector (EBC)	01, 02
2	LC-02	Expandable Top Connector (ETC)	01, 02
3	LC-03	EXP Packer (Hanger)	01, 02

Upper Completion Assembly Numbering Convention

ITEM	DESCRIPTION
UC	Upper Completion
UC**01**	Order to run in hole: Assembly 01 is first in the hole
UC01-**01**	Individual identifier

Planned Upper Completion Specific Numbering

Running Number	Identification	Description	Completion number
1	UC-01	Wireline Entry Guide	02, 03
2	UC-02	4.625” QN Nipple	02, 03
3	UC-03	Production Packer	02, 03
4	UC-04	Chemical Cut Sub	02, 03
5	UC-05	SSSV	02, 03
6	UC-06	Tubing Hanger	02, 03

APPENDIX G COMPLETION SUB ASSEMBLY DRAWINGS

Santos

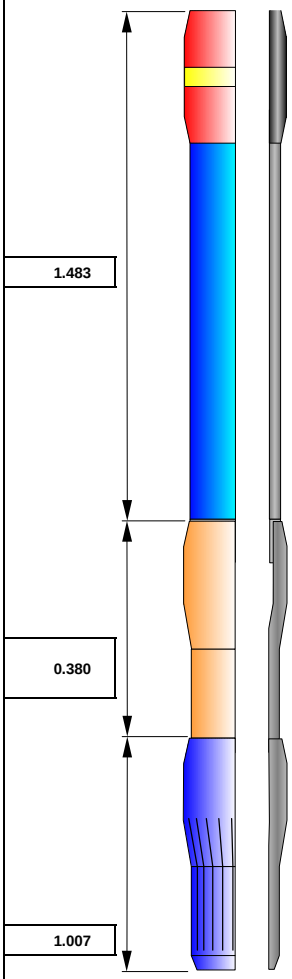
Casino - 5 Lower Completion Assembly

SUB-ASSEMBLY RECORD

Santos

EXPANDABLE TOP CONNECTOR (ETC) ASSEMBLY

SUB-ASSEMBLY NO. **LC-02-01**



ACTUAL LENGTH (m)	ACTUAL TORQUE (ft-lb)	DESCRIPTION	SIZE (In)	WEIGHT (p.p.f)	GRADE	THREAD UP	THREAD DOWN	I.D. (in)	O.D. (in)	DRIFT (in)	SUPPLIER
		Coupling	7-5/8"	29.7#	13%Cr L-80	7-5/8" 29.7# Fox SC Box	7-5/8" 29.7# Fox SC Box	7.012"	8.184"	6.750"	Santos
	10,371										
1.483		PUP Joint	7-5/8"	29.7#	13%Cr L-80	7-5/8" 29.7# Fox Pin	7-5/8" 29.7# Fox Pin	7.012"	7.625"	6.750"	Santos
	10,290										
0.380		X-Over	7-5/8"	29.7#	13%Cr L-80	7-5/8" 29.7# Fox SC Box	7-5/8" 29.7# Vam FLJ Pin	7.012"	8.017"	6.750"	Weatherford
	7,215										
1.007		5.5" Expandable Top Connector (ETC) Part # …723391…. Serial # …8530-01..	5.5"	N/A	5%Cr & 316	7-5/8" 29.7# FLV Box	5.5" Mk-II ESS Pin	4.795"	8.196"	N/A	Weatherford

2.870 = TOTAL ASSEMBLY LENGTH (m)

SPECIFIC SUB-ASSEMBLY FUNCTION/PRESSURES:

HYDROSTATIC PRESSURE TEST	Not Applicable	**TEST FLUID=**	
TEST FIXTURE SERIAL NO:		**NO SET INDICATION:**	
FULL BODY TEST		**DATE**	
		TEST NO	

COMMENTS:

RECOMMENDED TORQUE DATA

SIZE	WT/THREAD TYPE	MINIMUM (ft-lb)	OPTIMUM (ft-lb)	MAXIMUM (ft-lb)
7-5/8"	29.7# Fox	9,660	10,380	11,110
7-5/8"	29.7# Vam FJL	6,510	7,230	7,950

FRICTION FACTOR = 1.0

THREAD COMPOUND= Bestolife 72733

COMMENTS:

The Top Connector to Cross-Over Connection was over torqued initially (10,391 ft.lbs).

The connection was broken out, inspected for damage then made up again with no problems

TITLE	NAME	SIGNATURE	DATE
Weatherford - PROJECT ENGINEER:	Eamonn Arandiga		
Halliburton - SERVICES SUPERVISOR:	Bill Power		
Santos - COMPLETION SUPERVISIOR:	John Cooper		
Santos - SENIOR COMPLETION ENGINEER:	Mike Andronov		

3/05/2005

Santos

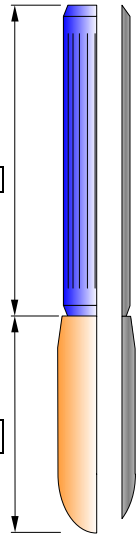
Casino - 5 Lower Completion Assembly

SUB-ASSEMBLY RECORD

Santos

EXPANDABLE BOTTOM CONNECTOR (EBC) ASSEMBLY

SUB-ASSEMBLY NO. **LC-01-01**

ACTUAL LENGTH (m)	MODULE DIAGRAM	ACTUAL TORQUE (ft-lb)	DESCRIPTION	SIZE (In)	WEIGHT (p.p.f)	GRADE	THREAD UP	THREAD DOWN	I.D. (in)	O.D. (in)	DRIFT (in)	SUPPLIER
2.981m		Made up with memac. 2 x grub screws made up with loctite.	**5.5" Expandable Bottom Connector Part # 571-5501-000-012 Serial # 8531/01**	5.5"	n/a	316L SS	5.5" Mk-II ESS	5.625" Stub ACME	4.830"	6.063"	4.705"	Weatherford
0.4m			**Bull Nose Part # 573-5500-021-020 Serial # PO233536-1/1**	5.5"	n/a	13%Cr L-80	5.625" Stub ACME	n/a	n/a	6.065"	n/a	Weatherford

3.381m = TOTAL ASSEMBLY LENGTH (m)

RECOMMENDED TORQUE DATA

SIZE	WT/TREAD TYPE	MINIMUM (ft-lb)	OPTIMUM (ft-lb)	MAXIMUM (ft-lb)
7"				

SPECIFIC SUB-ASSEMBLY FUNCTION/PRESSURES:

HYDROSTATIC PRESSURE TEST	N/A	**TEST FLUID=**	N/A
TEST FIXTURE SERIAL NO:		**NO SET INDICATION:**	
FULL BODY TEST	N/A	DATE	TEST NO

FRICTION FACTOR = 1.0

THREAD COMPOUND= Bestolife 72733

COMMENTS:

COMMENTS:

TITLE	NAME	SIGNATURE	DATE
Weatherford - PROJECT ENGINEER:	Eamonn Arandiga		
Halliburton - SERVICES SUPERVISOR:	James Bochel		
Santos - COMPLETION SUPERVISOR:	John Cooper		
Santos - SENIOR COMPLETION ENGINEER:	Mike Andronov		

3/05/2005

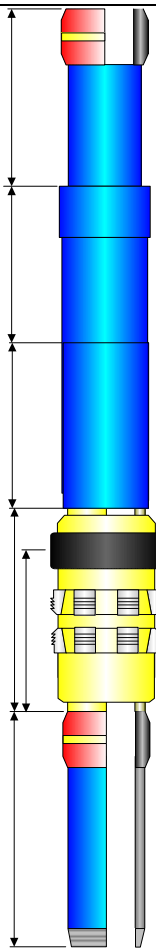
Santos

Casino - 5 Completion

SUB-ASSEMBLY RECORD

Santos

EXP Packer (Hanger) — **SUB-ASSEMBLY NO.** **LC-03-01**

ACTUAL LENGTH (m)	MODULE DIAGRAM	ACTUAL TORQUE (ft-lb)	DESCRIPTION	SIZE (In)	WEIGHT (p.p.f)	GRADE	THREAD UP	THREAD DOWN	I.D. (in)	O.D. (in)	DRIFT (in)	SUPPLIER
												
			Pup Joint + Cross Over	5"	19.5	S-135	4-1/2" IF Box	3-1/2" IF Pin				Weatherford
2.090			XO SN: 716477									
			PUP SN: 710158									
		9,100										
1.050			Running Tools				3-1/2" IF Box	N/A				Weatherford
		N/A										
			PBR	9-5/8"	47#	13%Cr L-80	Setting Sleeve	Stub ACME Box	7.622"	8.374"	n/a	Weatherford
1.930			Part # LEXY9RF18M									
			Serial # 5252440-2									
		48" + cheata										
1.261			EXP (Hanger)	9-5/8"	47#	13Cr 80ksi	Stub ACME Pin	7-5/8" 29.7# Fox Pin	6.949"	8.380"	6.750"	Weatherford
			Note: No nipple profile									
			Part # …760558....									
0.908			Serial # 5334528-2.									
		10,391										
			Coupling	6 5/8"	24	13Cr 80ksi	Fox Box	Fox Box	5.921	7.165	5.796	Santos
		10,391										
1.509												
			PUP Joint	6 5/8"	24	13Cr 80ksi	Fox Pin	Fox Pin	5.921	7.165	5.796	Santos

7.840 = TOTAL ASSEMBLY LENGTH (m)

RECOMMENDED TORQUE DATA

SIZE	WT/THREAD TYPE	MINIMUM (ft-lb)	OPTIMUM (ft-lb)	MAXIMUM (ft-lb)
7-5/8"	29.7# Fox	9,660	10,380	11,110

SPECIFIC SUB-ASSEMBLY FUNCTION/PRESSURES:

HYDROSTATIC PRESSURE TEST	N/A	**TEST FLUID=**	
TEST FIXTURE SERIAL NO:		**NO SET INDICATION:**	
FULL BODY TEST		**DATE**	

TEST NO

FRICTION FACTOR = 1.0

THREAD COMPOUND= Bestolife 72733

COMMENTS:

COMMENTS:

TITLE	NAME	SIGNATURE	DATE
Weatherford - PROJECT ENGINEER:	Eamonn Arandiga		
Halliburton - SERVICES SUPERVISOR:	Bill Power		
Santos - COMPLETION SUPERVISIOR:	John Cooper		
Santos - SENIOR COMPLETION ENGINEER:	Mike Andronov		

3/05/2005

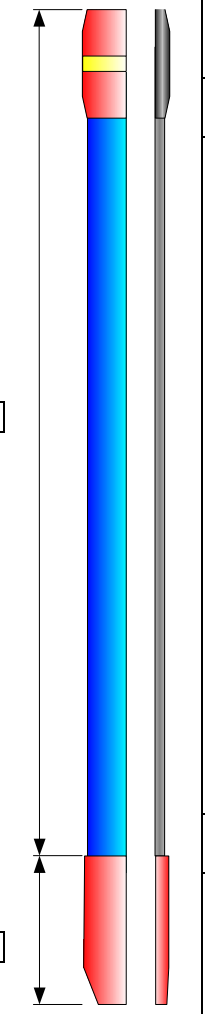
Santos

Casino - 5 Completion

SUB-ASSEMBLY RECORD

Santos

TAILPIPE ASSEMBLY | **SUB-ASSEMBLY NO.** **UC01- 02**

ACTUAL LENGTH (m)	Sub Assembly DIAGRAM	ACTUAL TORQUE (ft-lb)	DESCRIPTION	WEIGHT (p.p.f)	GRADE	THREAD UP	THREAD DOWN	I.D. (in) Nominal	O.D. (in) Nominal	DRIFT (in)	SUPPLIER
											
			Coupling	29	13Cr 80ksi	KS Bear, Box	KS Bear, Box	6.145	7.696	6.059	Santos
		13,205									
3.018m			**PUP Joint**	29	13Cr 80ksi	KS Bear, Pin	KS Bear, Pin	6.184	7.036	6.059	Santos
		13,285									
0.308m			**Muleshoe**	29	13Cr 80ksi	KS Bear, Box	Blank	5.900	8.329	5.850	Halliburton

3.326m = **TOTAL ASSEMBLY LENGTH (m)**

RECOMMENDED TORQUE DATA

SIZE = INCH	WT/THREAD TYPE	MINIMUM (ft-lb)	OPTIMUM (ft-lb)	MAXIMUM (ft-lb)
7"	29ppf KS Bear	12,770	13,215	13,660

SPECIFIC SUB-ASSEMBLY FUNCTION / PRESSURES:

COMMENTS: NO PRESSURE TEST REQUIRED

FRICTION FACTOR = 1.0

THREAD COMPOUND= Bestolife 72733

TITLE	NAME	SIGNATURE	DATE
Halliburton - Workshop SUPERVISOR:	Peter Berge		
Halliburton - SERVICES SUPERVISOR:	James Bochel		
Santos - COMPLETION SUPERVISIOR:	John Cooper		
Santos - SENIOR COMPLETION ENGINEER:	Mike Andronov		

