CUADRILLA RESOURCES LIMITED

APPENDIX - C

THE DRILLING OPERATION

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DETAILS OF TRANSPORTATION LOADS TO ERECT A ROTARY DRILLING RIG ON SITE

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DETAILS OF TRANSPORTATION LOADS TO CONSTRUCT AN EXPLORATION SITE

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THE DRILLING OPERATION

Wells for oil and gas are drilled using a rotary drilling rig, see diagram overleaf which illustrates the various components. This is a well tried and efficient method and employs a vertical "derrick", inside which is suspended a column of hollow steel pipe, known as a "drill string", with a drill bit fitted to its lower end. This "string" is rotated and the bit cuts downward through the rock strata.

During drilling, a dense fluid known as "mud" is pumped down the inside of the drill string. The mud lubricates the drill bit and brings to the surface fragments of rock which are analysed both to identify and correlate the strata through which the bit is passing, and for signs of any oil or gas within any reservoir rocks encountered. An aspect of safety is provided by the weight of the column of mud which exceeds any underground reservoir pressures and thereby contains them and therefore it is important in maintaining the safety of the drilling operation. The rig is fitted with valves known as "blow-out preventers" which can be closed immediately if an unexpected increase in pressure should occur.

As the depth of the well increases, drilling must stop periodically so that new lengths of pipe can be added to the drill string. When the drill bit becomes worn the whole string must be pulled out so that a new bit can be fitted. This is known as "round tripping", or "pulling out" and "running in".

At pre-determined stages in the drilling of such a well the walls of the borehole are supported by steel casing which is cemented into place, to provide additional safety measures by preventing the collapse of the borehole sides and the ingress of groundwater under pressure. It is essential that drilling continues throughout the day and night to keep the hole open and to maintain control for both safety and operational reasons. During the drilling of an exploration well, the progress of the operation is monitored constantly and a range of tests and analysis carried out.

"Well logging" is used to obtain information both on the borehole itself (including its precise depth and direction at any time), and on the rock strata through which it passes. These tests can be either geophysical, using instruments lowered into the well as it is drilled, or can involve analysis of Chipping's brought to the surface in the mud stream. "Coring" is the recovery of sizeable rock samples which may be required from particular strata. This procedure involves the use of a special core bit to cut a cylindrical core of rock. The core is then brought to the surface for testing and analysis.

If, on reaching its target depth or before, the well reveals the presence of oil or gas, then testing is carried out to give a preliminary estimate of the extent and characteristics of the reservoir.

During testing operations any fluids flowing from the well are piped into a small storage tank and transported away by road. Gas is either vented to the atmosphere or burned in a flare. Following the final testing , the drilling rig will be dismantled and a well-head valve assembly, known as a "Christmas Tree" installed. Only small volumes of gas will be produced during such well testing. The data obtained are essential in enabling a decision to be taken on whether further appraisal is justified.

TESTING PROCEDURE

The main aim of the Becconsall exploratory well is to test for natural gas trapped in the shale layers (formation) which lie directly beneath the Collyhurst formation ie the nearby Elswick gas producing structure. The company might test the Collyhurst formation if shows of gas are witnessed during the final stages of drilling. This would be a short test known as a drill stem test (or "DST") and is carried out with the drilling rig on site for a short period of up to 2 -8 hours. Testing the Collyhurst would take a lesser priority than to test any discovered shale formations and would only be tested if the shale gas was not present during drilling. If it was decided to test the Collyhurst then a typical DST would follow the example test procedure detailed below and depicted in the test equipment photograph No's 11 and 12 under Appendix I.

Testing the shale layers (known as stages) will be the main purpose of the Becconsall exploratory drilling operation and will only take place if sufficient gas is encountered in each stage during the drilling operation.

Testing the stage or stages would take between 14 – 28days and is generally carried out during daylight hours. The Company are expecting to encounter between five and seven shale stages and would expect to see sufficient shows in at least three that would warrant testing within the 28day period. This type of testing ie several stages is generally carried out in the United States within 14days. The testing time scale is governed by the amount of stages encountered, rock porosity (pore space in the rock), permeability (ease of movement of natural gas through the pore space), and natural fractures in the formation. Both the porosity and permeability within the Becconsall structure are considered to be poor to good but the natural fractures are expected to be good to very good ie the wells should flow un-stimulated. In any event the test would be complete within the usual 28days requested to test a conventional hydrocarbons discovery such as Elswick, ie the period generally requested within a temporary drilling exploration planning application.

There may be a need to stimulate a stage which flows gas but at a low rate to ascertain if the gas was being held back by poor porosity or permeability or lack of natural fracture or a combination of all three. Stimulation is carried out by pumping water under pressure into the natural fractures in the shale formations to open them up to allow the gas to flow more freely. In some case silicone sand is then pumped in to hold open the fractures once the water is removed. The recovered water is retained on site for use on other stages or removed and disposed of if not needed. Testing of each stage will take up to two 10hour days including any necessary stimulation. The water and sand will be brought to site by road using water tankers and 20tonne tipper lorries. The amount of water and sand will depend on the permeability ie the gas flow rate of a stage and with the permeability via fractures expected to be good to very good the stimulation required will be none or small and therefore the number of water and sand deliveries required are expected to be few.

