


**SURAT BASIN**  
**PL 230**  
**Daandine-37**  
**Walloon CSG**  
**Well Proposal**

**Approvals:**

Drilling Department:

DAMIR HORVAT



COO:

ANDREW PURCELL



(Name)

(Signature)



**February 2007**

**Compiled by:**

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## 1.0 Hole Summary

Well Name:	<b>Daandine-37</b>	
Authority to Prospect:	PL 230	
Map Sheet:	Dalby 1:100,000	
Latitude / Longitude:	27° 05' 54.4" S	150° 57' 56.1" E
	GDA 94, Zone 56	GDA 94, Zone 56
Easting/ Northing:	298 305 E	7 001 030 N
Elevation:	327.00 m	
Landholder:	Arrow Energy N.L.	
Nearest Town:	Dalby	
Nearest Road:	Dalby – Kogan Rd	
Directions To Site:	<ul style="list-style-type: none"> <li>- Head west along Dalby – Kogan Rd from Dalby (travel via Old Warrego Highway) approx 30km travel distance from western edge of Dalby)</li> <li>- Turn left (south) onto Kumbarilla Lane and follow for about 1.2km and enter gate on right (western) side of road. Head north staying close to treeline, east of the dam construction equipment.</li> <li>- Wellsite cleared approximately 600m north from gate</li> </ul>	
Nearest Wells:	Daandine-12 (production well), Daandine-2 (core – exploration)	
Surface Casing Depth:	<b>90 m</b>	
Target Interval:	Macalister – Argyle Coal Seams	
Estimated Total Depth:	<b>290 m</b>	
Net Coal Expected:	20 metres net production coal	
Reason For Drilling:	Daandine-37 will be drilled to develop the Daandine gas project.	

## 1.1 Contractor Contacts

Drilling Contractor: Ancon Directional Drilling  
36 Bridge Street,  
Korumburra VIC 3950

03 5658 1433

**Wayne Jefferis:** 0428 515 618

Wellsite Supervision: Triassic Geological Services Pty Ltd  
PO Box 1046  
Toowoomba QLD 4506

**Tony Kurtz:** 07 4638 5592

Geophysical Logging: Coal Seam Wireline  
Unit 2/7 Pitino Court  
Osbourne Park WA 6017

**Stuart Power** 0429 955 344

Surveyors: M.J. Hedges Geomeasure Pty. Ltd.  
16 Vanessa Boulevard  
PO Box 103  
Springwood QLD. 4127

