451001

DST PROCEDURE

PELICAN NO 5

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OR_357E

CONTENTS

ATTACHMENTS

PELICAN NO 5

DRILLSTEM TESTING
W/ THRU TUBING GUNS & TUBING CONVEYED GUNS

I. INTRODUCTION

This procedure outlines the test objectives and test procedures for the testing of the Well. All testing will be done in cased hole.

II. SERVICE COMPANIES

The following service companies will perform the test work:

Downhole Tools	Halliburton
Surface Testing Equipment	Otis
Perforating	Schlumberger
SRO	Otis

III. TEST OBJECTIVES

The testing program, as designed, should accomplish the following objectives:

ALL SANDS

A. Determine the initial reservoir pressure.

B. Determine reservoir parameters of Kh, skin, and changes in these parameters within the radius of investigation of the test.

C. Obtain representative water samples, if produced, to determine Rw and composition. Obtain hydrocarbon samples for laboratory analysis.

D. Determine well productivity.

"F" SAND ONLY

E. Perform mini-frac to obtain closure stress, leak off and modulus.

IV. TEST INTERVALS

The primary test intervals are the "F", "E" and "D" Sands of the Eastern View Coal Measures, exact perforating intervals and packer setting depths will be specified in Attachment No. 1 after evaluation of the open hole logs. Testing should commence at the lower most interval and proceed to the upper most interval. Upon the completion of each test a cement retainer will be set and the perforations squeezed.

Testing of deeper sands will be conducted if sufficient encouragement is obtained during the drilling of the 8-1/2" hole.

V. PROGRAM REVISIONS

Program revisions may occur from time to time during the course of this test. These revisions will be telexed to the rig and will overide any instructions contained in this program.

VI. GENERALIZED TEST PROCEDURE

In order to accomplish the objectives, the following test is outlined:

A. A minimum initial flow of 10 minutes to obtain storage free build-up data and to insure supercharging effect of mud column is relieved.

B. Shut in approximately 60 minutes to determine initial reservoir pressure from analysis of storage free pressure build-up data. Actual shut-in time will be determined by well test engineer based on surface readout data (if available).

C. Second flow will be 6-8 hours at stabilized flow conditions (actual time may be longer depending on the time required to reach a stabilized rate). Fluid samples will be taken during the stabilized test to determine properties. In addition, flow rate and pressure data obtained will be used to determine well productivity. Flow rate will be determined by well site engineer based on reservoir parameters estimated during first flow test.

D. Conduct build-up for 12 hours or until engineer considers build-up to be complete. The build-up will be used to determine reservoir parameters.

E. Flow well for maximum rate determination. Rate should be stabilized. Additional sample collection may be required during this part of test.

F. Shut well in.

VII. PACKER FLUID

Packer fluid for the DST should be adequate to control formation pressures. The fluid should be clean with minimal solids to minimize any formation damage.

VIII. TEST EQUIPMENT

In order to accomplish the outlined objectives, the following equipment is required:

A. DST Equipment -- Attachment 2 is a breakdown of the Halliburton/Otis down hole equipment required to run the test. Surface readout gauges using Otis wireline equipment will be used. Downhole shut-in will be used on the final well shut-in.

B. Additional Test Equipment -- Attachment 3 is a breakdown of additional equipment required to insure that the test is successful. Methanol injection may be required to reduce hydrate formation. Also an emulsion breaker and a pump to inject into the wellstream upstream of the separator is required in case problems are encountered during cleanup. Ensure spare equipment is available on critical items.

IX. TEST ENGINEERS RESPONSIBILITY

A. Prior to arrival on location, obtain list of surface test equipment and down hole tools that are onboard. Review equipment list and insure the equipment is adequate to conduct the test. If equipment is lacking, notify Drilling Superintendent.

B. Prior to arrival on location, confirm equipment in attachments 2, 3 and 8 are onboard.

C. Upon arrival on location, the test engineer should -

1. Locate all equipment in attachments 2, 3 and 8. If any equipment is missing, notify Drilling Foreman.

2. Witness all pressure and function testing as noted in the procedure. All connections to be made up on rig should be visually inspected.

3. Ensure crossovers and connections are available to make up downhole and surface test equipment.

4. Inspect all equipment (including orifice plates, test string, chokes, etc) and ensure equipment is adequate to conduct the test.

5. Witness any meter calibration and other testing as required to conduct the DST.

6. Engineer should conduct a meeting with all personnel involved in actual test operations to ensure data will be gathered as outlined in procedure. Emergency shut-down procedures are contained in Attachment 4.

D. Witness all data gathering and ensure test is adequate to meet test objectives.

X. TEST STRING RUNNING PROCEDURE

A. After running 5" liner or abandoning 6" hole, test BOP.

NOTE: Run casing pup joints below each possible test interval.

B. Dress Cement and Log

1. Cleanout casing with bit and scraper. Dress top of liner if run. Circulate with seawater (if using new packer fluid) while working scraper at packer seats and on bottom. Circulate till clean. When on bottom displace well with clean packer fluid (if used).

2. Close rams and pressure test liner lap to 3500 psi.

3. POH. PU RTTS and Hydrospring tester perform 2000 psi underbalance dry test.

4. Run CBL/CCL/GR (use 7" shooting nipple to hold 700 psi to 1000 psi at surface). If CCL/GR is not adequate for correlation, rerun without centralization.

C. Pressure Test Surface and Subsurface Equipment

NOTE: Where possible, testing of component parts of surface and downhole equipment should be performed before actual rig up to prevent wasting valuable rig time. It is VERY important that each pressure test be held for at least 10 minutes and that the test is recorded in a log and witnessed by an Amoco representative.