Any produced gas during testing will be flared using a screened low volume/pressure ground flare (see appendix C) and is generally carried out during daylight hours.

The testing and stimulation equipment will be brought to site if needed by a small number of HGV loads over a 1 -2 day period. The equipment will consist of a number of tanks for water and any produced fluids and water injection pumps.

The activity and noise testing a discovery is far less that that of the preceding drilling operation. The flow back activity (ie allowing the ejected water to return to surface) is a nil - low noise activity and therefore is occasionally allowed to occur over night thus shortening the overall testing period.

In any event the drilling rig will be removed from site a few days following the completion of the drilling and any drill stem testing and before the shale testing starts.

DRILL STEM TEST PROCEDURE

A "drill stem test", or "DST" (as it commonly referred to), is a special type of reservoir test that is done inside the drill pipe during the drilling operation. When a well is drilled, a geologist is on-site to determine if oil or natural gas shows are observed as the drill bit goes through a potential reservoir rock (ex. Collyhurst Sandstone). If oil or gas shows have been observed the rig will temporarily suspend drilling operations for a short period of time to conduct a DST, in an effort to evaluate the potential reservoir.

To conduct a DST, the drill bit and drill pipe are first pulled from the hole. At surface, the drill bit is removed from the bottom of the drill pipe, and replaced by a DST "test string". The test string is then run back into the well and landed at the depth of the potential reservoir. Then a bottomhole valve is opened (by rotating the drill pipe), and the well is allowed to flow. The flow rate is measured at the surface, and the pressure data is measured and recorded at the bottom of the well (inside the test string.

A typical DST would involve flowing the well for 1 hour, shutting in the well for 1 hour, conducting a 2nd flow of 2 hours and shutting in for 4 hours. In effect, the well is flowed for about 3 hours, and the total test time is about 9 hours. The data will then be brought back to surface by pulling the drill pipe and downhole test string. It is interpreted to give us some very basic reservoir properties including permeability and reservoir pressure. A DST is an excellent choice of test for high permeability sandstone formations (such as the Collyhurst), but it is a less effective test for lower permeability shale reservoirs.

THE COMPONENTS OF A ROTARY DRILLING RIG

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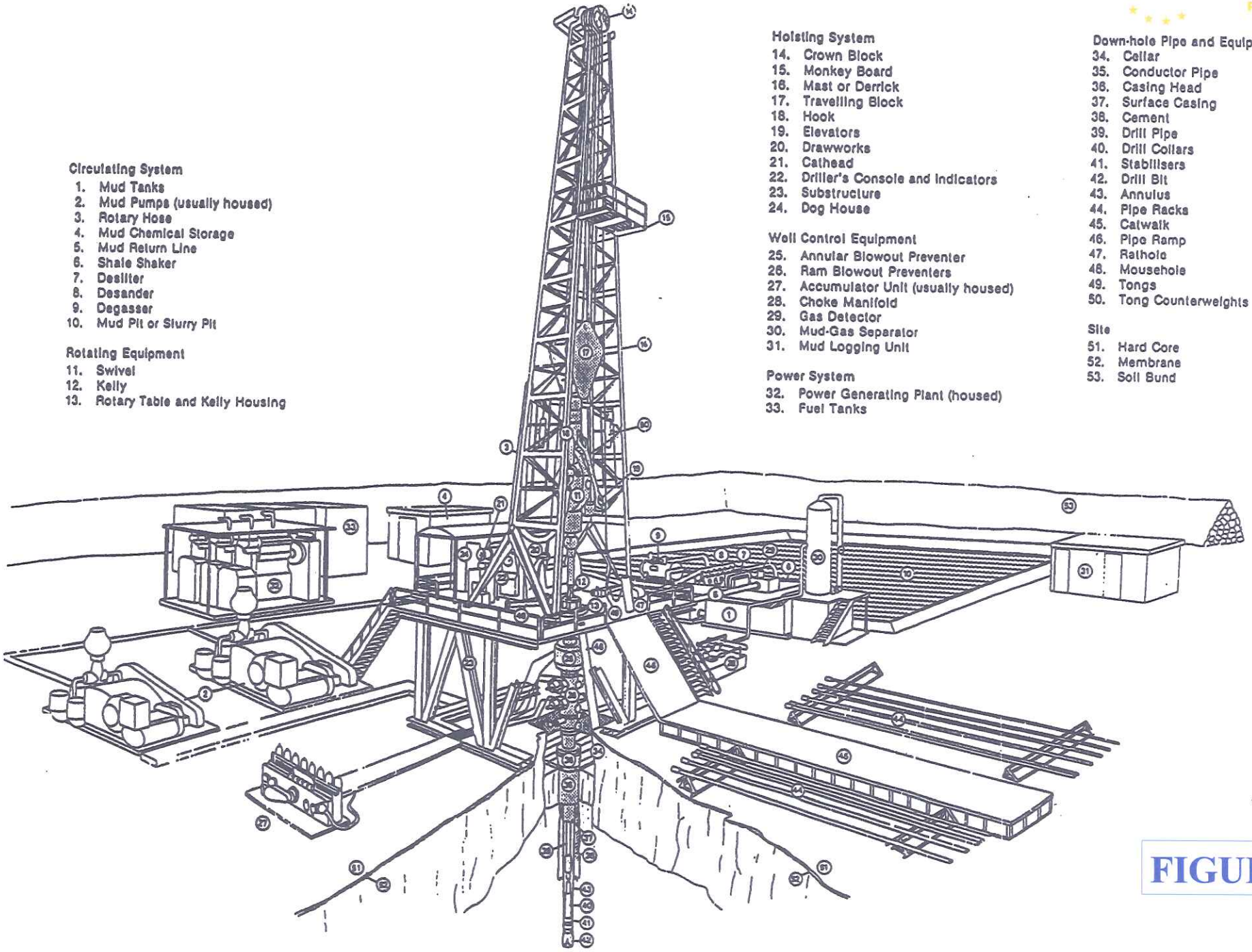