5/05/2005

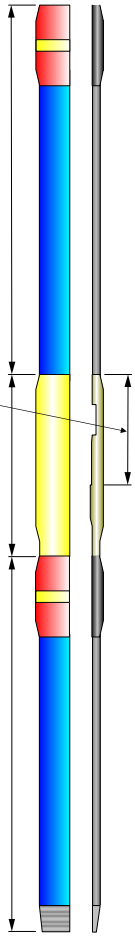
Santos

Casino - 5 Completion

SUB-ASSEMBLY RECORD

Santos

WEATHERFORD 4.625" QN NIPPLE | **SUB-ASSEMBLY NO.** **UC02-02**

ACTUAL LENGTH (m)	Sub Assembly DIAGRAM	ACTUAL TORQUE (ft-lb)	DESCRIPTION	WEIGHT (p.p.f)	GRADE	THREAD UP	THREAD DOWN	I.D. (in)	O.D. (in)	DRIFT (in)	SUPPLIER
											
			Coupling	29	13Cr 80ksi	KS Bear, Box	KS Bear, Box	6.203	7.678	6.059"	Santos
		13,406									
3.015m			**PUP Joint**	29	13Cr 80ksi	KS Bear, Box	KS Bear, Pin	6.184	7.033	6.059"	Santos
		13,245									
H.O.P 31.73"			**4.625" QN Nipple**								
				29	13Cr 80ksi	KS Bear, Box	KS Bear, Pin	4.626	7.678	4.500"	Weatherford
1.184m			**Part # 0204625000001** **Serial # 6141939**								
		13,205									
			Coupling	29	13Cr 80ksi	KS Bear, Box	KS Bear, Box	6.195	7.688	6.059"	Santos
		13,225									
3.154m			**PUP Joint**	29	13Cr 80ksi	KS Bear, Pin	KS Bear, Pin	6.201	7.034	6.059"	Santos

7.353m = **TOTAL ASSEMBLY LENGTH (m)**

RECOMMENDED TORQUE DATA

SIZE = INCH	WT/THREAD TYPE	MINIMUM (ft-lb)	OPTIMUM (ft-lb)	MAXIMUM (ft-lb)
7"	29ppf KS Bear	12,770	13,215	13,660

SPECIFIC SUB-ASSEMBLY FUNCTION/PRESSURES:

HYDROSTATIC PRESSURE TEST	5000 PSI	**TEST FLUID=**	Inhibited Water		
TEST FIXTURE SERIAL NO:	N/A				
FULL BODY TEST	N/A	**DATE**	N/A		N/A

FRICTION FACTOR = 1.0

THREAD COMPOUND= Bestolife 72733

SETTING PLUG TEST 15 MINS @ 5000 PSI

TEST ABOVE PLUG	5000psi	**DATE**	8/03/2005		1
TEST BELOW PLUG	5000psi	**DATE**	8/03/2005		2

COMMENTS:

I/D =4.633" AT SEAL BORE OF QN NIPPLE SUB

COMMENTS: Test was conducted utilising Weatherford QX Uni Set Lock Assembly (c/w test cap).

TITLE	NAME	SIGNATURE	DATE
Halliburton - Workshop SUPERVISOR:	Peter Berge		
Halliburton - SERVICES SUPERVISOR:	James Bochel		
Santos - COMPLETION SUPERVISOR:	John Cooper		
Santos - SENIOR COMPLETION ENGINEER:	Mike Andronov		

5/05/2005

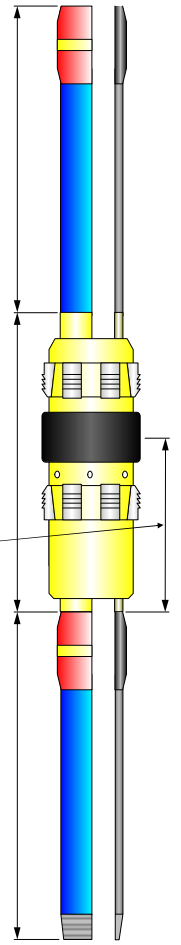
Santos

Casino - 5 Completion

SUB-ASSEMBLY RECORD

Santos

HALLIBURTON 'HHT' PACKER ASSEMBLY — **SUB-ASSEMBLY NO.** **UC03-02**

ACTUAL LENGTH (m)	Sub Assembly DIAGRAM	ACTUAL TORQUE (ft-lb)	DESCRIPTION	WEIGHT (p.p.f)	GRADE	THREAD UP	THREAD DOWN	I.D. (in)	O.D. (in)	DRIFT (in)	SUPPLIER
											
			Coupling	29	13Cr 80ksi	KS Bear, Box	KS Bear, Box	6.193	7.685	6.059"	Santos
		Made up at mill									
3.009m			**PUP Joint**	29	13Cr 80ksi	KS Bear, Pin	KS Bear, Pin	6.184	7.029	6.059"	Santos
		13,205									
			HHT' Packer								
			Model: 9-? " x 7" HHT	47	13Cr 80ksi	KS Bear, Box	KS Bear, Pin	5.900	8.374	5.886	Halliburton
2.663m			**Note: No nipple profile**								
H.O.P. 2.122m			**Part # 212HNT9511-FBBU**								
			Serial # 1204106-3								
		13,386									
			Coupling	29	13Cr 80ksi	KS Bear, Box	KS Bear, Box	6.184	7.684	6.059"	Santos
		13,205									
3.161m			**PUP Joint**	29	13Cr 80ksi	KS Bear, Pin	KS Bear, Pin	6.173	7.032	6.059"	Santos

8.833m = **TOTAL ASSEMBLY LENGTH (m)**

RECOMMENDED TORQUE DATA

SIZE = INCH	WT/THREAD TYPE	MINIMUM (ft-lb)	OPTIMUM (ft-lb)	MAXIMUM (ft-lb)
7"	29ppf KS Bear	12,770	13,215	13,660

SPECIFIC SUB-ASSEMBLY FUNCTION/PRESSURES:

HYDROSTATIC PRESSURE TEST	5000 PSI	**TEST FLUID=**	Inhibited Water		
TEST FIXTURE SERIAL NO:	N/A				
FULL BODY TEST	5000psi	**DATE**	10/03/2005		1

FRICTION FACTOR = 1.0

COMMENTS: Test pins fitted and shear screws removed for testing. Test pins removed and shear screws re fitted. Hydrostatic set mechanism disarmed. Modifications carried out by Halliburton, Cheltenham, Victoria.

THREAD COMPOUND= Bestolife 72733

COMMENTS:

TITLE	NAME	SIGNATURE	DATE
Halliburton - Workshop SUPERVISOR:	Peter Berge		
Halliburton - SERVICES SUPERVISOR:	James Bochel		
Santos - COMPLETION SUPERVISOR:	John Cooper		
Santos - SENIOR COMPLETION ENGINEER:	Mike Andronov		

5/05/2005

Santos

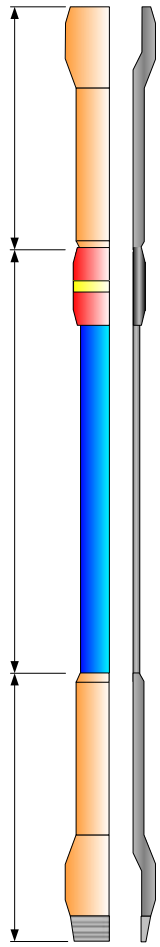
Casino - 5 Completion

SUB-ASSEMBLY RECORD

Santos

5-1/2" CHEMICAL CUT ASSEMBLY

SUB-ASSEMBLY NO. **UC04 -02**

ACTUAL LENGTH (m)	Sub Assembly DIAGRAM	ACTUAL TORQUE (ft-lb)	DESCRIPTION	WEIGHT (p.p.f)	GRADE	THREAD UP	THREAD DOWN	I.D. (in)	O.D. (in)	DRIFT (in)	SUPPLIER
											
		Made up at mill	Coupling	29	13Cr 80ksi	KS Bear, Box	KS Bear, Box	6.184	7.689	6.059"	MI
2.508m			Cross-Over	29	13Cr 80ksi	KS Bear, Box	n/a	6.184	7.689	6.059"	Santos
			Serial #	17	13Cr 80ksi	n/a	KS Bear, Pin	4.892	5.521	4.767"	
			S 1994/01/03								
		7,396									
			Coupling	17	13Cr 80ksi	KS Bear, Pin	KS Bear, Pin	4.914"	6.050"	4.767"	MI
		Made up at mill									
7.030m			PUP Joint	17	13Cr 80ksi	KS Bear, Pin	KS Bear, Pin	4.892	5.528	4.767"	MI
		7,396									
1.796m			Cross-Over	17	13Cr 80ksi	KS Bear, Box	N/A	4.892"	5.521"	4.767"	MI
			Serial #	29	13Cr 80ksi	N/A	KS Bear, Pin	6.184	7.013	6.059"	
			S 1994/03/03								

11.351	= TOTAL ASSEMBLY LENGTH (m)

RECOMMENDED TORQUE DATA

SIZE = INCH	WT/THREAD TYPE	MINIMUM (ft-lb)	OPTIMUM (ft-lb)	MAXIMUM (ft-lb)
7"	29ppf KS Bear	12,770	13,215	13,660
5 1/2"	17ppf KS Bear	6,660	7,400	8,140

SPECIFIC SUB-ASSEMBLY FUNCTION/PRESSURES:

HYDROSTATIC PRESSURE TEST	5000 PSI	**TEST FLUID=**	Inhibited Water		
TEST FIXTURE SERIAL NO:	N/A				
FULL BODY TEST	5000psi	DATE	11/0312005		1

FRICTION FACTOR = 1.0

THREAD COMPOUND= Bestolife 72733

COMMENTS:

COMMENTS:

TITLE	NAME	SIGNATURE	DATE
Halliburton - Workshop SUPERVISOR:	Peter Berge		
Halliburton - SERVICES SUPERVISOR:	James Bochel		
Santos - COMPLETION SUPERVISOR:	John Cooper		
Santos - SENIOR COMPLETION ENGINEER:	Mike Andronov		

5/05/2005

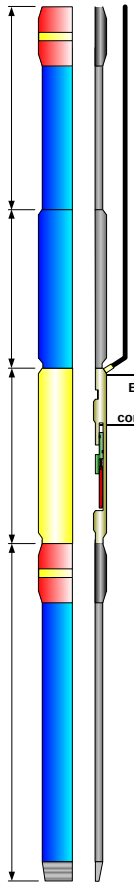
Santos

Casino - 5 Completion

SUB-ASSEMBLY RECORD

Santos

TUBING RETRIEVABLE - SURFACE CONTROL SUB-SURFACE VALVE | **SUB-ASSEMBLY NO.** **UC05-02**

ACTUAL LENGTH (m)	Sub Assembly DIAGRAM	ACTUAL TORQUE (ft lb)	DESCRIPTION	WEIGHT (p.p.f)	GRADE	THREAD UP	THREAD DOWN	I.D. (in)	O.D. (in)	DRIFT (in)	SUPPLIER
											
			Coupling	29	13Cr 80ksi	KS Bear, Box	KS Bear, Box	6.184	7.706	6.059	Santos
		13,205									
1.5m			**PUP Joint**	29	13Cr 80ksi	KS Bear, Pin	KS Bear, Pin	6.184	7.047	6.059"	Santos
		13,225									
			Flow Coupling	29	13Cr 80ksi	KS Bear, Box	KS Bear, Pin	6.184	7.701	6.059"	Halliburton
2.219m		**13,265**									
	Baker Jam Nut connection		**TSME-5** **Note: Self Equalising** **SC-TRSV c/c 5.875"** **BRQ Nipple Profile** **Part # H-057534300020** **Serial # 246235**	29	13Cr 80ksi	KS Bear, Box	KS Bear, Box	5.875	9.192	5.845"	Baker OT
2.405m		**13,285**									
			Coupling	29	13Cr 80ksi	KS Bear, Box	KS Bear, Box	6.184	7.698	6.059"	MI
		13,305									
3.144m			**PUP Joint**	29	13Cr 80ksi	KS Bear, Pin	KS Bear, Pin	6.184	7.039	6.059"	Santos

9.968m = **TOTAL ASSEMBLY LENGTH (m)**

RECOMMENDED TORQUE DATA

SIZE	WT/THREAD TYPE	MINIMUM (ft-lb)	OPTIMUM (ft-lb)	MAXIMUM (ft-lb)
SIZE = INCH	29ppf KS Bear	12,770	13,215	13,660

SPECIFIC SUB-ASSEMBLY FUNCTION/PRESSURES:

HYDROSTATIC PRESSURE TEST	5000 PSI	**TEST FLUID=**	Inhibited Water		
TEST FIXTURE SERIAL NO:	N/A				
FULL BODY TEST & BELOW FLAPPER	5000 PSI	**DATE**		1 & 2	**FRICTION FACTOR =** 1.0
BELOW & ABOVE PLUG TESTS	N/A	SETTING PLUG			**THREAD COMPOUND=** Bestolife 72733

CONTROL LINE PRESSURE TEST 15 MINS @ 7500 PSI

FUNCTION	PRESSURE (psi-avg 5 Cycles)
START TO OPEN	1,100 psi
FULLY OPEN	1,550 psi
START TO CLOSE	1,400 psi
FULLY CLOSED	1,100 psi