1. Otis should pressure test their surface tree, subsea test tree and lubricator valve. This should be done while the equipment is laying on the deck. Each valve should be independently tested from below, and each valve should be cycled twice before the pressure test. The tests will be to 8000 psig and will be held for 10 minutes as noted above.

2. The surface test system will include the test equipment for drill stem testing and a well cleanup system. The lines from the surface tree to the choke manifold should be tested to 8000 psig. The heater and lines downstream of the heater should be tested to 1000 psig. In addition, the lines to the well cleanup system (pressure tanks or degasser/mud system), should be pressure tested to 1000 psig. All equipment should be tested with drill water.

NOTE: If it is possible to isolate the high pressure coils in the heater, they should be tested to 5000 psig. The separator should be tested to its rated working pressure. If the design of the relief valve allows, the separator should be tested by pressuring up to the relief pressure. Do not pressure up too quickly or in excess of relief valve pressure setting to avoid weakening the rupture disks.

D. Space Out Landing String

1. Before running the DST string, it will be necessary to function test the Otis subsea test tree and lubricator valve and test the space out of the landing string from the wellhead back to rig floor so that that the surface test tree is about 10-12 feet above the rig floor. Coat a slick joint with white paint and allow to dry before RIH.

2. Make a dummy run to test landing string space out as follows:

   Run 2 stands of drill collars below fluted hanger, 5" slick joint (painted) and subsea test tree. Run 5" HWDP spacing out lubricator valve to about 100 feet below surface tree and 5" HWDP back to surface. Space out landing string using pup joints, if required, so that when the fluted hanger sits in the wear bushing, the surface tree will be about 10-12 feet above the rig floor.

NOTE: Run the SSTT and lubricator valve in the hole with valves in the open position.

3. After landing the fluted hanger in the 9-5/8" wear bushing, close appropriate rams on slick joint and mark white paint for correct space out.

4. Function and pressure test SSTT and lubricator valves to 3000' psi from below with surface tree open to atmosphere.

5. Open rams.

NOTE: In the case of the tool string being hung off from the wellhead, it will be possible to close the shear rams above the SSTT.

6. Lay down surface tree and pull landing string, lubricator valve and SSTT with valves in open position.

7. Stand landing string back in derrick. Rack drill string separately to ensure that the same stands will be used again for the actual run.

8. When the lubricator valve is on surface, close valve and stand in derrick.

9. When the SSTT is at surface, function quick disconnect coupling. Regrease, disconnect and reconnect.

10. Note position of ram marks on pipe and ensure measurements confirm that tree was fully landed.

NOTES: a. Otis should have pressure tested their lubricator and SSTT prior to making this dummy run.

b. Use Otis test pump on deck.

c. It is VERY important that all valves be pressure tested and that each pressure test be for at least 10 minutes. All tests should be witnessed by an Amoco Representative and recorded in a DST Tool Test Log.

E. Run Test String for Perforating Thru Tubing

1. Make up test tools and RIH ensuring that string is not rotated.

2. Ensure that each component of the test string is drifted to 2.6" above the Otis down hole shut in tool and 2.125" below the down hole shut in tool. Drift tools on rig floor as they are picked up just prior to makeup. Ensure drift has a wireline fishing neck.

NOTE: All drill collars, drillpipe and/or tubing should have been previously washed to remove any barite or debris which might settle in the test tools.

3. The annulus controlled test valve (LPR-N) should be set to function at ± 1200 psi applied annulus pressure. The annulus controlled circulating valve (APR-M2) should be set to function at ±2500 psi.

4. Run two 72 hour clocks and one 144 hour clock with 10,000 or 15,000 psi gauges (as appropriate) in the bundle carrier above the packer. The bundle carrier below the packer should have two electronic memory gauges and two temperature gauges. Refer to Attachment 3 for list of gauges available.

5. Prior to RIH w/ TBG, set packer, collapse slip joints. Test tools to 8000 psi.

6. RIH w/ TBG (SLM). Set Packer and collapse slip jts to close bypass valves. Pressure test the test string to 8000 psi for 10 min prior to making up SSTT. If no test, POH setting packer and retesting every ten stands. After positive test RIH and test next 30 connections with Gator Hawk Tester to isolate leak.

7. Pick up SSTT and lubricator valve. Function test each component. RIH w/ landing string.

8. Set packer and collapse slip joints to close by pass valves.

9. Set the packer as follows:

   a. Space out so that with the packer set and the fluted hanger landed in the wear bushing, the slip joints will be open 5'.

   b. Set slips, rotate to right to give 1/4 turn at the packer (beware of hoses, etc.).

   c. Pull slips and land fluted hanger in wear bushing.

10. Open LPR-N and test string to 8000 psi. Hold at least 10 min. (Monitor annular pressure). Close LPR-N.

11. Rig up 75 foot slings needed for wireline work. Rig up surface test tree.

F. Run Test String for Perforating with Tubing Conveyed Guns

1. Make up test tools and RIH (SLM). Ensure that the test string is not rotated.

2. Ensure that each component of the test string is drifted to 2.6" above the Otis downhole shut-in tool and 2.125" below the downhole shut-in tool. Drift the tools on the rig floor as they are picked up prior to make-up. Ensure drift has a wireline fishing neck.

NOTE: All drill collars, drillpipe and/or tubing should have been previously washed to remove barite and any debris which might settle in the test string.