**Michael Bessen:** 07 3208 6566

Earth Movers: Fosters Earthmoving  
"Boree"  
Toowoomba Rd  
Dalby QLD 4405

**Foster:** 07 4669 8553

**Table 1: Contractor Contacts List**

1.2 Location

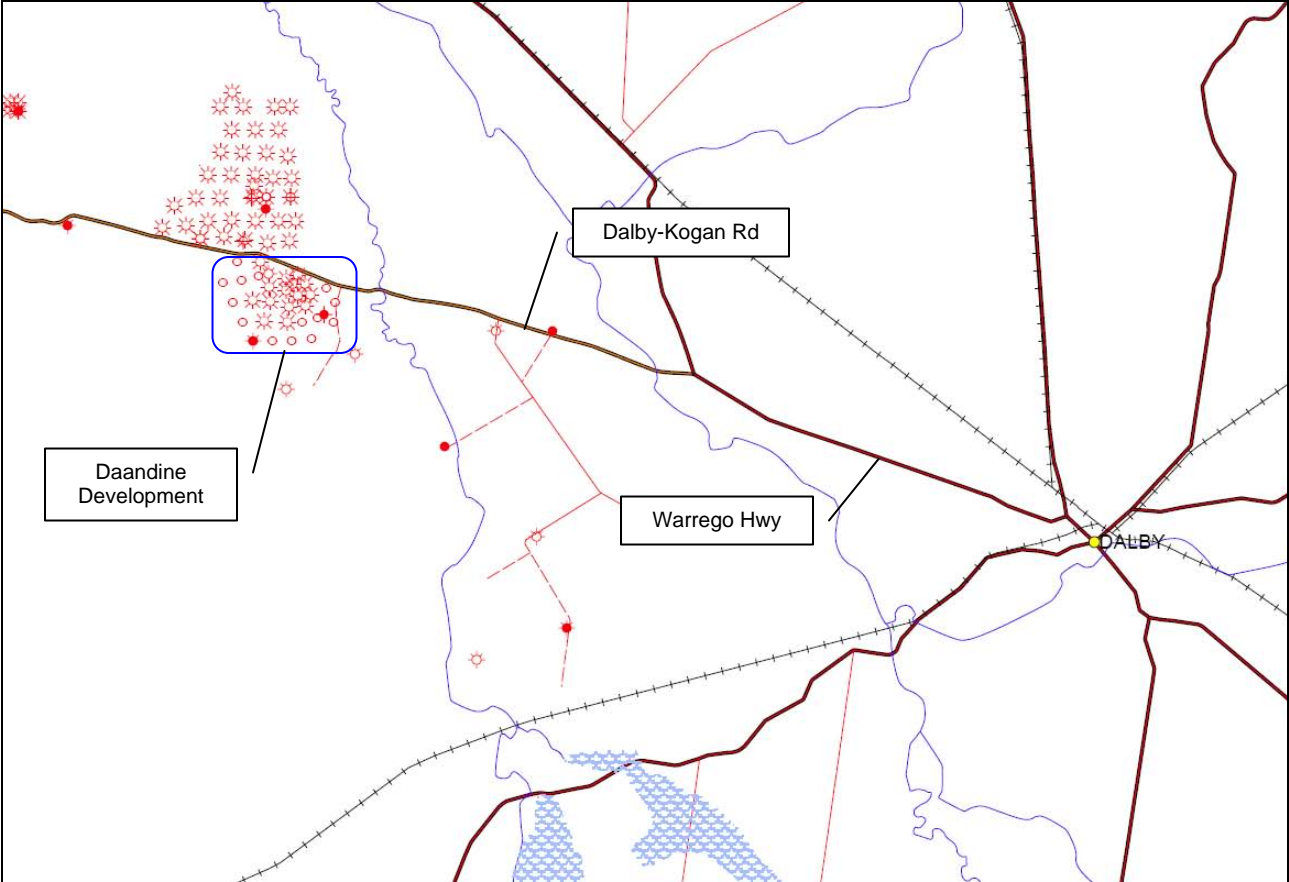


Figure 1: Daandine Field Location

1.3 Daandine Field Setout

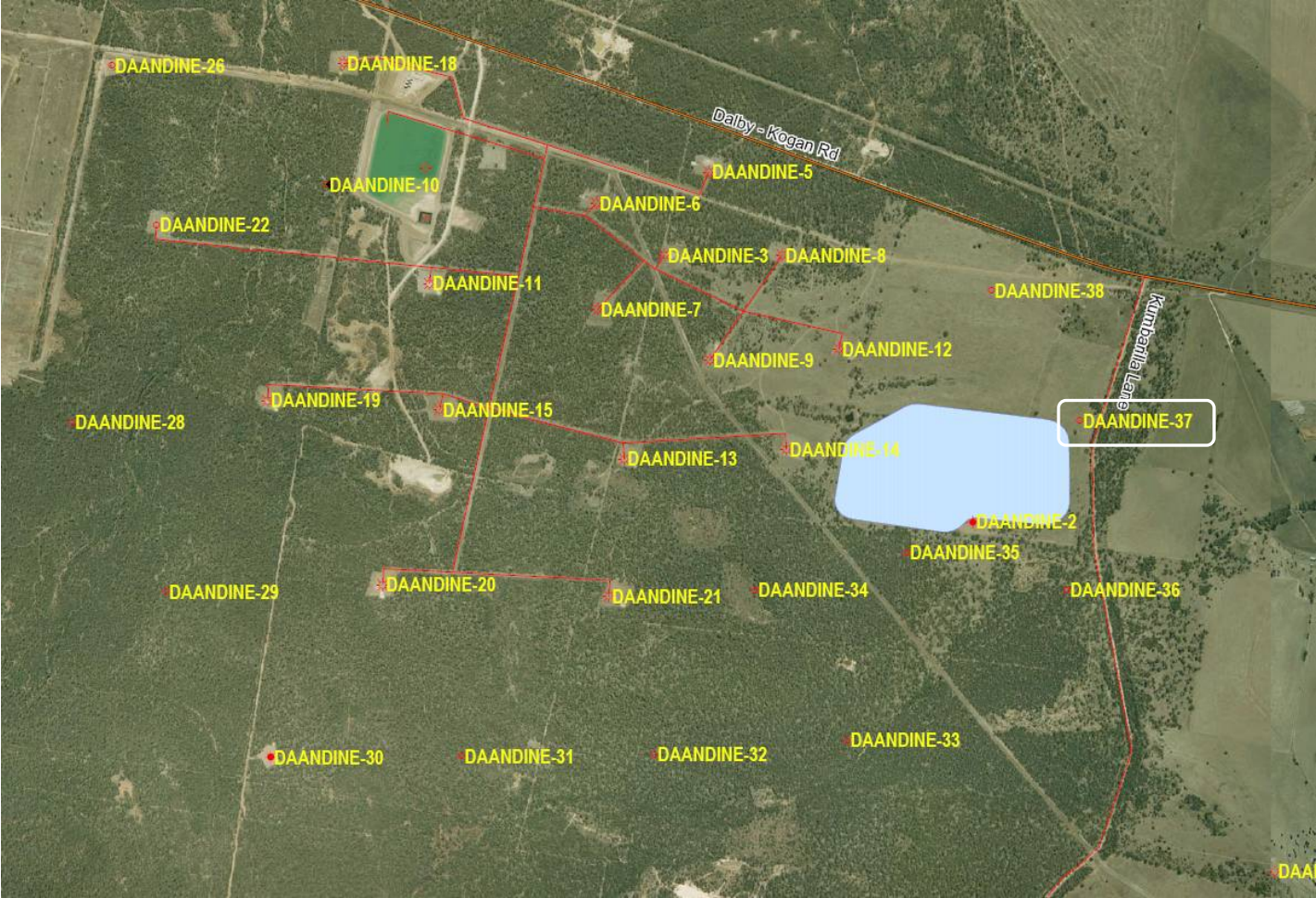


Figure 2: Daandine-37 Well Location

## 2.0 Hole Design

*The following is a guide for drilling the well. The actual work carried out may be contingent on the results during drilling and any subsequent special instructions. In the absence of any special instructions, use the guide below.*

