



Premier Oil Australasia

WHITE IBIS - 1

DRILL STEM TEST PROGRAMME

WHITE IBIS 1 DRILLING  
71585

C/KAB ✓

JR

CLASS 4  
Cased Hole, Permanent Packer,  
Premium Tubing

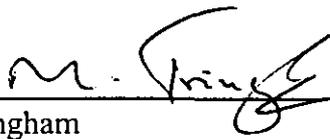
(177.8mm Liner, Single Zone Gas)

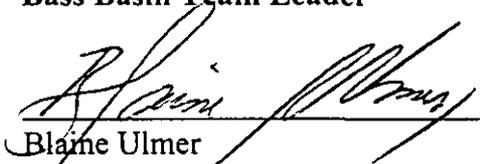
Revision 0

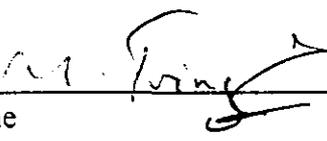
June 1998

**WHITE IBIS - 1  
DRILL STEM TEST PROGRAMME  
APPROVALS**

Approved by:

  
 \_\_\_\_\_  
 Mark Tringham  
 Bass Basin Team Leader  
 Date: 24/6/98

  
 \_\_\_\_\_  
 Blaine Ulmer  
 Drilling Manager  
 Date: JUNE 24th, 98.

  
 \_\_\_\_\_  
 PP Tom Fontaine  
 Petroleum Engineer  
 Date: 26/6/98

Prepared by:

  
 \_\_\_\_\_  
 Cameron Manifold  
 Advanced Well Technologies Pty. Ltd.  
 Date: 24/6/98

## DOCUMENT CONTROL STATUS

DOCUMENT No:	Cbm98046.doc; Rev 0	CONTRACT No. :	
CLIENT :	Premier Oil Australasia	CLIENT REP :	B. Ulmer
TITLE :	WHITE IBIS-1 DRILL STEM PROGRAMME - 177.8 mm Liner		

REVISIONS				
REV.	DATE	REASON FOR REVISION	AUTHOR	INITIAL
0	23-Jun-98	New Document	CBAM	<i>CBAM</i>

THIS REVISION			
PREPARED BY :		CHECKED BY :	
NAME	INITIAL/DATE	NAME	INITIAL/DATE
C. Manifold	<i>CBAM</i> , 24/6/98	<i>J.</i> J. Middleton	<i>CBAM</i> , 24/6/98
APPROVED FOR SUBMISSION :	C. MANIFOLD		<i>C. Manifold</i>

## WHITE IBIS - 1

## DRILL STEM TEST PROGRAMME

DISTRIBUTION LIST		
INTERNAL	LOCATION	NO. OF COPIES
Bass Basin Team Leader	Perth	1
Drilling Manager	Perth	1
Drilling Superintendent	Geelong	1
Drilling Supervisor	Well Site	2
Drilling Engineer	Geelong	1
Petroleum/Reservoir Engineer	Perth	1
Exploration Manager	Perth	1
File	Perth	1
<b>EXTERNAL</b>		
Boral Energy Resources Ltd	Adelaide	1
Cal Energy	London	1
Victorian Government DME	Melbourne	1
Tasmanian Government DME	Hobart	1
Schlumberger Pty Ltd	Perth/Wellsite	2
Premium Casing Services	Wellsite	1
Baker Oil Tools	Wellsite	1
Northern Offshore	Geelong	1
Rig PIC	Well Site	2
AWT Well Test Engineer	Perth/Wellsite	1
Petroleum Engineer	Perth	1

---

**WHITE IBIS - 1**
**DRILL STEM TEST PROGRAMME**
**TABLE OF CONTENTS**

<b>1. INTRODUCTION .....</b>	<b>7</b>
1.1 GEOLOGICAL BACKGROUND .....	7
1.2 WELL INFORMATION .....	8
1.3 SUMMARY OF EQUIPMENT/CONTRACTORS (ALL ITEMS TO BE CONFIRMED).....	9
1.4 TECHNICAL OBJECTIVES .....	9
1.5 TEST STRING OVERVIEW .....	10
1.6 TIME ESTIMATE - SINGLE ZONE, PERMANENT PACKER, 9-5/8" CASING .....	11
<b>2. PRE TESTING OPERATIONS .....</b>	<b>12</b>
2.1 TEST EQUIPMENT PREPARATION - GENERAL .....	12
2.2 SURFACE TEST EQUIPMENT .....	12
2.3 DST TOOLS .....	13
2.4 TCP GUN ASSEMBLY .....	13
2.5 SUB-SEA ASSEMBLY .....	13
2.6 GAUGES AND DATA RECORDING .....	13
2.7 TEST EQUIPMENT DOCUMENTATION TRACEABILITY AND QC .....	14
2.8 TUBULARS (PRODUCTION TUBING, LANDING STRING) .....	14
2.9 BOP STACK TESTS .....	14
<b>3. TESTING PREPARATIONS .....</b>	<b>15</b>
3.1 ASSUMPTIONS .....	15
3.2 WELL PREPARATION .....	16
3.3 FLEX TRIP .....	18
3.4 CEMENT BOND LOG .....	19
<b>4. TEST STRING INSTALLATION .....</b>	<b>20</b>
4.1 SETTING THE PRODUCTION PACKER - WIRELINE .....	20
4.2 SETTING THE PRODUCTION PACKER - DRILL PIPE (CONTINGENCY) .....	22
4.3 RUNNING TEST STRING .....	24
4.4 DIESEL UNDERBALANCE DISPLACEMENT .....	27
<b>5. FLOWING THE WELL .....</b>	<b>28</b>
5.1 PERFORATING THE WELL .....	28
5.2 CLEAN-UP FLOW PERIOD .....	30
5.3 MAIN FLOW AFTER FLOW AND FINAL SHUT-IN PERIODS .....	32
<b>6. WELL KILL PROCEDURE .....</b>	<b>33</b>
6.1 DISPLACE WELL TO KILL FLUID .....	33
6.2 REVERSE CIRCULATE TEST STRING .....	34
6.3 RETRIEVE TEST STRING .....	35
6.4 ZONAL ABANDONMENT .....	36

---

**WHITE IBIS – 1**  
**DRILL STEM TEST PROGRAMME**

**TABLE OF CONTENTS**

**FIGURES**

- Figure No.1 White Ibis-1 Single Zone, Lower Test String.  
Figure No.2 White Ibis-1 Upper Test String.  
Figure No.3 Electric Line Running Tool String – F-2 Packer and TCP Guns.  
Figure No.4 Surface Testing Layout Schematic.  
Figure No.5 Surface Testing P & ID.  
Figure No.6 BOP Space-out Schematic.  
Figure No.7 White Ibis-1 P & A Schematic.

**TABLES**

- Table No.1 Critical Tubing Data  
Table No.2 Petrotech Sampling Programme

**APPENDICIES**

- A Data Acquisition and Sampling Requirements  
B Pressure Testing Schedule  
C HS&E Guidelines and Responsibilities  
D Glossary of Terms

## 1. INTRODUCTION

White Ibis-1 is an exploration well to be drilled in the Offshore Bass Basin permit T/18P. The well will be drilled to a depth of about 2220m TVDmd in 311mm hole and cased with 244mm casing and a 177.8 mm liner set across the reservoir section. The expected reservoir characteristics indicate this well requires the use of conventional cased hole testing methods with premium test tubing and a permanent packer system.

Objectives for this well are defined as follows :

- Establish productivity of major hydrocarbon bearing intervals;
- Accurately determine extent of net reservoir sands and GWCs;
- Establish reserves in the proven category;
- Accurately define composition of reservoir fluids;

The design of well testing for this well is based on accurate assessment of hydrocarbon bearing sands and testing will be conducted only where effective information cannot be obtained by other means.

### 1.1 Geological Background

The White Ibis-1 well will be drilled approximately 45 m updip and approximately 4300m North West along strike from Bass-3, an exploration well drilled by ESSO in 1967. Bass-3 was plugged and abandoned after a formation integrity test (FIT) recovered 29cf of gas, 800cc of condensate and 12259cc of discoloured water.

Seismic data acquired since the drilling of Bass-3 has provided improved images at depth. These data have revealed that Bass-3 was drilled "off-structure" leaving approximately 45m of updip potential at White Ibis.

The primary objective of White Ibis-1 is to evaluate a series of Late Cretaceous to Palaeocene intra Eastern View Coal Measures (ECVM) stacked shoreline and delta plain reservoir seal couplets in a fault dependent closure situated over a basement high west of the Yolla Trough.

The secondary objective of the well is to test a fault dependent structural closure at the Top EVCM top-sealed by the Late Eocene Demons Bluff Formation.

## 1.2 Well Information

WELL	WHITE IBIS - 1
Permit	T/18P
Class (Exp\App\Dev)	Exploration
Rig	Northern Explorer III
Water Depth (m)	60m
RT Elevation (m)	12.5 m
Total Depth (tvd- mSS)	2220
Total Depth (md - mSS)	2220
Primary Objective (formation)	Intra-Eastern view coal measures
Primary Zone Depth (md - m)	1980 – 2150 (Approx)
Primary Zone Depth (tvd - m)	1980 – 2150
Secondary Objective (formation)	Upper most sandstones of Eastern View Coal Measures @ ~ 1595m
Deviation (degrees)	Nil
Expected Hydrocarbon	Gas/condensate
Estimated BHP (kPag / psia)	30,316 / 4400
Estimated BHT (°C / °F)	143 / 290
Maximum WHP (kPag / psig)	23,622 / 3426 gas to surface
Casing Size (mm / inches)	244 / 9-5/8
Casing Weight (kg/m / lbs/ft)	79.6 / 53.5 (8.50" special drift)
Casing Type	New VAM/VAM Ace special drift
Cased Interval	Mudline to 1900 m (approx)
Liner Size (mm / inches)	177.8 (7)
Liner Weight (kg/m / lb/ft)	43.2 (29)
Liner Type	FOX premium connection.
Liner Interval	1800 – 2215 (approximately)
Production Tubing	4-1/2" PH-6, 15.5 lb/ft
Completion Fluid Type	KCI Brine
Completion Fluid Weight (ppg)	1.10SG
Cushion Fluid Type	Diesel (approx. 0.82 SG)
Cushion Fluid Volume	Approximately 14m <sup>3</sup> (88 bbls).
H <sub>2</sub> S / CO <sub>2</sub>	H <sub>2</sub> S Possible / CO <sub>2</sub> (Up to 19%)

**1.3 Summary of Equipment/Contractors (All items to be confirmed)**

Perforating Guns TCP:	- Schlumberger:	114mm [4.50"] 5 spf, 51JL-UJ-HMX charges
Downhole Tools :	- Schlumberger :	10k, 57mm [2.25"] DST tools
Gauges :-	- Schlumberger :	2 x WTQR Quartz gauges 2 x WCQR Compensated quartz
Tubulars :-	- Premium Casing Services	114mm [4-1/2"] 15.5 # PH-6 tubing.
Chiksans :-	- Schlumberger: Cementer	4 x 51mm [2"] 1502 Loops 1 x 51mm [2"] 1502 Flow tee 1 x 51mm [2"] 1502 Plug valve
Surface:	- Schlumberger :	76mm [3"] Sen Tree, retainer lubricator valves. Standard surface well testing package w/ steam generator and heat exchanger. Air compressors from Schlumberger.
Logging :-	- Schlumberger :	Cement Bond Log CBL/CET GR / CCL Setting of bridge plugs.
Surface Data Acquisition :	- Schlumberger:	SCAN system
Surface Sampling :	- Petrotech:	As per sampling table in Attachments

**1.4 Technical Objectives**

The primary consideration of any well test is to ensure the safety of personnel and protection of the environment. This will be considered first and foremost.

The technical objectives of this well test is defined as follows :

**Target Zone – Eastern View Coal Measures**

1. Definition of reservoir characteristics, Kh, skin, Pi;
2. Obtain representative samples for accurate PVT analysis;
3. Define accurately the LKG depth by establishing the position of the Gas-Water Contact (GWC). This will allow better estimation of the field's reserves.
4. Rate after rate and a high rate deliverability flow periods.

## 1.5 Test String Overview

In order to minimise potential for weather and operations downtime, the testing has been designed to eliminate where possible all wireline interventions during testing operations. The perforated interval for each zone will be clearly defined prior to running the TCP guns and permanent packer and no re-perforation has been allowed for in the test design. It is not intended to release the TCP guns after perforation however a mechanical gun release has been provided in the packer tailpipe.

The test will be performed using a permanent production packer (Type F-2) set in the 177.8 mm [7"] liner. A locator seal assembly will be run at the bottom of the DST string and stung into the packer. The lower zone will be perforated utilising a pressure activated firing head with a bar drop back-up mechanical firing head. On completion of this test the well will be bullheaded to kill weight brine. The test string will be recovered and a 177.8 mm (7") bridge plug will be set on electricline above the permanent packer to abandon this zone.

Downhole flow control will be achieved using pressure-operated DST tools provided by Schlumberger, while the main test string will be 114mm (4-1/2") PH-6 production tubing. Other features of the downhole test string design include the following:

- The well will be perforated with 114mm (4.50") Tubing Conveyed Perforating (TCP) guns using 51JL UN HMX 34gm charges at 5 spf and 45 degree phasing. The guns will be run suspended below the production packer. The packer will be run and set on electric line prior to picking up test tools, where perforating intervals do not exceed 20m of total length. Where defined gun lengths exceed 20m, the packer and guns will be run and set with an hydraulic setting tool on drill pipe;
- The guns will be fired using a pressure fired system with drop bar redundancy,
- Reservoir pressure data acquisition will be provided by use of a DGA carrier run below the PCT valve;
- The tester valve (PCT) will incorporate a "hold-open" feature to provide additional versatility. Pressure testing of the string will be against a separate Tubing Fill and Test Valve (TFTV) located as low as possible in the string;
- The re-closable circulating valve (MCVL) will be the primary method of circulating with system redundancy provided by a single-shot rupture disc circulating valve (SHORT);
- No PLT surveys will be conducted during well testing operations;
- A fail-safe sub-sea test tree (SSTT) will be run and landed in the sub-sea wellhead to provide sub-surface safety and to allow safe unlatching of the landing string in event of emergency or severe weather conditions;
- The landing string will consist of 114 mm (4.5") 15.5 ppf PH6 tubing.

### 1.6 Time Estimate - Single Zone, Permanent Packer, 9-5/8" Casing

Item	Operation	Time Est. (hrs)
1.	Clean out and scrape 9-5/8" casing and 7" liner using tandem scrapers and 5"/3-1/2" drill pipe string.	8
2.	Pump seawater/biocide spacer then displace hole to freshwater KCl brine (approx 1.09SG) Circulate, condition brine.	4
3.	POOH, racking back drill pipe.	6
4.	Conduct flex run with 4-1/2" PH-6 tubing and TFT-V	18
5.	Make dummy run of landing string with fluted hanger.	4
6.	P/U and M/U flowhead on a joint of landing string. Lay down and test.	3
7.	Rig up wireline compensation system	3
8.	Run GR/CCL/CBL/CET in 7" liner.	6
9.	Make up TCP gun and permanent packer assembly.	4
10.	RIH on heptacable, correlate on depth and set packer.	4
11.	POOH and rig down Schlumberger.	2
12.	Make up stinger and test tools/gauges. PCT to be run in hold-open position. Make-up 1 stand of tubing and test BHA against TFT-V.	5
13.	RIH on premium tubing and conduct initial pressure test.	16
14.	Continue to RIH on 4-1/2" tubing and land locator into packer. Close rams on painted pipe. Pressure test annulus to 2.0 Mpa (300 psi) to confirm packer seal integrity. Re-open rams and pull back to painted joint. Space out.	5
15.	Make up fluted hanger & sub-sea test tree assy and RIH on landing string including lubricator valve.	4
16.	Make up flowhead and surface lines and pressure test string and surface equipment against TFTV before stinging into packer.	6
17.	Sting into packer and land hanger. Shear TFTV permanently open, actuate PORT and open PCT (shear PCT HOOP).	2
18.	Rig up to circulate diesel, cycle open MCVL circulating valve and displace string to diesel to within 5 bbls of circulating valve.	3
19.	Close MCVL and bleed off diesel to create desired underbalance. Wait on daylight if necessary. Hold safety meeting. Ensure DME has been notified of commencement of testing. Pressure up to fire guns.	6
20.	Initial clean-up flow period.	8
21.	Mid rate flow period	6
22.	High rate flow period flow period	6
23.	Final build up	36
24.	Lubricate in fluid onto closed PCT. Open PCT and bullhead kill well.	8
25.	Cycle PCT into hold open position. Unsting test string from packer and observe well. Reverse circulate well x 2 tubing volumes.	8
26.	POOH and lay down test tools – continuously monitoring well.	8
27.	RIH with 4-1/2" PH-6 tubing and set 177.8 mm (7") EZSV bridge plug .	10
28.	Complete well abandonment as per drilling programme.	0
29.	<b>TOTAL P50 (excluding any time spent waiting on daylight or weather).</b>	<b>199 (8.3 Days)</b>

## 2. PRE TESTING OPERATIONS.

### 2.1 Test Equipment Preparation - General

The majority of test equipment preparation, testing and inspection will be conducted at the various contractor bases in Perth before mobilisation to Geelong and shipping to the rig.