3. The annulus controlled test valve (LPR-N) should be set to function ± 1200 psi applied annulus pressure. The annulus controlled safety valve (APR-M2) should be set to function at ±2500 psi.

4. Run two 72 hour clocks and one 144 hour clock with 10,000 m 15,000 psi gauges (as appropriate) in the bundle carrier above the packer. The bundle carrier below the packer should have two electronic memory gauges and two temperature gauges. Refer to Attachment 3 for list of gauges available.

5. Prior to RIH w/ TBG, set packer. Collapse slip joints. Test tools to 8000 psi.

6. RIH w/ TBG (SLM). Set packer and collapse slip jts to close bypass valves. Pressure test the string to 8000 psi and hold for 10 minutes prior to making up SSTT. If no test POH setting packer and retesting every 10 stands. After positive test RIH and test next 30 connections with Gator Hawk tester to isolate leak.

7. Rig up Schlumberger and run GR to locate radio active tags in drill collars and casing. Correlate for space out.

8. Pick up SSTT and lubricator valve. Function test each component. RIH w/ landing string. Space out same.

9. Set the packer as follows:

   a. Space out so that with the packer set and the fluted hanger landed in the wear bushing, the slip joints will be open 5'.

   b. Set slips, rotate to the right to give 1/4 turn at the packer.

   c. Pull slips and land fluted hanger in wear bushing.

10. Rig up Schlumberger and run GR to confirm that TCP guns are on depth.

G. Pressure Test Surface Equipment

1. Connect surface line from choke manifold to actuator wing valve on surface tree. Connect other wing valve to cement unit.

Note: Choke manifold will be on rig floor

2. Purge lines to burners with water.

3. Close valve at heater and test to 5000 PSI. This will test chicksan connections and hose connections to choke manifold, and surface tree, and connections to test string.

H. Pump Cushion

1. Open upper hydraulic by-pass and pump appropriate cushion as required for ± 2000 psi underbalance (N2, Diesel or Seawater).

2. Close hydraulic by-pass and pressure annulus to 1000 psi and monitor drillpipe pressure to ensure proper sealing of hydraulic by-pass.

3. Open well to seperator and flare lines and blow down nitrogen. Monitor annulus for any fluid movement.

NOTE: ± 2000 psi underbalance is required in 2 md sandstone formations to achieve effective perforating per study by G. E. King et al, Amoco Tulsa Research.

I. Perforate with Through Tubing Guns

1. Open LPR-N. RIH w/ 2 1/8" gage cutter on slick line to ensure tester valve is properly open.

2. Ensure that:

   a. all tools are correctly set and landed in hole with required cushion.

   b. all surface lines, connections and vessels are tested and all valves are in the correct positions.

   c. the flow from the well is routed via the choke manifold to the burner for well cleanup.

Note: Leave well open to atmosphere while making wireline runs and monitor well for any fluid movement.

3. Rig up Schlumberger wireline BOP's and lubricator with 2 1/8" Enerjet guns. Test lubricator and BOP to 5000 psi.

Note: Caliper Gun adapters (top and bottom) to ensure clearance. (Use female drift provided and drift entire gun.)

4. Perforate with well on 1/4" choke if more than 1000 PSI under balance.

Note: Use 6 shots per foot if available.

5. Flow well for 10 minutes. Shut-in at surface tree and POH w/ wireline.

Note: During the 10 minute flow period, the well should be allowed to flow via 1/2" choke. Any fluid returned will be sampled using the cans provided (See Attachment 5 for fluid sampling summary). Pressure will be monitored using a dead weight tester (DWT) every minute. Time of first fluid to surface (cushion) should be noted, as well as time of any other fluids to surface.

6. If additional perf runs are required, flow well for 5 min before and during perforating and repeat step (4).

Note: Perforating operations should begin during daylight hours. Attachment 6 gives the precautions to be taken while perforating.

J. <u>Perforate with Tubing Conveyed Guns</u>

1. Open LPR-N. RIH with 2-1/8" gauge cutter to ensure ball valves are open. POH.

   Ensure that:

   a. All tools are correctly set and landed in hole with required cushion.

b. All surface lines, connections and vessels are tested and all valves are in the correct positions.

c. The flow from the well is routed via the choke manifold to the burner for well cleanup.

Note: Leave well open to atmosphere while making wireline runs and monitor well for any fluid movement prior to perforating.

d. Perforate the well with 5", 120° phased, tubing conveyed gun on a 1/4" choke.

K. Well Test

Note: Only essential personnel should remain on rig floor during DST operations. Prior to test, read safety procedures in Attachment 7.

1. After perforating, flow the well for 10 minutes.

2. Shut well in at surface for 60 minute shut-in period.

3. Rig up surface readout guages on wireline. Install in lubricator and pressure test wireline lubricator to 8000 psig with water. (Only if SRO is required by Test Engineer).

4. RIH with SRO gauge. Do not start final flow until SRO gauge is latched in place. Shut-in may be longer than 60 minutes for wireline rig-up, etc. The SRO gauge is used on tight gas sands to reduce the wellbore storage effect on the buildup pressure test data. Further benefit is derived from the SRO by providing real time pressure data and the ability to detect much smaller pressure changes than the old amerada gauges.

Notes: To prevent excess fluid drag on the cable causing severe movement of the gauge up the hole if the gauge is not properly latched in the downhole shut-in tool, it is important that:

i. The choke be opened very gradually at the start of each flow period, i.e. the flow should be increased slowly.

ii. The cable tension be closely monitored and telephone communication be maintained between wireline unit and choke manifold when opening the well to flow.

iii. The well is to be choked back at the first indication of cable or tool movement (as shown by cable tension decreases or CCL movement).