### **Drilling Program is as follows**

- Survey and clear wellsite as per drill site preparation procedures
- Site preparations, including mud pits, a flare pit as required by drilling rig. Ensure that the flare pit is at a minimum distance of 30m from the well. Site offices and parking areas should also be 30m from the well.
- Dig out and emplace cellar as required by drilling contractor
- Mobilisation of drilling rig, necessary equipment and personnel to well site
- Establishment of all equipment
- Ensure pre-drilling and Site Inspection Checklist has been filled out
- Ensure all personnel have been inducted as per Arrow Energy's Occupation Health and Safety Procedures
- Drill and set 14" (355mm) conductor if required by drilling rig, cement with **no less than 1.64 SG**
- The specific gravity (S.G.) of cement slurry must be measured with conventional and/or pressurized mud balance at atmospheric pressure and/or under 100psi simulated pressure.
- Cement powder & grout mixes – Portland/ GP 30 litres of water per 1 bag (40kg) of cement and/or Class A blend Builder's cement with 25% (pozzolan/ fly ash) 1 bag (40kg) mixed with no more than 25 litres of fresh water.
- Drill 317mm hole to **90m** to above Macalister coals. Picking surface casing point will require some communication with the Daandine Project Geologist. It is important that the Walloon Coal Measures top be accurately recorded to determine the precise depth for setting surface casing. Send in the data entry file before picking surface casing. Do not just blindly set casing point at the depth predicted. **Deviation surveys are to be run every 36m.** (Survey interval maybe increased dependant on results, after written confirmation from Arrow Energy's head office) Deviation must not exceed 2°. If excessive deviation is starting to occur, stop drilling and consult with Arrow Energy's Drilling Engineering Manager
- Run API 5LB 273.1mm OD x 6.4mm WT (10-3/4") surface casing to **90m** and cement using S.G. of 1.64 – 1.72 g/cc (to be checked with mud balance) with minimum of 50% excess or as per hole condition advised by the Arrow Senior Drilling representative (Lindsay Cullen and/or Les Friske). If uncontactable please consult directly with Arrow's Drilling Engineering Manager
- Install well head flange.
- Allow cement to set for a minimum of 6-8 hours before BOP test conducted
- Cement to be topped up as required immediately or within 12 hours (12 hrs if left overnight) and left to set a minimum of 2 hours prior to setting up of blow out prevention equipment
- Pressure test BOP system to 350 PSI for 5 minutes then 750 PSI for 10 – 15 minutes and record any pressure loss. The operator of the BOP must be ticketed and test must be witnessed by Arrow site representative. A BOP test record file



must be completed and filed.

- **Drill out cement plug and through top Macalister coal seam using air and water injection (approx 30m), then perform an airlift test** – recording water & gas production rates. Depending on flow rates, a further airlift test may be required after drilling ~40m, into the top of the Wambo seam to verify water production figures.
- The geologist onsite is to remain in constant communication with Arrow Office in regard to performing air lift test.
- Drill to **290m** using 9 7/8” **PDC** bit utilizing fresh formation water mixed with KCL at 3 % (30 kg per 1000litres) as drilling fluid. Maintain this KCL content until
- TD is reached.

Specific Gravity	Density (lb/gal)	KCl (% wt)	KCl (lb/bbl)	Water (m <sup>3</sup> /m <sup>3</sup> )	KCl (kg/m <sup>3</sup> )	TCT °C
1.003	8.3	0.5	1.6	0.9983	4.6	0
1.010	8.4	1.6	5.5	0.9942	15.7	-1
1.020	8.5	3.1	11.1	0.9882	31.7	-2
1.030	8.6	4.7	16.8	0.9820	47.9	-2

- At any time do not mix KCL (% wt) greater than 3.1% (31.7 kg/m<sup>3</sup>) to keep hydrostatic head in wellbore in nearbalanced state between 1.003 - 1.020 S.G.
- Deviation surveys are to be run every 36m. (Survey interval maybe increased dependant on results, after written confirmation from Arrow Energy's head office)
- Deviation must not exceed 2°. If excessive deviation is starting to occur, stop drilling and consult with Arrow Energy's Drilling Representatives. **NOTE:** The target coal seams are the Macalister – Argyle coals. To create a large a sump as possible, TD has been predicted at 30m below the last Argyle coals. However, it is important to not run into the Taroom coal seams. As coal seam geometries can vary, this pick will require continual mud logging, and communication with the Daandine Project Geologist.
- Upon reaching TD the hole is to be flushed clean of cuttings and a wiper trip may be necessary depending on hole conditions
- Run geophysical logs as outlined on page 12. Minimum runs: GR-SSD-LSD-Caliper, Resistivity, & Deviation. Logs are to be combined into one LAS file on site and sent into the Arrow office as soon as possible. Paper copies should be inspected to make sure there are no errors by the wellsite geologist. Quality of logs must be confirmed prior to releasing logger and proceeding to next stage of the program.
- Flow test well if directed by Arrow Energy head office and take water samples
- If gas flows occur, rate of flow should be recorded and samples should be collected (minimum of 3)
- Select coal intervals from geophysical logs and under ream to 16”. Coals may be under reamed to 22” only after consultation with Arrow's Drilling Representatives. Driller and Wellsite geologist must keep accurate records of which intervals were under reamed. Under-reaming must be done using air, with 1-2% foam continuously injected.
- After underreaming, coal intervals must be jetted using air as per the procedures below.

- If required, run caliper log over under reamed zones to check that the entire zone was under reamed. If not then zone may have to be under reamed again.
- Run API 5LB 168.3mm OD x 6.4mm WT (6-5/8") production casing across production interval. A casing program must be developed in conjunction with the wireline logs. Where possible 30-36m of unslotted casing must be run at the bottom of the string with slotted run over the coals and unslotted casing run over the non-coal bearing zones. Casing program to be confirmed from Head Office. Casing hanger/ crown to be placed on last joint going into hole.
- Due to the excessive loads on pc pumps, torque anchors are to be attached on our pump assemblies so that the pumps don't "back off" during production. Therefore the following must be adhered to on all production wells so we can effectively run torque anchors.
- The bottom 30-36m of 6-5/8" casing is to be tack welded together and/or secured using Halliburton's Tru-Lock Compound (the pump will be set within the sump section of the casing string where there is no slotted casing). Hole must be filled with water and gas monitoring setup during this process. Risk assess the operation and check well for gas levels prior to proceeding.
- The bottom length of casing is to be left open and will have a minimum of three 25mm diameter holes cut below the box thread,
- **Ream-Down Liner System**
- The second length is a short length of threaded casing filled with pre-cured cement to act as the plug for the remainder of the production liner. Many areas experience considerable difficulty with wellbore stability when it is time to run liner. Sloughing shales, semi-to-unconsolidated sands, and relief of stresses during under-ream may cause hole problems which require liner manipulation to ream the liner into the hole. This hookup includes selection and position of pre-cured cement plug specifically designed for this demanding application.
- The bottom joint will have three small plates of steel welded to them in a counter rotating fashion so the if the casing wants to turn then it will bury itself into the gravel
- 6-5/8" production liner should hang a minimum of 30m inside the 10-3/4" surface casing.
- Gravel is to be poured into the annulus using the method outlined in the section headed "**2.3 Gravel-packing (formation stabilizer) Installation**"
- The liner is to be flushed clear of cuttings using the jetting tool/open ended drill pipe
- Upon completion of drilling operations the well head is to be attached prior to demobilisation of drilling rig