COMMENTS:

FLUID RETURN AVERAGE @ 5k psi = 73.5m

TITLE	NAME	SIGNATURE	DATE
Halliburton - Workshop SUPERVISOR:	Peter Berge		
Halliburton - SERVICES SUPERVISOR:	James Bochel		
Santos - COMPLETION SUPERVISOR:	John Cooper		
Santos - SENIOR COMPLETION ENGINEER:	Mike Andronov		

5/05/2005

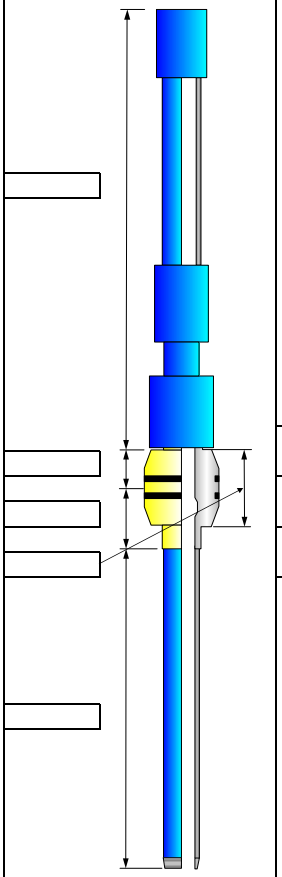
Santos

Casino - 5 Completion

SUB-ASSEMBLY RECORD

Santos

TUBING HANGER | **SUB-ASSEMBLY NO.** **UC06-02**

ACTUAL LENGTH (m)	Sub Assembly DIAGRAM	ACTUAL TORQUE (ft-lb)	DESCRIPTION	SIZE (In)	WEIGHT (p.p.f)	GRADE	THREAD UP	THREAD DOWN	I.D. (in)	O.D. (in)	DRIFT (in)	SUPPLIER
												
			Cameron	4.5	17	New Grade E	4 1/2" IF Box	N/A	3.750	17.500	3.625	Cameron
			Tubing Hanger handling									
			Test Tool. Pt # 2142721-06									
			Modified to be Pump Thru									
			Tubing Hanger	**7**	7	29	13Cr 80ksi	N/A	KS Bear, Box	6.254	17.765	6.059
			Part # 2201912-06					interfaces with hyd. THRT			Unlocked	
		14,138	**Serial # TBA on rig**									
			PUP Joint	7	29	13Cr 80ksi	KS Bear, Pin	KS Bear, Pin	6.184	7.040	6.059"	Cameron

= TOTAL ASSEMBLY LENGTH (m)

RECOMMENDED TORQUE DATA

SIZE	WT/THREAD TYPE	MINIMUM (ft-lb)	OPTIMUM (ft-lb)	MAXIMUM (ft-lb)
SIZE = INCH	29ppf KS Bear	12,770	13,215	13,660

SPECIFIC SUB-ASSEMBLY FUNCTION/PRESSURES:

HYDROSTATIC PRESSURE TEST	5000 PSI	**TEST FLUID=**	Inhibited Water
TEST FIXTURE SERIAL NO:			
FULL BODY TEST	5000psi	**DATE**	11/03/2005
SETTING PLUG TEST 15 MINS @ 5000 PSI			
TEST BELOW PLUG	5000psi	**DATE**	

FRICTION FACTOR = 1.0

THREAD COMPOUND= Bestolife 72733

COMMENTS:

COMMENTS:

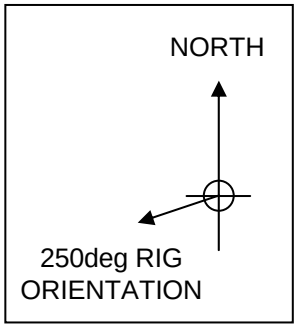
7" KS Bear Tubing Hanger connection make up by Oil Tools Pte Ltd, Singapore. Witnessed by JFE, Singapore.

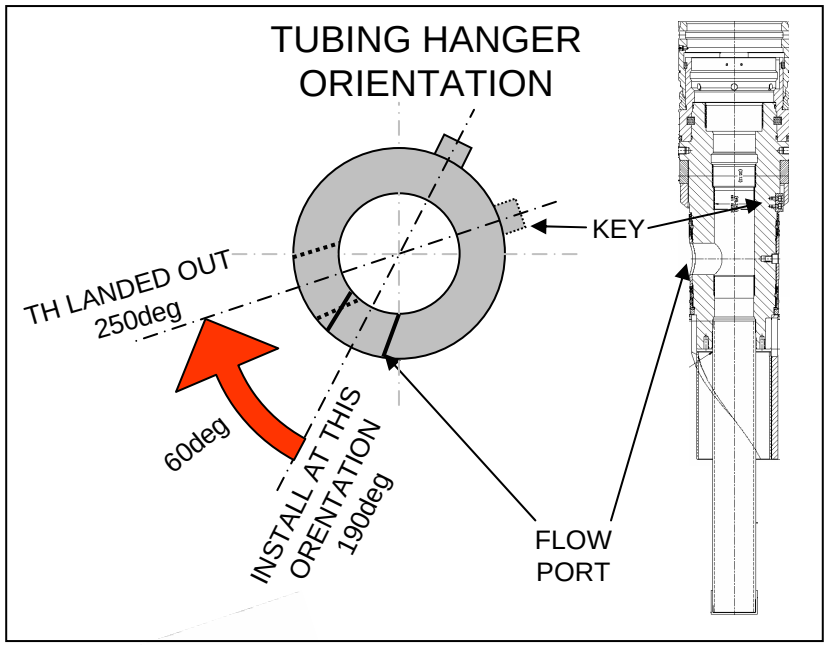
TITLE	Name	SIGNATURE	DATE
OilTools- Workshop SUPERVISOR:	?		
JFE - SERVICES SUPERVISOR:	Roger Tan		
Santos - COMPLETION SUPERVISOR:	John Cooper		
Santos - SENIOR COMPLETION ENGINEER:	Mike Andropov		

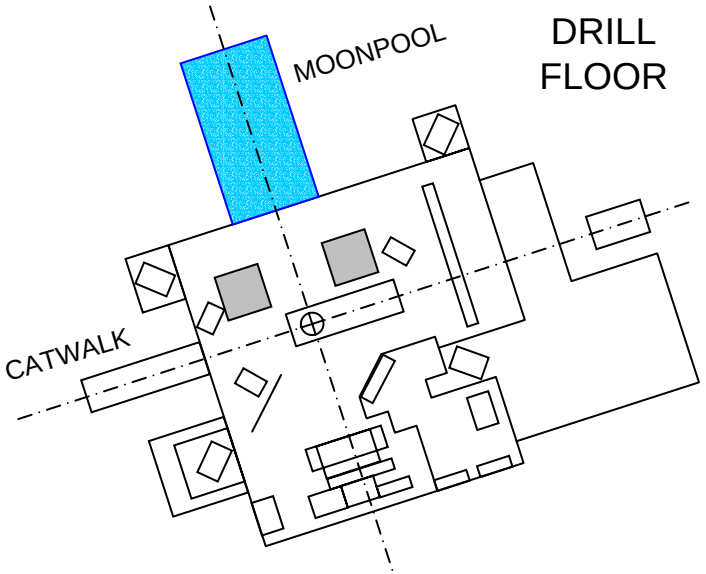
 5/05/2005

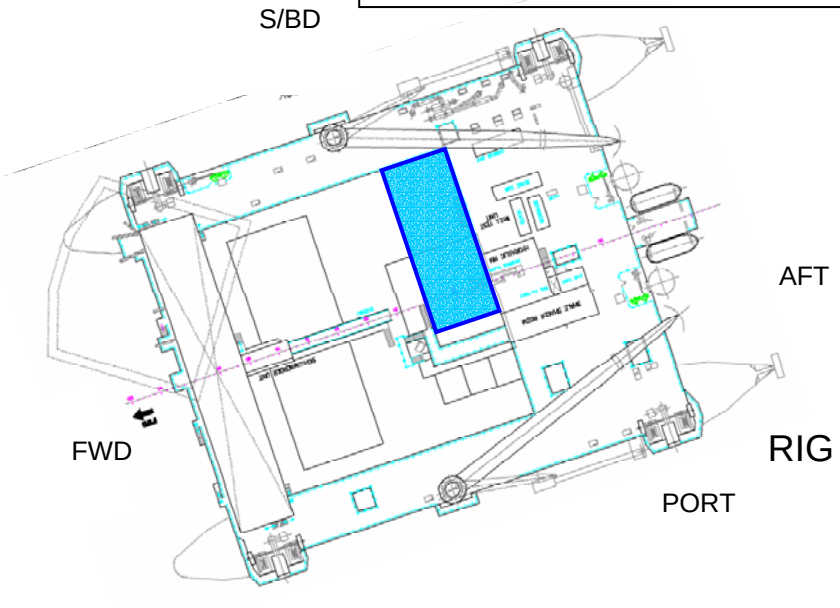
APPENDIX H TREE / TUBING HANGER ORIENTATION SCHEMATIC

Rig and Subsea Orientation

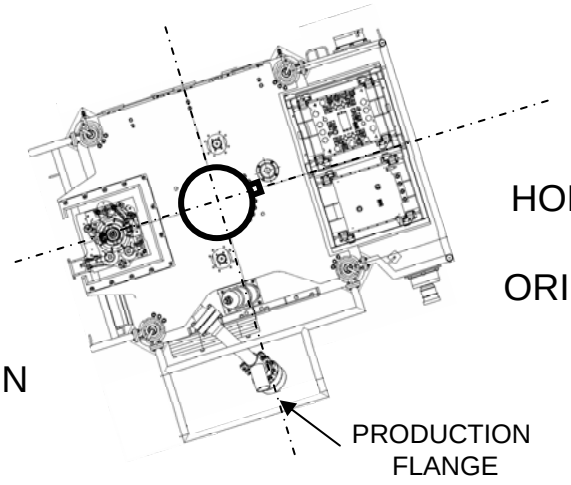








RIG ORIENTATION

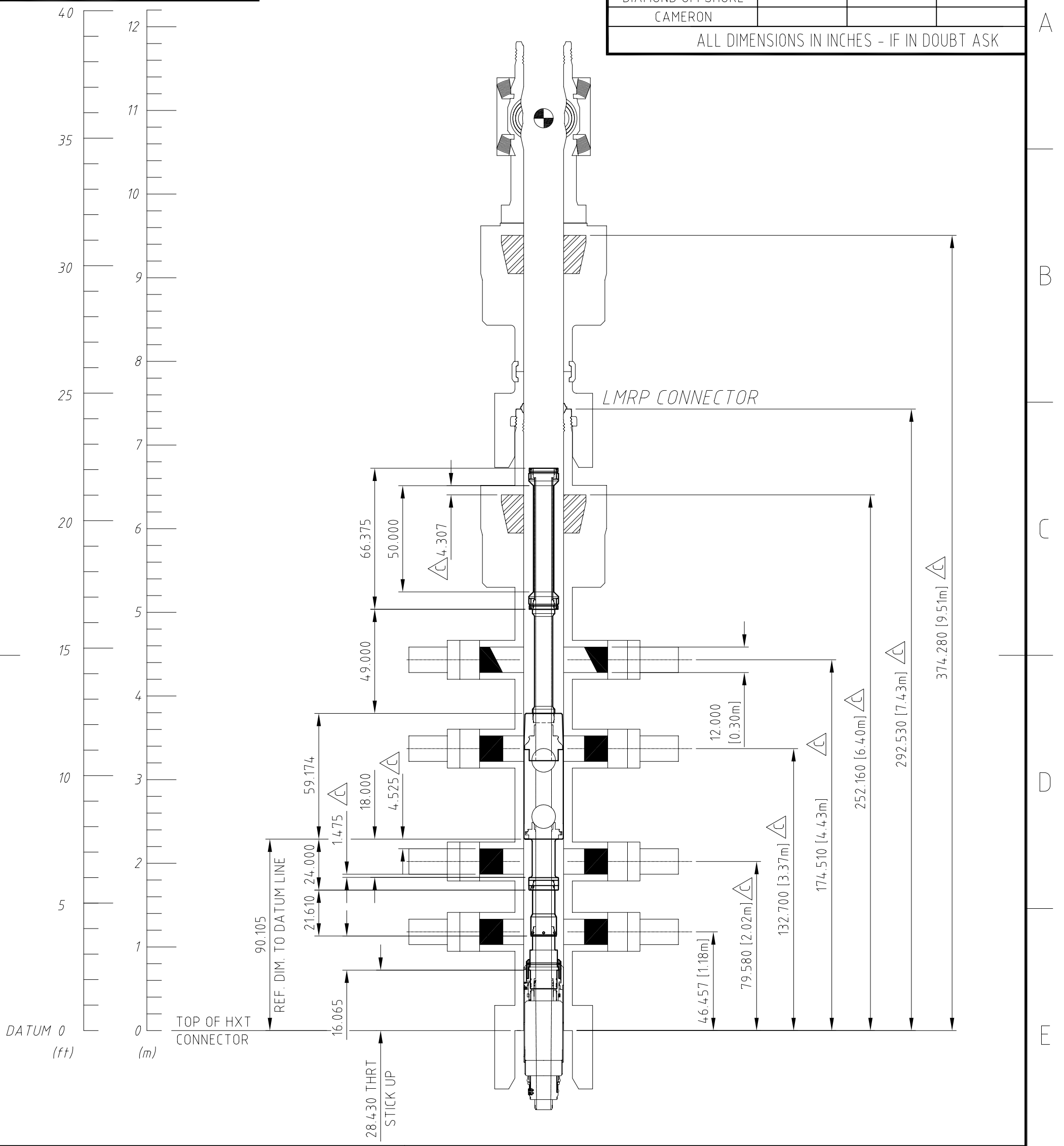


HORIZONTAL
TREE
ORIENTATION

APPENDIX I1 PATRIOT BOP SCHEMATIC. THRT/SSTT/TH SPACE OUT

REV	DATE	E.C.N. No.	BY
B	04/10/04	2061	MAB
C	22/11/04	2204	MT

DRAWING AND DIMENSIONAL APPROVAL			
FOR AND ON BEHALF OF	PRINT NAME	SIGNED	DATE
EXPRO			
SANTOS			
DIAMOND OFFSHORE			
CAMERON			
ALL DIMENSIONS IN INCHES - IF IN DOUBT ASK			