5. Open well to flow, controlling rate of flow with adjustable choke. Attempt to moderate the flow so that a differential to the wellbore of 1000-1500 psig is maintained. Samples of the fluid returned will be taken every 15 minutes and checked for BS&W content. This is a 6-8 hour stabilized flow period after initial unloading and unstable flow.

   a. Sufficient methanol should be onboard (5 drums), as well as a high pressure (5000 psig) injection pump to allow injection of methanol directly upstream of the choke manifold should hydrate formation be suspected.

   b. Emulsion breaker should also be on hand to allow treatment of any crude which forms stable emulsions during flowing. The fluid will be injected upstream of the choke manifold.

6. Once flow is established, catch samples every 30 minutes to one hour, and at obvious fluid changes. An estimate of gas and oil gravity should also be obtained. If the well does not flow, see section O (no flow or low flow response of well) below.

   NOTE: It will be necessary to collect uncontaminated oil samples. This can be done by bottom-hole sampling (see section M) or by not injecting chemicals at good flow conditions prior to shutting the well in. The test engineer and drilling supervisor should evaluate well flowrate, temperatures, pressures, etc. prior to stopping chemical injection. If major problems that will result in losing the test are anticipated, bottom-hole sampling should be considered. It is important that these samples are collected in order to evaluate the crude in the laboratory for future treating requirements. Oil, gas and water rates should be established every 15 minutes using the test separator. Oil and gas gravity, water salinity and shrinkage factor should also be recorded. Oil and water samples should be taken every hour in the cans provided (Attachments 5 & 8). Larger pressured samples of oil and gas will be taken as dictated by the engineer using the vacuum container technique. During sampling, pressure of the separator will be recorded with a dead weight tester.

7. Shut in well at downhole shut-in tool after a minimum of 8 hours flowing. Longer flow periods may be required to achieve a stabilized rate.

8. Monitor build-up for 12 hours or until the engineer considers build-up to be complete.

9. After build-up is complete, open well slowly on adjustable choke to flow at maximum production rate. Produce on 2" choke or at separator capacity. Change to fixed choke bean if possible. Pending analysis of engineer on site, bottom hole surface readout gauges may be pulled prior to this test. Flow well at maximum stabilized rate for 2-4 hours. Monitor injection equipment, test equipment, sand production, etc. and ensure that rate does not exceed equipment, safety and reservoir constraints.

10. Shut well in at choke manifold

11. POH with wireline gauges.

L. Data Gathering - Duration of Test

1. Gather data for flowing well (FWHP, FBHP, temperature) every one minute for first 5 minutes, every 5 minutes for next 25 minutes, every 15 minutes (at least) thereafter.

2. Gather data for shut-in well (BHP, WHP, temperature) once per minute for first 5 minutes, once per 5 minutes next 25 minutes thereafter, and every 15 minutes thereafter.

M. Bottom-hole Samples

Bottom-hole samples are to be collected as instructed by the test engineer. Bottom-hole samples may be required to obtain non-contaminated fluids (i.e., no emulsion breakers, etc.).

Note: Check to verify that Otis bottom hole sampler is available.

1. After final shut-in RIH with gauge, CCL and tandem bottom-hole samplers to top of lubricator valve. Sufficient sinker bars should be included in the string to hold string in a reduced flowrate.

2. Pressure up tubing to the shut-in tubing pressure to equalize pressure across lubricator valve.

3. Open valve and RIH to producing formation.

4. Flow well at a very small rate before taking sample. Three (3) hr clocks in samplers should be set so that well can be flowed at a reduced rate for 2 hrs before samples are taken.

5. Wellhead pressure and temperature, as well as gas, oil and water rates will be recorded throughout the flowing period.

6. Recover the bottom-hole samples.

7. Repeat steps 1-6 as necessary to obtain a minimum of three good samples.

N. Procedure to Kill Well

1. Displace with packer fluid down test string to Perfs.

2. Pressure up on annulus and shear the APR-M2 valve.

3. Circulate until mud weight in and out are equal.

4. Be sure well is dead before unseating packer.

5. Unseat packer and observe well. Be sure hole is static before POH.

6. POH with test string.

7. If further zones are to be tested, the perforations will be isolated with a packer (EZSV) and squeezed before the next zone is perforated. Attachment 9 gives the squeeze procedure.

O. No Flow or Low Flow Response of Well

If once the well is opened to flow, no response is seen and if the well will not flow to the surface, the following steps will be taken to remedy the situation.

1. Check that surface valves are open.

2. Determine fluid level in pipe and fluid gradient from surface readout gauge.

3. If (2) above indicates no flow into the wellbore and perforating gun misfires seem not to be a problem consider swabbing if using tubing for test string. After swabbing, proceed to flow test or evaluate fluid movement.

4. If (2) or (3) above indicates fluid movement, either catch a bottom-hole sample or consider reversing out contents of pipe.

5. If the contents of the pipe was not reversed out, attempt to establish an injection rate to the formation.

NOTE: Caution should be exercised to ensure that formation is not fractured while trying to establish injection rate. Use a fracture gradient of 0.7 psi/ft if no other data is available.

6. Acid should be onboard. After evaluation of all available data, stimulation of the formation may be desirable. Attachment 10 contains an acid procedure. This should be used after consultation with Regional personnel.

