


*PEDL 137*

**Horse Hill 1** exploration well  

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**Well Testing, Stimulation and Abandonment  
Programs**

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# Horse Hill 1

## Well Testing, Stimulation and Abandonment Programs

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## 1. BASIC WELL DATA

<b>Licence Number</b>	:	PEDL 137
<b>Operator</b>	:	Magellan Petroleum (UK) Limited Level 1, 167 Eagle St, Brisbane Australia, 4000
	:	Registration Number 6807023 Registered office: 6/7 Market Place, Devizes, Wiltshire SN10 1HT, United Kingdom
<b>Well name</b>	:	Horse Hill 1
<b>Location</b>	:	Surrey, Southern England
<b>Basin</b>	:	Weald Basin
<b>Well type</b>	:	Deviated Exploration Well
<b>Anticipated spud date</b>	:	Q2 2014
<b>Surface Coordinates Latitude/Longitude</b>	:	Latitude: 51 <sup>0</sup> 10' 40.81"N Longitude: 0 <sup>0</sup> 12' 33.776"W
<b>Surface coordinates UTM (Datum : UK OS)</b>	:	525149.2E 143667.1N (Provisional-Subject to Survey)
<b>Ground Elevation</b>	:	212 ft AMSL (Provisional – Subject to Survey)
<b>Drill floor elevation (KB)</b>	:	227 ft AMSL (Assuming GL - KB = 15 ft) (Provisional – Subject to Survey)
<b>Planned TD</b>	:	8,682 ft MD BRT (Provisional)
<b>Target tolerance</b>	:	Bottom Hole Location is prognosed to be as follows: Total Depth: 524723 E, 144242 N North-South tolerance should be no more than 100 ft.
<b>Target Reservoir</b>	:	Primary Targets are the Portland Sandstone and Corallian Sandstone, which are expected to be oil bearing at this location, and the Triassic, which is expected to be gas bearing at this location.
<b>Proposed Drilling Options</b>	:	After encountering a commercial oil flow (Portland and/or Corallian) or gas flow (Triassic), the well will be completed for production.  The top Triassic could be from 160 ft to 360 ft deeper than predicted due to an unknown thickness of Lias Shale at this location. As a result, total depth for the well may be deepened by +/- 360 ft to approximately 9050 ft (assuming a Triassic interval of 1000 ft).
<b>Well Objective and expected completion status</b>	:	The objective of the well is to obtain a commercial flow of oil and/or gas from one or all of the Portland, Corallian and Triassic and complete the well for production.  Depending on the well result, production may be through casing or open hole.

## 2. WELL STATUS

If the results from mud logging and a contingent wireline logging program are positive after drilling the Horse Hill 1 well, the well will be fully cased or plugged back and completed prior to moving the drilling rig off location.

The completion procedure will be as follows:

1. Circulate the well to a completion calcium chloride brine of 1.3 SG. The existing mud in the well will be displaced with 3m<sup>3</sup> of freshwater followed by 8m<sup>3</sup> of a cleaning spacer. A viscous brine pill will be set across the open hole section with CaCl<sub>2</sub> brine at 1.3 SG to surface. The completion brine will contain a corrosion inhibitor, an oxygen scavenger and a defoamer
2. If the test is to be conducted on either the Portland or Corallian formations, which are anticipated to be oil bearing, the completion assembly will compose of the following items from the bottom up:
  - TCP Guns
  - X-over to TCP guns
  - WXN 2.313" ID Landing Nipple 2.25" No Go
  - 2<sup>7</sup>/<sub>8</sub>", 6.4 lb/ft, K55, EUE perforated joint
  - WX 2.313" ID Landing Nipple
  - 2<sup>7</sup>/<sub>8</sub>", 6.4 lb/ft, K55, EUE tubing joint
  - Pump Seating Nipple
  - 2<sup>7</sup>/<sub>8</sub>", 6.4 lb/ft, K55, EUE tubing joint
  