Testing and inspection procedures will be as per the contractors' standard operating procedures and will be controlled and, where required, witnessed by the Well Test Engineer.

The Permit To Work (PTW) system and Job Safety Analysis (JSA) shall be used prior to performing any potentially hazardous activities.

The following sections outline the equipment preparation to be carried out on site.

### 2.2 Surface Test Equipment

- Rig up surface equipment and flow lines as per Figures 4 and 5. This shall include the agreed ESD stations.
- Pressure test according to the schedule detailed in Appendix B. **General Test Pressure will be 34.5MPa (5,000psi).**
- Perform calibration checks on all recorders, meters and gauges, in particular the differential pressure recorder and liquid flow meters.
- Make up a single of 114mm (4.1/2") PH6 landing string tubing below the flowhead using the Schlumberger make-up tongs. Drift the flowhead and single to 69.85mm (2.75").
- Pressure test the Flowhead assembly on the deck to general test pressure against the master valve from below, against the swab, flow wing and kill wing valves from below, and externally against the kill wing valve.
- Function test the ESD devices.
- Connect and function test the steam generator and compressors.
- Ensure that all burner and spray nozzles are free from debris and are not plugged.
- Function test the rig water curtain system.
- The gas run down line has been tested by pumping through it to the boom at maximum possible rate.
- Ensure that the rig mud pits and suction/discharge lines have been thoroughly cleaned of drilling fluid as effectively as possible to prevent unnecessary contamination of test brine.
- Mud Engineer to prepare sufficient quantities of clean KCl brine to cover all test operations.

### 2.3 DST Tools

- Make up test string into suitable sub assemblies and torque up using Schlumberger's make-up tongs on deck.
- Drift all test string components to a minimum of 54mm (2.125") with an API.
- Pressure and function test the tools to general test pressure as per standard contractor procedures.
- Prepare a running list with all critical dimensions and operating pressures.
- Prepare a test string diagram with the dimensions and depths of each string component.
- Calculations and pressure/function tests to be checked and signed off by the Test Engineer/Drilling Engineer, and records compiled for end of test report.

The pressures required to operate the downhole test tools are given below :-

Tool	Operating Pressure kPa (psig)
PCT (6 cycle)	10,350 (1500) – annulus
MCVL	7,000 (1000)- tub/ann differential
SHORT	24,100 (3500)- annulus – to be confirmed
PORT	7,000 (1000) – annulus
TFTV	3,500 (500)- annulus

### 2.4 TCP Gun Assembly

- Make up the TCP guns as specified by the Premier Petroleum Engineer.
- Prepare a report detailing lengths and dimensions of the TCP Gun Assembly and the calculations to determine the firing pressure of the direct pressure actuated firing head.
- Calculations to be checked and signed off by the Petroleum Engineer/Test Engineer.
- Ensure that specific perforation intervals are advised to Tasmanian and Victorian DMEs well in advance of perforating.

### 2.5 Sub-Sea Assembly

- Pressure test the SSTT (Sen Tree) on the deck to 34.45 MPa (5000 psi) from below against both valves and perform a full body pressure test.
- Pressure test the lubricator ball valve from above and below to 34.45 MPa (5000 psi ) and perform a full body pressure test.
- Drift all assemblies to at least 2.75".

### 2.6 Gauges And Data Recording

- Program the downhole memory gauges as per the gauge sampling specifications in Appendix A. Set a suitable delay time on the gauges to avoid wasting memory capacity by recording excessive amounts of data while RIH.

- Check batteries are new and appropriately specified for the job.
- Check gauge calibrations.
- Ensure the Well Test Data Acquisition system is functional and acquiring data prior to initial stinging of the seal assembly into the packer.
- Gauges to be run will be as follows:  
2 x WTQR and 2 x WCQR gauges in DGA carrier below PCT ball.

## 2.7 Test Equipment Documentation Traceability And QC

- All items to be run in hole will be inspected and pressure-tested prior to running, as per above procedures.
- All equipment delivered to the rig for downhole or surface use must be accompanied by current, valid inspection certificates (less than 6 months old). These shall be recorded and kept in a QC documentation file by the Well Test Engineer.
- All onboard pressure testing must be witnessed and signed off by the Premier Petroleum Engineer, Drilling Supervisor, or by the Test Engineer. Chart recorder records will be kept on file in the QC documentation file.
- Copies of critical pressure, space out and tally calculations will be kept in the QC file.
- Calculations of operating pressures and space out must be reviewed by at least 2 competent persons.

## 2.8 Tubulars (Production Tubing, Landing String)

- When tubing arrives on location remove thread protectors, clean threads and inspect for damage. Reject any damaged joints on the basis of visual inspection.
- Number and measure the joints and compile an accurate tally.
- Drift the 114mm [4-1/2"] landing string tubing to at least 89mm [3-1/2"] using a non-marking API drift.
- Ensure the figures for correct make-up torques are available.

## 2.9 BOP Stack Tests

Minimum requirements for BOP stack tests, which will be performed after the 177.8 mm (7") liner has been run (or within 48 hours of commencing to RIH with DST string – as per PSLA), are as follows :

Item	Test Pressure
BOP rams	3,500 kPa (500 psi) / 51,750 kPa (7,500 psi).
Annular	3,500 kPa (500 psi) / 24,150 kPa (3,500 psi).
Choke and kill manifold	3,500 kPa (500 psi) / 51,750 kPa (7,500 psi).

### **3. TESTING PREPARATIONS**

#### **3.1 Assumptions**

This program assumes the following :-

- 3.1.1** 177.8 mm (7" ) liner has been run, cemented and pressure tested to 34,500 kPa (5000 psi).
- 3.1.2** Pre-testing operations have been completed in accordance with Section 2 of this program.
- 3.1.3** 177.8 mm liner pup joints and pip tags have been run approximately 50m above the target units for packer/guns correlation. The position of both the pip tags and pup joints will have been noted on the liner tally.
- 3.1.4** The openhole logging program has been completed.
- 3.1.5** Logging tools have been laid out and the drill floor and catwalk are clear.
- 3.1.6** The dimensions of all items in the test string have been noted and confirmed.
- 3.1.7** Expected flowing well parameters are within equipment specifications.
- 3.1.8** The heli-fuel package has been confirmed to be gas free.
- 3.1.9** All equipment not required for well testing operations will have been offloaded prior to receiving testing equipment.

## 3.2 Well Preparation

**3.2.1** Pick up a BHA including an 152 mm (6") drill bit (without nozzles), a nominal 177.8 mm (7") casing scraper, 89mm (3-1/2") drillpipe, a 89mm (3-1/2") x 114mm (4-1/2") crossover, one joint of 127mm (5") drillpipe, and 244mm (9-5/8") casing scraper. Run in hole on 127mm (5") drill pipe.

**NOTE :** Ensure care is taken when entering the liner top.

**3.2.2** Work the scraper from ~20 m above the upper most packer depth and to ~20 m below the planned lower most packer setting depth, then RIH and tag PBTD.

**3.2.3** Carry out pressure test to 34.45 MPa (5000psi) on the casing for 15 minutes.

**3.2.4** Clean the well by displacing with 2 hole volumes of seawater.

**3.2.5** Pump a 4m<sup>3</sup> (25bbl) hi-visc HEC pill.

**3.2.6** Circulate hole to clean KCl brine. Circulate until confirmed KCl brine returns are seen at surface.

**3.2.7** Pump clean untreated brine to ensure perforations are not exposed to treated brine.

**3.2.8** POOH laying down excess drill pipe and collars. Rack the drill pipe, break out and lay down the casing scraper BHA.

**3.2.9** Make up a dummy landing string assembly as follows (bottom up) :

- |                                     |   |
|-------------------------------------|---|
| - One stand of 127mm (5") drillpipe | To centralize assembly in BOP.                |
| - X Over                            | 127mm (5") Drillpipe to fluted hanger.        |
| - Fluted hanger                     | Painted on the underside of the hanger        |
| - X Over                            | Fluted Hanger to 127mm (5") drill pipe        |
| - 127mm (5") Drill PipeJoint        | Freshly Painted                               |
| - 127mm (5") Drill Pipe             | Sufficient to run and land the fluted hanger. |

**3.2.10** Run in hole on 127mm (5") drill pipe and land hanger in the wear bushing for the 244mm (9-5/8") casing hanger. Ensure compensator is set at mid stroke.

**NOTE :** Measure the dummy landing string on the way in to confirm the fluted hanger has seated correctly in the wear bushing

**3.2.11** Close the Lower Pipe Rams (LPR's) and the VBR's on the painted joint. Count strokes to ensure that rams have fully closed – record number of strokes.

**3.2.12** Open both sets of rams and pull out of the hole. Check from the paint marks that the fluted hanger seated correctly in the wear bushing.

**3.2.13** Measure the distance from the centre of the mark made by closing the VBR's to the bottom of the crossover below the fluted hanger. Measure the distance from the centre of

the mark made by closing the LPR's to the bottom of the crossover below the fluted hanger. Use this measurement to adjust the fluted hanger as required to ensure that the LPR's can close on the slick joint with adequate clearance from the SSTT body and the shear rams can also be closed when the SSTT has been unlatched. Make up the SSTT assembly using the space-out determined from this dummy run.

- 3.2.14** From the landing string measurement design the landing string configuration in order to have the lubricator valve below the marine riser slip joint and the bottom of the flowhead master valve at least 5 m above the rotary table to allow for tide and heave.
- 3.2.15** Make up and rack back the landing string sub assemblies.
- 3.2.16** If a joint of 4-1/2" PH-6 landing string tubing could not be made up on deck to the flowhead, pick up flowhead now with a joint below it and torque up all connections. Lay down flowhead and single joint assembly.

### 3.3 Flex Trip

The flex trip has been recommended for this test to minimise the exposure to weather conditions and running time for the test string once the permanent packer has been set (ie; test string can be run in stands to minimise exposure to weather).

- 3.3.1** Rig up the Premium Casing Services handling equipment for the 4-1/2" PH-6 production tubing.
- 3.3.2** Make up a bottom hole assembly consisting of the following:
- TFT-V set to shear open at 1000 psi
  - 2 stands of 114mm [4-1/2"] tubing
  - SHORT reversing valve set to open at 3000 psi
- 3.3.3** Run in hole while picking up the tubing. The TFT-V will allow the string to fill while running in. Run tubing to the lower zone packer setting depth (TBA). Ensure care is taken when entering liner top.
- 3.3.4** Make up a crossover on top of the tubing & connect the stabbing valve.
- 3.3.5** Flex the tubing by pressuring up internally to 34.45 MPa (5000 psi) and bleeding off. Repeat this 3 times. On the final flex, hold the pressure for 10 minutes to pressure test the tubing.
- 3.3.6** Close the VBR's on the tubing and pressure up the annulus to 20.67 Mpa (3000 psi) to shear the TFTV open and to shear the SHORT.
- 3.3.7** Circulate 2 tubing volumes at a high rate to clean out any scale or debris.
- 3.3.8** Pull out of hole, racking back the tubing. Ensure care is taken to protect threads from damage and corrosion during running and racking back.

### 3.4 Cement Bond Log

3.4.1 Conduct JSA for logging.

3.4.2 Rig up Schlumberger openhole with wireline compensation system.

3.4.3 Conduct GR/CCL/CBL/VDL/CET cement bond evaluation over interval of interest in 177.8mm (7") liner. Ensure care is taken when entering the liner top with the logging tools.

**NOTE :** Ensure that cement bond log is accurately correlated to openhole GR on the reference log PEX dated xx/xx/1998, scale 200:1. This will provide the correct depth for the casing pup joint and pip tag.

3.4.4 On completion of logging, POOH. Logging sheaves and the wireline compensation system should remain rigged up for packer setting operations.

## 4. TEST STRING INSTALLATION

### 4.1 Setting The Production Packer - Wireline

Where the total weight of the permanent packer, tailpipe and TCP guns does not exceed 900 kg (2000 lbs), the packer will be set on electricline. Where weight exceeds this, the packer and TCP guns will be run and set on drillpipe as per section 4.2. Setting of the packer/TCP guns on electric line is also dependent on acceptable weather and heave conditions prevailing at the time.

**4.1.1** Hold safety meeting on rig floor concerning the handling, make up and arming of TCP guns. Discuss and review JSA's for this operation.

**4.1.2** Initiate rig radio silence procedures.

**NOTE :** This is only required for the packer setting tools and not the TCP gun assembly but should be initiated at this time for sufficient notice.

**4.1.3** Make up the TCP gun and packer assembly as per the test string schematic (refer Figure 3). Strap accurately and record the distance from the packer mid element to the top shot. TCP guns will have 3-1/2" lift subs.

**4.1.4** Pick-up and install firing heads (HDF and BHF), EUE pup joints, mechanical gun release sub with 3-1/2" lift sub and make up to TCP guns.

**NOTE :** From this point on, a hole cover should be used when pipe is stationary in the rotary table.

**4.1.5** Install 3-1/2" x 2-7/8" crossover, 2-7/8" debris/ported sub and RIH on 1 joint of 2-7/8" tubing. Secure in slips with dog collar.

**4.1.6** The production packer with 10ft seal bore extension and crossover to 2-7/8" EUE will have been made up to the setting and logging tools on the catwalk.

**4.1.7** Crane in the logging tool/production packer assembly. Pick-up the assembly into the vertical position, with the logging cable. Carefully stab this assembly into the 2-7/8" connection in the rotary table.

**4.1.8** Unlock the rotary table and turn to the left by hand to make up this 2-7/8" EUE connection.

**NOTE :** Observe the tools above the packer to ensure connections do not back-out.

**4.1.9** Pick-up on cable with dog collar still installed to confirm the integrity of the connection between logging tools and packer.

**4.1.10** Accurately measure distance from CCL locator point to packer mid element and record. Ensure distance from packer mid element to top shot has been previously recorded.

- 4.1.11 Pick up assembly, remove dog collar and slips.
- 4.1.12 Commence RIH with packer assembly and TCP guns. Ensure extreme care is taken RIH through LMRP/BOP and wellhead.
- 4.1.13 RIH to required setting depth. Correlate depth with CCL against 9-5/8" pup joint and/or pip tag closest to packer setting position. Confirm correlation and reset cable depth.
- 4.1.14 RIH to below packer setting depth and pick-up to correct depth. Confirm depth is correct and set packer.
- 4.1.15 Confirm packer has been released by loss of weight. DO NOT re-tag packer once set as running tool can become lodged in packer.
- 4.1.16 POOH and rig-down Schlumberger.