Circulating System

1. Mud Tanks
2. Mud Pumps (usually housed)
3. Rotary Hose
4. Mud Chemical Storage
5. Mud Return Line
6. Shale Shaker
7. Desilter
8. Desander
9. Degasser
10. Mud Pit or Slurry Pit

Rotating Equipment

11. Swivel
12. Kelly
13. Rotary Table and Kelly Housing

Hoisting System

14. Crown Block
15. Monkey Board
16. Mast or Derrick
17. Travelling Block
18. Hook
19. Elevators
20. Drawworks
21. Cathead
22. Driller's Console and Indicators
23. Substructure
24. Dog House

Well Control Equipment

25. Annular Blowout Preventer
26. Ram Blowout Preventers
27. Accumulator Unit (usually housed)
28. Choke Manifold
29. Gas Detector
30. Mud-Gas Separator
31. Mud Logging Unit

Power System

32. Power Generating Plant (housed)
33. Fuel Tanks

Down-hole Pipe and Equipment

34. Cellar
35. Conductor Pipe
36. Casing Head
37. Surface Casing
38. Cement
39. Drill Pipe
40. Drill Collars
41. Stabilisers
42. Drill Bit
43. Annulus
44. Pipe Racks
45. Catwalk
46. Pipe Ramp
47. Rathole
48. Mousehole
49. Tongs
50. Tong Counterweights

Site

51. Hard Core
52. Membrane
53. Soil Bund

FIGURE (C01)

01.07.10

WELLHEAD ASSEMBLY SCHEMATIC EXAMPLE ONLY

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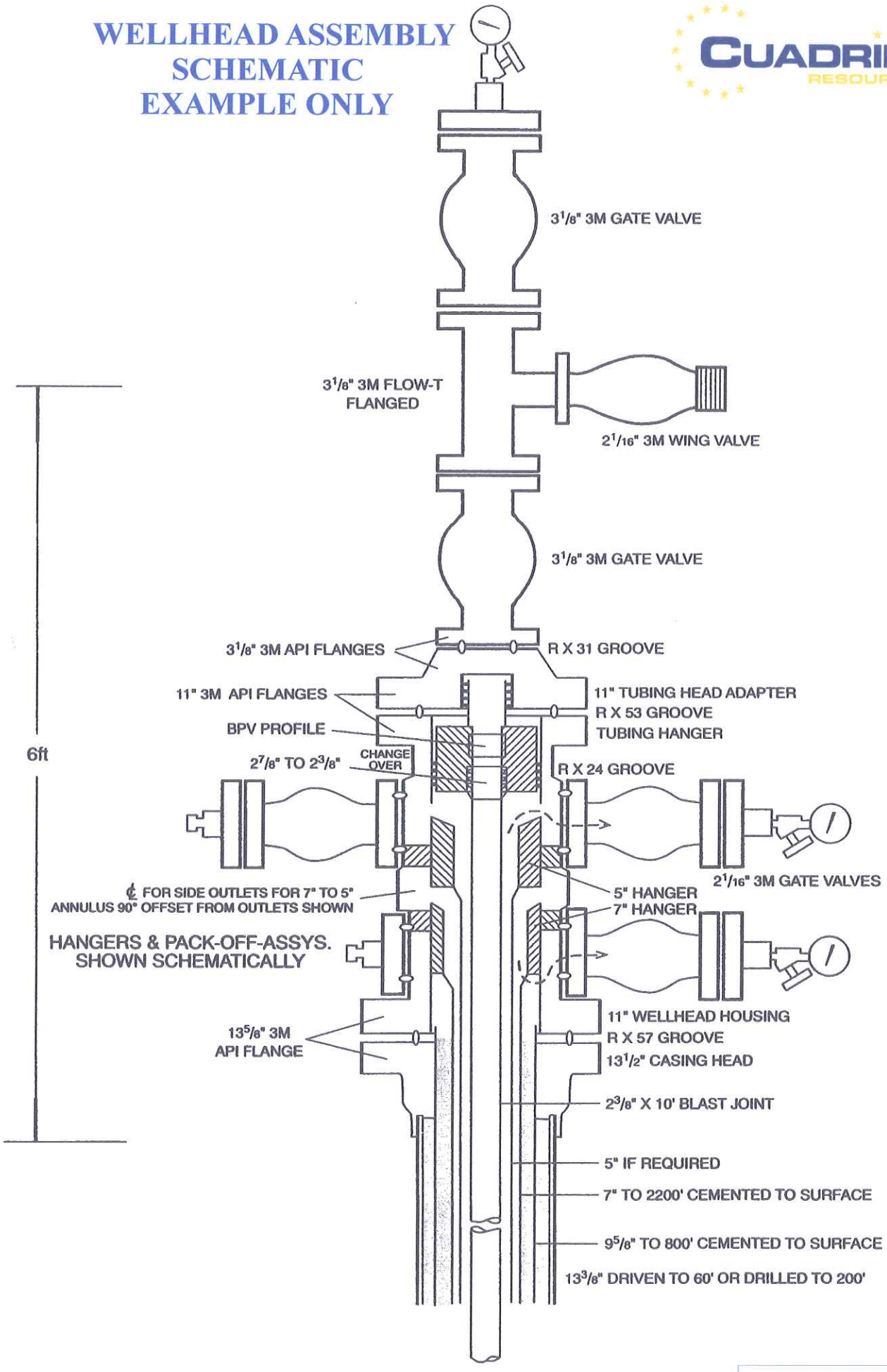