  - Tubing anchor
  - Sliding Sleeve
  - 2<sup>7</sup>/<sub>8</sub>", 6.4 lb/ft, K55, EUE tubing to surface
3. If the test is to be conducted in the Triassic target, which is anticipated to be gas bearing, the completion assembly will compose of the following items from the bottom up:
  - TCP Guns
  - X-over to TCP guns
  - WXN 2.313" ID Landing Nipple 2.25" No Go
  - 2<sup>7</sup>/<sub>8</sub>", 6.4 lb/ft, K55, EUE perforated joint
  - WX 2.313" ID Landing Nipple
  - 2<sup>7</sup>/<sub>8</sub>", 6.4 lb/ft, K55, VAGT or similar tubing joint
  - Hydraulic set permanent packer for 7", 29 lb/ft, L80, VAGT or similar casing
  - Sliding Sleeve
  - 2<sup>7</sup>/<sub>8</sub>", 6.4 lb/ft, K55, VAGT or similar tubing to 200 ft from surface
  - Tubing Retrievable surface controlled, sub surface safety valve with 2.313" WX profile
  - 2<sup>7</sup>/<sub>8</sub>", 6.4 lb/ft, K55, VAGT or similar tubing to surface
4. The completion assembly will be made up, run in hole and spaced out so that the packer elements, where used, are not across a collar and that the TCP guns are adjacent to the interval to be perforated.
5. Install tubing hanger and hang off in wellhead

6. Once the tubing hanger is installed and the tubing bonnet nipped up, rig up the slickline unit and set a plug in the WX landing nipple. Pull out of the hole with the slickline and rig down
7. Pressure up on the tubing string slowly to 3000 psi and hold for 5 minutes. Slowly increase pressure to 4500 psi and hold for 10 minutes. Release pressure
8. Once the tubing has been pressure tested satisfactorily, open the sliding sleeve and displace the tubing contents with nitrogen to give a 1000 psi drawdown when the nitrogen column has been bled off.
9. Close sliding sleeve and bleed off nitrogen column.
10. Drop bar and detonate TCP Guns. Observe tubing head pressure for indication of inflow from perforated interval.
11. RIH with slickline and set blanking plug in WX nipple. Bleed down tubing pressure to check that blanking plug is isolating tubing. POOH with slickline and blanking plug setting tool.
12. If SCSSSV is installed, close valve to isolate tubing
13. Install back pressure valve in profile in tubing hanger.
14. Secure well and move rig off location.

Completion schematics are shown below for oil and gas completions:

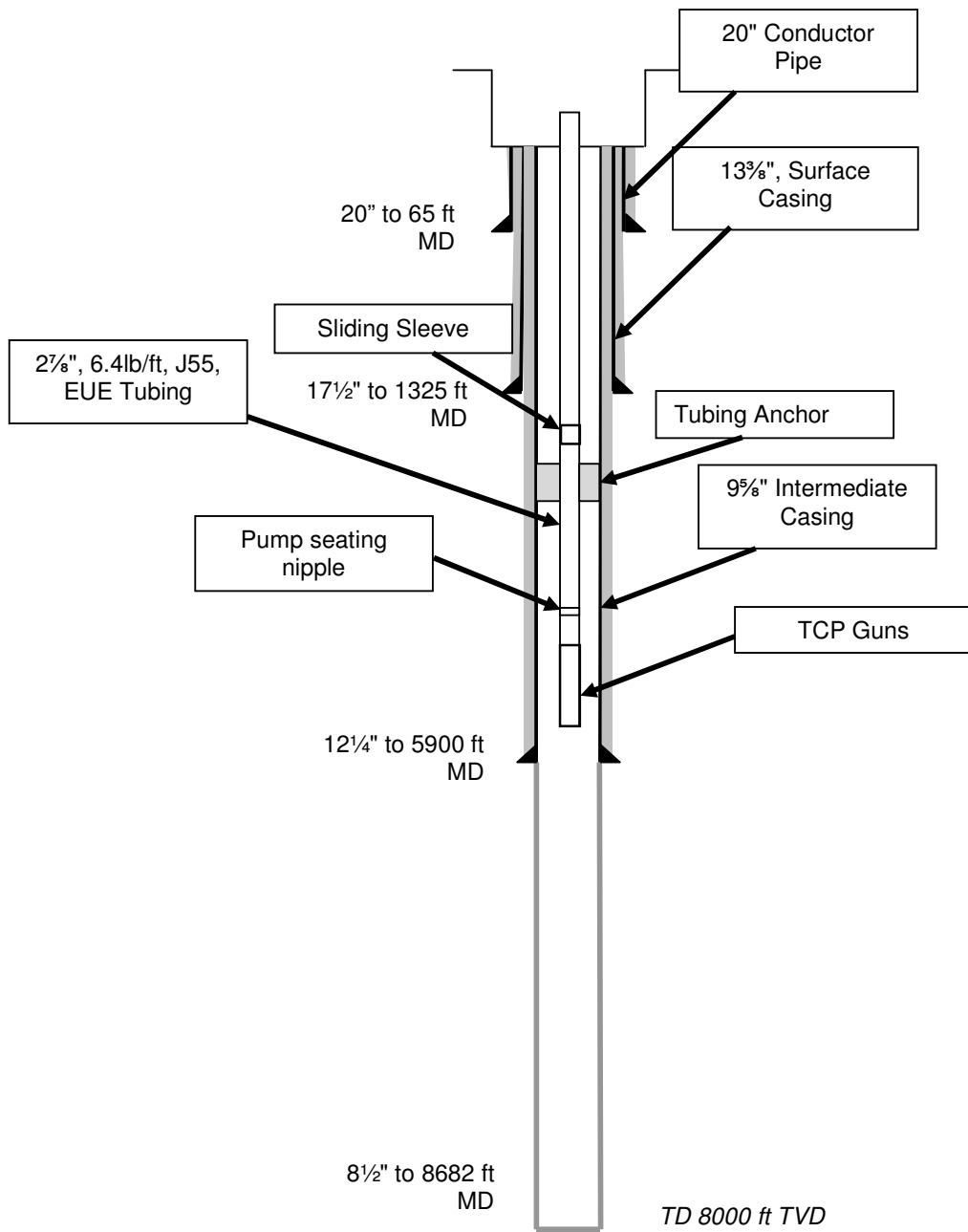


Figure 1: Proposed Completion Schematic for Oil Test

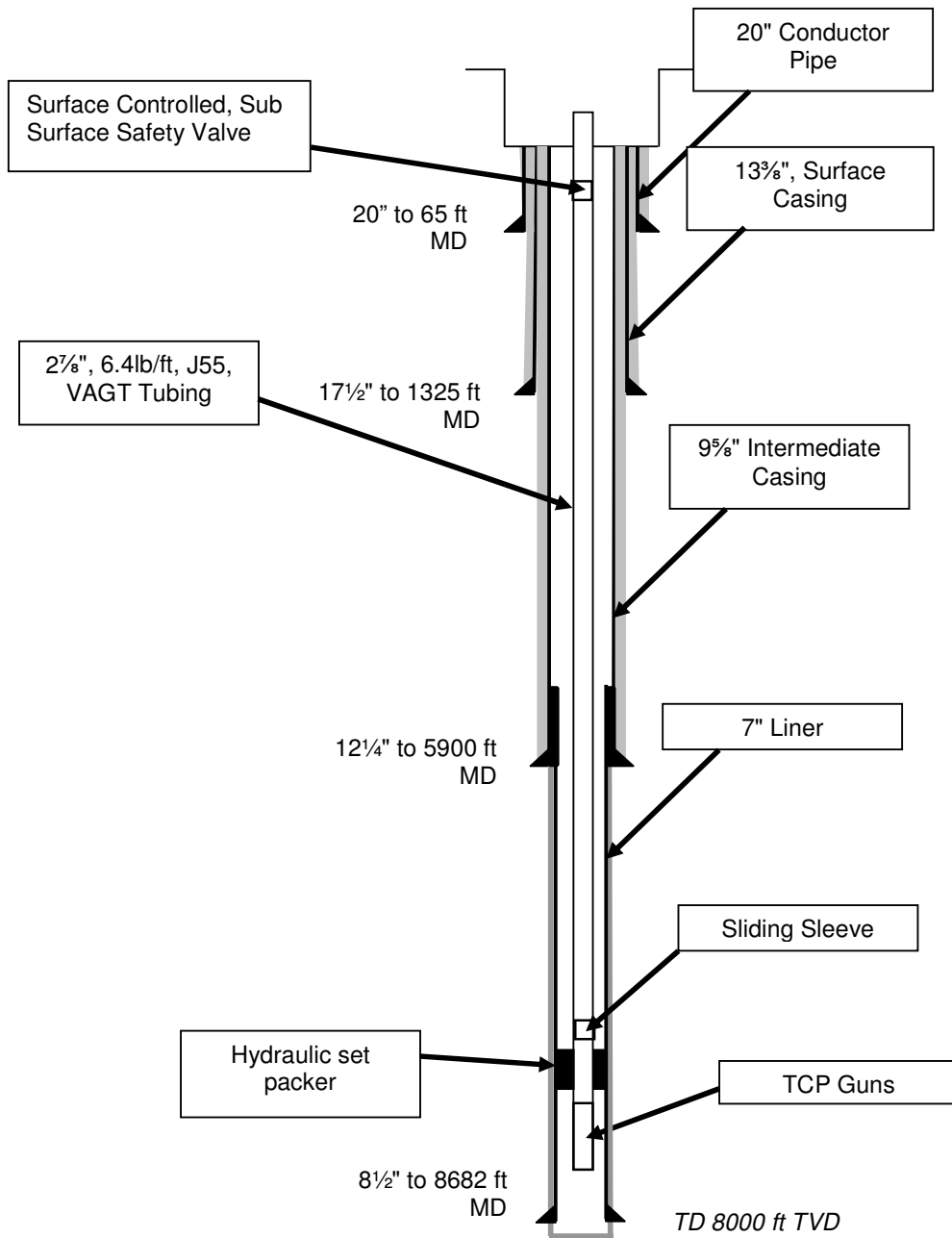


Figure 2: Proposed Completion Schematic for Gas Test

### 3. SHORT WELL TEST OF AROUND ONE MONTH DURATION

This test is designed to:

- Establish well productivity
- Obtain critical data in order to design and specify the equipment required for the Extended Well Test or Production, including representative oil and gas samples and other fluid and/or solids samples.

The equipment and personnel will be rented in from a specialist well testing company. As this well may be incapable of producing oil to surface we will also have to acquire a sucker rod pump and ancillary equipment.

The well may be swabbed for several days prior to installation of the pump unit to stimulate production to establish a flow rate and determine the produced fluid composition.

The anticipated equipment and personnel required is listed below:

#### **Surface Testing Package**

- 3" 5000 psi Working Pressure Emergency Shut Down Valve
- Emergency Shut Down control panel
- Data Header
- Choke manifold
- Inline Heater
- 3 Phase Separator
- Surge Tank
- 6" Vent Stack
- 4" Vent Stack
- Ground Flare
- Chemical Injection Pump
- Air driven Transfer Pump
- Tool Container with Spares
- Laboratory Cabin
- Primary flowline
- Gas line
- Relief Line
- Liquid Line
- Pressure test pump and chart recorder

#### **Sucker Rod Pump System (for oil test only)**

- Linear Sucker Rod Pump Unit
- Down Hole Pump
- Sucker Rods
- Flow Tee
- Rod BOPs



## Personnel

- 2 x Senior Operators
- 2 Operators

To give 24 hr coverage plus temporary local assistance as required.

The layout on the wellsite will not be dissimilar to the semi-permanent installation for the Extended Well Test.