7. Attempt to flow well after acid stimulation by repeating steps K.3 to K.10.

8. If well still does not flow, abandon test.

ATTACHMENT 1

PROPOSED DST INTERVALS

	FORMATION	INTERVAL
A.	TBN	3672 m - 3699 m
B.	TBN	3607 - 3619m (if previous no good)
C.	TBN	3440 m - 3451 m (if previous intervals give poor results)
D.	TBN	3143 m - 3162.5 m
E.	'F' SAND	2869 m - 2883 m 1100 ppm N.C1
F.	'E' SAND	2786 m - 2790 m (if previous interval gives poor results)
G.	'D' SAND	2735 m - 2751 m (if either of the two previous intervals gives good results)

ATTACHMENT 2

DST STRING

Landing String

Lift Sub
Surface Test Tree
XO
5" HWDP
Lubricator Valve
5" HWDP
Centralizer & Sub
SSTT
Slick Joint
Fluted Hanger

DOWNHOLE DST STRING
(THRU TBG & CASING GUNS)

XO
DP/TGB
XO
DP
XO
Otis SRO Nipple
XO
XO
Full Flow Safety Valve
XO
1 STD DC
XO
2-Slip Jt
XO
1-STD DC
XO
HYD By-pass
1 STD DC
2 Slip Jt
XO
1 STD DC
XO
APR-A
APR-M2
Side Port Drain Valve
Drill Pipe Tester Valve
LPR-N
HYD Bypass
Bundle Carrier
Jars
XO
Safety Joint
RTTS Packer
Bundle Carrier
Drag Block Assembly
XO
Tail Pipe
W/L Guide

DOWNHOLE DST STRING (TCP)

XO
DP/TGB
XO
DP
XO
Otis SRO Nipple
XO
XO
Full Flow Safety Valve
XO
1 STD DC
XO
2-Slip Jt
XO
1-STD DC
XO
HYD By-pass
1 STD DC
2 Slip Jt
XO
1 STD DC
XO
APR-A
APR-M2
Side Port Drain Valve
Drill Pipe Tester Valve
LPR-N
HYD Bypass
Bundle Carrier
Drag Block Assy
Jars
Safety Joint
Pressure Ported Sub (Schl)
XO
RTTS Packer
XO
Bundle Carrier
Drag Block Assembly
XO
Slotted Tail Pipe
Firing Head
Guns

ATTACHMENT 3

ADDITIONAL MATERIALS FOR PRODUCTION TESTING

1. Methanol (5 drums) and injection pump

2. Emulsion breaker (2 drums).

3. Bottom-hole gauges: 6 amerada pressure gauges, 2 echo memory gauges, 2 temperature gauges; clocks: 72 and 144 hour clocks for all above gauges. Will need 15,000 and 10,000 psi gauges depending on test depth.

4. Sand trap for surface equipment

5. Shrinkage meter (should be attached to separator)

6. Gas gravity meter (Ranarex or equivalent).

7. Two deadweight testers.

8. Two sets of fixed chokes from 1/8" capacity and larger to the maximum size of manifold. At least one set to be ceramic type.

9. Complete set of orifice plates for gas and oil meter package. NOT OF LOCAL MANUFACTURE. API specification plates are required.

10. Acid, mixed or concentrate, to make 5000 gal. of 7 1/2% HCL with all normal additives (inhibitor, emulsion breaker, etc.). Should be made available on call out basis if possible.

EMERGENCY SHUTDOWN PROCEDURE

A safety meeting of all key personnel will be held prior to the test. Emergency shut down procedures will be thoroughly discussed and course of action established.

If, during a flow test, it becomes necessary to shut the well in due to an emergency situation, the following procedure should be followed:

a. Pull wireline tools out of hole.

b. Prepare to release SSTT and riser from stack. Close hydraulic actuated wing valve on surface test tree.

c. If required to move rig off well location:

   i. Close LPR valve.

   ii. Bleed pressure from test string.

   iii Close SSTT valves, ensure lubricator valve is open.

   iv. Release landing string clear above SSTT and shear rams.

   v. Close shear rams if short SSTT is used. Close pipe rams if shear rams cannot be closed.

   vi. Release riser and move off location.

NOTE: In the event that the well must be shut in downhole with the wireline at depth; the ball valve of the SSTT should be closed by use of the valve assist control line. This ball valve will shear the wireline and close for a positive shut off.

ATTACHMENT 5

FLUID SAMPLING SUMMARY

1. The following is a summary of samples to be caught during the well test:

   a. Initial flow period -

      i. Any fluid returned will be sampled using one quart tin containers.

   b. Second flow period -

      i. Catch samples to check for BS&W content every 5 minutes.

      ii. Catch samples in one quart tin containers every 30 minutes to one hour and at obvious fluid changes.

      iii Pressured samples will be caught in 500cc oil sample bottles and 20 liter gas sample bottles using vacuum container technique. Number of samples and frequency of sampling will be determined during test.

   c. Maximum flow rate -

      i. Additional sampling may be required during this flow period.

   d. If required, bottom-hole samples will be collected following second build-up period.

   e. Reversing out to kill well or after no flow/low flow response -

      i. Catch samples of reversed fluid in one quart tin containers.

   f. Tripping out of hole -

      i. Catch non-pressurized sample from between APR-M2 and the LPR-N from the side port drain valve.

ATTACHMENT 6

PRECAUTIONS TO BE TAKEN WHILE PERFORATING:

1. Before any gun is armed, the supply base, any boats, required authorities and Amoco offices should be notified of impending radio silence.

2. The boat/boats will be required to stand off one mile and to intercept any approaching vessels fitted with radios. Boats are to be instructed not to transmit until called by the rig at the end of radio silence. Boats in supply base should be informed of the expected duration of radio silence.