FIGURE (C02)

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DRILLING RIG / EXPLORATION SITE LAYOUT

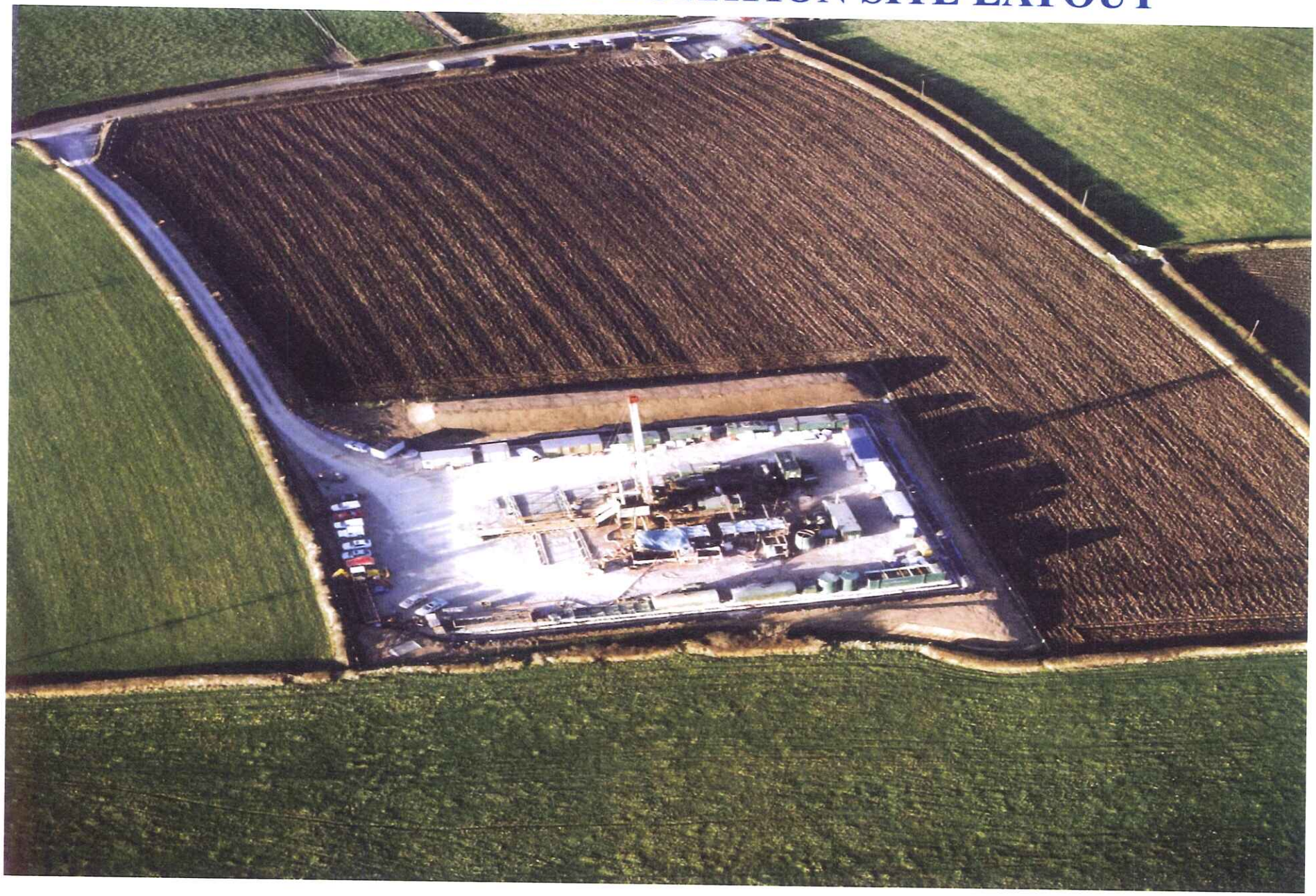

FIGURE (C03). 01.07.10

EXPLORATION DRILLING RIG

CUADRILLA RESOURCES

BRITISH DRILLING AND FREEZING COMPANY LIMITED

RIG 28 – IDECO BIR 5625

RIG 28 - IDECO BIR 5625

Rig 28, a five axle self propelled Back in Rambler (BIR), purchased in 1991, is ideally suited for drilling wells to depths of 2250 metres, re-entry and workover operations.

Major rig features include:

- IDECO H37 (500 H.P) double drum drawworks, with DETROIT 12 V 71 power.
- IDECO KM 108 270 KH telescopic mast with an API static hookload of 270,000 lbs and 108ft clear height to permit mousehole connections.
- IDECO substructure with 12ft clear working height enabling use of 13⅝" double ram and annular B.O.P.S.
- IDECO 20½" rotary table.
- 2 No triplex mud pumps - 500HP, 600HP and 800HP pumps available.
- High specification ancillary equipment.
- All electrical equipment conforms to the latest I.P. Code of Practice and BASEEFA approval.
- Compact modular design of components ensures minimum site area is required and maximises efficiency of rig moves.
- Extensive acoustic enclosures to all prime movers ensures the rig can operate in environmentally sensitive locations.