However, in this case the equipment installation will be of short duration and the provisions for spillages will be of a temporary nature. Essentially this will take the following form:

- All oil and produced water storage tanks will be in a bunded area with the bunding taking the form of railway sleepers with an oil resistant impervious membrane laid on the ground and up the sleepers to contain any spillage.
- Critical areas such as the separator will be located on sheet steel lipped pans to contain any drips or leaks.
- The tanker loading area will be covered with an oil resistant impervious layer draining to a collection tank
- An adequate supply of drip trays will be available on location to place under any valves or joints which may show signs of minor leakage
- An adequate supply of oil spill kits will be available on location to deal with small spills

The test will take the form of a continuous production test which will run 24/7 with monitoring of the following parameters:

- Oil production
- Water production
- Gas production
- Produced water salinity
- Bottom hole temperatures and pressures (memory gauges hung in WXN nipple)
- Wellhead pressure and temperatures
- Separator temperatures and pressures
- Produced solids (BS&W)
- Chemicals injected

In addition to the above oil, water and gas samples will be obtained for laboratory analysis using time delay samplers hung in the WXN nipple.

During this test all produced liquids will be trucked to either the local refinery or an approved disposal site. Any gas will be flared.

#### 4. EXTENDED WELL TEST

This test is only applicable to oil wells and is designed to:

- Determine the long term production capability of the reservoir and prove the commerciality of the discovery.
- Collect representative samples and confirm the fluid properties of the produced hydrocarbons.
- Collect additional information such as pressure data together with reservoir production data to help determine the production mechanism and the degree of aquifer pressure support.

The tanker loading area will be located on a concrete pad with drainage to a full retention oil separator with an oil level alarm.

The installed equipment is likely to include the following:

- Heater Skid
- Production Separator Skid
- Linear Sucker Rod Pump Unit
- Down Hole Pump
- Sucker Rods
- Flow Tee
- Rod BOPs
- Tanker Loading Pump Skid including two loading pumps
- Storage tanks (150 m<sup>3</sup>; subject to well productivity test)
- Produced Water Tank
- Chemical Injection Skid
- Ground Flare and Ignition Panel
- Drain Pumps
- Electrical Switchgear and UPS in a container
- Diesel Generator
- Emergency Shut Down, Telemetry and Communications (in the control cabin)

In addition to the above, depending on the quantity of associated gas, a gas powered electricity generator may also be installed with the facility to export excess electricity to the grid.

Again this test will operate 24/7, with a similar level of monitoring to that for the short term well test.