DEPTH OF RAMS				RIG INFORMATION			
UPPER ANNULAR	TBC	UPPER PIPE RAM	TBC	END USER:	SANTOS	FIELD:	CASINO
LOWER ANNULAR	TBC	MIDDLE PIPE RAM	TBC	INSTALLATION:	OCEAN PATRIOT		
SHEAR RAM	TBC	LOWER PIPE RAM	TBC	WELL NO:	TBA		

DO NOT SCALE - IF IN DOUBT ASK

THE EXPRO GROUP

Drawn by	Date Drawn	Responsible Engineer
S Fong	09/06/2004	M A Burns

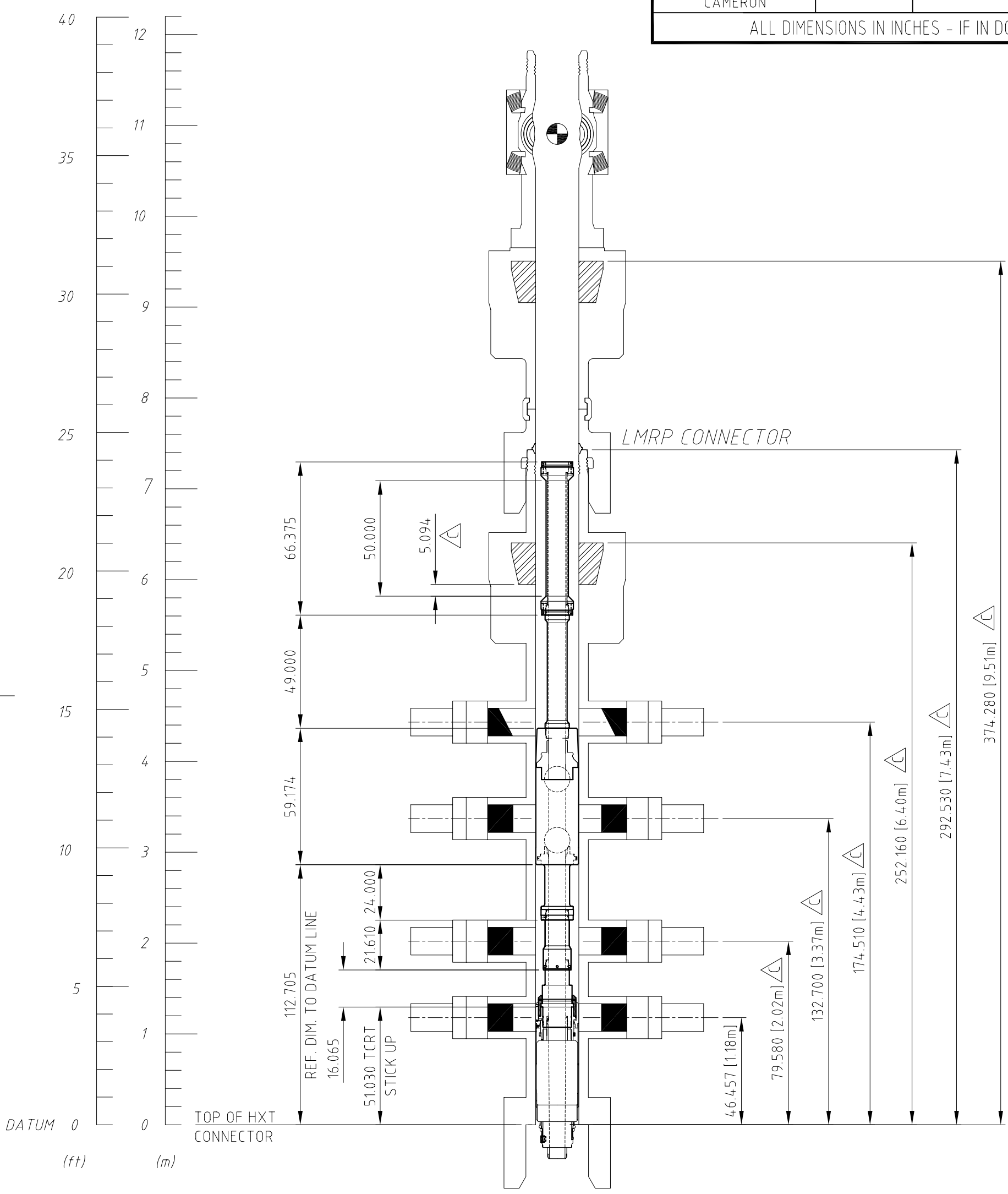
Title: SANTOS, CASINO
OCEAN PATRIOT, CAMERON THRT
SPACEOUT (TH MODE)

Drawing No	Sheet No.	Revision
112538	1 OF 2	C

APPENDIX I2 PATRIOT BOP SCHEMATIC. THRT/SSTT/ITC SPACE OUT

REV	DATE	E.C.N. No.	BY
	SEE	SHEET	1

DRAWING AND DIMENSIONAL APPROVAL			
FOR AND ON BEHALF OF	PRINT NAME	SIGNED	DATE
EXPRO			
SANTOS			
DIAMOND OFFSHORE			
CAMERON			
ALL DIMENSIONS IN INCHES - IF IN DOUBT ASK			



DEPTH OF RAMS				RIG INFORMATION			
UPPER ANNULAR	TBC	UPPER PIPE RAM	TBC	END USER:	SANTOS	FIELD:	CASINO
LOWER ANNULAR	TBC	MIDDLE PIPE RAM	TBC	INSTALLATION:	OCEAN PATRIOT		
SHEAR RAM	TBC	LOWER PIPE RAM	TBC	WELL NO:	TBA		

DO NOT SCALE - IF IN DOUBT ASK

THE EXPRO GROUP

Drawn by	Date Drawn	Responsible Engineer
S Fong	09/06/2004	M A Burns

Title: SANTOS, CASINO
OCEAN PATRIOT, CAMERON THRT
SPACEOUT (TC MODE)

Drawing No	Sheet No.	Revision
112538	2 OF 2	C

APPENDIX J RIG FLOOR COMPLETION VALVE STATUS SCHEMATIC.

Casino Rig Floor Completion Valve Schematic

Santos	Drawn by: Paul Nardone
	Reviewed by: Chris Butler
	Reviewed by: Mike Andronov
08/Mar/2005	Approved by: Peter Dodd
	\1. Detailed Design\1 Landing String\3 Drawings

Flowhead
KWV Kill Wing Valve
SV Swab Valve
FWV Flow Wing Valve
MV Master Valve
DV Drain Valves

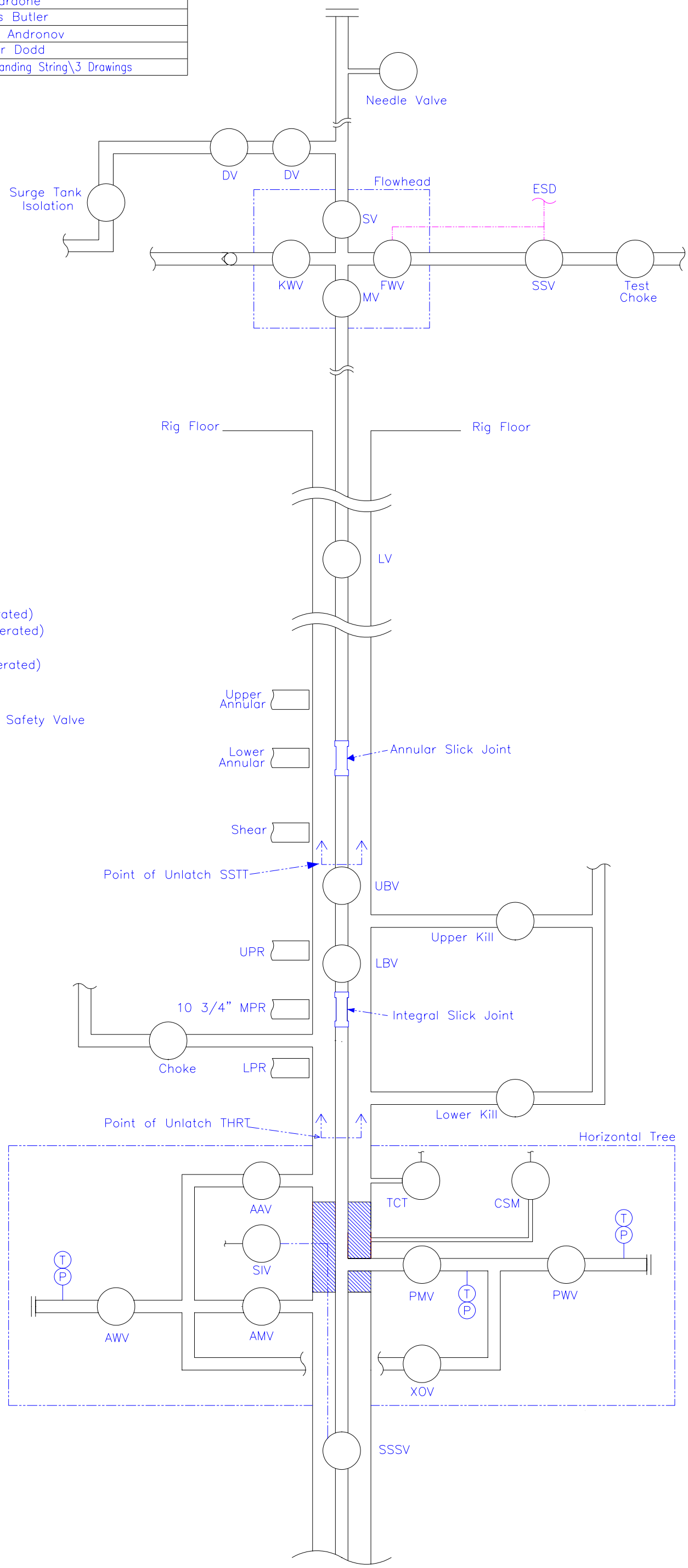
Surface Equipment
SSV Surface Shutdown Valve
ESD Emergency Shut Down

Landing String
LV Lubricator Valve
UBV Upper Ball Valve
LBV Lower Ball Valve

BOP
UPR Upper Pipe Rams
MPR Middle Pipe Rams
LPR Lower Pipe Rams

Horizontal Tree
THV Tubing Hanger Vent
PWV Production Wing Valve
PMV Production Master Valve
XOV Crossover Valve
AAV Annulus Access Valve
AMV Annulus Master Valve
AWV Annulus Wing Valve (ROV Operated)
CSM Control Stab Monitor (ROV Operated)
TCT Tree Cap Test (ROV Operated)
SIV SSSV Isolation Valve (ROV Operated)