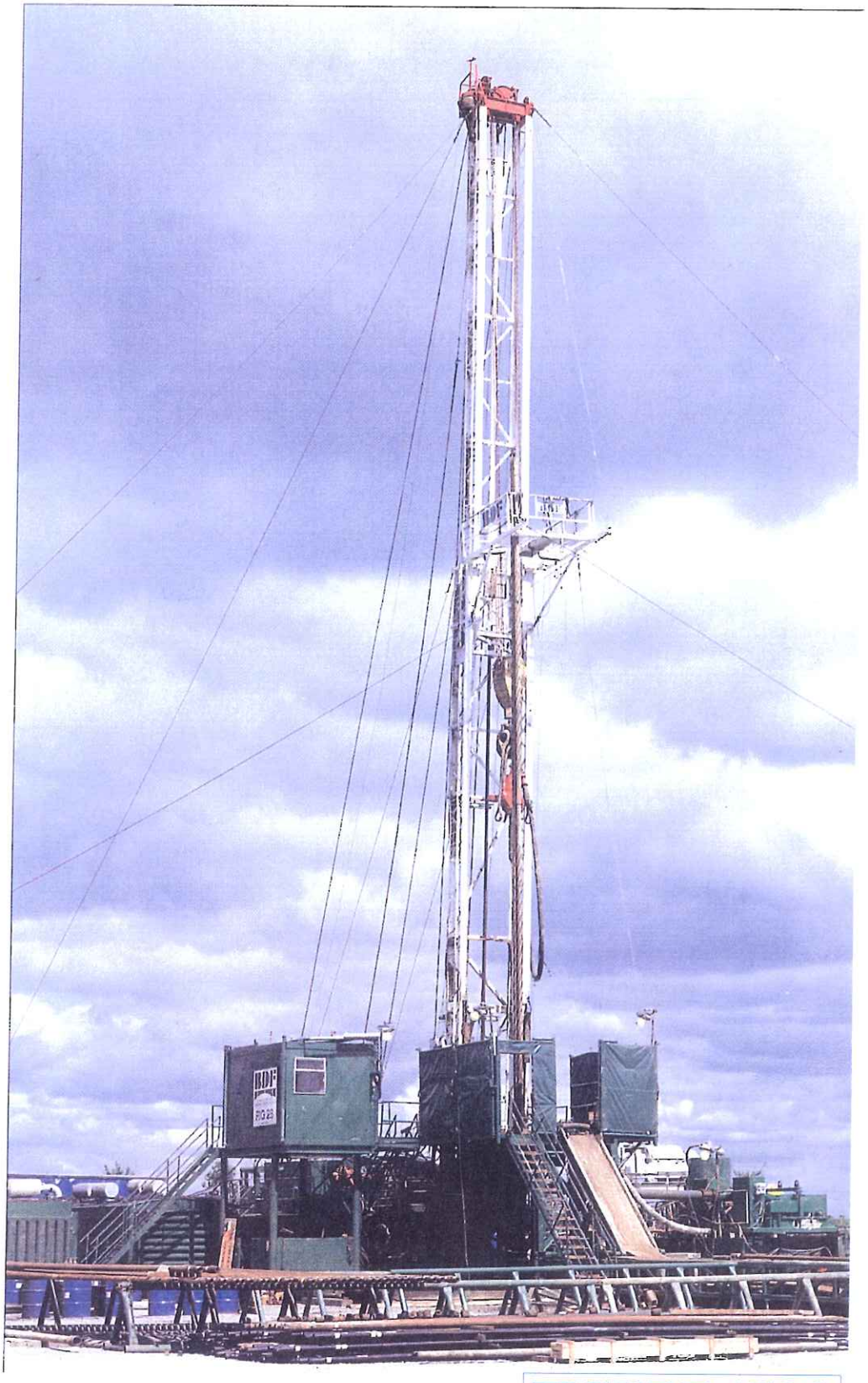

FIGURE (C04)

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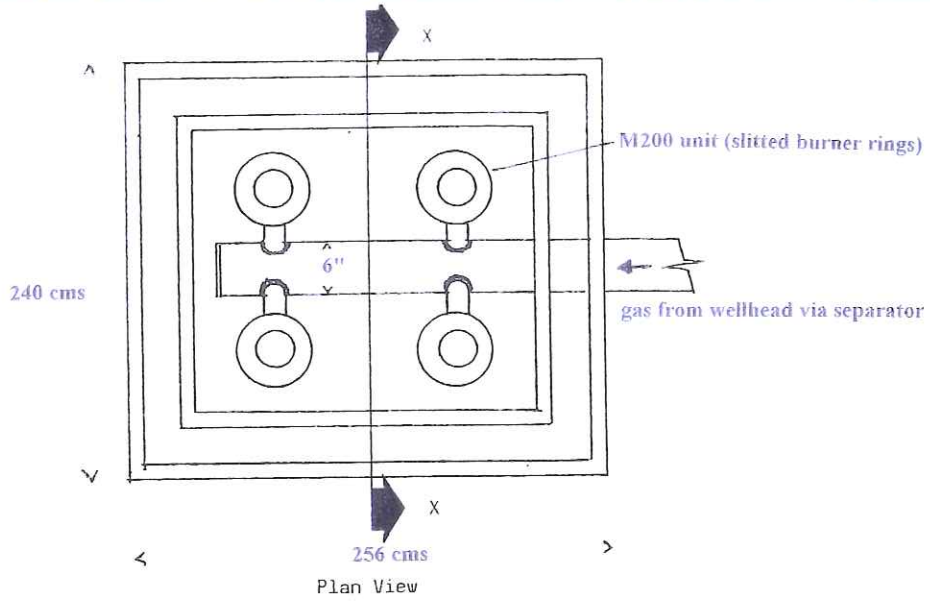
EXPLORATION TESTING GROUND FLARE



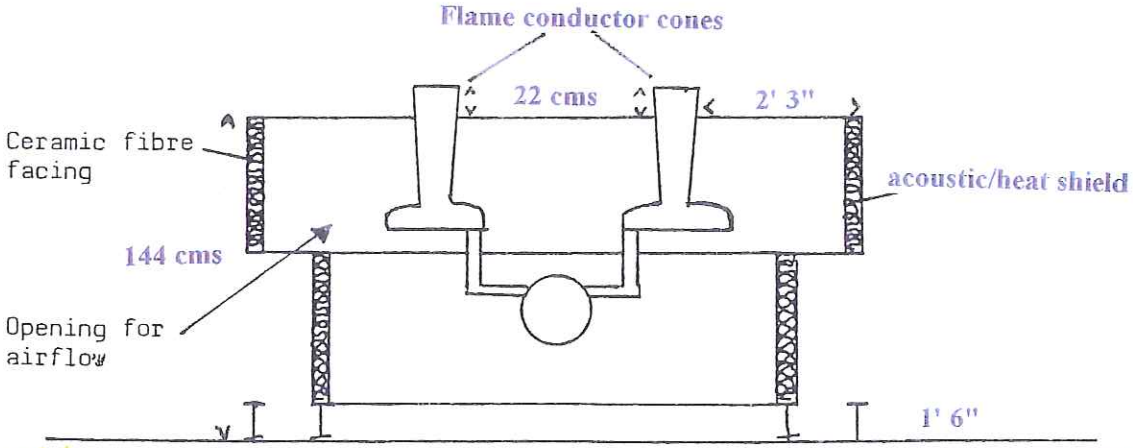


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FIGURE (C05)

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Becconsall-1 Well section prognosis

Nearest seismic line: IELP-99-11 200m to SW

Nearest well: Banks-1 3km to SW

Depth (ft)

FormationTops

8 ft cellar

20" casing (hammered in)

13 3/8" casing set at 2200ft; 17 1/2" open hole

95/8" casing set at 6200ft; 121/4" open hole

2000

4000

6000

8000

10,000

5 1/2" casing set at 10,200ft; 81/2" open hole (TD)

Triassic

MERCIA MUDSTONE GROUP:

Red claystones and silty mudstones with occasional thin sandstones

Possible halite (400 ft in Banks-1)

SHERWOOD SANDSTONE GROUP: (1650ft)

Red and buff coloured medium grained sandstones and thin shales

ST BEES SANDSTONE: (2500ft)

Red fine gained sandstones with abundant interbedded shales. Hard and relatively well cemented compared with the Sherwood Sandstone

Permian

KINNERTON SANDSTONE FM: (3400ft)

Fine grained red and orange-red sandstones. Argillaceous in places and with abundant thin claystone bands. In places dolomitic and anhydritic.