## 4.2 Setting The Production Packer – Drill Pipe (Contingency)

- 4.2.1 Hold safety meeting on rig floor concerning the handling, make up and arming of TCP guns. Discuss and review JSA's for this operation.
- 4.2.2 Make up the TCP gun and packer assembly as per the test string schematic (refer to Figure 3). Strap accurately and record the distance from the packer rubbers mid point to the top shot.
- 4.2.3 Note that the slips can be set on the seal bore extension (with dog collar) to facilitate make up of this assembly.
- 4.2.4 Make up the Baker model "J" setting tool to the packer assembly. The setting tool should be a 3-cylinder tool with an operating pressure of 7000kPa (1000 psi).
- 4.2.5 Make up the crossover from the setting tool to 89mm (3-1/2") drill pipe (3-1/2" IF box x 2-3/8" 8 rd pin).
- 4.2.6 Run the assembly in hole on 89mm (3-1/2") drill pipe. A radioactive pip tag should be inserted in the threads of a connection 1 stand above the setting tool. The distance from the pip tag to the mid point of the packer element must be strapped accurately and recorded.

**NOTE:** While running the packer and gun assembly it is important to run at a steady and controlled speed and to set the slips and pick up the string gently. Sudden jerky movements should be avoided in order not to risk damaging the shear pins in the back-up direct pressure firing head. The Schlumberger TCP engineer will advise on running speed.

- 4.2.7 Sufficient 89mm (3-1/2") drill pipe should be run to ensure that the crossover to 127mm (5") drill pipe is at least 30m clear of the liner top when the packer is at the correct depth.
- 4.2.8 Make up crossover to 127mm (5") drill pipe and continue running the packer/TCP assembly in hole on 127mm (5") drill pipe.
- 4.2.9 Run sufficient drill pipe to position the packer (and therefore the top shot) at the correct setting depth according to the pipe tally, and set the slips.
- 4.2.10 The primary reference for this log will be the 311mm [12-1/4"] open hole log across the reservoir section. Use the Schlumberger Top Drive sub (4-1/2" IF x Pad eye) to hang the top sheave from the top drive and rig up the GR-CCL correlation log open hole. Ensure there is sufficient gap to allow the drill pipe to be picked up and the sheave wheel to be rigged up at the same time. This may require the extended bails to be used.
- 4.2.11 Using the elevators pick up the drill pipe and engage the heave compensator on the top drive so both the logging string and the drill pipe are compensated.
- 4.2.12 RIH with the GR/CCL correlation log.

**NOTE:** It will not be possible to pass the packer setting tool.

- 4.2.13** Correlate the log on depth using the 311mm [12-1/4"] open hole log as reference. Carry out a GR-CCL run past the running string pip tag to determine its depth. POOH and rig down GR-CCL log. Mark the pipe prior to rigging down the logging string.
- 4.2.14** Knowing the distance from the running string pip tag to the top of the TCP guns calculate the depth of the top shot.
- 4.2.15** Using the index wire as a fixed point, make any necessary space out adjustments to position the packer at the correct depth. Ensure the heave compensator is on line.
- 4.2.16** Make up the top drive and circulate 1.6m<sup>3</sup> (10bbls) of KCl brine to clean any debris from the ball seat in the setting tool.
- 4.2.17** Using the top drive drop the packer-setting ball. Wait 10 minutes to allow the ball to drop. (If ball not seated after 10 minutes, circulate down at ~ 1 bpm to assist seating).
- 4.2.18** Under the direction of the Baker packer technician, pressure up string 7000kPa (1000psi) to set the packer.
- 4.2.19** Pick up to release from packer. Note required overpull (should require approximately 15.6T [34,500lbs]).
- 4.2.20** Pull out of hole, laying out drill pipe and lay down setting tool.

### 4.3 Running Test String

**Do not arm PSL1 or PSL2 until specified in the program.**

- 4.3.1** Install the bottom hole pressure gauges in their carriers with recording set up referenced in Appendix A. The gauge carriers will have been pressure tested on deck to general test pressure after gauges have been installed.
- 4.3.2** Pick up and make up the G22 locator seal assembly, DST tools, gauge carriers and 114mm [4-1/2"] tubing under the direction of the Schlumberger DST tools supervisor. Refer to Figure 1 for details of the of the test string configuration.
- Run the PCT valve in the hold-open position to permit pressure testing of the test string against the Tubing Test Valve (TFTV).
  - The MCVL Circulating Valve should be run closed with at least 4 cycles remaining.
- 4.3.3** Make up one stand of 114mm [4-1/2"] tubing above the uppermost DST tool (the SHORT reversing valve).
- 4.3.4** Pressure test the assembly to general test pressure against the TFTV. Maintain test for 10 minutes and record. Bleed off test pressure.
- 4.3.5** Continue to run in hole with the 114mm [4-1/2"] tubing until all necessary tubing as calculated from the pipe tally has been run.
- The TFTV will allow the string to fill as the DST tools are run in.
- 4.3.6** Before pressure testing, reverse circulate 0.5 to 0.8m<sup>3</sup> (3 to 5 bbls) to clear any debris build up off the TFTV seat. Rig up to pressure test the string.
- Ensure the BOP rams are open. While pressure, testing monitor for annular returns which would indicate a leak in the tubing string. Some returns will be noted due to tubing ballooning.
- 4.3.7** Install the stabbing valve. Close the stabbing valve and pressure test from the cement unit against it to general test pressure for 5 minutes. Open the stabbing valve and pressure test the string to general test pressure against the TFTV Valve. Record the pressure test for 10 minutes on the cement unit chart.
- 4.3.8** Continue to RIH with 114mm [4-1/2"] tubing. Paint the joint which will be opposite the lower pipe rams when the locator is fully landed in the packer.
- 4.3.9** Run in hole on the 114mm [4-1/2"] tubing. Carefully sting the seal assembly into the packer under the direction of the Baker packer technician and set down weight as he directs, using the compensator to land the locator. Ensure care is taken when entering the liner top with the stinger seal assembly.

**4.3.10** Close the Variable Bore Rams rams (VBR's) on the painted pipe Pressure test the annulus for 10 minutes to not more than **2,100kPa (300 psi)** to confirm packer integrity.

**4.3.11** Bleed off pressure and open the rams.

**4.3.12** Pull out of hole to painted joint. Measure the distance from the centre of the mark made by the VBR's to the first connection below the mark (this is length B). Break off the marked joint.

**NOTE :** The string will trip wet due to the TFT-V being closed. A mud bucket should be used to prevent unnecessary exposure to KCl brine.

Space out by making up a combination of 114mm [4-1/2"] tubing pup joints of sufficient length (B-A) where A is the distance from the centre of the VBR's to the bottom of the crossover below the fluted hanger of the SSTT, as measured during the dummy run of the landing string.

- The intention of the space out is to maintain the locator landed in compression throughout the flow and build up periods of the test. This will minimise movement of the pressure gauges relative to the perforations while testing, and reduce the seal movement within the seal bore extension which will reduce the possibility of seal damage during the test.
- Tubing movement calculations indicate a packer-to-string force of maximum 10T (22,000 lbs) during flow at the maximum rate with a tubing head temperature of 70°C (158°F).
- If the correct space-out length cannot be achieved exactly with the available tubing pups, use a shorter length of pups rather than a longer length. This will result in a stick up of the locator above the packer.
- The space out calculation must be reviewed and agreed by both the Well Test Engineer and the Drilling Supervisor.

**4.3.13** Pick up the SEN tree/retainer valve assembly and make up onto the tubing. With the SEN tree in the rotary table, perform a function check of the unlatch and relatch mechanism.

**4.3.14** Run in hole on the 114mm [4-1/2"] PH6 landing string tubing, including the lubricator valve which must be run in the open position.

**4.3.15** Pick up the long bails and make up with shackles to the rig bails already on the top drive.

**4.3.16** Pick up and make the flowhead on its joint of tubing and make up the coflexip hoses. Do not sting into the packer at this point.

**NOTE :** RAMS MUST BE OPEN AT THIS POINT

**4.3.17** Prepare to pressure test the test string, landing string, flowhead and surface flowlines against choke manifold and TFT-V. Before pressure testing, reverse circulate 0.5 to 0.8m<sup>3</sup> (3 to 5 bbls) to clear any debris build up off the TFT-V seat. Ensure that SSTT assembly is clear of VBRs before closing for this reverse circulation.

- 4.3.18** Pressure test the string and BHA to general test pressure against the TFT-V. Record the pressure test for 10 minutes on the cement unit chart. Rams must be open during the pressure test.
- 4.3.19** Check that SEN-tree and lubricator valves are in the open position. Ensure that the master and swab valves on the flowhead are open and the string is open to atmosphere. Confirm the compensator is engaged.
- 4.3.20** Sting into the permanent packer, set down required weight and land the fluted hanger in the wear bushing with 2.3T (5,000lbs) downweight, then close the swab valve on the flowhead.
- Ensure the data acquisition system is recording and being monitored.
- 4.3.21** Connect the Emergency Shut Down system and function test from two stations. Record closure times.
- Ensure all personnel who will be involved on deck during the test witness the demonstration and understand the mode of operation of the ESD system.
  - Also ensure personnel are briefed on change of tour.
- 4.3.22** Close the lower pipe rams (LPR's) on the slick joint and pressure up the annulus to 4,200kPa (600 psi) (or as instructed by the DST tools supervisor) to lock the TFT-V in the open position. Cycle annulus pressure to 7,000kPa (1000 psi) (or as instructed by DST supervisor) to actuate PORT reference tool.

#### 4.4 Diesel Underbalance Displacement

The well is to be brought on with a Diesel cushion to provide approximately 4,000 kPa (580psi) underbalance. The cushion will be circulated in by pumping down the tubing and through the MCVL valve. Before operating downhole tools, ensure that annulus pressure is being monitored by the surface data acquisition system.

- 4.4.1 Hold safety meeting and ensure foam fire extinguishers are on standby near the cement unit.
- 4.4.2 Confirm rig diesel supply lines are correctly lined up to the cement unit and all required valves to the cement unit are open. Dip the diesel supply tank as an additional check as to volumes pumped.
- 4.4.3 Using the mud pump, cycle the MCVL to the circulate position with KCl brine under instructions of the Schlumberger DST operator.
- 4.4.4 Once the MCVL is in the circulating position, line up the cement unit to pump down the tubing, taking returns up the annulus across the trip tank with the BOP rams open. Slowly establish circulation to the trip tank.
- 4.4.5 Commence displacing required amount ( $14\text{m}^3/88\text{bbl}$ ) volume of diesel to the test string via the cement unit at a maximum rate of  $0.3\text{m}^3/\text{min}$  (2bbl/min). Monitor return volumes throughout pumping operations.

**NOTE:** The displacement rate will be determined by the capacity of the rig supply.

- 4.4.6 Use the cement unit meter and displacement tanks to monitor volume displaced. Confirm this with returned volumes.
- 4.4.7 Pump a  $0.8\text{m}^3$  (5bbl) seawater tail spacer across the flowhead to ensure diesel in lines between the cement unit and the rig floor is flushed.
- 4.4.8 Bleed off tubing pressure to cycle MCVL to test position under instructions of DST supervisor.

## 5. FLOWING THE WELL

### 5.1 Perforating The Well

5.1.1 Wait on daylight if necessary. Hold pre-perforation safety meeting. Ensure that the following steps are implemented prior to perforating:

- Hold safety meeting and review JSAs relating to the operations to follow.
- Personnel are familiar with Appendix C, Line Rupture and Leak Response Procedures.
- Personnel are aware of their responsibilities as defined in Appendix 1.
- The Safety Guidelines as defined in Appendix C are adhered to.
- Surface equipment has been installed as per Figures 4 and 5.
- Emergency Shut Down system has been installed and function tested.
- Surface equipment pressure tests have been conducted as per Appendix B.
- Data acquisition system is functioning.
- Air compressors are running and have adequate fuel and water and a dedicated person has been assigned to monitor these units.
- Sufficient kill fluids available for pumping in event of emergency well kill.
- Burner pilot lights are lit and the water deluge system is operational.
- Advise work boats and the aviation shore base that testing operations are about to commence.
- Advise Premier Drilling Manager that well testing and flaring are imminent so that necessary notification to government bodies can be made.
- Make an announcement over the PA that testing operations are about to commence.
- The separator should be by-passed and the well lined up to the oil burners.
- The steam generator is function and has adequate fuel supply. The steam heat exchanger is functioning.
- Chemical injection will be started immediately after pressuring up to fire the guns.
- Walk and inspect all lines.
- Radios are checked and functioning.
- Confirm all valves are in correct position as follows

Flowhead Master Valve	Open
Swab Valve	Closed
Flow Wing Valve	Open
Kill Wing Valve	Closed
Lubricator Valve	Open
EZ tree	Open
Upstream Choke Manifold	Closed

- Refer to Disconnect Procedures (issued as separate document) for relevant response in event of adverse weather conditions:

- 5.1.2** Pressure up annulus to 1500 psi to open PCT and maintain this pressure.
- 5.1.3** Pressure up the test string to 31,000 kPa (4500 psi) and hold for 2 minutes to initiate firing head. Bleed off pressure and wait programmed period for guns to detonate.
- 5.1.4** Once wellhead pressure response indicates that the guns have fired, proceed with test programme as per next section.

**NOTE:** If the guns do not fire after initial pressurisation, repeat this procedure to general test pressure. In the event that the guns still do not detonate a decision will be taken to rig up for back-up drop bar perforating. A separate procedure will be provided in this event.

- 5.1.5** The well will be open on a 16/64" choke for the initial clean-up flow through the choke manifold to the oil burners.
- The objective of the initial clean-up flow period is to ensure that the well has been cleaned up of debris and non-formation fluids before sampling and higher rate testing commences.
  - The driller and a Schlumberger DST tool technician must be on the rig floor at all times. The annulus pressure is to be continuously monitored and recorded on a chart recorder. Pressure is to be bled off as required to maintain the correct annulus surface pressure for tool operation and to remain safely clear of SHORT valve operating pressure.
  - Data acquisition requirements are detailed in Appendix A and Table 2.

**NOTE:** In the following sections, the indicated choke sizes should be considered as a guide only and the actual chokes to be used will be determined at the time by the Petroleum Engineer or the Well Test Engineer. The suggested choke sizes assume the well responds reasonably strongly when opened.

## 5.2 Clean-Up Flow Period

Flow periods, choke settings and expected durations are detailed in the table below for reference only. Actual settings and rates will be determined offshore and will be dependent on the well response and operational considerations prevailing at the time.

Flow Period	Expected Duration	Possible Choke Setting
1. Clean-up flow	6-8 hours	64/64"
2. Low Rate Flow	6 hours	24/64" – 36/64"
3. High Rate Flow	6 hours	128/64"

These flow periods have been defined to minimise exposure to adverse weather conditions whilst ensuring recovery of essential data from the well testing operations.

**5.2.1** The well will remain open at the choke manifold on 16/64" adjustable choke for the clean-up flow. Increase the choke gradually (over about 10 minutes) to 40/64", then maintain on this choke size until reservoir fluids are flowing at surface.

- When reservoir fluids are recovered to surface, H<sub>2</sub>S and CO<sub>2</sub> measurements must be made immediately and repeated every 15 minutes until the well is stabilised on a stable choke size (after which measurement interval may be increased to 30 minutes). The well will be shut in immediately if an H<sub>2</sub>S level in excess of 50 ppm in the wellstream is detected.
- An H<sub>2</sub>S level of 5 ppm or greater is to be immediately reported to the Premier Petroleum and Well Test Engineers who will confirm the information and then report to the Drilling Supervisor and the PIC.
- Flow will be directed through the steam exchanger until surface flowing temperatures downstream of the choke are adequate to prevent pipe frosting.
- Data acquisition requirements are detailed in Appendix A
- **PSL1 and PSL2 should be armed once flow is diverted to the separator.**

**5.2.2** Once reasonably stable flow (as determined by the Well Test Engineer) has been achieved on a 40/64" choke, the reservoir fluids are burning cleanly, and are shown to contain less than 50 ppm H<sub>2</sub>S, the adjustable choke should be increased gradually to 64/64" and the steam exchanger should be by-passed pending acceptable surface flowing temperatures.