## 2.1 Fluid programme

The following programme is set for drilling surface and production zones, as well as under reaming

- **12 /14" PDC** to surface casing shoe: drill with formation water only

- **9 7/8” PDC** ,drill out cement and to 30m blow surface casing shoe with air (and water injection if required)
- From this point to TD .drill with clean formation water mixed with 3 % KCL (30kg per 1000litres) Do not drill with fluids used to drill the surface section or the drill out of the cement.
- **16 or 22” under reaming** of coal production zones: under-reaming coal production zones to 16 or 22” must be done on air using 1-2% foam. Since foam is rheologically a dynamic and complex mixture of gas and fluid, good measurements e.g. 1-2% continuously injected are needed to
  - (a) maintain underbalance in the system across the entire open-hole section,
  - (b) eliminate annulus pack-off, and
  - (c) optimize bit hydraulics in narrow annuli.

For any problems experienced while drilling; contact Arrow Energy’s Drilling Engineering Manager (Damir Horvat 0429-053-431) **before** altering the fluid programme.

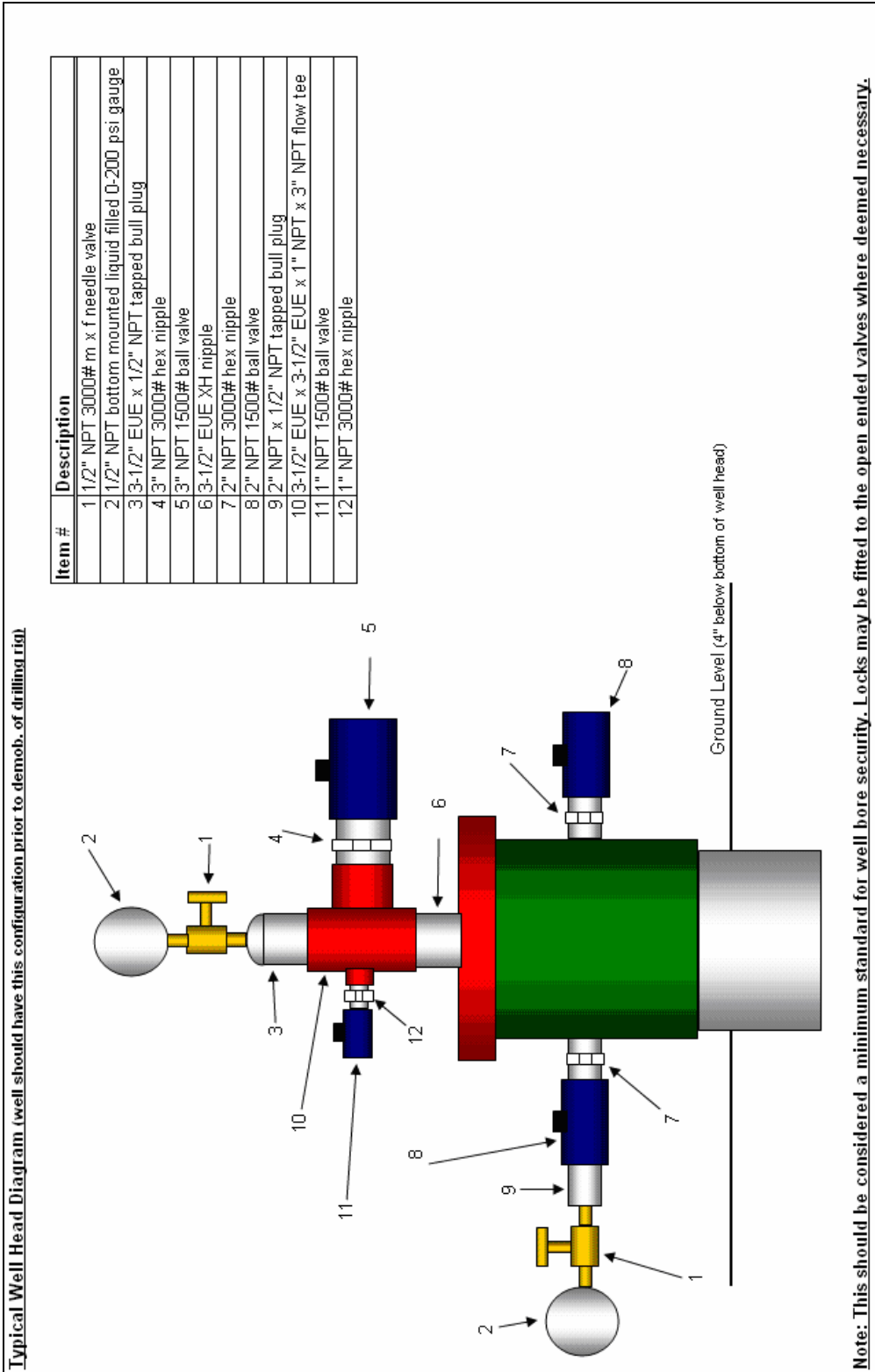


Figure 3: Typical Wellhead Diagram

## **2.2 Hydraulic Jetting & Well Stimulation Methodology**

The jetting tool is rotated at a speed less than ten (10) rpm. The jetting tool is positioned at one level for not less than two minutes and then moved to the next level which should be no more than 6-10 inches vertically from the preceding jetting level. Jetting proceeds from the bottom of the production casing/ liner to the top.