MANCHESTER MARL: (4800ft)

Purple and reddish siltstones and mudstones with thin anhydrite interbeds and nodules

COLLYHURST SANDSTONE: (5400ft)

Alternations of white and orange fine sandstones with claystone partings

Carboniferous

MILLSTONE GRIT GROUP: (6200ft)

Fine, medium and coarse hard sandstones interbedded with darkshales

BOWLAND SHALE FORMATION: (6900ft)

Dark grey and black mudstones with thin interbedded carbonate bands. Hard and flinty in places.

Limestone Unit. Pendleside Limestone equivalent

HighTOC basal Namurian shales. Black, fissile. Pyritic

CARBONIFEROUS LIMESTONE: (10,200ft) Hard, grey, well-cemented, limestones

Figure (C06)

HYDROCARBON TEST EQUIPMENT & TANKS

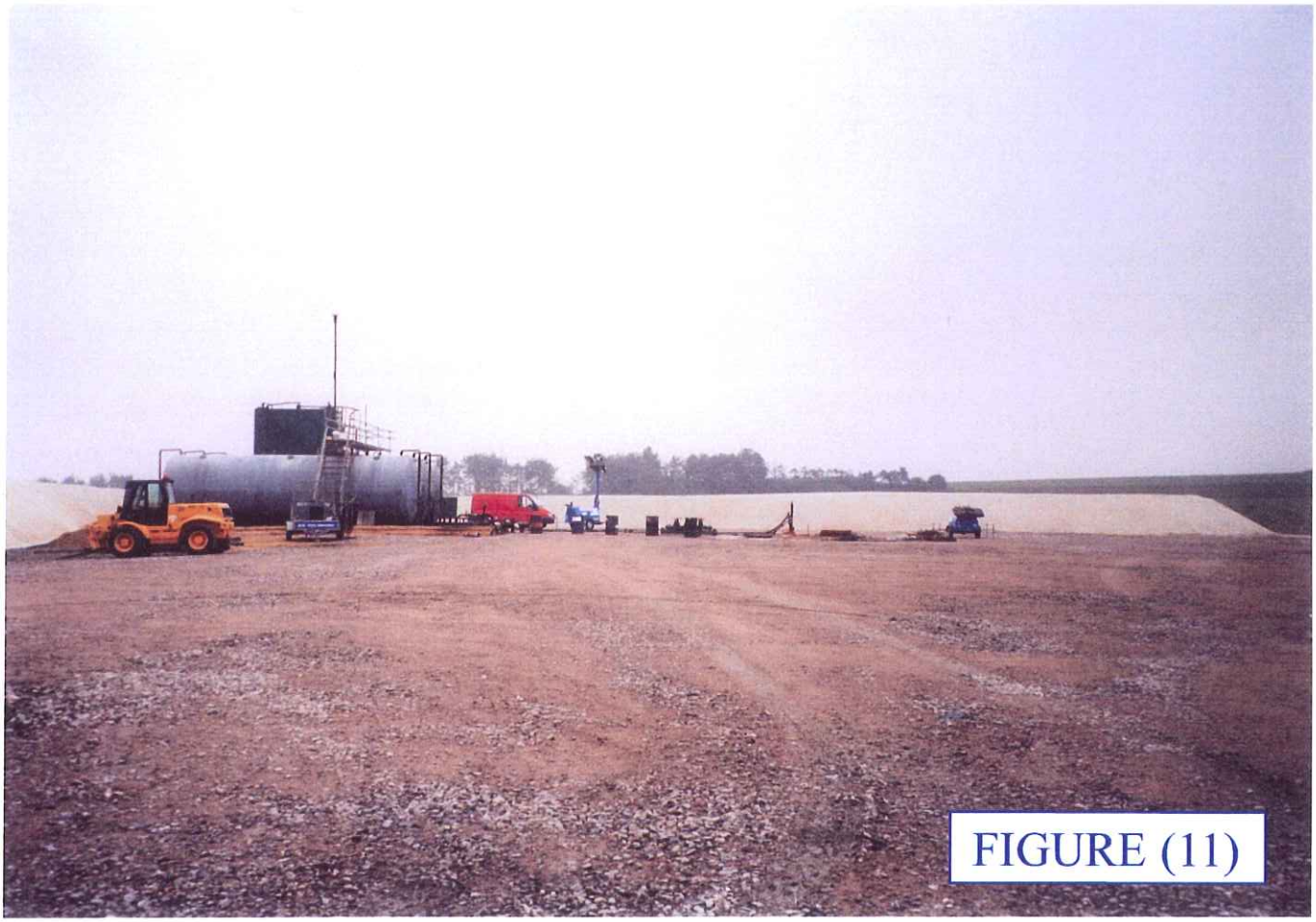

FIGURE (11)