Upper Completion
SSSV Surface Controlled Subsurface Safety Valve

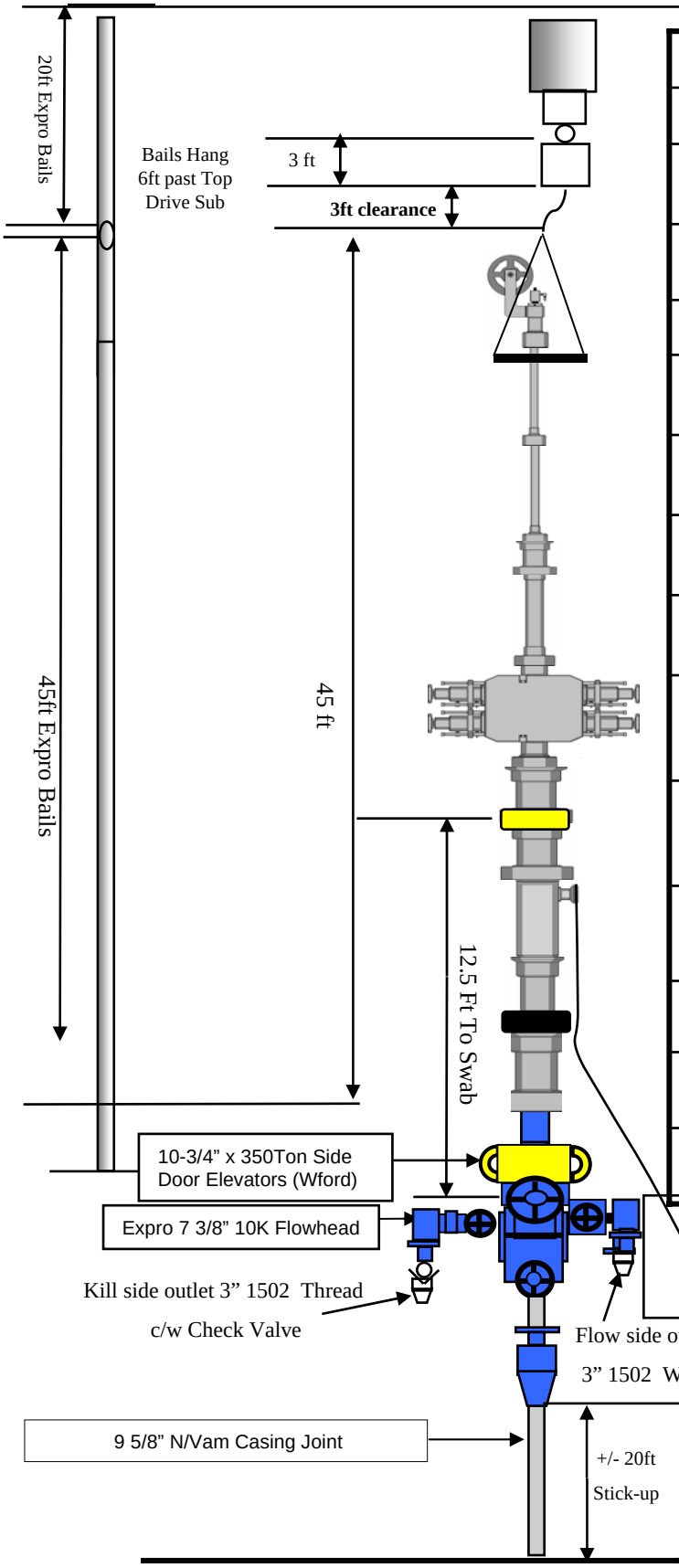


APPENDIX K FLOWHEAD AND SLICKLINE PRESSURE CONTROL SCHEMATIC

EXPRO SCOPE AND DIMENSIONS
SANTOS - CASINO

THE EXPRO GROUP

Stackup drawing 08/3/05



DESCRIPTION	LENGTH	ID
Top Drive Sub	N/A	N/A
5 Tonne Air Hoist	3 ft	N/A
Lubricator Clamp / Sling (5 Tonne)	5 Ft	N/A
5 ¾" Otis Stuffing Box	N/A	N/A
5 ¾" Lubricator Section	8 Ft	3"
5 ¾" Lubricator Section	8 Ft	3"
Crossover 8 7/8" Bowen P/C x 5 ¾" Otis Box	1 Ft	3"
8 7/8" Bowen Lubricator Section	8 Ft	5"
8 7/8" Bowen Dual Ram BOP	4 Ft	5"
11 ½" Otis P/C x 8 7/8" Bowen Box In-Situ Test Sub (Yellow Tool Break-out Collar	4 Ft	5" top 7" btm
11 ½" Otis Pump-In Tee c/w 2" 1502 Thread	4 Ft	7"
13" Bowen P/C x 11 ½" Otis Box	2 Ft	7"
10" Stub Acme Thread x 13" Bowen Box	1 Ft	7.375"
Top of Flowhead Saver Sub to Top of Swab Valve Gate	4 Ft	7.375"

Maximum Toolstring 'Swallow' Swab Valve to Stuffing Box

44 Ft

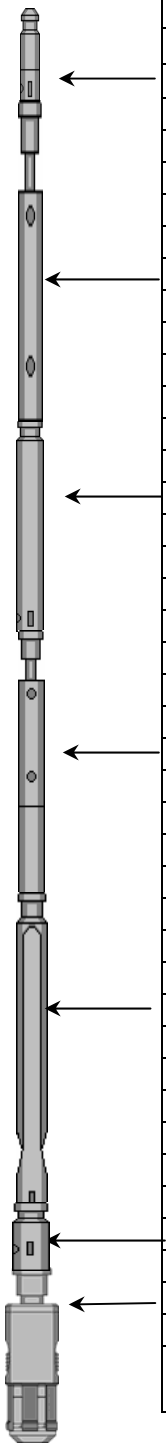
APPENDIX L PLANNED SLICKLINE TOOL STRINGS

THE EXPRO GROUP

Santos

Proposed Toolstrings
Santos Casino

Toolstring a) - Run # 1– Pull TH Isolation Sleeve



ITEM	DESCRIPTION	OUTSIDE DIAMETER	FISHING NECK	LENGTH	SUPPLY	CONNECTION TYPE
1	Rope Socket (0.125”)	1.875”	1.75”	12”	Expro	QRJ
2	Accelerator	1.875”	1.75”	60”	Expro	QRJ
3	Stem	1.875”	1.75”	60"	Expro	QRJ
4	Spring Jar	1.875”	1.75”	60" Open	Expro	QRJ
5	Spang Jars	1.875”	1.75”	84" Open	Expro	QRJ
6	Crossover	1.875”	1.75”	4”	Expro	QRJ-1 1/16” Box
7	7 ” GS	5.83”	3.125”	20.36”	Cameron	1 1/16” pin
8	Isolation Sleeve	6.69”	5.83	29.01	Cameron	
	TOTAL LENGTH 27.45 feet					

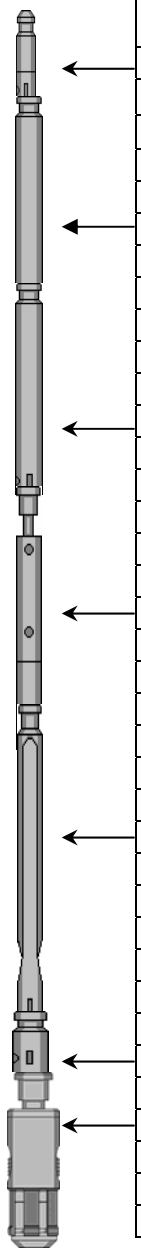
****Tool break out point is Yellow Collar.****

THE EXPRO GROUP

Santos

Proposed Toolstrings
Santos Casino

Toolstring b) - Run # 2 – Set TH Short Protection Sleeve.



ITEM	DESCRIPTION	OUTSIDE DIAMETER	FISHING NECK	LENGTH	SUPPLY	CONNECTION TYPE
1	Rope Socket (.125”)	1.875”	1.75”	12”	Expro	QRJ
2	Stem	1.875”	1.75”	60”	Expro	QRJ
3	Stem	1.875"	1.75”	36"	Expro	QRJ
4	Spring Jar	1.875”	1.75”	60" Open	Expro	QRJ
5	Spang Jar	1.875”	1.75”	84" Open	Expro	QRJ
6	X-Over	1.875”	1.75”	4”	Expro	QRJ-1 1/16” Box
7	7 3/4” GS Pulling tool	6.94"	3.125"	20.25"	Cameron	1 1/16" Pin
8	Short bore protector	7.26”	6.25”	19.2”	Cameron	
	TOTAL LENGTH					
	24.6 FT.					

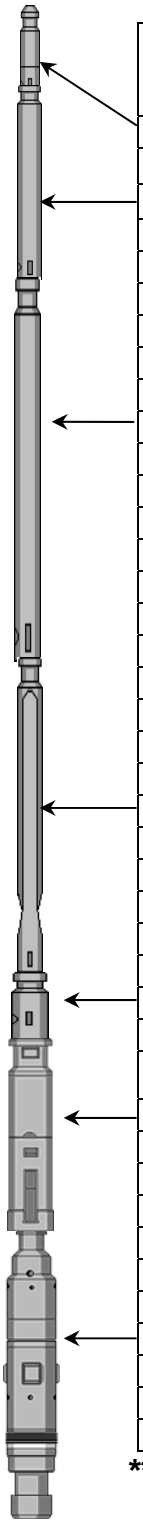
Break out point is Black 13” Bowen Pin & Collar.

THE EXPRO GROUP

Santos

Proposed Toolstrings
Santos Casino

Toolstring c) - Run # 3 –Run 4.625” RNQN standing valve

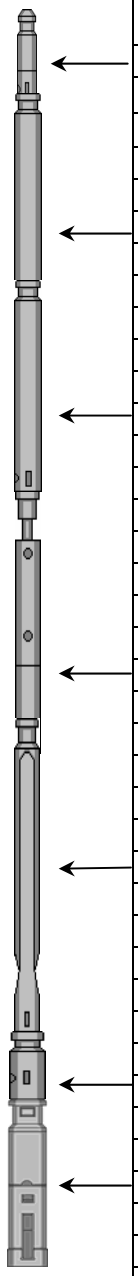


ITEM	DESCRIPTION	OUTSIDE DIAMETER	FISHING NECK	LENGTH	SUPPLY	CONNECTION TYPE
1	Rope Socket (0.125”)	1.875”	1.75”	12”	Expro	QRJ
2	Stem	1.875"	1.75”	60"	Expro	QRJ
3	Stem	1.875"	1.75”	36”	Expro	QRJ
5	Spang Jars	1.875”	1.75”	84" Open	Expro	QRJ
6	X-Over	1.75”	1.75”	4”	Expro	QRJ-1 1/16” Box
7	3” SB running tool	2.7”	2.313”	16”	Expro	1 1/16” pin
8	4.625” RNQN	4.686”	2.313””	36.66”	Wford	
	TOTAL LENGTH					
	20.72 FT.					

****Toolstring Breakout Point is Yellow Collar****

Proposed Toolstrings
Santos Casino

Toolstring d) - Run # 4 – Retrieve 4.625” RNQN standing valve



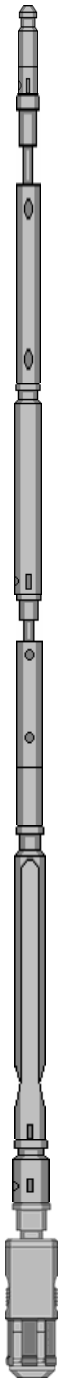
ITEM	DESCRIPTION	OUTSIDE DIAMETER	FISHING NECK	LENGTH	SUPPLY	CONNECTION TYPE
1	Rope Socket (.125”)	1.875”	1.75”	12”	Expro	QRJ
2	Stem	1.875”	1.75”	60”	Expro	QRJ
3	Stem	1.875”	1.75”	36”	Expro	QRJ
4	Spring Jar	1.875”	1.75”	60" Open	Expro	QRJ
5	Spang Jars	1.875”	1.75”	84" Open	Expro	QRJ
6	Crossover	1.75”	1.75”	4”	Expro	QRJ-1 1/16” Box
7	3” SB	2.7”	2.313”	16”	Expro	1 1/16" Pin
	TOTAL LENGTH	22.67ft				
	TOTAL WITH STANDING VALVE	25.72ft				

****Tool Breakout Point is Yellow Collar***

THE EXPRO GROUP

Santos

Proposed Toolstrings
Santos Casino
Toolstring e) - Run # 5– Pull TH Short Protection Sleeve



ITEM	DESCRIPTION	OUTSIDE DIAMETER	FISHING NECK	LENGTH	SUPPLY	CONNECTION TYPE
1	Rope Socket (.125”)	1.875”	1.75”	12”	Expro	QRJ
2	Accelerator	1.875”	1.75”	60”	Expro	QRJ
3	Stem	1.875”	1.75”	60"	Expro	QRJ
4	Spring Jar	1.875”	1.75”	60" Open	Expro	QRJ
5	Spang Jars	1.875”	1.75”	84" Open	Expro	QRJ
6	X-Over	1.875”	1.75”	4”	Expro	QRJ-1 1/16” Box
7	7 3/4” GS	6.94”	3.125”	20.25”	Cameron	1 1/16” pin
8	Short Bore Protector	7.26”	6.25”	19.2”	Cameron	
	TOTAL LENGTH **26.63feet**					

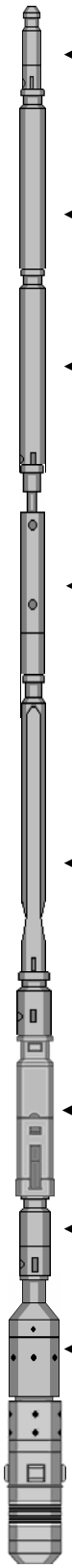
****Breakout Point is Black 13” Bowen Collar above Flowhead****

THE EXPRO GROUP

Santos

Proposed Toolstrings
Santos Casino

Toolstring f) - Run # 6 – Set 6.70” TH Plug (With Shear Up Release Facility).