## **2.3 Gravel-packing (formation stabilizer) Installation**

After the production casing/liner have been installed, continue to rinse the borehole by circulating clean water through the bottom of the MT liner hanger assembly. Slowly pour the filter media into the annular space and let it settle into the upward flowing water (i.e., 2 - 3 L/s). This process, called "*floating in the gravel pack*" helps prevent the filter material from bridging, voids, or segregation and keeps the fines from settling. A feeler line or weighted measuring tape MUST be used to confirm where the top of the filter pack is.

Modification on any procedures MUST be first discussed with the Arrow Energy Drilling Engineering Manager. Subsequently, such modifications must be fully documented.

### 3.0 Geological Summary

#### 3.1 Recent Drilling Activity

Daandine-1 was drilled in October 2004 and intersected similar thickness of coals as seen in the Kogan North Development area to the north. Several step out core holes were then drilled around May 2005 which resulted in the defining of the Daandine CSG resource. Several production wells targeting the Iona/Argyle were then drilled in late 2005 /early 2006 with the remaining wells in the initial stage of development being drilled during the mid 2006.

#### 3.2 Walloon Coal Measures

The Middle Jurassic Walloon Coal Measures form part of the Injune Creek Group and are well developed throughout the Surat Basin, ranging in thickness from less than 50m to greater than 700m. They comprise of very fine to medium grained, labile, argillaceous sandstone, siltstone, mudstone and coals. The Walloon Coal Measures are divided into Juandah Coal Measures, and Taroom Coal Measures. The Juandah coal interval generally comprises five coal groups or seams. In descending stratigraphic order these are the Kogan, Macalister, Wambo, Iona and Argyle Seams.

#### 3.3 Predicted Formation Tops

Formation		Age	Depth
Alluvials		Recent	0 m
Springbok Sandstone		Late Jurassic	10 m
	Kogan	Mid Jurassic	60m
Walloon Coal Measures	Macalister	Mid Jurassic	95 m
	Wambo	Mid Jurassic	140 m
	Iona	Mid Jurassic	190 m
	Argyle	Mid Jurassic	210 m
	Tarooms	Mid Jurassic	270 m
Total Depth			290 m