DRILLING RIG VEHICLE MOVEMENT LOADS

DRILLING RIG & ASSOCIATED MACHINERY MOBILISATION & SET UP: 2 - 4 DAYS
Multiply numbers x (2) for total number of movements

No	PLANT/ LOAD DESCRIPTION	Weight (Tonnes)	Load Dimensions (Metres) L	W	H	Trailer Type
	Day 1					
1	Crane	25 - 45				
2	Cat Walk Extension	20	12.19	2.60	3.00	40FT
3	4 1/2" Pipe Bin + 2 x Pipe Rack	27	12.19	2.60	2.50	40FT
4	4 1/2" Pipe Bin	27	12.19	2.60	3.20	40FT
5	4 1/2" Pipe Bin	25	12.19	2.60	2.50	40FT
6	Deck Annular BOP + Trip Tank	25	12.19	2.92	3.35	Low Loader
7	Dog Hut, Junk Bin & Choke	20	12.19	2.74	2.90	40FT
8	Rig Pads	24	12.19	2.95	2.70	40FT
9	F.B.G	25	12.19	2.60	2.50	40FT
10	F.B.G	25	12.19	2.60	2.50	40FT
	Day 2					
11	Shaker Tank	25	12.19	2.86	3.16	40FT
12	Suction Tank	25	12.19	2.86	3.16	40FT
13	Mix Tank	25	13.10	2.60	2.80	40FT
14	Rig Ramp	24	12.19	2.95	2.70	40FT
15	Koomey	24	10.30	3.28	3.08	40FT
16	Camp & Ram BOP	24	10.00	2.55	2.61	40FT
17	Fuel, Pump & Screen Stores	25	12.19	2.60	2.70	40FT A.D.R
18	Stores & 2 Square Tanks	25	12.19	2.60	2.70	40FT T/L
	Day 3					
19	Fitters & Round Water Tanks	25	12.19	2.60	2.70	40FT T/L
20	RIG	50	18.19	1.17	4.26	Self Prop
21	4 3/4" D.C & 6 1/4 D.C	25	12.19	2.60	2.00	40FT
22	5" HW & 2 Pipe Racks Kelly + 6 x 6 1/4" D.C	25	12.19	2.60	2.00	40FT
23	PZ9 Pump No 2	20	6.00	3.06	2.54	T/Axle
24	PZ9 Engine No 2	20	9.40	2.80	3.40	Low Loader
25	PZ9 Pump N0 1	20	6.00	3.06	2.54	T/Axle
26	PZ9 Engine No 1	20	9.40	2.80	3.40	Low Loader
27	PZ9 Lift Beam Pump Suctions	20	12.19	2.95	2.50	40FT
	Day 4					
28	Logging Unit and BDF Stores					
29	Containers	25	12.19	2.60	2.50	40FT T/L
30	Fire Water Tank	16	9.50	2.75	3.35	Low Loader
31	Office ECT	18	9.70	2.60	3.12	45FT
32	Canteen & Drying Room	16	12.19	2.73	2.60	40FT T/L
33	3 x Hired Generators and Fuel Tanks	20	12.19	2.60	2.60	40FT
34	Forklift Truck and Shower Cabin	20	12.19	2.60	2.80	45FT

During day (4) and for the next (5) days there would be an additional 10 - 15 HGV loads delivering consumable such as drill pipe, drilling mud, casing, water, skips etc.

After the first (5) days of drilling the HGV deliveries range from none up to 3 - 5 per day.

During the rig set up i.e days 1 - 4 there would be 10 - 15 light van and car visits per day.

Once drilling starts on day (5) the light van and car visits increases to cover the 12 hour shift changes to 15 - 25 visits per 24hours.

SITE PREPERATION/RESTORATION LOADS TRANSPOT LOADS

Site construction

20ton Trailer

Truck 1	Site Preparation Equipment delivery
Truck 2	Site Preparation Equipment delivery
Truck 3	Geo Membrane delivery

10ton Vehicle

Truck 4	Cellar concrete rings delivery
Truck 5	Fencing delivery

Cement Mixer Lorry

Truck 6	Concrete delivery
Truck 7	Concrete delivery
Truck 8	Concrete delivery

20ton Tipper Lorry

160 loads of base stone (based on 0.25m - 0.3m thick). Average loads per day = 6

20ton Trailer

Truck 1	Removal of site preparation machinery
Truck 2	Removal of site preparation machinery

Car/light van movements will be 2 per day plus occasional visitors which would be 1/2 per week.

Restoration

Restoration is a reverse of the construction traffic/loads except where sections of the upgrade track/access point are seen as an improvement and could remain subject to planning approval.