**5.2.3** Switch to a suitable fixed choke size and stabilise the well. Monitor WHP, BS&W and produced water salinity to monitor the clean up.

**5.2.4** Once BS&W shows absence of solids and a reasonably stable water cut, and once the salinity measurement of the produced water indicates that completion fluids have been largely removed from the wellbore, divert flow through the separator.

**NOTE :** Prior to diverting to the separator, shut down the chemical injection system to ensure samples are not contaminated. At low rates this may require extended use of the steam heat exchanger.

**5.2.5** Continue the clean up on this choke until the Well Test Engineer is satisfied that the well is clean, i.e. stable BS&W with low water salinity, reasonably stable gas rate and WHP. Stable condensate rates may probably not be achieved during the clean up flow.

**NOTES :** The objectives of the clean up flow are primarily to avoid having clean-up effects disturb the flowrates of the flow-after-flow test; and to obtain a stable gas flowrate on a known choke size to assist in determining appropriate choke sizes for the flow-after-flow.

- 2 pairs of separator recombination samples should be taken on each flowrate including the clean-up flow. In general sampling should not commence until the well is flowing with a stable CGR, however due to the expected low condensate rate it may be difficult to confirm the stability of the CGR on the first flowrate. Sampling should commence after not more than 5 hours of flow even if CGR cannot be confirmed as stable at that time.
- The Well Test Engineer, in consultation with the Petroleum Engineer will determine the flow period duration. As a preliminary estimate around 6 to 8 hours duration would be expected for each flow.
- Two 1 litre samples of produced water should be taken from the separator prior to shut in.
- Clean-up flow duration is not expected to exceed 8 hours.

### 5.3 Main Flow After Flow and Final Shut-in Periods

- 5.3.1** Bean up the well to the required choke setting for the lowest rate of the flow after flow test. Switch to a fixed choke once the Test Supervisor is satisfied with flow conditions on this choke size. Flow through the steam heat exchanger if required. Choke setting is likely to be in the range 24/64" to 36/64" but will be decided on the rig.
- 5.3.2** Pass through the separator as soon as flow has been switched to the fixed choke and stabilise separator conditions. Make measurements as specified in Appendix A and Table 2.
- 2 pairs of separator recombination samples should be taken on each flowrate including this one. In general sampling should not commence until the well is flowing with a stable CGR, however due to the expected low condensate rate it may be difficult to confirm the stability of the CGR on the first flowrate. Sampling should commence after not more than 5 hours of flow even if CGR cannot be confirmed as stable at that time.
  - The Well Test Engineer in consultation with the Petroleum Engineer will determine the flow period duration. As a preliminary estimate around 6 to 8 hours duration would be expected for each flow.
- 5.3.3** At the end of the first flowrate, by-pass the separator, switch to the adjustable choke and increase choke settings to the final choke size over a moderate period. Switch to a fixed choke as soon as possible and pass flow through the separator.
- 5.3.4** Stabilise the separator and make measurements. Towards the end of the flow, once stable CGR has been achieved, take samples as defines in the Sampling Programme in Appendicies.
- On the larger choke sizes critical flow across the choke may not be achieved. It is therefore important that separator pressure is stabilised as soon as possible and thereafter not adjusted.
  - BS&W should be carefully monitored for solids production on the higher flowrates. In case an increasing trend of sand production is observed, the choke must be reduced.
- 5.3.5** On completion of the final flowrate, bleed off the annulus to close the PCT for the Main Build Up.
- 5.3.6** Shut in at the choke manifold once PCT closure is confirmed and observe the wellhead pressure to confirm the PCT is sealing.
- Do not bleed off the tubing pressure by more than 100 - 200 psi to minimise the differential pressure when re-opening the test valve.
  - **DO NOT APPLY PRESSURE TO THE ANNULUS DURING BUILD UP PERIODS.** Pressure should be regularly monitored and fluid topped up to replace fluid vented during the production periods. Rams must remain closed to provide sufficient annulus barriers during testing.
- 5.3.7** The final build up duration is unlikely to exceed 36 hours.

## 6. WELL KILL PROCEDURE

**NOTE :** Kill fluid volumes and pump pressures are to be determined by the Drilling Supervisor in conjunction with the Well Test Engineer and Drilling Engineer.

### 6.1 Displace Well to Kill Fluid.

6.1.1 Conduct pre-job JSA.

6.1.2 Cycle the PCT to one cycle before the hold open position.

6.1.3 Bleed off all pressure above the closed PCT ball to flare via the choke manifold. Open the kill wing valve and fill the string with 20 Bbls of kill weight KCl brine, 10 Bbls of viscocified brine (XCD) and the remaining volume with kill weight KCl brine from the cementing unit to the PCT ball.

**NOTE :** The volume required to fill the string above the PCT ball will be approximately 14.8 m<sup>3</sup> (93 Bbls).

6.1.4 Cycle the PCT into the hold open position with annulus pressure as directed by the Schlumberger supervisor. Bullhead kill fluid to the formation using the cementing unit (do not exceed the bullhead pressure specified by the Schlumberger DST Supervisor). The volume to bullhead is calculated as follows:

Bullhead volume = Volume of string to bottom perfs (i.e. tubing volume plus rathole volume below packer to bottom perfs) PLUS 2 barrels LESS volume required to fill string in 6.1.3 above.

6.1.5 Bleed off pressure via the choke manifold and flow check well for 15 minutes.

## 6.2 Reverse Circulate Test String

6.2.1 With the PCT in hold open position, open the rams and monitor the well on the trip tank for 15 minutes.

**NOTE :** Ensure personnel are well clear of rotary when rams are opened as inserts may lift in event of pressure release.

6.2.2 With the compensator engaged, slowly pick-up the test string, removing the G22 stinger seal assembly from the packer. Ensure string is picked up sufficiently to clear the packer, given heave conditions at the time.

6.2.3 Line up to take returns from the flowhead to the rig manifold via the de-gasser to the mud pits.

6.2.4 Reverse circulate at least 1.5 times the hole volume with inhibited brine, via the poor boy degasser to the pits. Continue circulating until gas units are reduced to an acceptable level.

**NOTE :** DO NOT exceed 6,890 kPa (1000 psi) back pressure on the annulus to prevent activation of PCT.

6.2.5 Perform a 15 minute flow check.

6.2.6 Circulate the well at least 1 full circulation with the rig pumps to confirm that no gas remains in the well.

6.2.7 Close master valve on flowhead. Pump inhibited drill water across flowhead using cement unit and flush through choke manifold and all surface equipment to burners.

6.2.8 Re-open master valve and check wellhead pressure.

6.2.9 Monitor well for 15 minutes on the trip tank to confirm well is stable.

### 6.3 Retrieve Test String

Upper test string assemblies should be laid out complete and will have service breaks made once test zone has been abandoned. Lower test string BHAs should be laid out in assemblies as per running order and will be broken out on deck using Schlumberger torquing machine.

The test string will be utilised for isolation cementing and should be tripped out in stands at this time.

The test string will then be utilised to run and set a bridge plug, and then dump a cement plug on top to abandon this zone.

- 6.3.1 Conduct pre-job JSA for rigging down of Coflexip hoses, and flowhead.
- 6.3.2 Flush the flowhead and surface lines with inhibited drillwater. While observing the well, breakout and laydown the Coflexip hoses, flowhead, and long bail.
- 6.3.3 Pull out of hole with the landing string, service breaking the assemblies as required and laying down the landing string tubing.
- 6.3.4 Pull out of the hole with the DST string observing normal tripping procedures. Service break and lay down test tools and the locator seal assembly. Conduct regular flow checks.

**NOTE :** It may be necessary to pick up subsea assemblies to conduct service breaks once the test string has been recovered.

- 6.3.5 Prepare to abandon zone with 177.8 mm bridge plug set 5m above permanent packer.

## 6.4 Zonal Abandonment

### 6.4.1 Make up the following components for the isolation run.

- Baker Model K-1 244mm bridge plug
- Baker Model K-1 snap latch mechanical setting tool (2-7/8" EUE box up)
- Crossover 2-7/8" EUE pin x 3-1/2" IF box
- Crossover 3-1/2" IF pin x 3-1/2" PH-6 box
- Crossover 3-1/2" PH-6 pin x 4-1/2" PH-6 box
- 4-1/2" PH6 test tubing

### 6.4.2 RIH with bridge plug on test tubing ensuring caution is taken through all profile changes. Ensure care is taken when entering the liner top.

### 6.4.3 RIH and gently tag 177.8 (7") production packer.

### 6.4.4 Pull back 5m. Mechanically set bridge plug.

### 6.4.5 Break circulation. Spot a cement plug extending for a minimum of 15m above the bridge plug. (minimum volume of cement to be displaced should be 10 Bbls which is approximately 45m height in 9-5/8" casing).

**NOTE :** It will be also be necessary to set a cement plug across the top of the 177.8 mm (7") liner extending a minimum of 30m above the liner top.

### 6.4.6 POOH laying down 9 joints of tubing. Reverse circulate to remove all traces of cement from test string.

### 6.4.7 Continue with remainder of abandonment programme as per the detailed Drilling Programme. Tubing should be laid out in singles and every effort made to ensure threads are adequately cleaned and protected before backload. Protectors provided with tubing MUST be re-installed prior to back loading.

**FIGURES**



**FIGURE 1 - White Ibis -1 Single Zone, Lower Test String (7" Liner Option)**

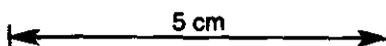
Res. Detail	Schematic	Description	Length m	Depth mBRT
		4-1/2" 15.5 #/ft PH-6 tbg (as required)		
		X-over 4-1/2" 15.5 #/ft PH-6 x 3-1/2" 15.8 #/ft PH-6		
		Single shot reversing valve (SHORT)	0.87	
		Multi cycle locking valve (MCVL)	1.88	
		1 jt 3-1/2" PH-6 12.95 #/ft tbg	9.14	
		PCT with hold open module (HOOP)	7.80	
		Pressure operated reference tool (PORT)	2.18	
		Gauge carrier (DGA stand alone)	8.14	
		Tubing fill tester valve (TFTV)	0.91	
		7" Liner top hanger and integral liner top packer		
		G22 Seal assembly		
		7" F-2 permanent production packer		
		Seal bore extension	3m	
		Xover 4-5/8" stub acme x 2-7/8" EUE		
		1 jt 2-7/8" EUE tbg		
	Mechanical gun release sub			
	Ported debris sub with 2-7/8" handling pup			
	Xover 2-7/8" EUE box x 3-1/2" EUE pin			
	HDF (pressure activated) and BHF (bar drop) firing heads			
	TCP spacer (min 10')			
	4-1/2" TCP gun, 5 spf, 51J HMX charges			
	7", 29# liner with FOX connections.			

**Perforation History**

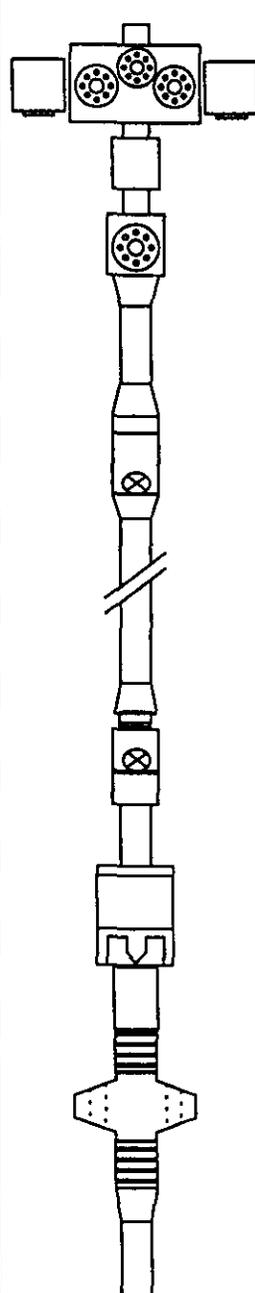
Unit	Interval	Gun	Charge	Spacing	Phasing
Intra Eastern	TBA	4-1/2" TCP	51JL UJ, 34 gm, HMX	5 spf	45 deg

Prepared by: J. Middleton Initial/Date: 11/06/98 Revision: 1  
 Reviewed by: C. Manifold Initial/Date: 15/06/98

File Path: F:\Engineering\Clients\Premier\JN21100\Drawings\jwm98001.vsd



## FIGURE 2 - White Ibis - 1 Upper Test String

Res. Detail	Schematic	Description	Length m	Depth mBRT
		<p>Flowhead</p> <p>Xover 4-1/2" Stub Acme x 4-1/2" PH-6 4-1/2" PH-6 tubing (as required)</p> <p>Xover 4-1/2" PH-6 x 5" Stub Acme Lubricator valve</p> <p>Xover 5" Stub Acme x 4-1/2" PH-6 4-1/2" PH-6 tubing (as required)</p> <p>Xover 4-1/2" PH-6 x 5" Stub Acme Retainer valve Bleed off valve 4" shear jt</p> <p>Latch and valve assembly</p> <p>5" Slick jt</p> <p>Adjustable fluted hanger</p> <p>X-over 5" Stub Acme x 4-1/2" PH-6 4-1/2" PH-6 tubing (as required)</p>	<p>0.42</p> <p>1.53</p> <p>0.25</p> <p>0.43</p> <p>0.84</p> <p>0.48</p> <p>1.46</p> <p>1.30</p> <p>1.53</p> <p>2.10</p> <p>0.35</p>	

### Perforation History

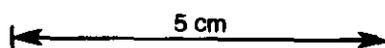
Unit	Interval	Gun	Charge	Spacing	Phasing

Prepared by: J. Middleton  
 Reviewed by: C. Manifold

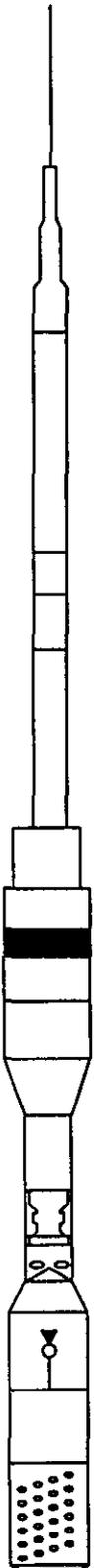
Initial/Date: 11/06/98  
 Initial/Date: 15/06/98

Revision: 0

File Path: F:\Engineering\Clients\Premier\JN21100\Drawings\jwm98002.vsd



### FIGURE 3 - Electric Line Running Tool String - F-2 Packer and TCP Guns

Schematic	Description	Length m	O.D in	Connections
	7-46 VXS high strength logging cable			
	LEH-QT 7-46 VXS hepta cable head	0.89	3.625	Standard Schlumberger inter tool connections
	PGGT-D gamma ray, collar locator, tension	1.79	3.625	
	PPGC PPGH-D			
	AH-63 adaptor	0.10	3.625	
	AH-EAH-B 10-1 adaptor	0.40	3.625	
	AH-CPST pyrotechnic setting tool	2.29	3.625	
	Baker wireline adaptor kit	0.61		
	Baker 7" F-2 194-40 permanent production packer			4-5/8" stub acme pin
	Seal bore extension	3m		4-5/8" stub acme box x pin
	Xover			4-5/8" stub acme box x 2-7/8" EUE
	1 jt 2-7/8" L80 EUE tbg		2.875	2-7/8" EUE box x pin
	Mechanical gun release sub		2.875	2-7/8" EUE box x pin
	Ported debris sub w/ 2-7/8" handling pup joint Xover		3.5	2-7/8" EUE box x 3-1/2" EUE pin
HDF (pressure activated) and BHF (bar drop) firing heads		3.5	3-1/2" EUE box x 2-3/8" mod reg pin	
TCP spacer	min 3m	4.5	2-3/8" mod reg box x pin	
4-1/2" TCP gun, 5 spf, 51J charges		4.5	2-3/8" mod reg box x pin	