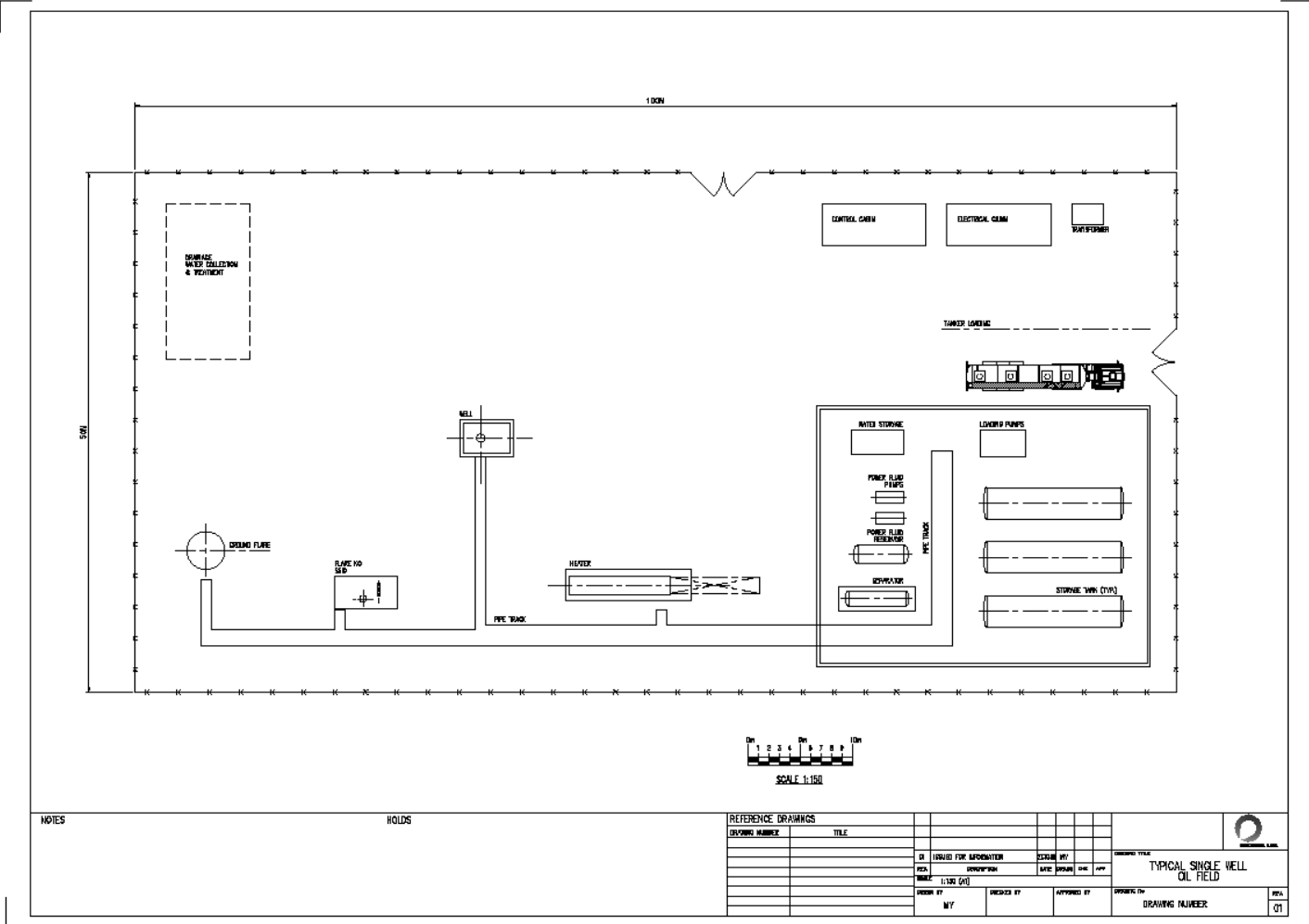


Figure 2 Extended Well Test Site Layout

## 5. STIMULATION

The following stimulation options are only applicable in the event of an oil discovery. No stimulation would be undertaken on a gas discovery well.

As indicated in Section 3, the well may be swabbed for several days prior to installation of the pump unit to stimulate production of oil to establish a flow rate.

In the event that the well does not produce as well as expected, or the initial test data indicate that the flow properties of the formation have been damaged by the drilling mud, an acid wash/acid matrix job may be considered.

In this event an injection test into the reservoir will be carried out using completion brine prior to the acid job. 15% Hydrochloric (HCl) acid solution will be pumped down the tubing with downhole injection pressures below the reservoir fracture pressure. 15% HCl volumes of between 50 and 150 gal/ft are likely.

The final acid job parameters; i.e. acid composition, acid volumes, pump rates, pressures and schedule will be finalised following the initial production testing, if required.

## 6. ABANDONMENT PROGRAM

The abandonment program will follow good oilfield practice and will involve setting several cement plugs in the wellbore.

The first balanced cement plug will be set across and above any porous intervals in the Triassic to prevent communication from this interval. A second balanced cement plug will be set through part of the open formation and 150 ft inside the 9 $\frac{5}{8}$ " casing.

The third cement plug will be set across any perforated or tested intervals in the Portland or Corallian formations. A fourth from 1475 to 1175 ft MD inside the 9 $\frac{5}{8}$ " casing. After allowing this plug to set, it will be tagged to ensure it is competent and located correctly. If this cement plug is deemed unsatisfactory another 300 ft cement plug will be set immediately above it.

The final cement plug will be set from 300 ft to surface.

After setting the cement plugs, the casing will be cut 2.5m below surface and the wellhead removed.

A plate with a nipple and valve will be welded on top of the cut 9 $\frac{5}{8}$ " casing and the cement plug and casing cap pressure tested to 250 psi for 10 minutes.