Table 2: Predicted Formation Tops

*Attached in Appendices are copies of offset wells*

### 3.4 Predicted Section

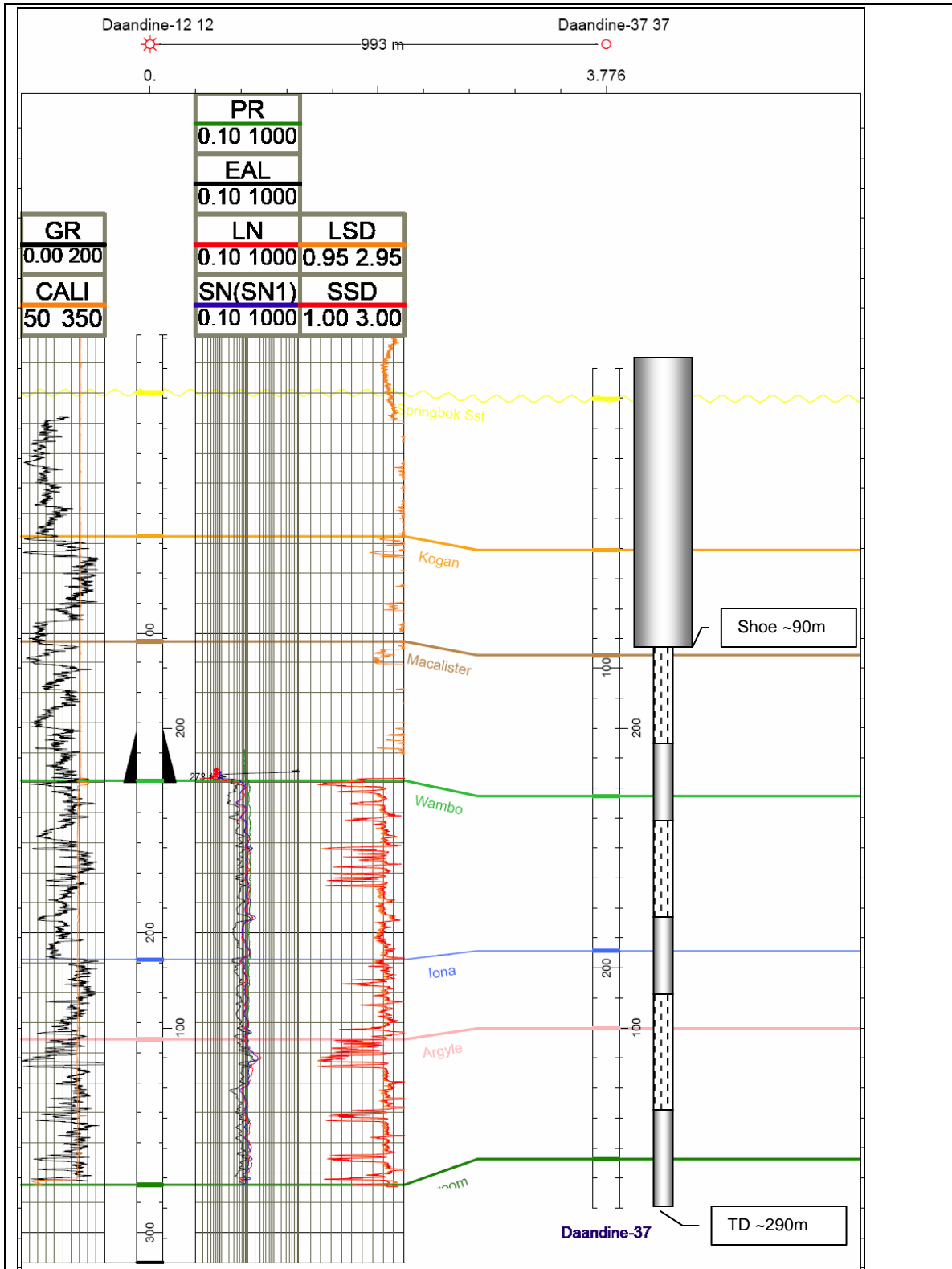


Figure 4: Predicted section through Daandine-37

## **4.0 Evaluation & Reporting**

### **4.1 Sampling of cuttings**

Drill cuttings are to be sampled at 6 metre intervals through the Springbok Sandstone and every 3 metres through the Walloon Coal Measures. Logging of drill cuttings should indicate any lithological change as it occurs irrespective of 3m intervals. Coal seams within the Walloon Coal Measures are of importance in this drilling program and should be accurately recorded while drilling.

All cuttings are to be washed and dried, with a small representative sample from each interval to be stored in plastic sample storage trays, and labeled with well name, and depth of each interval.

During under reaming; collect cuttings and note lithology to ensure stratigraphic position in the hole.

### **4.2 Gas Sampling**

Gas levels are to be recorded using VRAE gas monitor. While drilling on mud / formation fluid the mud agitator shall be used with VRAE attached. While drilling on air the detector is to be connected to a point along the blowline where air can be sampled.

All data is to be downloaded from the VRAE at the end of each shift and included in the data entry file or forwarded directly to the operations geologists at Arrow Energy.

### **4.3 Water Sampling**

Any substantial water flow encountered should be flow tested and sampled for analysis.



#### 4.4 Geophysical Logging

Coal Seam Wireline will provide geophysical logging service. The logging suite will consist of Gamma – Density – Caliper & Neutron – Resistivity – Deviation. Hard copy printouts are to be received in the field by the wellsite supervisor from the logging operator. Digital LAS data are to be received as a single file with the complete suite of log curves in it. All LAS data is to be transferred by email to Arrow Energy operations geologists at the earliest possible convenience.

#### 4.5 Reporting to Arrow Energy

##### Daily Reporting

Daily drilling reports will be sent to the Arrow office, then forwarded to Arrow Energy's Board Members, DNR & M State Mining Engineer, and the Person-in-charge at the end of each day. Suitable communications will be established from the well site as well as the motel. The report will contain:

- Well Name
- Date
- Current depth and daily meterage
- Current operations summary and next 24 hrs summary
- Detailed description of daily activities
- Chip / core descriptions
- Net coal encountered during last shift and cumulative total for well
- Wellsite geologist interpretation of results so far (formation picks)
- Gas readings
- Foreseeable problems
- Wellsite geologist name and contact details
- Drillers name and contact details

The Daily Activity Report and Data Entry files will only be sent to the following people (unless notified by Arrow head office):

Nev Robinson	Arrow Energy N.L.	<a href="mailto:nrobinson@arrowenergy.com.au">nrobinson@arrowenergy.com.au</a>
Damir Horvat	Arrow Energy N.L.	<a href="mailto:dhorvat@arrowenergy.com.au">dhorvat@arrowenergy.com.au</a>
Darren Holden	Arrow Energy N.L.	<a href="mailto:dholden@arrowenergy.com.au">dholden@arrowenergy.com.au</a>
Michael Oberhardt	Arrow Energy N.L.	<a href="mailto:moberhardt@arrowenergy.com.au">moberhardt@arrowenergy.com.au</a>
Ailsa McDonald	Arrow Energy N.L.	<a href="mailto:amcdonald@arrowenergy.com.au">amcdonald@arrowenergy.com.au</a>
Les Friske	Arrow Energy N.L.	<a href="mailto:lfriske@arrowenergy.com.au">lfriske@arrowenergy.com.au</a>
Lindsay Cullen	Arrow Energy N.L.	<a href="mailto:lcullen@arrowenergy.com.au">lcullen@arrowenergy.com.au</a>

### **Geological Reporting**

All geological information gathered while drilling is to be entered into the data entry file supplied to the well site geologist from Arrow Energy N.L. This report will contain all well data including:

- Basic well information
- Lithology data
- Deviation data
- Flow Test Data
- Formation Picks
- Drilling Rate
- Gas Log to be sent as separate file (\*.DAT file which should be downloaded daily from gas detector unit)
- Coal Intercepts
- Well Design including Bit Size and Casing Details

## 5.0 Well Completion

### 5.1 Casing Program:

	<b>Surface Casing</b>	<b>Production Liner</b>
<b>Hole Diameter – Inches:</b>	12 ¼"	9 7/8"
<b>Casing Size – Inches:</b>	273.1mm (10 ¾")	168.3mm (6 5/8")
<b>Weight:</b>	42.09 kg/m	25.55 kg/m
<b>Grade:</b>	API5LB x 6.4mm WT AS1396	API5LB x 6.4mm WT AS1396
<b>Type Coupling:</b>	Welded	Threaded couplings/ Welded
<b>Make:</b>	Steel	Steel
<b>Approximate Setting Depth</b>	<b>90 m</b>	<b>60 – 290m</b>