Prepared by: J. Middleton  
Reviewed by: C. Manifold

Initial/Date: 11/06/98  
Initial/Date: 15/06/98

Revision: 0

File Path: F:\Engineering\Clients\Premier\JN21100\Drawings\jwm98003.vsd

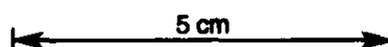
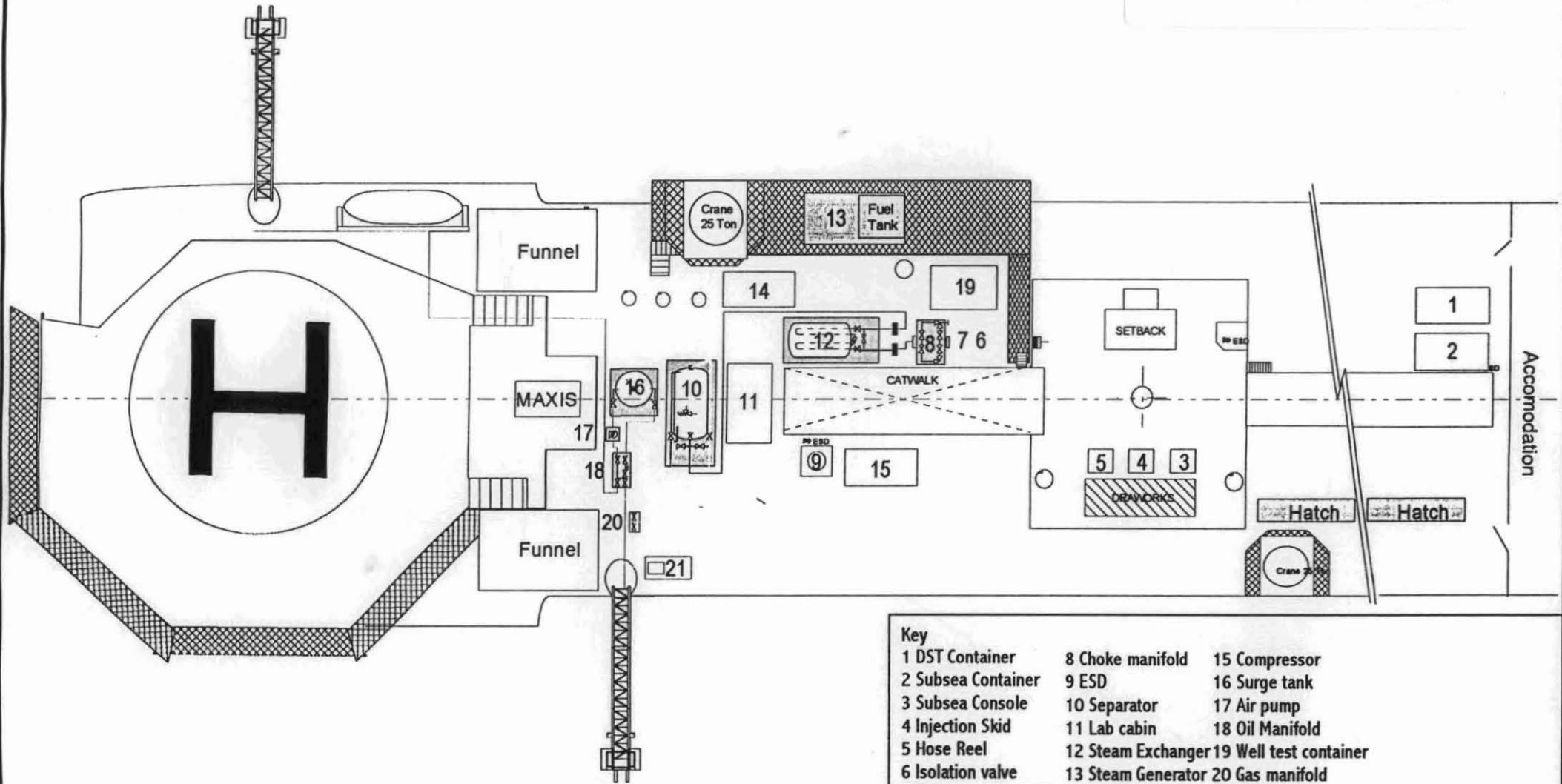


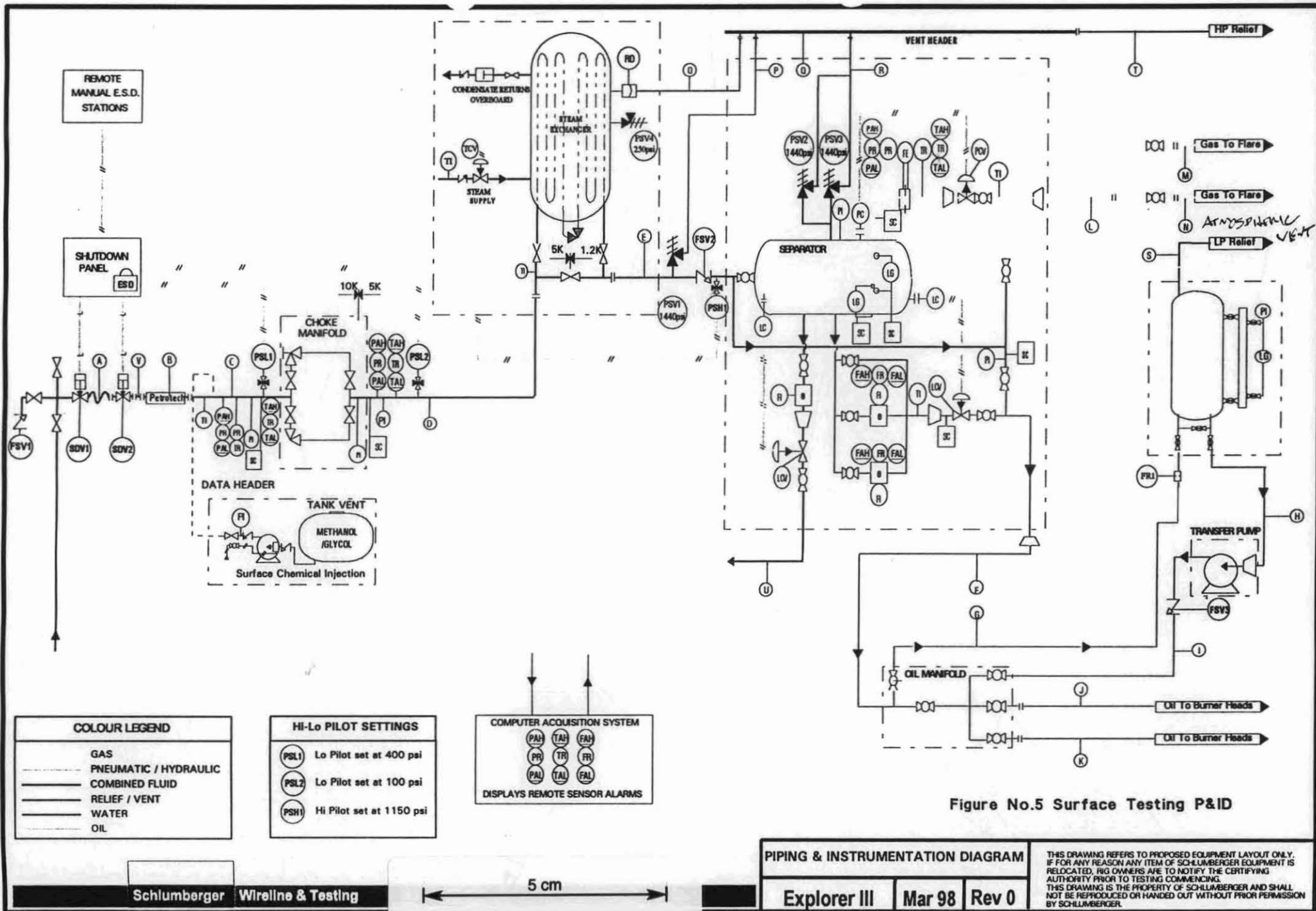
Figure No.4 Surface Testing Layout Schematic

5 cm



- Key
- |                      |                    |                        |
|----------------------|--------------------|------------------------|
| 1 DST Container      | 8 Choke manifold   | 15 Compressor          |
| 2 Subsea Container   | 9 ESD              | 16 Surge tank          |
| 3 Subsea Console     | 10 Separator       | 17 Air pump            |
| 4 Injection Skid     | 11 Lab cabin       | 18 Oil Manifold        |
| 5 Hose Reel          | 12 Steam Exchanger | 19 Well test container |
| 6 Isolation valve    | 13 Steam Generator | 20 Gas manifold        |
| 7 Petrotech Manifold | 14 Compressor      | 21 Vent header         |

535041



COLOUR LEGEND	
(Solid line)	GAS
(Dashed line)	PNEUMATIC / HYDRAULIC
(Thick solid line)	COMBINED FLUID
(Thin solid line)	RELIEF / VENT
(Dotted line)	WATER
(Double line)	OIL

HI-Lo PILOT SETTINGS	
(PSL1)	Lo Pilot set at 400 psi
(PSL2)	Lo Pilot set at 100 psi
(PSH1)	Hi Pilot set at 1150 psi

COMPUTER ACQUISITION SYSTEM		
(PAH)	(TAH)	(FAH)
(PR)	(TR)	(FR)
(PAL)	(TAL)	(FAL)

DISPLAYS REMOTE SENSOR ALARMS

Figure No.5 Surface Testing P&ID

PIPING & INSTRUMENTATION DIAGRAM

Explorer III Mar 98 Rev 0

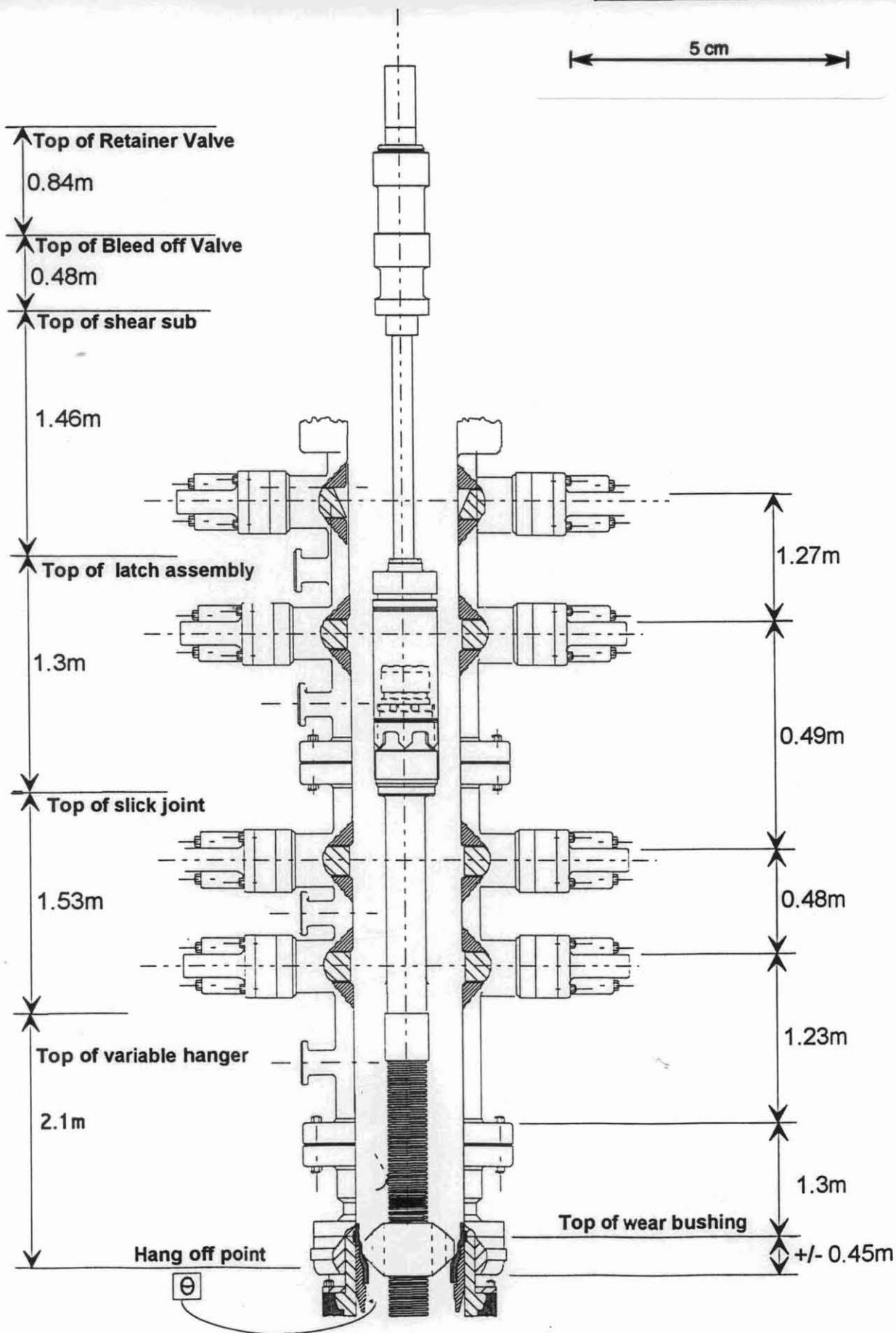
THIS DRAWING REFERS TO PROPOSED EQUIPMENT LAYOUT ONLY. IF FOR ANY REASON ANY ITEM OF SCHLUMBERGER EQUIPMENT IS RELOCATED, RIG OWNERS ARE TO NOTIFY THE CERTIFYING AUTHORITY PRIOR TO TESTING COMMENCING. THIS DRAWING IS THE PROPERTY OF SCHLUMBERGER AND SHALL NOT BE REPRODUCED OR HANDED OUT WITHOUT PRIOR PERMISSION BY SCHLUMBERGER.

FIGURE 6.