Following abandonment, the workover rig will be moved off location and the wellsite restored to its native condition, unless the landowner wishes to retain the wellsite hard standing, in which case the well cellar will be filled in.

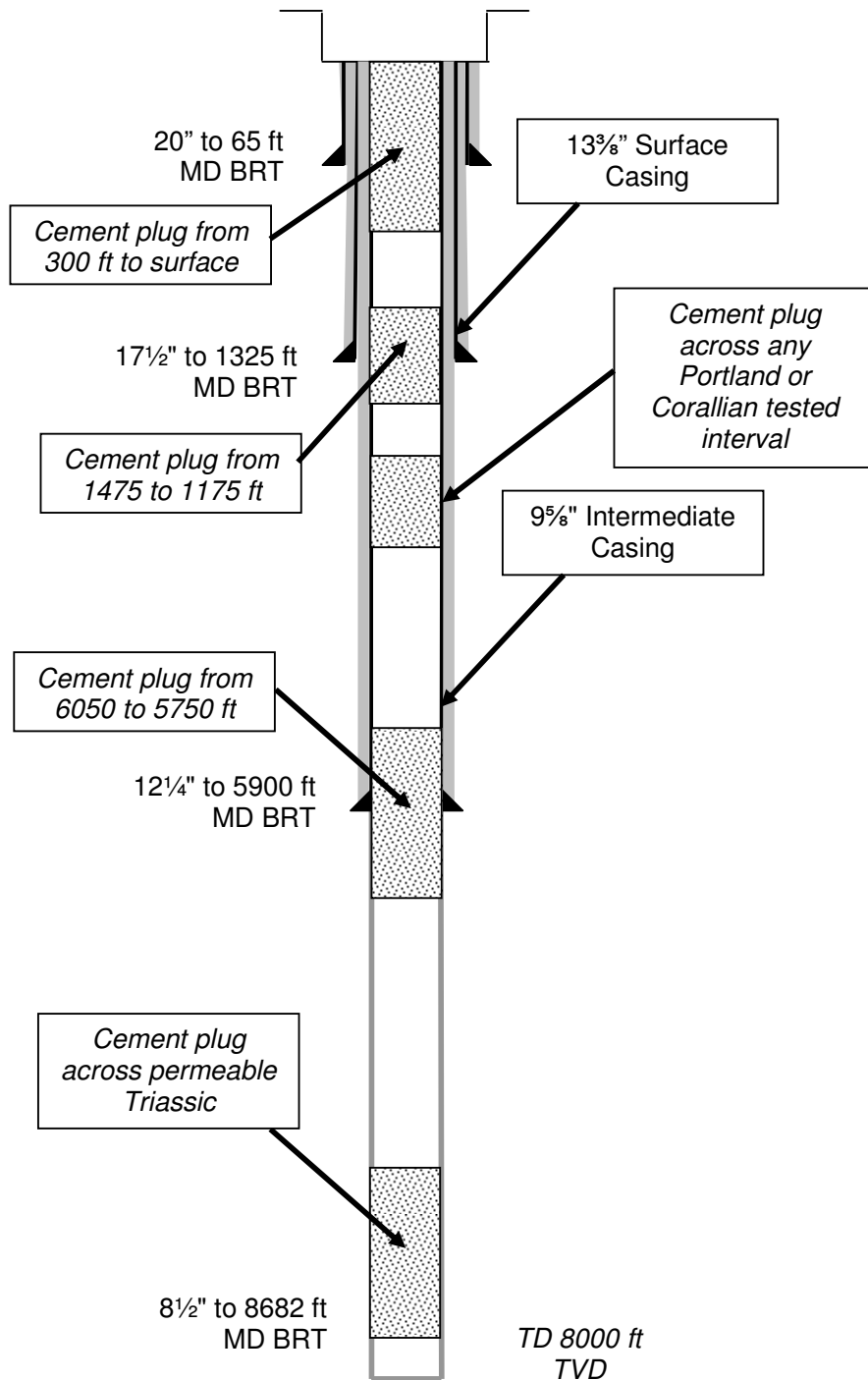


Figure 3 – Abandonment Schematic