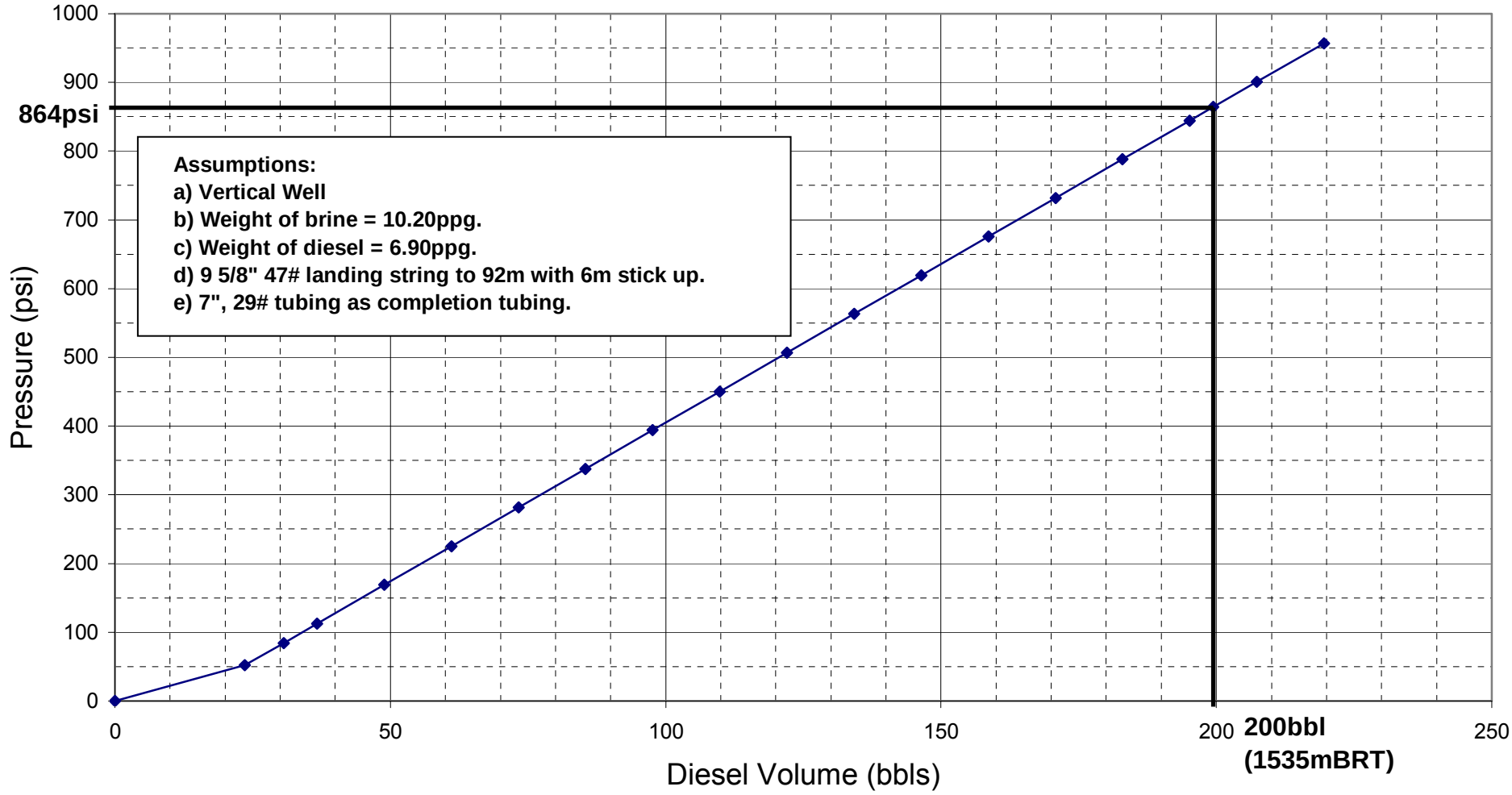


ITEM	DESCRIPTION	OUTSIDE DIAMETER	FISHING NECK	LENGTH	SUPPLY	CONNECTION TYPE
1	Rope Socket (.125”)	1.875”	1.75”	12”	Expro	QRJ
2	Stem	1.875”	1.75”	60”	Expro	QRJ
3	Stem	1.875"	1.75”	36"	Expro	QRJ
4	Spring Jar	1.875”	1.75”	60" Open	Expro	QRJ
5	Spang Jar	1.875”	1.75”	84" Open	Expro	QRJ
6	Crossover	1.875”	1.75”	4”	Expro	QRJ-1 1/16” Box
7	3” UPT (Shear Up)	2.8”	1.75”	21”	Expro	1 1/16” pin
8	2 1/2” Dummy Rope Socket c/w Crossover	2 ½”	2.313”	12”	Expro	1 9/16” pin x 1 1/16” box
9	6.7” Lower TH Plug c/w Running Tool	6.7”	2.313” on Running Tool	21”	Cameron	1 1/16” pin
	TOTAL LENGTH	**25.83 FT.**				

****Tool Breakout Point is Yellow Collar****

APPENDIX M PRESSURE VS. VOLUME GRAPH FOR DIESEL DISPLACMENT

Casino 5 - Pressure vs. Volume for Diesel Displacement



APPENDIX N DATA ACQUISITION

Surface Data Acquisition Frequency

Data Type	Acquisition Frequency
Wellhead	
Pressure and Temperature	1 minute throughout test.
BS&W	15 minutes initially 30 minutes stabilised (If possible)
H2S / CO2 Content	15 minutes initially 30 minutes stabilised
Choke changes	Take additional BSW
Downstream	
Condensate Gravity	15 minutes initially 30 minutes stabilised
Gas Gravity	15 minutes initially 30 minutes stabilised
Tank Level	15 minutes initially 30 minutes stabilised

NOTE: ALL EVENTS TO BE RECORDED ON DATA READING SHEETS ONLY.

APPENDIX O SAMPLING REQUIREMENTS

CASINO 5 SAMPLING/TRACE ANALYSIS PROGRAMME

CLEAN UP FLOW

Fluid	Analysis	Onsite Offsite	Frequency or number	Sample Point	Volume	Comments
gas	H_2S	On	10 min - 1 hr	choke	-	Draeger
gas	CO_2	On	10 min - 1 hr	choke	-	Draeger
water		On	1 hr, if possible	sep	1L	for onsite analysis
water		Off	2	sep	2 x 1L	

END OF CLEAN UP FLOW

Duration determined by sampling programme

Fluid	Analysis	Onsite Offsite	Frequency or number	Sample Point	Volume	Comments
gas	H_2S	On	30 min	sep	-	Draeger
gas	CO_2	On	30 min	sep	-	Draeger
gas	R-SH	On	30 min	sep	-	Draeger
gas	radon	On	3	sep	-	commence when in separator
water		On	1 hr, if possible	sep	1L	for onsite analysis
water		Off	1 set	sep	6 x 1L	samples to be preserved
LP cond		Off	2	sep	5L tin	
LP cond		Off	2	sep	1L glass	
gas/cond	PVT	Off	2 sets	sep	20L/640cc	commence when in separator
LP cond	Assay	Off	8	stock tank	25L	taken at end of test
gas	Ar, He, H_2, O_2	Off	2	sep	150 cc	taken at end of test
gas		Off	4	sep	2 x 150cc	for Authorities / taken at end of test

ONSITE METHODS - for gas

CO_2 Draeger tube
Mercaptan (RSH) Draeger tube
Radon Inhouse method utilising a scintillator counter

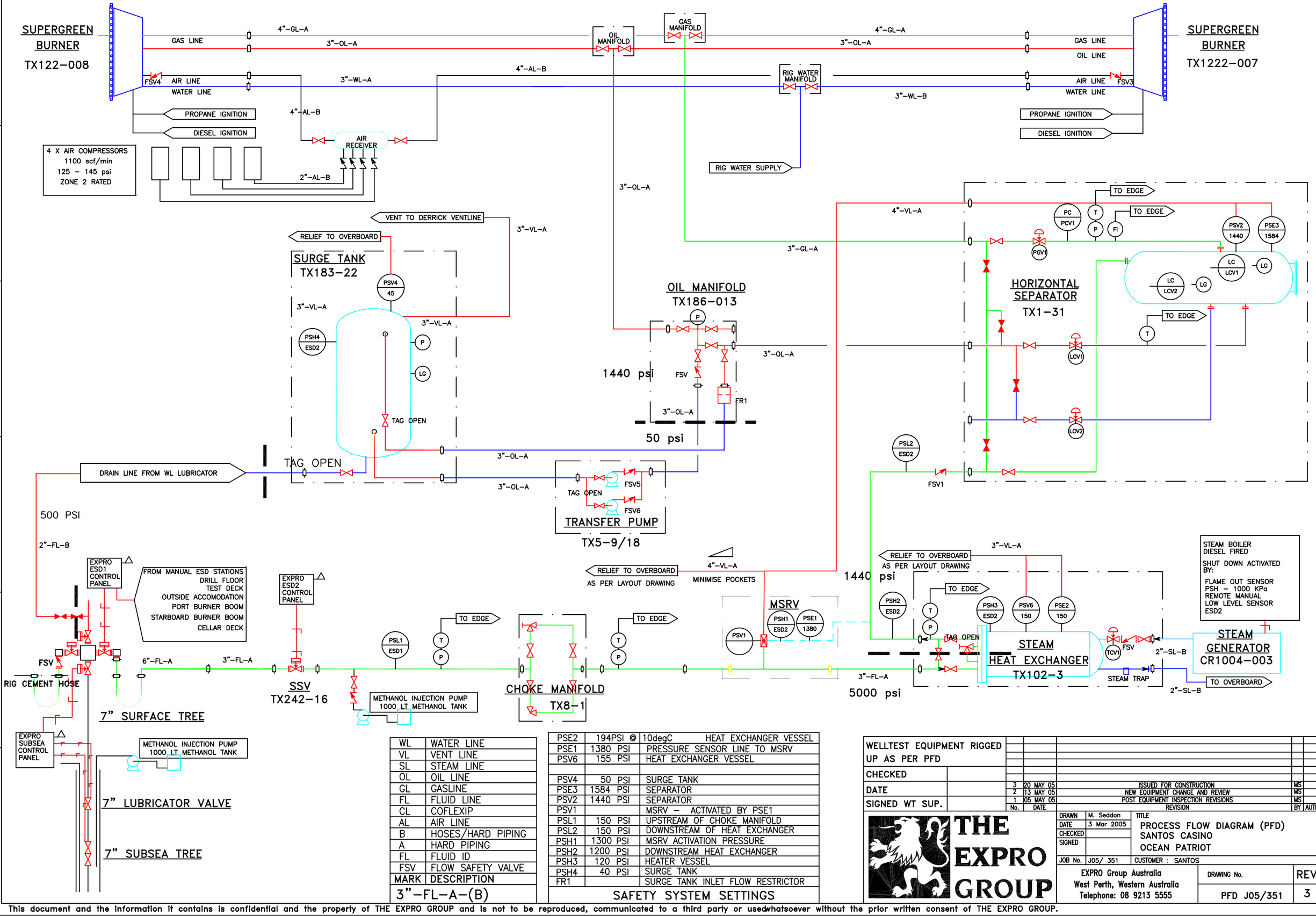
WATER ANALYSIS

Includes: conductivity / resistivity, pH, density, chlorides, Barium/Strontium sulphate, alkalinity

MUD SAMPLES

Drilling Mud and completion brine to be sampled from pits prior to test (2 x 1L per set)

APPENDIX P1 WELL TEST PFD



WL	WATER LINE
VL	VENT LINE
SL	STEAM LINE
OL	OIL LINE
GL	GASLINE
FL	FLUID LINE
CL	COFLEXIP
AL	AIR LINE
B	HOSES/HARD PIPING
A	HARD PIPING
FL	FLUID ID
FSV	FLOW SAFETY VALVE
MARK	DESCRIPTION

3"-FL-A-(B)

PSE2	194PSI @ 10degC	HEAT EXCHANGER VESSEL
PSE1	1380 PSI	PRESSURE SENSOR LINE TO MSRV
PSV6	155 PSI	HEAT EXCHANGER VESSEL
PSV4	50 PSI	SURGE TANK
PSE3	1584 PSI	SEPARATOR
PSV2	1440 PSI	SEPARATOR
PSV1		MSRV - ACTIVATED BY PSE1
PSL1	150 PSI	UPSTREAM OF CHOKE MANIFOLD
PSL2	150 PSI	DOWNSTREAM OF HEAT EXCHANGER
PSH1	1300 PSI	MSRV ACTIVATION PRESSURE
PSH2	1200 PSI	DOWNSTREAM HEAT EXCHANGER
PSH3	120 PSI	HEATER VESSEL
PSH4	40 PSI	SURGE TANK
FR1		SURGE TANK INLET FLOW RESTRICTOR

SAFETY SYSTEM SETTINGS

WELLTEST EQUIPMENT RIGGED UP AS PER PFD				
CHECKED				
DATE		3	20 MAY 05	ISSUED FOR CONSTRUCTION MS
SIGNED WT SUP.		2	13 MAY 05	NEW EQUIPMENT CHANGE AND REVIEW MS
		1	05 MAY 05	POST EQUIPMENT INSPECTION REVISIONS MS
		No.	DATE	REVISION BY AUTH