SUBSEA/BOP diagram

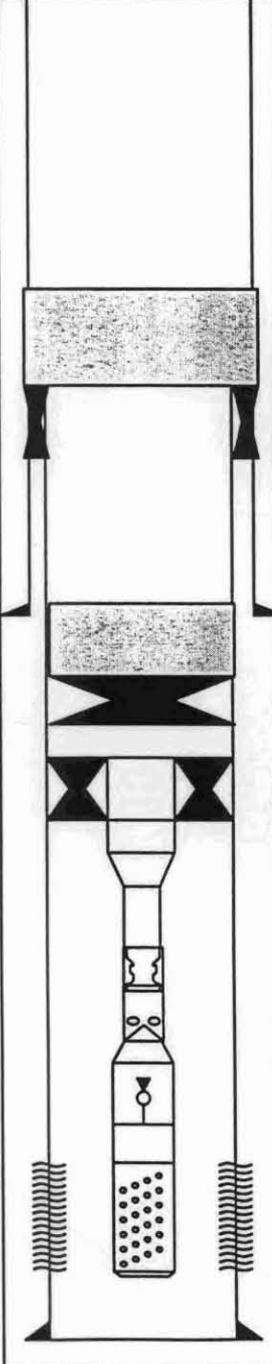
Schlumberger Wireline & Testing

Northern Explorer III MAR 98 REV.0





**FIGURE 7 - White Ibis -1  
Suspension Schematic (7" Liner Option)**

Res. Detail	Schematic	Description	Length m	Depth mBRT
		<p>Cement isolation plug</p> <p>Cement isolation plug</p> <p>7" Bridge plug</p> <p>7" F-2 Permanent production packer</p> <p>Seal bore extension</p> <p>Xover 4-5/8" stub acme x 2-7/8" EUE</p> <p>1 jt 2-7/8" EUE tbg</p> <p>Mechanical gun release sub</p> <p>Ported debris sub with 2-7/8" handling pup</p> <p>Xover 2-7/8" EUE box x 3-1/2" EUE pin</p> <p>HDF (pressure activated) and BHF (bar drop) firing heads</p> <p>TCP spacer (min 10')</p> <p>4-1/2" TCP gun, 5 spf, 51J HMX charges</p> <p>7", 29# liner with FOX connections.</p>	<p>Min 30m</p> <p>Min 30m</p> <p>3m</p>	

**Perforation History**

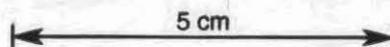
Unit	Interval	Gun	Charge	Spacing	Phasing
Intra Eastern	TBA	4-1/2" TCP	51JL UJ, 34 gm, HMX	5 spf	45 deg

Prepared by: J. Middleton  
Reviewed by: C. Manifold

Initial/Date: 11/06/98  
Initial/Date: 15/06/98

Revision: 1

File Path: F:\Engineering\Clients\Premier\JN21100\Drawings\jwm98001.vsd



**TABLES**

**TABLE No.1 Critical Tubular Data**

<b>OD</b>	57.2 mm (2.25") ID Test Tools	114mm (4.5") PH6 Testing String	178mm (7") liner	244mm (9-5/8") Casing Special Drift
<b>Weight</b>	Variable	23.1 kg/m (15.5 lb/ft)	43 kg/m (29 lb/ft) L80	79 kg/m (53.5 lb/ft) L80
<b>Connection Type</b>	3-1/2" PH6	4-1/2" PH6	FOX	New VAM VAM Ace
<b>ID mm (")</b>	57.2 (2.25")	95.6 (3.765")	157 (6.184")	220.5 (8.681")
<b>Drift mm (")</b>	54 (2.125")	94 (3.701")	153.8 (6.059")	216.5 (8.525")
<b>Capacity - m<sup>3</sup>/m</b>	0.00257	0.00718	0.01938	0.0369
<b>- bbl/ft</b>	0.00492	0.01377	0.03714	0.0708
<b>- m/m<sup>3</sup></b>	389.1	139.2	51.61	26.18
<b>- ft/bbl</b>	203.4	72.6	26.92	13.66

**Test Tubing Make-up Torques**

<b>Tubing Size</b>	<b>Minimum Torque (Ft-lbs)</b>	<b>Optimum Torque (Ft-lbs)</b>	<b>Maximum Torque (Ft-lbs)</b>
3-1/2" PH-6 12.95 lb/ft Test Tubing	5,600	6,200	6,900
3-1/2" PH-6 13.8 lb/ft Test Tools		6,000	
4-1/2" PH-6 15.5 lb/ft Test Tubing	6,000	6,750	7,500

## TABLES

TABLE No.2 Petrotech Sampling Programme

FLUID	ANALYSIS	NUMBER FREQUENCY	SAMPLE POINT	VOLUME	COMMENTS
-------	----------	---------------------	-----------------	--------	----------

## CLEAN-UP FLOW ( 6-8 Hours)

Gas	H <sub>2</sub> S	10-30 mins	Choke		
Gas	CO <sub>2</sub>	10-30 mins	Choke		
Water	Cl, pH, Alk	30 min	Choke	500 ml	
Water	Offshore Ψ	1Hr	Choke	500 ml	
LP Cond		1	Sep	1 L	
Gas/Cond	PVT	1 set	Sep	20L/640cc	Contingency set
Gas/Cond	CGR	1-2	minilab		CGR after flowing through separator

## LOW RATE SAMPLING FLOW (6 hours)

Gas	H <sub>2</sub> S & CO <sub>2</sub>	1 Hr	Sep	-	Draeger
Gas	R-SH	2 Hr	Sep	-	Draeger
Gas	Radon	2-3	Sep	-	
Gas	Mercury	3-4	Sep	-	
Gas	Total sulphur	2	Sep	2 x US 1 gal	Onshore lab analysis
Gas	O <sub>2</sub> , Ar, He	2	Sep	2 x 125cc	Onshore lab analysis
Water	Offshore Ψ	1Hr	Sep	1 L	
Water	Lab onshore	1 set	Sep	1 L	Samples to be preserved
LP cond	Trace elements	1	Sep	2L glass	Onshore lab analysis
LP cond	Bulk samples	1	Sep	20L, 5L, 1L	Taken at end of flow
Gas/Cond	PVT	2 sets	Sep	20L/640cc	
Gas/Cond	Recomb set	2 sets	Minilab	-	Atmospheric compositional samples
Gas/Cond	PVT	2 sets	Minilab	20L/640cc	
Gas/Cond	CGR	continuous	Minilab		As many as practical

## MAXIMUM RATE (6 hours)

Gas	H <sub>2</sub> S & CO <sub>2</sub>	1 Hr	Sep	-	Draeger
Gas	R-SH	2 Hr	Sep	-	Draeger
Gas	Radon	2-3	Sep	-	
Gas	Mercury	3-4	Sep	-	
Water	Offshore Ψ	1 Hr	Sep	1 L	
Water	Lab onshore	1 set	Sep	1 L	Samples to be preserved
LP cond	Bulk samples	1 set	Sep	20L, 5L, 1L	Taken at end of flow
Gas/cond	Sep eff.	2 sets	Sep	2x20L/640c	
Gas/cond	PVT	2 sets	Sep	20L/640cc	
Gas/cond	Recomb set	2 sets	Minilab	-	Atmospheric compositional samples
Gas/cond	PVT	2 sets	Minilab	20L/640cc	
Gas/cond	CGR	Continuous	Minilab	-	As many as practical

**APPENDIX A - DATA ACQUISITION & SAMPLING REQUIREMENTS****A1 General**

- The data acquired shall be recorded with the relevant date and time.
- The data acquisition frequency will be at a minimum as directed by the Premier Petroleum Engineer. Guidelines are given in A6 below.
- The frequency of data acquisition should match the stability of the flow or pressure data.
- Guidelines are detailed below on data type and recommended frequency.
- Original "raw data" report forms shall be completed and maintained for all well testing activities. These are in addition to that recorded by the computerised data acquisition system.
- All samples, whether oil, gas or water, must be assigned a unique sample number.

**A2 Flow And Build Up Regime**

The durations of the flow and build up periods will be determined by the well response and by any preliminary estimates of permeability which are available (eg from the formation tester tool). Variations to the programmed duration will be specified by the Premier Petroleum Engineer as testing operations progress.

The choice of choke sizes will also be determined by the well response and is difficult to predict in advance. The following table provides an estimate/guideline only and decisions will need to be taken in "real time".

Flow / Build Up Period	Duration	Probable Choke Size
Clean Up Flow	~ 6 to 8 hours	Increase to max rate on adj. choke then stabilise on fixed choke
Main Flow Period - Rate 1	~ 6 hours	28-36/64" fixed
- Rate 2	~ 6 hours	64/64" fixed
Final Build Up Period	~ 36 hours	N/A

**A3 Wellhead Measurements**

- Pressure and temperature, upstream and downstream of the choke, by Data Acquisition System (pressures confirmed by DWT).
- Choke size (64th) and type (fixed or adjustable).
- BS&W % (by centrifuged sample)
- H<sub>2</sub>S and CO<sub>2</sub> concentrations (by Draeger analysis and by Petrotech).
- Annulus pressure. Monitor and record throughout the test to ensure the correct operation of the annulus pressure operated test tools.

**A4 Flow Rate Calculations**

- Well test data shall be reported in Oilfield Units (Imperial) except for depth which will be reported in meters.
- Correction factors to calculate oil and gas flow rates at standard conditions of 14.73 psia & 60 °F.
- Production rates and ratios (CGR, WGR) of produced well fluids.
- Cumulative production (including clean up flow) of produced well fluids.
- Meter calibration records to be included in the test reports.

**A5 Separator**

- Vessel - Pressure and temperature.
- Oil - Shrinkage(Wf).  
- Meter calibration.  
- Oil flowline temperature.  
- Physical properties (density, pour point, API gravity).
- Water - Physical properties (density, salinity, resistivity and pH).
- Gas - Gas meter run and orifice plate sizes.  
- Static (Pf) and differential pressure (Hw).  
- Gas flowline temperature.  
- Physical properties (gas gravity, H<sub>2</sub>S/CO<sub>2</sub> content and chromatograph analysis).

**A6 Data Type and Acquisition Frequency**

Data acquisition frequency will be dependent on well performance, the stability of flow rates or build up data. Minimum guidelines are as follows:

**Data Acquisition Table**

<b>Data Type</b>	<b>Acquisition Frequency</b>
<b>Downhole Gauges</b>	
WTQR x 2	Every 5 seconds
WCQR x 2	Every 5 seconds
<b>Wellhead</b>	
Pressure and temperature	15 minutes initially    30 minutes stabilised
BS&W	15 minutes initially    30 minutes stabilised
H <sub>2</sub> S / CO <sub>2</sub> content	15 minutes initially    30 minutes stabilised
Choke changes / opening and shutting the well	Every 2 minutes for 15 minutes Every 15 minutes thereafter 30 minutes stabilised
<b>Separator</b>	
Pressure and temperature	15 minutes initially    30 minutes stabilised
Oil / Gas flow rate variables	15 minutes initially    30 minutes stabilised
Physical properties	30 minutes
Shrinkage	60 minutes
H <sub>2</sub> S & CO <sub>2</sub>	30 minutes
Meter Calibration	3 times per flow rate.

**A7 Sampling Requirements.**

The sampling programme will be limited to the acquisition of surface samples. Preliminary determination of oil API gravity and pour point and gas SG and CO<sub>2</sub>/H<sub>2</sub>S content will be made at the wellsite. Planned requirements will be as detailed in Table 2:

A Petrotech Sample Report Form must be completed for every sample taken during testing operations and faxed to the Premier office. All samples are to be marked, in a waterproofed manner, with the following information:

Date; Time; Well Name; DST Number; Sampling Point; Sample Number; Premier contact details

PVT samples should additionally have the following information:

Gas Rate; Oil Rate; Stabilised GOR; Other bottle in pair; Separator or Wellhead Conditions as appropriate); Perforation Interval

Appropriate hazard warning labels must be affixed so that they are clearly visible. All fluid samples are to be sent to the designated sample analysis laboratory (TBA). All hydrocarbon samples must travel by land or sea, not air, unless packaged in accordance with CAA regulations for air transportation of dangerous substances and clearly identified externally.

A dedicated basket or container should be allocated for shipping samples from rig to shorebase.

**APPENDIX B - PRESSURE TESTING SCHEDULE****B1 General**

- Pressure testing shall be conducted using the Permit To Work system.
- A Job Safety Analysis shall be performed prior to commencing any pressure test.
- Cordon off the test area and display "Pressure Test" signs.
- Make an announcement over the PA system that pressure testing is about to start.

**B2 Duration of Pressure Tests**

Pressure tests shall be performed with water for a duration as specified in the table below.

Large volume systems > 10 barrels	5 minutes with decline less than 5 psi per minute.
Small volume systems < 1 barrel	10 minutes with a maximum of 5% decline of the test pressure.
Larger volume systems 1 - 10 barrels	10 minutes with a maximum of 2% decline of the test pressure.

**B3 Pressure Testing Guidelines**

The following pressure test guidelines should be reviewed and adjusted according to well specific requirements. Pressure tests are only required to simulate the maximum exposure pressure anticipated during well testing operations. In most cases the maximum pressure observed will be when pressuring up the test string to activate the pressure-fired TCP firing head. Although this may be the back up firing system the required pressure must be accounted for when planning pressure tests. In most cases this will dictate a pressure test pressure for all string components and for sub-surface and surface equipment downstream as far as the choke manifold.

All pressure tests are to be recorded on a chart recorder and filed in the Test Documentation file.

The surface test equipment shall be pressure tested as per the schedule tabled below.

**B4 Pressure Testing Schedule – Surface Equipment**

<b>Surface Test Equipment Pressure Testing Schedule</b>		
<b>Equipment Type</b>	<b>Test Type</b>	<b>Test Pressure</b>
Choke Manifold & Petrotech Manifold	Upstream Valves	GTP
	Downstream Valves	GTP
Steam Exchanger	Upstream valves	GTP
	Downstream Valves	8.3 Mpa (1,200 psi)
Separator	Against inlet valve	8.3 Mpa (1,200 psi)
	Vessel test (outlet valves closed)	8.3 Mpa (1,200 psi)
Surge Tank	Against inlet valve (if possible)	6.9 Mpa (1,000 psi)
	Vessel test	(not done on rig)
Flowlines	Choke manifold to separator	8.3 Mpa (1,200 psi)
	Separator to Burner Booms	5.5 Mpa (800 psi)

As an integral part of pre-mobilisation checks all test equipment (surface and down hole) will be pressure tested to the working pressure of that particular piece of equipment.

The following guidelines shall be used when pressure testing.

- Ensure a JSA is held prior to any pressure testing.
- The Well Test Engineer and Driller shall confirm all valves are in the correct position.
- If required rope off areas to be pressure tested.
- The Well Test Engineer and Cementer shall ensure the test pressure is clearly understood and confirm this with the Schlumberger DST Supervisor.
- Remove all non essential personnel from all areas that will be exposed to pressure.
- An announcement shall be made that pressure testing is about to commence and that non-essential personnel are to be kept clear.
- The lines shall be filled slowly and all air bled from the system where possible.
- Rate of pressure increase shall be slow to ensure correct volume is being pressured up.
- All pressure testing shall be carried out in accordance with the guidelines given in Schlumberger Energy Services CEM Manual 4.0 Section 14, Cementing Operating Manual.
- On completion of the test pressure shall be bled of at the cement unit.
- Announce that pressure testing is completed.

**APPENDIX C - HS&E Guidelines and Responsibilities****C1 General**

The first priority of the Production Testing programme is to ensure that all operations are carried out safely and efficiently, with due regard for safety of personnel and equipment and for protection of the environment.

**C1.1** Testing will be carried out in accordance with the following legislation and corporate procedures and regulations:

**C1.1a** Premier Oil Australasia Operations Procedures and Manuals :

- Premier Offshore Drilling Operations Manual.
- Premier Safety and Emergency Response Manual.
- Premier Aviation Operations Guide
- Premier Oil Spill Contingency Manual.
- Premier Safety Case Bridging Document, Northern Explorer III, WHITE IBIS -1

**C1.1b** Other Corporate Reference Documents, Procedures and Manuals :

- Northern Explorer III Vessel Safety Case
- Northern Offshore Safety, Health & Environment S&P Manual (incl. Permit to Work System)
- Northern Offshore Operating Procedures and Well Control manuals
- Schlumberger Testing Field Operating Manual
- Schlumberger Tubing Conveyed Perforating Field Operating Manual
- Schlumberger Design of Service Document

**C1.1c** Statutory regulations :

- Petroleum Submerged Lands Act - Schedule, Specific Requirements as to Offshore Petroleum Exploration and Production - 1995.
- Occupational Health and Safety Regulations.

**C1.2** Without prejudicing emergency requirements, any deviation from this programme which could have safety implications or could significantly affect the test objectives must be approved by the Petroleum Engineering Manager and the Drilling Manager, or their delegates. A programme deviation must be issued and approval indicated by the signatures of the Petroleum Engineering Manager and the Drilling Manager, or their delegates, prior to commencement of any activities covered by the programme deviation. Minor procedural variations to the program may be initiated offshore.

**C1.3** Ultimate responsibility for the safety of all personnel on board and for the security of the

rig rests with the Northern Explorer III PIC. All matters which could affect the safety of personnel or the rig must be discussed with him or with his appointed delegates, and close liaison between Northern Offshore, Premier and Contractor personnel must continue at all times.

- C1.4** The Premier Drilling Supervisor is the senior authority offshore responsible for the execution of this programme in a safe and sound manner, in accordance with Premier standard procedures, any regulations imposed by the authorities and any relevant industry codes and standards.
- C1.5** The Premier Petroleum Engineer and the on-site Well Test Engineer report to the Premier Drilling Supervisor offshore. The Premier Drilling Supervisor, or his designate, is responsible for the supervision of the activities and personnel covered by this programme, though he may delegate responsibility for specific aspects of the program to the Well Test Engineer or the on-site Petroleum Engineer.
- C1.6** Prior to the commencement of any new phase of operations the Drilling Supervisor and the Well Test Engineer will conduct a safety and operations briefing.
- C1.7** All work to be carried out under this programme will be carried out under the Northern Explorer III Permit To Work System.
- C1.8** Well perforation and initial flow periods will not be undertaken at night unless as previously agreed and where allowed under the PSLA legislation.
- C1.9** In the event Hydrogen Sulphide (H<sub>2</sub>S) levels above 50 PPM in the wellstream or above 10 PPM in the atmosphere are detected, the well will be shut in downhole and at surface and the situation assessed with consideration for terminating testing operations.