3. All hand held radios are to be collected and stored in radio room.

4. Notices are to be posted on all radios outside the radio room and where possible they should be disabled from transmit mode.

5. All welding permits are to be revoked and no welding is to take place during the radio silence period.

6. Radio operator is to switch off as much of his equipment as is practicable, and he is to be made fully aware of the requirements of radio silence and the possible consequences of breaking of radio silence.

7. Radio silence is to be maintained from the time that the gun is armed to the time that the gun is out of the hole and disarmed or has proved to be discharged.

8. The Amoco Drilling Foreman may, at his discretion, allow the use of the radio when the gun is 800' below mud line (at least 1000' of line in hole). The wireline company engineer should be informed of this because he will be required to stop at this depth when POH until he has been assured that radio silence is again in effect.

9. Once all the above has been accomplished, the wireline engineer should be informed that he may proceed to arm the gun. It should be emphasized that the wireline engineer should satisfy himself that the above has been carried out and that the above in no way absolves him from the usual check and procedures demanded by his company.

10. Vent lines on bulk tanks will be kept open during test program.

ATTACHMENT 7

AMOCO WELL TESTING SAFETY PROCEDURES

A. General

1. Nonessential personnel will be put ashore for the duration of the test program.

2. Rams, bag type preventers, kill/choke lines and valves, surface well control equipment will be tested before program commences. All surface well test equipment will be tested to rated working pressure. All downhole well test equipment will be pressure tested to an appropriate pressure for the particular test.

3. Man overboard, fire and abandon ship drills will be held before testing commences. Drills will be repeated between tests if thought desirable (i.e. if test program is lengthy or crew change occurs, etc.).

4. Pretest safety meetings will be held to ensure that all personnel concerned are fully familiar with test safety procedures and are fully aware of their duties and responsibilities.

5. Lifeboats/rucker capsules, engines, equipment, and operating gear will be checked out.

6. No smoking, matches or cigarette lighters will be allowed outside living quarters. Anyone found breaking this rule will be dismissed immediately.

7. All doors to living quarters, pump room, engine room, mud pit area, etc., will be kept closed throughout test period.

8. During test periods, all exit doors from quarters will be posted as follows.

   "Well test in progress.
   No exit for off duty personnel or personnel not concerned with well test without permission from installation manager or Amoco representative. No smoking, matches or cigarette lighters permitted beyond this door."

9. Fire mains will be pressured and fire hoses manned and laid to strategic points throughout test periods.

10. All gas pressure bottles will be stored on deck as far away as possible from test lines and burners. They should be positioned for easy dumping.

11. If service personnel change during testing operations, ensure that the relief personnel are fully briefed as to operations, test program, safety procedures, and their specific responsibilities.

12. Electrical equipment and installations not required during tests will be disconnected from power supply.

13. Helicopter scheduling will be controlled from rig throughout Amoco shore base office throughout test program to accord with test requirements.

14. The following people will be informed (before well is opened) of commencement time of each test, and upon completion of each test, when the well is closed in and killed.

    a. Amoco Drilling Foreman
    b. Rig Superintendent
    c. Vessel's Master

15. All hands will be informed via the P.A. system when well is to be opened for test.

16. During test periods, a fire watch will be kept on helicopter refuelling tanks, and they will be made ready for dumping in the unlikely event that this becomes necessary.

17. Gas explosion meters, a hydrogen sulphide detector and breathing apparatus will be checked and made ready. Key personnel will be taught operating procedure for same. Produced fluids will be monitored continuously for hydrogen sulphide -- if this is detected, Amoco representative will be informed immediately.

18. Adequate killing fluid of the correct weight should be available. An emergency kill line will be connected from one wing of the surface control head to the high pressure cementing unit. The supply of killing fluid will be connected to the cementing unit.

19. Working areas around the control head of rig floor and around the choke manifold, separator, etc., will be kept clear and there will be unobstructed access to these areas at all times. When work is to be carried out on the control head, a suitable platform will be erected.

20. Testing will only be carried out during hours of darkness if the flow test can be satisfactorily commenced during daylight hours.

B. <u>CREW ORGANIZATION AND DUTIES</u>

1. Contractor's Captain is the appointed "Offshore Installation Mananger" and as such has final responsibility on the rig for rig and crew safety. He must approve safety procedures and can make overriding decisions in cases of doubt or emergency.

2. Amoco Drilling Foreman will coordinate and control testing operations, and will work closely with contractor's superintendent to ensure he is kept well informed on test progress and any changes to agreed test program.

3. All service company personnel will report to and be under control of Amoco representative.

4. Rig Floor - Driller and two floormen will be on rig floor at all times. Driller will be responsible for monitoring annulus pressure during test periods. He will report immediately to Amoco representative should he observe any untoward happening.

   One subsea test tree operator will be on rig floor at all times during test period to operate SSTT and subsea lubricator valve.

   One downhole tool operator (if appropriate) will be on rig floor at all times during test period to operate downhole test tool.

5. A cementer will be on standby at cementing unit or on rig floor during test periods.

6. Derrickman and helper will be on duty in pump and mud rooms throughout test periods.

7. Barge control room will be manned at all times during tests.

8. Radio operator or his substitutes will man radio room throughout test periods. Standby boat will maintain constant radio watch and will be contacted by radio operator at regular intervals. Amoco Drilling Foreman will advise boat through radio operator of test start up and shut down, and any emergency or other instructions.

9. Boat will be at steaming stations throughout tests and will make ready to use dispersant gear if this should be called for.