**Table 3: Casing Program**

### 5.2 Well Design:

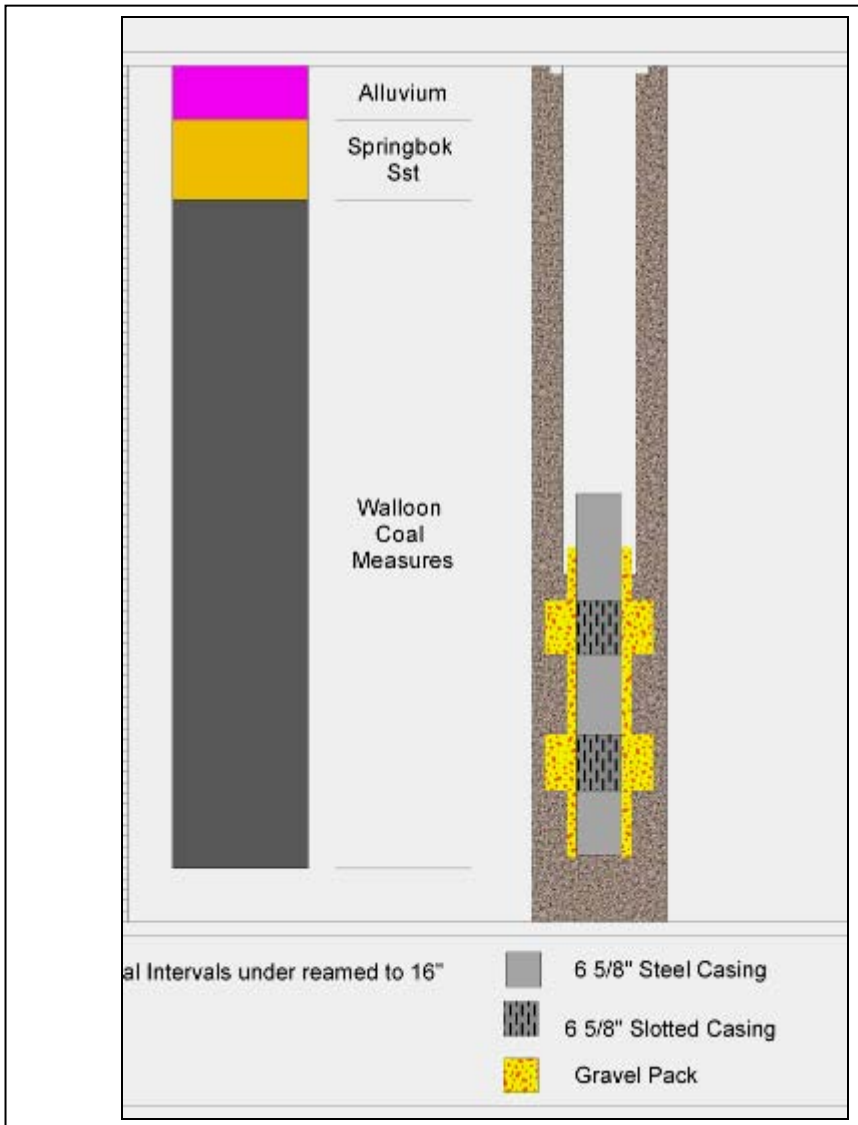


Figure 5: Predicted Well Design

## **6.0 Workplace Health and Safety**

*Revised Monday 27<sup>th</sup> February 2006*

*AE = Arrow Energy NL*

### **6.1 Safety Management Plan and Training:**

Prior to commencement of the drilling program, the drilling contractor is to provide a CD ROM to the AE OHS Manager with the following:

- Project Safety Management Plan (the contents of which must comply with procedure E9.1.1 Contractor OHSMP Compliance Requirements of the AE OHS Management Plan),
- Drilling Procedures Manual (SOPs, SWIs etc)
- Risk Management Manual
- MSDS Register with contents consistent with all chemical substances used on site
- List of all employees, sub-contractors and staff anticipated to work on the drilling operation together with legible copies (or scanned onto CD) of evidence that all have been trained in the contractor company's OH&S Safety Management System and Risk Management System (signed certificates etc.), vehicle licenses, industrial inductions, plant and vehicle use training (drilling qualifications/experience, Hiab, crane etc).

Drillers are required to have a current Senior First Aid Certificate (at least one qualified Senior First Aider must be on site each shift).

Drillers are required to have a current BOP introductory training certificate so that at least one BOP qualified driller shall be on the rig for each shift.

Contractor Drilling Supervisors shall be fully BOP trained and certified (Full 5-day BOP course).

The drilling contractor and crew should be aware of the geological risk assessment carried out for this drill hole by AE prior to commencing drilling operations. The risk assessment is found on the last page of this document in Appendix 1.

### **6.2 AE Generic Operational Induction**

Also, prior to accessing any AE operational area to carry out work, all Contractors, service providers etc are to complete the AE Generic Operational Induction. If the operational activity is in the Dalby area (Tipton West Project, Daandine Project and Kogan North Project), the AE Generic Operational Induction is to be completed at the Dalby Depot, corner of Bennie and Russell

Sts, Dalby. This can be organised by contacting Paul Boland or Nathan Williams on 07 4662 3999.

For exploration or other project areas, please contact Brisbane office on 07 31053 400, and you will be directed to the project supervisor who will organise a time and location for the induction.

### **6.3 Drillsite Inductions**

All AE staff and contractors working on a new drill-workover site shall complete the site specific AE Drill - Workover Site Workers Induction Course, sign the Drill – Workover Site Induction Register and must be familiar with AE's Occupational Health and Safety Policies and Procedures Manual and compliance forms located within the site hut.

All visitors to site must complete the AE Drill - Workover Site Visitors Induction Course, sign the Drill – Workover Site Induction Register and be supervised at all times when on site.