THE EXPRO GROUP

DRAWN	M. Seddon
DATE	3 Mar 2005
CHECKED	
SIGNED	
JOB No.	J05/ 351

TITLE: PROCESS FLOW DIAGRAM (PFD)
SANTOS CASINO
OCEAN PATRIOT

CUSTOMER : SANTOS

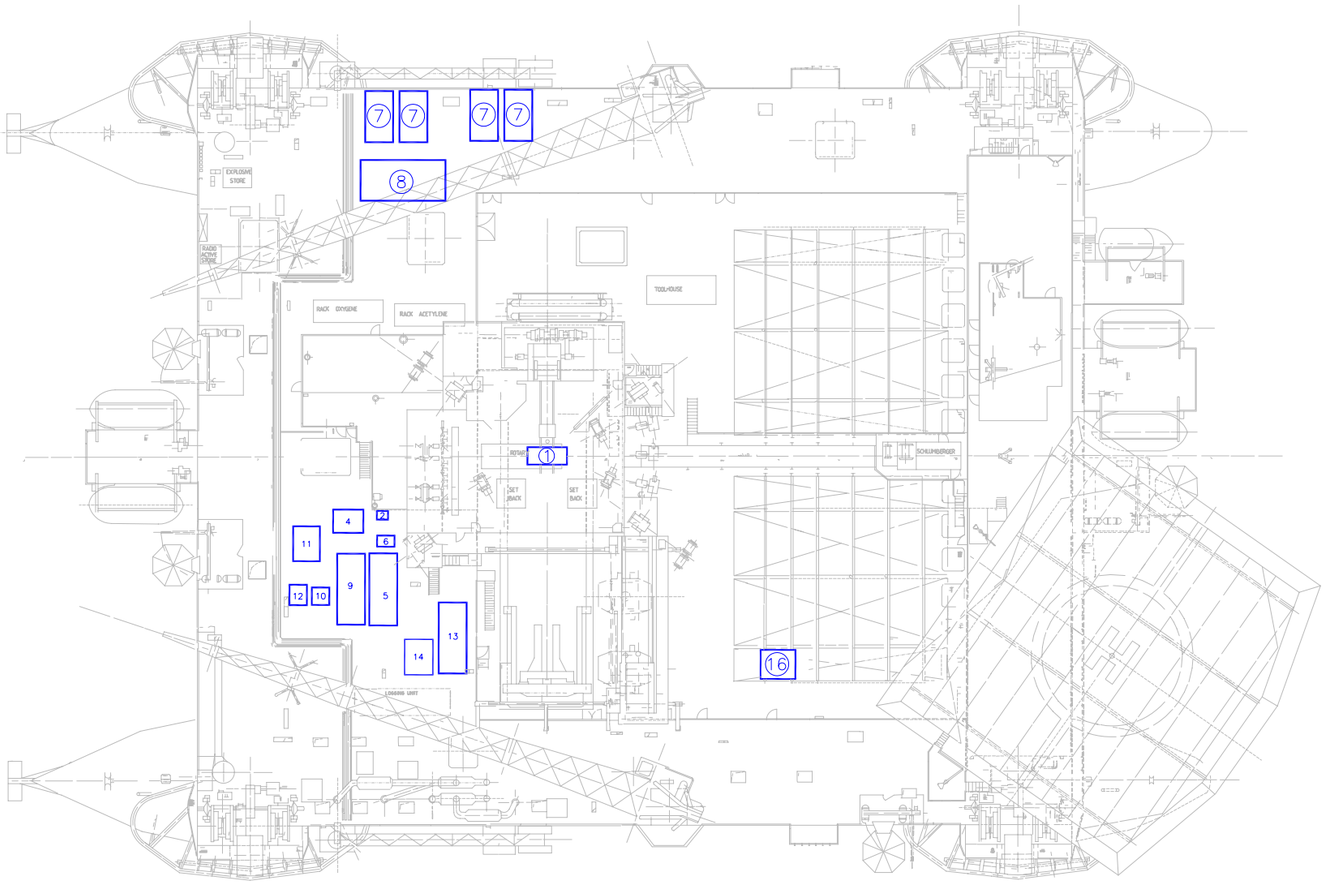
EXPRO Group Australia
West Perth, Western Australia
Telephone: 08 9213 5555

DRAWING No. PFD J05/351

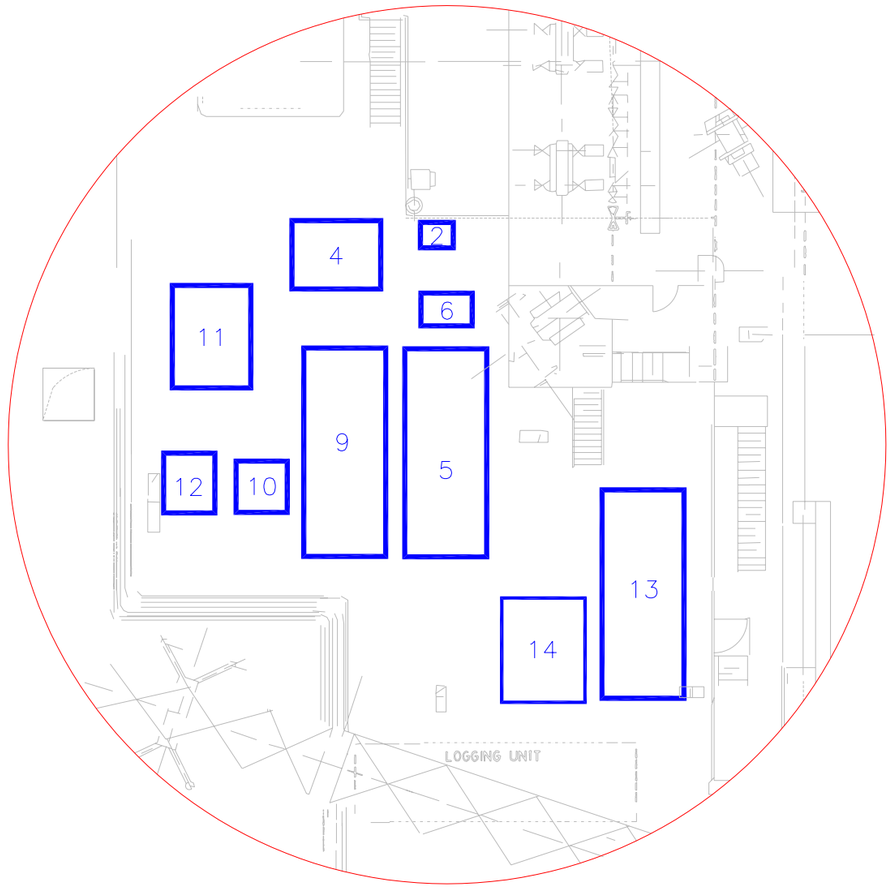
REV. 3

APPENDIX P2 WELLTEST LAYOUT

RIG OVERVIEW



EXPLODED VIEW OF MAIN DECK



ITEM	DESCRIPTION	DIMENSIONS L	W	H	WET WEIGHT TONNES	WORKING PRESS PSI
1	TEST TREE	11' 2"	5' 0"	3' 6"	2.0	5000
2	ESD VALVE	1' 0"	0' 3"	1' 0"	1.2	5000
3						
4	CHOKE MANIFOLD	8' 6"	6' 6"	4' 0"	3.0	5000
5	STEAM HEAT EXCHANGER	25' 0"	7' 9"	8' 0"	8.5	5000
6	MSRV	1' 0"	0' 7"	1' 0"	0.5	1440
7	COMPRESSOR	14' 6"	8' 0"	8' 0"	6.0	
8	STEAM GENERATOR	23' 8"	11' 6"	11' 6"	22.5	
9	SEPARATOR	20' 0"	8' 0"	8' 0"	15.0	1440
10	OIL MANIFOLD	5' 0"	4' 10"	1' 10"	0.5	1440
11	SURGE TANK	10' 0"	7' 6"	19' 0"	22.0	50
12	TRANSFER PUMP	2' 0"	2' 0"	2' 0"	0.5	
13	PRESSURISED LABORATORY	20' 0"	8' 0"	8' 0"	10.0	
14	WELLTEST WORKSHOP	10' 0"	8' 0"	8' 0"	6.0	
15	SAMPLE CONTAINER	10' 0"	8' 0"	8' 0"	6.0	
16	WIRELINE WORKSHOP	10' 0"	8' 0"	8' 0"	6.0	

No.	DATE	REVISION	BY	AUTH
2	28/02/05	ADDITIONAL AIR COMPRESSORS	MS	DL
1	05/10/04	EQUIPMENT LAYOUT MODIFIED	SA	DL
0	23/09/04	ISSUED FOR REVIEW	SA	DL

CHECKED
DATE
SIGNED SUP.

THE EXPRO GROUP

DRAWN	S. ASHTON
DATE	23/09/04
CHECKED	D. LINKSTON
SIGNED	
JOB No.	J05/351

TITLE: EQUIPMENT LAY OUT DIAGRAM
SANTOS CASINO
OCEAN PATRIOT

CUSTOMER : SANTOS

The EXPRO Group
West Perth, WA Australia
Telephone: +61 8 9213 5555

DRAWING No. LAY J05/351

REV. 2

APPENDIX Q COMPLETION HANG OFF PROCEDURES & EMERGENCY RELEASE

Cases 1, 2, 3 and 4 To be used if sufficient time is available e.g. deteriorating weather. Case 5 to be used in an Emergency eg loss of anchors or for well control.

1. Completion string close to surface

a) POOH and lay down 7" KSBEAR tubing joints / completion assemblies.
b) Change over to 5" Drill pipe handling equipment.
c) Make up 25,000lbs of Drill Collars / HWDP.
d) Install a 9 5/8" DLT packer.
e) RIH on 5" Drill pipe and hang off DLT packer in 1st joint of 9 5/8" casing.
f) Pressure test the DLT packer. POOH above the BOP's
g) Close the BOP Shear rams. Pressure test between DLT packer and shear rams.
h) Disconnect LMRP (ideally after displacement of the marine riser with water).

Barrier Status: 9 5/8" DLT Packer, Kill Weight Brine, Shear Rams,

2. Completion string inside casing.

a) Remove 7" KSBEAR tubing joints as required so as to space out once humg off in the 9 5/8" casing the Wireline Entry Guide above the lower completion and the SSSV above the 9 5/8" x 10 ¾" casing xover. If TRSSSV in hole, cut control line if required and plug end.
b) Install a 7" KSBEAR x 4 ½" IF Xover on top of the 7" KSBEAR completion.
c) Change over to 5" Drill pipe handling equipment.
d) Install a 9 5/8" DLT packer to the top of the completion.
e) RIH on 5" Drill pipe and hang off DLT packer in 1st joint of 9 5/8" casing.
f) Pressure test the DLT packer. POOH above the BOP's
g) Close the BOP Shear rams. Pressure test between DLT packer and shear rams.
h) Disconnect LMRP (ideally after displacement of the marine riser with water).

Barrier Status: 9 5/8" DLT Packer, Kill Weight Brine, Shear Rams,

3. Tubing Hanger made up to the completion String. THRT not installed.

a) Install THHTT onto tubing hanger.
b) Remove the Tubing hanger from the completion string.
c) Remove and lay down 7 joints of 7" KSBEAR tubing.
d) Hang off completion on 9 5/8" DLT packer as per 2a).

Barrier Status: 9 5/8" DLT Packer, Kill Weight Brine, Shear Rams,

4. Tubing Hanger made up to the completion String. THRT installed.

Either:

a) Lay down THRT and proceed as per 3a).

Barrier Status: 9 5/8" DLT Packer, Kill Weight Brine, Shear Rams,

Or:

a) RIH tubing hanger on THRT on 9 5/8" landing string and land in XT. Lock the tubing hanger in the XT.
b) Disconnect from the tubing hanger at the SSTT. POOH with 9 5/8" landing string.
c) Close Shear Rams

Barrier Status: Kill Weight Brine, Shear Rams,

5. Emergency Procedure

a) Adjust string elevation to locate one tubing coupling 0.5m below the shear rams.
b) Close BOP shear rams.
c) Open BOP Shear rams and pull string above shear rams.
d) Close BOP Shear rams.
e) Proceed with LMRP disconnection as per DOGC standing instruction.

Barrier Status: Kill Weight Brine, Shear Rams,

APPENDIX R WELL CONTROL GUIDELINES RUNNING THE COMPLETION

- The following is meant as a guide only for the rig. A JSA should be conducted to review the well control precautions and actions at each new stage of the completion. The mud loggers and driller must monitor the well throughout the completion operations.

1) Section 6.0 – Running Lower Completion

Situation	Actions if Well Flows
ESS above the BOP	• Close the BOP shear rams.
ESS over BOP's	Either: • Space out mid joint of ESS joint across the BOP shear ram. • Close the BOP shear rams. Or: • Drop ESS. • Close the BOP shear rams.
7 5/8" tubing across the BOP's. Packer NOT Installed	• Space out mid joint of ESS or 7 5/8" joint across the BOP shear ram. • Close the BOP shear rams. Or: • Drop ESS. • Close the BOP shear rams.
7 5/8" tubing across the BOP's, Packer Installed	• Install well control sub onto drill pipe. • Space out and close the annular or variable rams around the 7 5/8" tubing.