10. Fire hoses will be manned at strategic points through test periods (see A, General, item 9).

11. Roustabout crew under supervision of crane operator will standby at a designated area throughout test periods. Crew will be equipped with axes, sledgehammers, crow bars, and 36" through 12" pipe wrenches.

12. Welder with cutting gear and helper will standby at appointed area. No hot work will be carried out without approval of toolpusher and Amoco representative.

13. Mechanic and electrician will obtain permission from both Amoco Drilling Foreman and contractor's toolpusher before starting up and stopping equipment.

14. Cranes will not be operated during test periods without permission of Amoco Drilling Foreman,and contractor's toolpusher and will not be allowed to make lifts over pressured equipment.

15. Subsea engineer and assistant driller will be utilized by contractor's pusher for relief work. Amoco Drilling Foreman should be notified when personnel are being released temporarily.

16. The Amoco Drilling Foreman will base himself in the Amoco office, which will be the test control center. Should he wish to leave the office for any reason, he will leave it manned with instructions regarding his whereabouts and length of absence.

C. EMERGENCY WEATHER PROCEDURE WHILE TESTING

1. Due attention will be paid to weather forecasts at all times. Tests will not be started without a favourable forecast.

2. If weather forces suspension of test and sufficient time is available.

   a. Retrieve wireline tools.

   b. Secure well as appropriate for fluid produced.

   c. Close SSTT. Hang off test string and retrieve running string.

   d. Close shear rams. Prepare to unlatch riser.

3. If weather change forces suspension of test and time does not permit retrieval of wireline or killing of well:

   a. Close LPR-N

   b. Close rams on slick joint of SSTT.

   c. Close SSTT.

   d. When it is thought advisable, unlatch from SSTT and pull running string if time permits. Close shear rams if short SSTT is used. Prepare to unlatch riser.

4. If weather forecast changes while tripping test tools and time does not permit pulling tools:

   a. Install hang off tool and land in wellhead.

   b. Retrieve running string.

ATTACHMENT 8

FLUID SAMPLES

1. Fluid samples should be collected as instructed by the test engineer. The following equipment will be available:

   a. Two 600 cc bottom-hole samplers complete with clocks, transfer pump, mercury and (8) 10,000 psi sample bottles.

   b. (12) - 20 liter gas sample bottles.

   c. (12) - 500 cc oil sample bottles.

   d. (4) - clean 55 gallon drums.

   e. (100) - one quart tin containers c/w screw caps.

   f. Required new piping to obtain sample as described in the Amoco Sampling Handbook.

   g. If shipping samples to U.S., ensure sample containers have valve coverings to meet D.O.T. regulations.

ATTACHMENT 9

SQUEEZE CEMENT PRODCEDURE

The following is a brief outline for squeeze cementing the open perforations for each DST interval. Exact slurry information to be advised.

1. Run Schlumberger gage ring and junk basket and work at squeeze packer seat.

2. Run EZSV on wireline and set 10 feet above top perf. Correlate with CCL.

3. Pressure test EZSV to 1000 psi.

4. RIH with cement stinger and star guide. Sting into EZSV and established injection rate. Unsting from EZSV.

5. Pump 5 BBL fresh water spacer. Mix and pump squeeze cement and spot ± 5 BBL from stinger. (Use mud to displace).

NOTE: Slurry volume to be determined as follows:

Casing volume from EZSV to lower perf plus 2 SX cement per foot of perfs plus 5 BBL cement to be left above packer. Mix 100 SX cement if the calculated volume is less than 100 SX.

6. Sting into EZSV and pressure annulus to 500 psi. Displace cement to perfs. Leave 5 BBL CMT in drill pipe.

NOTE: Final squeeze pressure should be 500-1000 psi above injection pressure but in no case should 5500 psi be exceeded.

7. Unsting from EZSV. POH 2 stands. Circulate out remaining cement. Pressure test EZSV to 1015 psi. If no test WOC and retest. If no test spot 50 SX neat (15.8 ppg) cement on EZSV. POH 2 stands and circulate out remaining cement. POH. Test cement to 1015 psi.

NOTE: Do not bleed off pressure before unstinging from EZSV. Maximum differential pressure to unsting from a 9 5/8" EZSV is 9000 psi and for a 7" EZSV is 8000 psi.

8. If another DST is to be conducted RIH with bit and scraper to top of cement. Dress cement as required for rat hole and retrest plug to 1015 psi. POH.

9. If no further DST is to be conducted RIH to ±280 feet below mudline and spot a balanced cement plug with 54 SX 'G' neat at 15.8 ppg and 1.15 cu ft/sx.

10. POH to ±50' below the wellhead and wash wellhead. POH.

11. Perf casing with 2-1/8" enerjets from 400' to 398' and monitor well.

12. Pull riser and BOP

13 Sever all casing strings at the first 30" connector below the mudline.

14. Retrieve wellheads and guide bases.

SLURRY FORMULATION

DEPTH ± 9000'

CLASS 'G' +	1%	(or 25 gal/10 BBL CFR-2L)
+	.8%	Halad-22-A (or 19 gal/10 BBL Halad-22-AL)
+	.3%	HR-12 (or 7.5 gal/10 BBL HR-13L)
+	5	Gal/SX fresh water (WT = 15.8, Yield = 1.15)

DEPTH ± 6000'

CLASS 'G' +	.75%	CFR - 2(or 18 Gal/10 BBL (CFR-2L)
+	.5%	Halad - 22 - A (or 13 Gal/10 BBL Halad - 22-AL)
+	5	Gal/SX fresh water (WT = 15.8, Yield = 1.15)

ATTACHMENT 10

ACIDIZING PROCEDURE

Currently Halliburton is working up a mud acid treatment consisting of a 7 1/2% HCL preflush, a HCL/HF acid clean up and an HCL overflush per R. J. Byham request.