### **6.4 Other Site Safety Issues**

The Personnel Movement Register is to be completed on arrival and departure by all site workers and visitors.

All contractors are to attend a daily Prestart Safety Meeting (minuted) to discuss and record daily safety/risk issues and compile required JSEA's or review a relevant SOP, the titles of which are to be documented on the Prestart Meeting form. A copy of minutes and a dated and signed attendance record must be provided to the AE Site Supervisor *after each daily site safety meeting*.

Prior to the rig moving on site, the drilling contractor representative and the AE Site Supervisor are to agree on a site layout plan in accordance with both the Contractor's and AE's site requirements. This is to determine the appropriate location for the site office, site entrance, vehicle parking, emergency evacuation muster location and designated smoking area, all to be located outside the 30m ignition exclusion zone.

The Pre-drilling and Safety Checklist is to be completed by the AE Site Supervisor prior to commencement of drilling to ensure that site layout is appropriate with safety issues addressed.

The following is a list of key instructions that must be followed:

- AE have a total smoking ban within 30m of the rig and in the AE site office on all drill - workover sites while the rig is on site. That means no smoking or ignition sources are allowed within 30m of the rig. All potential ignition

- sources including cigarettes, matches and cigarette lighters, flash cameras and mobile phones are to be left at the site hut and are not allowed within the 30m ignition exclusion zone.
- Any person caught smoking within the 30m ignition exclusion zone will be dismissed from site. If the removal of a worker from site (for a smoking breach) results in a perceived unacceptable work safety risk, the AE Site Supervisor is authorised to shut down the rig at the Contractors expense until such time as a replacement worker is supplied at site. Smoking is allowed adjacent to the site hut in the designated smoking area only.
  - PPE to be worn at all times – including hard hats, steel capped boots, eye protection (safety glasses) and long sleeve shirts and pants. Ear protection is to be worn when working in the vicinity of operating drill rigs and compressors.
  - All drill-workover site injuries-incidents are to be immediately reported to the OHS Manager (0428 193959). Incidents involving Contractor staff are to be documented immediately by the Contractor on Contractor incident report forms with a copy provided to the AE Site Supervisor who will send a copy to the OHS Manager immediately. The Contractor will be required to report Prescribed Incidents in accordance with Schedule 2 or the Pet and Gas (Prod & Safety) Regs 2004.
  - Emergency Evacuation procedures are to be discussed at the first Prestart Safety Meeting to ensure that Contractor staff and AE staff are aware of joint responsibilities in an emergency.
  - Emergency response details including emergency contact number lists for all contractors on site must be posted in all site offices or accommodation units.
  - No hot work is to be commenced without a Hotwork Permit.

**7.0 Contact Phone / Fax Numbers**

<b>Service</b>	<b>Contact</b>	<b>Number</b>
<b>EMERGENCY SERVICES</b>		<b>000</b>
Person-in-charge	Nick Davies	Tel: (07) 3105 3425 Mob: 0427 015 147 Fax: (07) 3105 3401
Arrow Energy N.L.	Nev Robinson GM Exploration	Tel: (07) 3105 3439 Mob: 0409 848 663
	Chris Tedman-Jones OHS Manager	Tel: (07) 3105 3441 Mob: 0428 193 959
	Peter Roles Asset GM (South)	Tel: (07) 3105 3468 Mob: 0409-533-710
	Ralph Gunness Environmental Manager	Tel: (07) 3105 3428 Mob: 0427 605 952
	Damir Horvat Drilling Engineering Manager	Tel: (07) 3105 3431 Mob: 0429 053 431
	Jason Schroder Production Manager	Tel: (07) 4662 3999 Mob: 0427 691 116
	Darren Holden Senior Geologist	Tel: (07) 3105 3430 Mob: 0429 490 011
	Michael Nisbet Operations Geologist	Tel: (07) 3105 3436 Mob: 0427 490 019
	Ailsa McDonald Geologist	Tel: (07) 3105 3435 Mob: 0433 019 835
Triassic Geological Services	Tony Kurtz	Mob: 0438 760 766
Coal Seam Wireline	Stuart Power Craig Dixon	Mob: 0429 955 344 Mob: 0427 000 766



## ***Appendix 1: Job Safety and Environmental Analysis (Risk Assessment based)***

<b>Task</b>	<b>Description of Task</b>	<b>Tools, equipment PPE</b>	<b>Hazards within the task</b>	<b>Raw Risk</b>	<b>Controls</b>	<b>Residual Risk</b>
1.	Drill through Springbok Fm and Walloon Coal Measures to the Iona package and setting casing prior to installation of BOP for drilling production zone	Petroleum gas drilling rig and support equipment	Uncontrolled gas flows	19	<p>Extended history of drilling of a number of wells by Arrow within the Springbok Formation and top of Walloon Coal Measures without recorded significant gas flows or “gas kicks”;</p> <p>Extended history of drilling of a number of wells by petroleum and coal exploration companies within the Springbok Formation and top of Walloon Coal Measures without recorded significant gas flows or “gas kicks”;</p> <p>Experience-based knowledge of the Walloon Coal Measures production zone allowing controlled drilling to nominated depths within the Walloons;</p> <p>Drill well overbalanced;</p> <p>Additional mud stocks maintained on site;</p>	10

Task	Description of Task	Tools, equipment PPE	Hazards within the task	Raw Risk	Controls	Residual Risk
2.	Drilling through potentially gassy coal sequence to TD	Rig, BOP	Gas blowout from coal	14	Use BOP rated and tested to at least 750 PSI (Hydrostatic Pressure at estimated TD + margin) Monitoring of mud pit levels to detect any influx into well	10
			Gas leaking from mud into air around rig causing fire hazard	9	Continuous gas monitoring, eliminate ignition sources	6

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