**C1.10 Well Testing Personnel and Contractors****COMPANY****SERVICE**

Premier	Drilling Supervisor, Drilling Engineer
Premier	Petroleum/Reservoir Engineer
AWT	On-Site Well Test Engineer
Schlumberger (Steam generator sub-contracted to Bukom)	Surface & Sub-Sea Equipment and slickline
Schlumberger	Downhole Test Tools and TCP
Schlumberger	Electric Line
Petrotech	Wellhead Sampling Services
Premium Casing Services	Pipe Handling Services
Baker	Permanent Packers and Seal Assemblies

**C2 Personnel Responsibilities****C2.1 Main Contractors For Well Testing Services**

Contractor	Services Provided	Brief Description
<b>Main Testing Contractor: Schlumberger</b>		
Schlumberger	Perforating	Tubing Conveyed Perforating
Schlumberger	Down Hole Tools	Retrievable DST tools. Downhole Gauges
Petrotech	Sampling	Surface PVT and dead fluid samples.
Schlumberger	Test Package	Surface Test Equipment Data Acquisition
<b>Support Services</b>		
Baker Oil Tools	Permanent packer equipment	Installation and if required, recovery of permanent packer.
Premium Casing Services	Tubing and Casing handling services	Installation of casing strings and running/retrieving tubing test strings.
Schlumberger	Perforating Cased Hole Logging	Through tubing (if required) Packer / TCP depth correlating Bridge plug installation CBL logging

Premier Oil Australasia GENERAL Production Testing Programme	Section 11 APPENDIX C	Page 4
--	--------------------------	--------

Dowell Schlumberger	Well Completion and Drilling Fluids	Preparation and conditioning of mud, clean up and fluid loss pills.
AWT	Well Test Engineer	Wellsite test supervision & planning

<b>Premier</b>		
	Petroleum Engineer	Gauge settings, data analysis, daily data reporting
	Drilling Engineer	Tool makeup, running procedures
	Drilling Supervisor	Overall test supervision and safety, marine issues

## C2.2 Premier

### C2.2.1 Premier Drilling Supervisor / Drilling Engineer

- Directly responsible for all downhole operations. May delegate responsibility to Well Test Engineer during flow & shut-in periods.
- Ensure operations are managed in a manner that protects the environment, complies with all government regulations and follows Company policy.
- Review with key personnel contingency plans for potential testing emergencies.
- Co-ordinate the overall conduct of the production test and assign personnel responsibilities.
- Liaise with the rig PIC to ensure that all safety preparations are made.
- Hold a safety meeting with all personnel involved in testing at an opportune time prior to running the test string and assign personnel responsibilities.
- Ensure the Permit To Work system is utilised for all test operations.
- Review weather forecasts to ensure the environmental conditions will allow an adequate window for the test to be conducted safely.
- Ensure test procedures are implemented in a safe and efficient manner.
- Arrange reporting and communications procedures with shorebase.
- Co-ordinate logistics, including standby helicopters and standby/supply vessels, with shorebase and at the wellsite.
- Formally notify the Premier Drilling Superintendent or Drilling Manager prior to perforating and commencing flaring :

### C2.2.2 Premier Petroleum Engineer (may be delegated to Premier Well Test Engineer)

- Quality control of the well test data.
- Review metering arrangements.
- Advise data acquisition parameters for memory gauges.
- Advise on the duration of the flow and buildup periods.
- Advise on surface sampling requirements.
- Determine choke sizes.
- Analyse well test data to ensure test objectives have been achieved.

- Check and issue daily test report
- Witness packer setting correlation run and verify correct setting depth for TCP guns.

### C2.2.3 Premier Well Test Engineer

- Ensure the test is carried out according to the approved program or that any changes to the program are first agreed to by the relevant personnel.
- Report to the Premier Drilling Supervisor and Petroleum Engineer.
- Supervise the testing contractors' test preparations. Check equipment for completeness and condition.
- Review and confirm with the respective contractor supervisor the operating parameters of the entire well testing package and associated equipment :
  - The Production Test tools
  - Sub Sea Tree
  - Perforating equipment.
  - Surface Equipment.
- Compile the QC file for the well testing operations. Ensure that inspection reports for all test equipment are current and on file. Ensure that calculations for space outs, operating pressures and other critical factors are reviewed and signed off by at least 2 competent people and kept on file.
- Be the focal point for the contractors involved in implementing the test program. Act as liaison between Premier, testing contractor(s) and rig contractor to ensure sufficient co-ordination.
- Act as a technical adviser to the Drilling Supervisor and Petroleum Engineer in the planning and conduct of the well testing operation.
- Assist Drilling Supervisor in conducting safety and procedural meetings.
- Ensure that downhole and surface equipment has been functioned and pressure tested prior to the commencement of the test.
- Technical supervision of logging correlation runs to ensure that packers are set and the well is perforated at the correct depth (in conjunction with Petroleum Engineer).
- Provide a daily report on the progress and results of the test for the Drilling Supervisor and Petroleum Engineer.

## C2.3 Northern Offshore

### C2.3.1 Person In Charge (PIC)

- The PIC has overall authority regarding the safety of personnel and the drilling rig and is responsible for the following:
  - Ensuring that all rig equipment is operational as per the Vessel Safety Case.
  - Ensuring the Permit To Work system is implemented, as appropriate, for all test preparations .
  - Organising and conducting fire and rig evacuation drills prior to commencing well

testing & ensuring that key personnel are trained in use of breathing apparatus.

- In conjunction with the Drilling Supervisor and the Rig Superintendent, ensuring that all safety checklists items are addressed and implemented prior to testing.
- Informing personnel of the basic production test procedure and ensuring that all work is conducted in a safe manner.
- Liaison with the Drilling Supervisor in implementing the detailed step by step production test procedures and any aspects of the Emergency Response Manual or Oil Spill Contingency Plan.

### C2.3.2 Tourpusher

- Assist the PIC to perform responsibilities specified above with particular consideration for those aspects which ensure the continuity of testing operations.
- Check the availability and condition of the necessary tongs, slips and other handling and makeup equipment for the TCP Gun Assembly, DST tools, SSV Package and the Surface Test Tree (STT).
- Ensure the availability of the necessary stab-in valves for possible use during tripping.
- Function test the deluge system to ensure adequate protection will be provided during flaring of hydrocarbons.
- Ensure the Permit To Work system is implemented, as appropriate, for all test preparations .
- Provide relief for the driller to take scheduled breaks during testing activities.

### C2.3.3 Driller

- Stay on the drill floor with two floormen at all times during the test. **During flow and build-up periods, the driller may be relieved only by the Toolpusher / Rig Superintendent, and NOT the Assistant Driller.**
- Immediately report to the Drilling Supervisor or Rig Superintendent / Toolpusher any abnormalities.
- The Driller is to be familiar with the Surface Test Tree (STT) Emergency Shut Down (ESD) system and the mode of operation.
- Ensure that one person (Assistant Driller or Derrickman) is in the pump room at all times to line up kill fluids to the cement unit.
- Monitor annulus pressure and trip tank volume through the flow and buildup periods. Record pressures and volumes every 15 minutes.
- Keep a check on wind duration during flaring operations and inform Schlumberger testing supervisor and Barge Master in case switching flare booms needs to be considered.

### C2.3.4 Radio Operator

- Make a register of all portable radios and telephones onboard the rig. Ensure all transmitters are collected and secured prior to radio silences.
- Implement "Radio Silence" procedures and notify shorebase when Radio Silence will be in effect and when communications are re-established.
- Liaise with standby vessels and warn other vessels to remain outside the safety zone around the rig during testing operations.

- Keep the helicopter base advised of expected flaring times.

### **C2.3.5 Barge Master/Captain**

- Ensure all fire fighting and life saving equipment is ready for immediate use.
- Ensure all cooling and wetdown equipment is in position and tested.
- Brief crew regarding testing-related duties eg monitoring for gas, patrolling for hot spots etc, and ensure such duties are carried out.
- Obtain latest weather information and brief PIC.
- Monitor wind and weather conditions during test period and report accordingly to PIC.
- Ensure there are persons with radios on boom watch during flaring.
- Ensure PTW system is implemented with regard to hot work.
- Ensure Radio Operator has completed all his duties relating to DST operations.

### **C2.3.6 Standby Vessel Captain**

- Review standby and support vessel responsibilities and duties as designated in the Premier Safety Case documentation.
- Maintain station upwind of the rig as instructed by the drilling vessel.
- Watch for oil spills and report immediately to the Barge Master.

## **C2.4 Testing Contractor**

### **C2.4.1 Schlumberger Test Supervisor**

- The Schlumberger Test Supervisor is the focal point for the testing crew, including surface and downhole test personnel, gauge and electronic data acquisition technicians, TCP and (if on board) slickline personnel. In general instructions for the testing crew will be passed through him and reports will be issued through him. His duties therefore include the following:
- Supervise and co-ordinate the Schlumberger test personnel and the activities being performed.
- Liaise with the Premier Drilling Supervisor and Petroleum Engineer and Well Test Engineer to ensure all activities are carried out safely and efficiently.
- Brief test personnel on the testing procedures and their responsibilities.
- Review inventory quantities and condition of all Schlumberger test equipment onboard. Make sure adequate backup and spares are available.
- Organise and co-ordinate pressure and function testing in compliance with the Permit To Work system.
- Ensure all rig supervisory personnel are aware of the location and operation of emergency shut down equipment.
- Ensure well testing results are kept up-to-date and are accurate with all necessary factors and parameters applied.
- Provide Drilling Supervisor, Petroleum Engineer and Test Engineer with testing results (flowrates, pressures etc) as required.
- Maintain good relations and co-operation with rig personnel, from the PIC down, to help ensure the smooth installation of the equipment and implementation of the program.
- Provide Premier personnel with a test string schematic complete with IDs, ODs, connections and lengths prior to running any equipment in the hole.

### **C2.4.2 Schlumberger Downhole Tools Supervisor**

- Make up, function and pressure test the downhole tools.
- Prepare a report detailing the running list, with all critical dimensions and operating pressures.
- Check the availability of the necessary tongs, slips and other handling and makeup equipment for the DST tools and SSV Package.
- Ensure that adequate backup equipment and spares are available at the rig.
- Maintain a "status board" showing the status of all DST valves including the MCCV and the PCT-HOOP Test Valve, and keeping track of the cycles on these tools.
- Man the rig floor at all times to instruct the driller in the correct operation of annulus pressure operated tools and the optimum running speed.

### **C2.4.3 Schlumberger TCP Supervisor**

- Make up, function and pressure test the TCP Gun Assembly.
- Prepare a report detailing lengths and dimensions and operating pressures.

- Maintain explosives inventory and ensure that adequate spares are available.
- Review explosives safety procedures with the Drilling Supervisor and ensure that all safety procedures are followed when handling explosives.

#### **C2.4.4 Schlumberger Data Acquisition Supervisor**

- Ensure all data acquisition equipment is functioning correctly.
- Co-ordinate calibration of gas, oil and water meters.
- Check data-downloading capabilities, reporting and plotting software are functional.
- Ensure adequate batteries and spares are available.
- Double check results from Data Acquisition system against manually-calculated results to ensure correct parameters are entered in the system.

#### **C2.4.5 Schlumberger Downhole Gauge Technician**

- Check bottom hole gauges are functioning correctly
- Ensure adequate supplies of spares and batteries are available
- Advise Premier Petroleum Engineer on gauge set up parameters to record sufficient data
- Download data from gauges to diskette in the format required by Premier
- Produce plots and reports of the bottom hole pressure data
- Quality control the pressure data to ensure the gauges are performing to specification
- Pressure test the gauge carrier

#### **C2.4.6 Schlumberger Sampling Specialist (May be delegated to specialist company)**

- Ensure adequate sampling bottles and dead fluid containers are available for the intended sampling program.
- Prepare the bottles as necessary for sampling (eg evacuation of gas bottles) and ensure bottles have been cleaned.
- Acquire samples as per program, following standard procedures to assure the quality of the samples for analysis
- Prepare a list of all samples acquired and prepare samples for shipment as per Appendix 6 of this program.

## **C2.5 Drilling Service Companies**

### **C2.5.1 Logging Engineer**

- Liaise with the Premier Well Test Engineer on through-tubing perforating requirements (if any).
- Liaise with the Premier Well Test Engineer to ensure that the retrievable packer and TCP gun assembly are set at the correct depth.
- Maintain inventories of all explosives devices and ensure that adequate spares are available.
- Review explosives safety procedures with Drilling Supervisor and ensure that all safety procedures are followed when handling explosives.
- Liaise with the Drilling Supervisor and Radio Operator for the implementation of "Radio Silence".

### **C2.5.2 Cementer**

- Function and pressure test the cement lines.
- Operate the cement unit pumps to perform pressure testing, calibration and displacement as directed by the Well Test Engineer or Schlumberger Test Supervisor.
- Review well kill procedures with the Drilling Supervisor.
- Line suction up to pump kill fluid and be ready to implement well kill procedures at short notice.

### **C2.5.3 Mud Loggers**

- Take periodic gas samples from the separator for chromatograph analysis
- Monitor gas detectors in the shaker area, moon pool and on the rig floor.
- Monitor annulus pressure, trip tank volumes and flow detector.

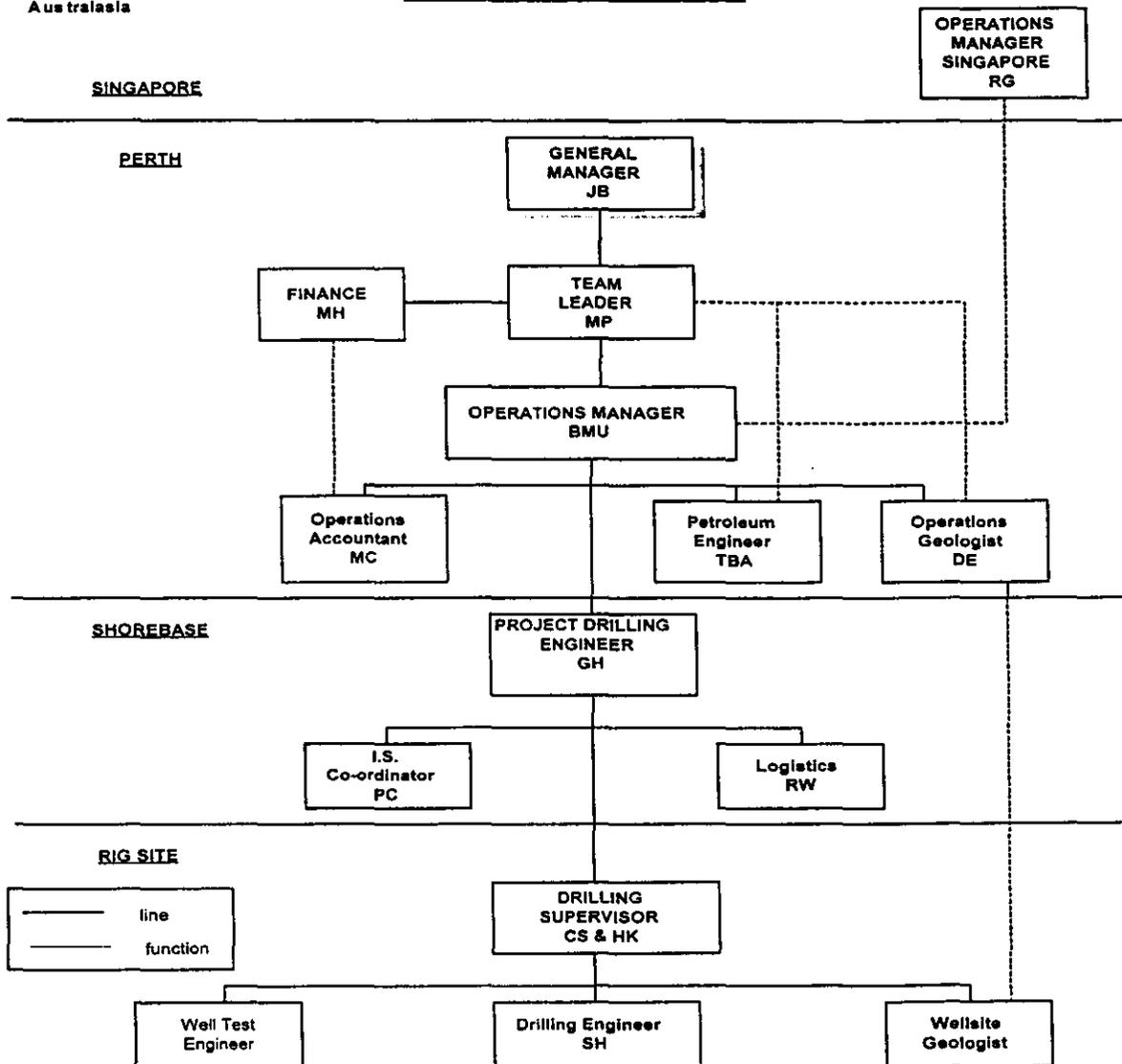
### **C2.5.4 Mud Engineer**

- Maintain completion fluid properties as specified in the test programme.
- Ensure adequate volumes are on hand to kill the well.
- Analyse produced fluids for salinity and pH as requested by the Test Engineer.