1. Establish an injection rate with the test string. (Do no fracture the formation. Use .7 psi/ft for a frac gradient if no other data available.

2. Open the LPR-N valve and begin to slowly pump into the formaiton. The acid required for a sandstone mud clean up at 250° F and carbonate content of less than 5% is as follows: a 35 gal/ft of perforation - 7 1/2% HCL preflush to dissolve the carbonates. Then continue to slowly pump the HCL/HF mud acid treatment followed by a diluted HCL overflush to prevent the HCL/HF from contacting the displacement fluid and forming precipitates.

3. After the acid has been pumped do not shut in. IMMEDIATELY attempt to flow the well back.

4. If the well does not flow abandon the test.

ATTACHMENT 11

MINI FRAC PROCEDURE

In order to determine the potential benefit from a possible future fracture stimulation of the lower permeability EVCM gas bearing sands, a mini frac may be conducted. The decision to conduct the mini frac will depend on the type and quantity of fluid obtained during the proposed test of the "F" sand. The purpose of the mini frac is to obtain design parameters such as closure stress and leak off necessary to design a full scale propped fracture. The mini frac will consist of three separate tests. A pump-in/flow back to determine closure stress, a step rate test to determine fracture pressure and mini frac to determine leak off. It is planned to have a research person on location to conduct these tests. Included is a typical minifrac program and short description of each test that will be run.

PRELIMINARY PRE FRAC AND MINIFRAC PROGRAM

1. Prior to performing the main stimulation work, it will be necessary to conduct prefrac testing followed by a minifrac.

2. The main objectives of this program will be to establish the following parameters:

   a. fracture closure stress (pressure)

   b. formation elastic modulus

   c. fracture height and height growth

   d. fluid loss coefficient

   e. fluid loss height

NOTE: A short treatise on each of these parameters and their effect on the design of the fracturing process is included toward the end of the Attachment.

3. Fracture closure stress wil be estimated through analyzing the results of step-rate and pump-in/flowback tests. Here the formation is fractured with small volume of fluid and then flowed back at a controlled rate. The injective is to flowback at an approximate rate equal to the fluid loss to the formation. A change in pressure decline rate when the fracture has closed will hopefully identify closure pressure. The injected volume and flowback rate may have to be adjusted so that closure stress can be identified on a pressure versus time plot.

4. Considering the extent of our present knowledge the following pre-frac test program will be conducted:

   a. POH and remove TCP equipment. RIH with test string.

   b. Rig up Schlumberger and run a base temperature and gamma ray log w/ PLT.

   c. Leave PLT in hole.

d. Pressure test the stimilation equipment.

e. Spot gelled diesel to upper hydraulic bypass. Open LPR-M.

f. Commence pumping gelled diesel at a rate of 2 BPM in order to establish the initial formation breakdown pressure.

g. When the downhole pressure peaks, shut down the pumps and allow the downhole pressure to decrease by 500 psig. Do not attempt to flow back at this time.

h. If the downhole pressure does not peak, increase the injection rate by 1 BPM until it does. Shut in and allow the downhole pressure to decrease by 500 psig without flowing back.

NOTE: It is essential that all downhole pressures, surface pump pressures and pumping rates should be recorded.

5. Begin the step rate test (SRT) procedure, recording downhole treating pressures, surface pump pressures and rates, in accordance with the table below:

SAMPLE
MINIMUM REQUIREMENTS

PUMP RATE (BPM)	PUMPING TIME (minutes)	CUMULATIVE Volume (bbls)	CUMULATIVE Time (minutes)
1/2	2	1	2
1	5	6	7
2	5	16	12
4	5	36	17
6	5	66	22
8	5	106	27

NOTE: The pumping time at the various rates may vary depending upon the length of time required for the rate of pressure increase to stabilize or pressure decline to begin at each specific pump rate.

6. At the end of the SRT, shut down the pump and record the instantaneous shut-in pressure (ISIP).

7. Flow the well back through a flowmeter at 0.75 BPM until the downhole flowing pressure is less than the estimated fracture closure pressure.

8. The Amoco Engineer will estimate the closure pressure by analysis of the results from the SRT in step 5.

NOTE: The pump-in/flowback procedure may have to be repeated at different flowback rates until an accurate estimate of fracture closure pressure can be obtained. If this happens the pump in rate will be 8 BPM in each case.

9. Continue to pump gelled diesel at a rate of 10 BPM for a total of 10 minutes. Shut down the pump and record the ISIP. Flowback the well at a controlled rate of 0.75 BPM until the downhole pressure is less than the estimated fracture closure pressure.

10. Run a pre-minifrac temperature and gamma ray log. Leave PLT in hole.

11. Mix and pump gelled diesel at a rate of 15 BPM for approximately 30 minutes. The gelled diesel will have the following additives:

TBA

NOTE: The gelled diesel should have a total of 1 pound of radioactive sand added throughout the pumping phase. No proppant will be added.

12. Record all downhole pressures, surface pump pressures and rates. Strip charts should be annotated during the job to indicate the main events. In particular it is important to note (on the strip chart) the time when the gelled diesel reaches the perforations.

13. Run a temperature and gamma ray log at a speed of 20 fpm over an adequate interval after the minifrac.

14. Wait three hours and run an additional temperature log.

15. Continue to record surface pressure decline until the downhole pressure is less than the estimated fracture closure pressure.