2) Section 8.0 – Pulling XT Bore Protector

- 4 ½" IF well control valves are ready to be used

Situation	Actions if Well Flows
Pulling the XT Bore Protector / Jetting the XT / BOP's	• Pull BHA above the BOP's. • Close the BOP Shear rams.

3) Section 9.0 – Running Upper Completion

- Ensure two 7" KSBEAR x 4 ½" IF xovers are on the rig floor, made up to well control valves ready to be used

Situation	Actions if Well Flows
Upper Completion above the BOP's	• Close the BOP shear rams.
Running 7" tubing with no SSSV control line.	• Pick up crossover (7" KSBEAR x 4 ½" IF) and well control valve. • Make up 5" Drill Pipe. • Close BOP variable pipe rams or annular around the 7" tubing. • Monitor pressures and prepare for kill.
Running 7" tubing with SSSV control line.	Either: • Pick up crossover (7" KSBEAR x 4 ½" IF) and well control valve. • Make up 5" Drill Pipe. • Pull the SSSV above the BOP's (if necessary). • Close BOP variable pipe rams or annular around the 7" tubing. • Monitor pressures and prepare for kill Or: • Close the BOP shear rams

4) Section 10.0 – Tubing Hanger at Rotary Table

- Ensure well control valve made up to THHTT during SSSV make up.
- The THHTT is rated to 500,000lbs only with 0psi. The Tubing hanger must be landed off in the split landing bowls / rotary table with the THHTT installed during a well control situation.

Situation	Actions if Well Flows
Tubing Hanger at Rotary Table	• Blank end of SSSV control line (If time permits). • Install the Tubing Hanger split bowls on the tubing hanger and land off in the Rotary Table. • Make up 5" drill pipe to top of THHTT. • Check space out of the completion at the BOP and close the annular around the 7" tubing and SSSV control line. • If annular does not seal, close the BOP shear rams

5) Sections 11.0 & 12.0 – THRT made up to Tubing Hanger / Running 9 5/8" Landing String

- Ensure two 9 5/8" NEW VAM x 4 ½" IF xovers are on the rig floor, made up to well control valves ready to be used

Situation	Actions if Well Flows
Running 9 5/8" Landing String (SSSV control line across BOPs)	• Pick up crossover (9 5/8" NEW VAM x 4 ½" IF) and well control valve. • Make up 5" drill pipe. • Space out mid 7" completion joint across the BOP's. • Close the BOP annular around the 7" tubing & SSSV control line. • If annular does not seal, close the BOP shear rams

APPENDIX S MANAGEMENT OF CHANGE FORM

Santos	DRILLING PROGRAMME CHANGE CONTROL	

PART A (To be completed by Originator)	Date:

Well Name: Exeter-4A Originator:

Change Required:

Risks if Change Not Approved:

Change in Risks and Risks Costs (if known):

PART B (To be completed by Drilling Engineer)

Request No.: Recommend to Proceed: Yes ☐ (Proceed to PART C) No ☐ (Completed)

Reasons For Not Proceeding:

RECOMMENDED	APPROVED	CONCUR

PART C (To be completed by SDE if SDG change recommended)

Variation to DMS: Yes ☐ (If Yes, Summarise) No ☐

Summary of Risks:

Summary of Costs and Benefits:

Review Manager: Yes ☐ No ☐

THIS FORM IS SUPPORTED BY THE FOLLOWING ATTACHMENTS:

APPENDIX T CONTACTS

Baker Atlas Level 2, 200 Adelaide Terrace, Perth, WA 6004 Contact: Dave Thorne	Tel: (08) 9217 7100 Fax: (08) 9217 7101 Mob:0412 263 180	Wireline Logging
Diamond Offshore General Company Unit 2, 5 Turner Ave, Bentley WA 6102 Contact: Steve Ramsey	Tel: (08) 6363-8900 Fax: (08) 6363 8999 Mob:0431 507 423	Drilling Contractor
Baker Oil Tools (Australia) 1-5 Bell Street, Canning Vale, WA 6155 Contact: Paul La Roche (District Engineer)	Tel: (08) 9455-0155 Fax: (08) 9455-1117 Mob:0417 960 665	SSSV
Halliburton Australia 256 St Georges Tce, Perth, WA 6000 Contact: Willie Ching	Tel: (08) 6424-4600 Fax: (08) 6424-4699 Mob:0418 836 408	Production Packer
MI Australia Pty Ltd Level 11, 251 Adelaide Terrace, Perth, WA 6000 Contact: Dave Bennett	Tel: (08) 9325 4822 Fax: (08) 9325 1897 Mob: 0417 971 769	Drilling Fluids
Weatherford Casing Running Servces Level 1, 225 St Georges Terrace Perth, WA 6000 Contact: Aaron Sinnott	Tel: 08 9212 4600 Fax: 08 9226 4638 Mob: 0418 514 759	Casing Running Service
Weatherford Completions 19 Catalano Rd, Canning Vale, WA 6155 Contact: Eamonn Arandiga	Tel: 08 9455 5233 Fax: 08 9455 5244 Mob: 0400 109 176	Lowe Completion Equipment. 4.625” QN nipple & associated equipment
Farstad Shipping Level 9, 16 St Georges Tce, Perth, WA 6000 Contact: Captain Bruce Dann	Tel: (03) 9254 1546 Fax: (03) 9254 1659 Mob:0408 488 382	Workboats
Swire Pacific Offshore 2nd Floor, Queensgate Centre, Cnr William & Newman Streets Fremantle, WA 6160 Contact: Sam Pullen	Tel: (08) 9430 5434 Mobile: 0411 430 669	Workboats
Cooper Cameron 1 Glencairn Ave, Deer Park, VIC 3023	Tel: 03 9361 4443 Perth: 08 9483 4444 Fax: 03 9361 4400 Mob: 0411 704 920	Wellhead, Horizontal Tree, Tubing hanger and landing string
Dowell Schlumberger Level 5, 256 St Georges Terrace, Perth WA 6000 Contact: Leen Vlot	Tel: 08 9420 4845 Fax: 08 9420 4715 Mob: 0411 022 967	Cementing services
Expro Group Australia Pty Ltd 42-44 Wittenberg Drive, PO BOX 1522, Canning Vale, WA 6970 Contact: Dave Meyjes	Tel: (08) 9456 7619 Mob:0411 865 779	Slickline
Expro Group Australia Pty Ltd 42-44 Wittenberg Drive, PO BOX 1522 Canning Vale, WA 6970 Contact: Dave Linkston (Operations Engineer)	Tel: (08) 9456 7619 Mob:0403 242 966	Testing & Landing String
Fugro Contact: Terry Blake	Tel: (08) 6241 1351 Mob:0427 779 190	ROV
SPS / Weatherford 17 Truganina Road, Malaga, Perth, WA 6090. Contact: Paul Donald	Tel: 08 9262 7100 Fax: 08 9249 8200 Mob: 0438 385 755	Casing and riser Scrapers / jetting tools

APPENDIX U ID &OD INTERFACE TABLE

DRIFT ID		inches
BOP & Riser	DOGC	18.750
XT with Bore Protector	Cameron	13.275
XT w/out Bore Protector	Cameron	13.275
10-3/4" Casing	Santos	9.604
10-3/4" x 9-5/8" X-over	Santos	*9.604*
9-5/8" Casing	Santos	8.525
5-3/4" PCE	Expro	3.000
8-7/8" PCE incl BOP's	Expro	5.000
11-1/2" PCE	Expro	7.000
Flowhead	Expro	7.375
Landing String	Expro	8.732
LLSA X-over	Expro	*7.375*
LLSA	Expro	7.375
THRT	Cameron	7.040
Internal Tree Cap	Cameron	6.730
Tubing Hanger	Cameron	7.000
TH Wireline Prot. Sleeve	Cameron	6.250
TH Wireline Isol. Sleeve	Cameron	4.620
7" 29# KSB Tubing	Santos	6.059
TRSV	BOT	5.875
BRQ Profile	BOT	5.840
TRSV Wear Sleeve	BOT	*5.875*
7" 29# KSB Tubing	Santos	6.059
CCS X-over	Santos	4.904
Chem Cut Sub	Santos	4.767
CCS X-over	Santos	4.904
HHT Packer	alliburton	5.900
7" 29# KSB Tubing	Santos	6.184
4.626" Landing Nipple	Weatherf	4.626
WEG	alliburton	6.184
LC Blackcat Packer	Weatherf	4.875
Packer X-over	Weatherf	4.875
LC 6-5/8" 24# KSB Tubing	Weatherf	5.796
Screens (unexpanded)	Weatherf	5.500
Lipstick Muleshoe X-over	Santos	4.767
Lipstick Muleshoe	Santos	0.000

MAX OD	Landing String & Umbilical Clamp	Lube Valve eccentric prof.	LLSA X-over	LLSA	THRT	Internal Tree Cap	Tubing Hanger	7" 29# KSB Tubing and TRSV Clamp	TRSV	7" 29# KSB Tubing	Chem Cut Sub X-over	Chem Cut Sub	CCS X-over	HHT Packer	7" 29# KSB Tubing	Landing Nipple	WEG	LC Blackcat Packer	Packer X-over	LC 6-5/8" Tubing	Screens (unexpanded)	Lipstick Muleshoe X-over	Lipstick Muleshoe	TH-Wireline Prot. Sleeve	TH-Wireline Isol. Sleeve	Upper Crown Plug	Lower Crown Plug	Standing Valve & RT	Bomb hanger	Gauges/Centraliser	Chemical Cutter & RT	TRSV/Wear Sleeve & RT	ESS Tools	Suspension Plugs	Fishing Overshots	Casing Scrapers	Sintered Screens
inches	14.500	15.750		18.500		18.600	17.760	7.656	9.220	7.656	7.656		7.000	8.455	7.656	7.400	8.310	8.319		7.072	6.033			7.220	6.630	7.000	6.700						5.875				7.161
	Expro	Expro	Expro	Expro	Cameron	Cameron	Cameron	Cameron	BOT	Santos	Santos	Santos	Santos	Halliburton	Santos	Weatherford	Weatherford	Weatherford	Weatherford	Santos	Weatherford	Santos	Santos	Cameron	Cameron	Cameron	Cameron	Cameron	Weatherford	Expro	BA	BOT	Weatherford	Halliburton	Weatherford	SPS	
BOP & Riser	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK										OK	OK	OK	
XT with Bore Protector					OK			OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK										OK	OK	OK	
XT w/out Bore Protector					OK			OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK										OK	OK	OK	
10-3/4" Casing										OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK										OK	OK	OK	
10-3/4" x 9-5/8" X-over										OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK										OK	OK	OK	
9-5/8" Casing										OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK										OK	OK	OK	
5-3/4" PCE																								X	OK	X	OK	OK	OK	OK	OK	OK	OK				
8-7/8" PCE incl BOP's																								OK	OK	OK	OK	OK	OK	OK	OK	OK	OK				
11-1/2" PCE																								OK	OK	OK	OK	OK	OK	OK	OK	OK	OK				
Flowhead																								OK	OK	OK	OK	OK	OK	OK	OK	OK	OK				
Landing String																								OK	OK	OK	OK	OK	OK	OK	OK	OK	OK				
LLSA X-over																								OK	OK	OK	OK	OK	OK	OK	OK	OK	OK				
LLSA																								OK	OK	OK	OK	OK	OK	OK	OK	OK	OK				
THRT																								OK	OK	OK	OK	OK	OK	OK	OK	OK	OK				
Internal Tree Cap																								OK	OK	OK	OK	OK	OK	OK	OK	OK	OK				
Tubing Hanger																								OK	OK	OK	OK	OK	OK	OK	OK	OK	OK				
TH Wireline Prot. Sleeve																								OK	OK	OK	OK	OK	OK	OK	OK	OK	OK				
TH Wireline Isol. Sleeve																								OK	OK	OK	OK	OK	OK	OK	OK	OK	OK				
7" 29# KSB Tubing																								OK	OK	OK	OK	OK	OK	OK	OK	OK	OK				
TRSV																								OK	OK	OK	OK	OK	OK	OK	OK	OK	X				
BRQ Profile																								OK	OK	OK	OK	OK	OK	OK	OK	OK	X				
TRSV Wear Sleeve																								OK	OK	OK	OK	OK	OK	OK	OK	OK	X				
7" 29# KSB Tubing																								OK	OK	OK	OK	OK	OK	OK	OK		OK				
CCS X-over																								OK	OK	OK	OK	OK	OK	OK	OK		X				
Chem Cut Sub																								OK	OK	OK	OK	OK	OK	OK	OK		X				
CCS X-over																								OK	OK	OK	OK	OK	OK	OK	OK		X				
HHT Packer																								OK	OK	OK							OK				
7" 29# KSB Tubing																								OK	OK	OK							OK				
4.626" Landing Nipple																								OK	OK	OK							X				
WEG																								OK	OK	OK							OK				
LC Blackcat Packer																																	X				
Packer X-over																																	X				
LC 6-5/8" 24# KSB Tubing																																	X				
Screens (unexpanded)																																	X				
Lipstick Muleshoe X-over																																	X				
Lipstick Muleshoe																																	X				