C2.6 Organisation Chart

**PremierOil**  
Australasia

**BASS BASIN ORGANOGRAM**



— line  
- - - function

Operations Manager: Blaine Ulmer (BMU)  
 Project Drilling Engineer: (Bass Basin) TBA  
 Team Leader: (Bass Basin) Mark Tringham(MT)  
 Mark Pogson (MP)

RG -	Richard Gray	RW -	Rick White
MH -	Mark Hancock	DE -	David Evans
JB -	John Begg	GH -	Gordon Hunter
BMU	Blaine Ulmer	DS -	Charlie & Herman
SH -	Stuart Harrison	DE -	SH & KD
		Geologists	Greg Clota Keith Frankiewicz

### C3 Safety Guidelines

#### C3.1 Pre-Test

This section details safety policies and procedures to be adhered to during the testing programme. The Premier Drilling Supervisor and the rig PIC are responsible for addressing each item and ensuring compliance with the policy or procedure.

These guidelines are intended to complement the policies and procedures contained in the manuals referenced in Section 1.

1. Ensure all the required emergency response equipment is on board the rig and is in good working order. This will include, but not be limited to, life boats, fire extinguishers, firefighting equipment, breathing apparatus, gas detectors, emergency lighting, PA system, and all lifesaving equipment.
2. Ensure that all H<sub>2</sub>S safety equipment is deployed and operable, and all personnel are trained in the use of it.
3. The number of personnel will be reduced to only those necessary for the testing operation.
4. The surface testing equipment is to be inspected to ensure that all lines are properly routed, installed, secured and, where required, electrically grounded. All components to be pressure tested with water and a report submitted to the Drilling Supervisor, including pressure testing charts.
5. BOP and well control equipment to be pressure tested prior to the testing programme.
6. Emergency Shut Down (ESD) stations will be installed on the rig floor, the testing area and outside the accommodation block. Ensure that the system has been tested and is operable.
7. A pre-test safety meeting is to be held with each rig crew to discuss safety during well testing operations. Service company and Premier personnel will attend both meetings to answer any questions and concerns. Testing procedures, lines of authority and responsibility and deployment of safety equipment will be discussed. Where there is a crew change a safety meeting will be held with the new crew as soon as possible.
8. Rig evacuation and fire drills will be held before each test. Personnel arriving on the rig after the evacuation drill will be given a demonstration of procedures if a drill is not scheduled before the next test.
9. Define the exit routes from the test area and ensure they are clearly understood.
10. The Permit To Work system will be adhered to at all times. No hot work permits

will be issued during well testing operations.

11. The standby vessel will be stationed upwind of the rig and be prepared to provide immediate assistance as required. Standby vessel crews should be drilled in the correct standby and support procedures.
12. Confirm that gas detection equipment is operational and properly calibrated.
13. Ensure that the compressors are fitted with spark arrestors, air supply intakes are in a designated safe area and emergency shut down systems are operational.
14. Schlumberger procedures for handling explosives will be strictly adhered to.
15. Helicopter flights will be restricted during testing at the discretion of the Premier Drilling Supervisor and the rig PIC.
16. Ground all production vessels to avoid static electricity ignition sources.
17. Ensure all required personnel are trained and familiar with any safety equipment which they may be expected to operate.
18. Review systems for shutting down non-essential electrical equipment.
19. Pressure testing will be conducted in compliance with the Permit To Work system. Pressure testing areas will be cordoned off and non essential personnel warned to stay clear.

### **C3.2 Prior To Perforating**

- C3.2.1. The first perforations and flow period will not commence at night without prior approval from the Drilling Manager. Subsequent flow periods from the same zone may be recommenced at night at the discretion of the Premier Drilling Supervisor and the PIC.
- C3.2.2. Hold a rig floor safety meeting with all the rig crew and service company personnel involved in the testing operations to discuss responsibilities and the sequence of events. At this time, situations when the Emergency Shut Down (ESD) system would require activation will be discussed, the procedure to operate the ESD system will be demonstrated and the Surface Safety Valve reset.
- C3.2.3. Remind all personnel of the strict adherence to safety regulations, especially no smoking outside the living quarters, and all hot work permits suspended.
- C3.2.4. The Drilling Manager shall advise the Government bodies that well testing is about to commence.
- C3.2.5. Advise the standby and work boats to assume a position upwind of the rig and that well testing is about to commence.

**Note** The Standby boat must not be at anchor during testing operations from the time of perforating until the well is killed.

- C3.2.6. Deploy the fire fighting equipment and assign personnel to fire watch.
- C3.2.7. Assign personnel to tour the testing areas with gas detectors, and deploy breathing apparatus with procedures to follow if there is evidence of H<sub>2</sub>S.
- C3.2.8. All doors, hatches and vents in the vicinity of the test equipment will be closed for the duration of the test.
- C3.2.9. Working on burner booms is covered under the Permit To Work system and it should be emphasised that work vests must be used when working on the booms.
- C3.2.10. Cranes will not be operated when the well is open to flow. Limited crane operations will be permitted during shut in periods at the discretion of the Premier Drilling Supervisor and the rig PIC (but no lifts over pressurised lines or vessels will be permitted).
- C3.2.11. Wireline perforating guns or wireline set packers will not be armed until the radio operator has notified the standby boat and shorebase. Rig transmitters, mobile phones and electrical equipment such as welding machines will also be switched off. The marine VHF should be tuned to the international emergency frequency. Transmission on any field radio or mobile phone is prohibited.
- NOTE:** The above does not apply to mechanically or hydraulically fired guns.
- C3.2.12. Do not remove explosives from the magazine during electrical storms.
- C3.2.13. Preparation of perforating gun assemblies and wireline set production packers will be performed under the Permit To Work system. The work area will be cordoned off and all unnecessary personnel will vacate the area while perforating guns or packers are armed.
- C3.2.14. Radio and electrical equipment may be switched on when the perforating gun is 150m below the seabed.
- C3.2.15. All radio transmitters, mobile phones and electrical equipment are to be switched off prior to pulling a perforating gun through the BOP's. Once the gun is on the catwalk and disarmed, radios can be returned to normal service.
- C3.2.16. Prior to perforating an announcement will be made over the intercom that well testing is about to commence.

### C3.3 Well Testing

- C3.3.1. Initial perforating and flow period will not be performed at night without prior approval. Subsequent flows from the same zone may be conducted at night at the discretion of the Premier Drilling Supervisor and the rig PIC.

- C3.3.2. Check H<sub>2</sub>S concentration in produced fluids as soon as possible. If instream concentrations greater than 50 ppm are recorded the Drilling Supervisor is to be advised and the advisability of continuing the testing operations must be immediately assessed.
- C3.3.3. Frequent checks should be made for sand production at the choke manifold (BS&W samples and at the choke box when chaging choke) . If excessive quantities of unconsolidated sand are produced the advisability of continuing the testing operations must be immediately assessed.
- C3.3.4. Life jackets must be worn when working on the burner booms.
- C3.3.5. Standby vessels will maintain a constant alert upwind of the rig.
- C3.3.6. The radio room will be manned at all times during testing operations.
- C3.3.7. Helicopters will be permitted to land on the drilling vessel during well testing during shut-in periods only and at the discretion of the Premier Drilling Supervisor and the rig PIC.
- C3.3.8. A Premier representative shall be present during all well testing operations.
- C3.3.9. Non-essential personnel will keep clear of the rig floor and the test equipment areas during well testing operations.
- C3.3.10. The cement unit shall be connected to the kill line on the Surface Test Tree (STT) and be ready to start pumping immediately, if required.
- C3.3.11. Before pulling the test string, the string contents will be reverse circulated. The well will be circulated at least once the long way around. All gas cut mud / brine will be circulated out and flow checks conducted before starting out of the hole, every 20 stands, and before pulling the lower test string through the BOP stack.
- C3.3.12. A stabbing valve and inside BOP will be available on the floor ready for use, with all necessary crossovers for any component of the test string.
- C3.3.13. Either the driller, the rig superintendent or the toolpusher must be on the rig floor at all times during flow and shut in periods. The assistant driller is not permitted to act as the relief for the driller.
- C3.3.14. Cordon off the area between the "V" door and the wireline unit during wireline operations.

### **C3.4 Safety Meetings, Drills And Alarms**

#### **C3.4.1. Safety Meetings**

Prior to commencing testing operations, a safety meeting will be held where the Premier Drilling Supervisor, Well Test Engineer and Petroleum Engineer will brief the drilling crew, service company representatives, and all key personnel on board on the planned sequence of events, potential hazards, and planned responses to emergencies. Personnel

responsibilities have been defined and the procedures should be reviewed with an emphasis on the safety systems in place.

A discussion of safety issues should be encouraged at the meetings. Guidelines for issues to be addressed are as follows:

- Restricted areas and work activities.
- Review of station drill.
- Fire fighting equipment deployment.
- Personnel rescue.
- Safety rules and policies, including no smoking and hot work.
- Rig evacuation procedures.
- Security of information and communications between rig and shore.
- Safe pressure testing procedures.
- Designate teams of personnel for fire watch and monitor for gas and H<sub>2</sub>S.
- Planned test procedures and equipment involved.
- Operation of alarms, warning signals and the appropriate reactions.
- Explanation of the emergency shut-down system.
- Emphasis on good housekeeping, especially where test personnel are operating.

#### **C3.4.2 Drills**

Fire, Man Overboard, Abandon Rig and BOP drills are to be held before starting testing operations. Drills simulating a fire at the separator or an explosion at the shakers, or a release of H<sub>2</sub>S, will be conducted.

Training and drills in the use of H<sub>2</sub>S safety equipment, particularly self contained breathing apparatus, should be completed prior to testing.

#### **C3.4.3 Alarms**

All H<sub>2</sub>S sensor alarms, explosive limit gas alarms, and smoke detectors must be tested and in working order prior to perforating the well.

Actual alarms should be used to initiate drills to familiarise personnel with the various alarms.

### **C3.5 Emergency Response**

#### **C3.5.1 Test String Leak Below Surface Test Tree – Above BOP Rams**

Vent annulus pressure to close PCT.  
Vent string pressure via choke manifold.  
Close SSTT, disconnect from SSTT and recover Upper Test String.  
Repair leak and re-connect.

#### **C3.5.2 Test String Leak Below Surface Test Tree – Below BOP Rams**

SHORT valve will likely shear open.  
Annulus to tubing u-tube of kill weight fluid will occur.  
Vent pressure above PCT via choke manifold.  
Displace tubing and annulus to kill weight fluid.  
Kill well – this may require unstinging from packer.

#### **C3.5.3 Leak in Surface Lines – Flowhead to Choke**

Close SDV1 – flowhead actuator.  
PSL1 should trip if leak is significant.

#### **C3.5.4 Leak in Surface Lines – Downstream of Choke**

Activate ESD from any remote station.  
Close choke manifold.  
PSL2 should trip if leak is significant.

**APPENDIX D - GLOSSARY OF TERMS**

API	American Petroleum Institute
bbl(s)	barrels
BHA	Bottom Hole Assembly
BHP	Bottom Hole Pressure
BOP	Blow Out Preventer
BOPD	Barrels Of Oil Per Day
BS&W	Basic Sediment and Water
CBL/VDL	Cement Bond Log / Variable Density Log
CGR	Condensate-Gas Ratio
cc	cubic centimetres
CO <sub>2</sub>	Carbon Dioxide
°C	Degrees Celsius
DGA	Downhole Gauge carrier with surface read out connection
DP	Deep Penetrating
DST	Production Test (shorthand for any well test performed from a
MODU	with a retrievable test string).
DWT	Dead Weight Tester
EMW	Equivalent Mud Weight
ESD	Emergency Shut Down
EZ Tree	Schlumberger's Sub-Sea Test Tree
FTHP	Flowing Tubing Head Pressure
°F	Degrees Fahrenheit
gms	grams
GOR	Gas Oil Ratio
GLR	Gas Liquid Ratio
GR/CCL	Gamma Ray / Casing Collar Locator
Hg	Mercury
Hw	Differential Pressure (inches of water)
H <sub>2</sub> S	Hydrogen Sulphide
ID	Internal Diameter
JSA	Job Safety Analysis
KB	Kelly Bushing
kPa	Kilo Pascals
KCl	Potassium Chloride
LGR	Liquid Gas Ratio
lbs	pounds
LPR	Lower Pipe Rams

MCCV	Schlumberger's tubing pressure operated reclosable circulating valve
MD	Measured Depth
mm	millimetres
MMSCFD	Millions Of Standard Cubic Feet Per Day
MPR	Middle Pipe Rams
MODU	Mobile Offshore Drilling Unit
MSL	Mean Sea Level
NaCl	Sodium Chloride
OD	Outside Diameter
OIM	Offshore Installation Manager
P & A	Plug and Abandon
PBTD	Plug Back Total Depth
PCT	Schlumberger's Pressure Controlled Tester Valve
Pf	Separator Pressure
PIC	Person In Charge
POOH	Pull Out Of Hole
PPF/ppf	Pounds Per Foot
PPG/ppg	Pound Per Gallon
PPM/ppm	Parts Per Million
PSI/psi	Pounds per Square Inch
PSIA	Pounds Per Square Inch (absolute pressure)
PSIG	Pounds Per Square Inch (gauge pressure)
PTW	Permit To Work
RIH	Run In Hole
RT	Rotary Table
R <sub>w</sub>	Formation Water Resistivity
°R	Degrees Rankin (i.e. absolute temperature; = °F + 460)
SG	Specific Gravity (Air = 1 if gas; Fresh Water = 1 for liquid)
SHORT Valve	Schlumberger's Rupture Disk circulating valve (annulus pressure)
SITHP	Shut In Tubing Head Pressure
SIBHP	Shut In Bottom Hole Pressure
SPF/spf	Shots Per Foot
SRO	Surface Read Out (of bottom hole pressure data)
SS	Sub-Sea
SSTT	Subsea Test Tree
STB/stb	Stock Tank Barrels
STT	Surface Test Tree
TCP	Tubing Conveyed Perforating
TD	Total Depth
TFTV	Schlumberger's Tubing Fill & Test Valve
TVD	True Vertical Depth
UPR	Upper Pipe Rams

Wf

Weathering Factor

WCQR

Schlumberger's Quartz crystal pressure recorder

WTSR

Schlumberger's Strain gauge pressure recorder