

# Falklands oils

Time to pause and draw breath

After a busy three years of drilling up to the end of 2012, activity in the Falklands in 2013 is significantly quieter, with the focus switching to 3D seismic acquisition. Much was learnt in the 2012 South Falklands drill programme, although an oil discovery remains elusive. Borders exited the 2012 campaign with what could be a commercial condensate development in Darwin, while in the north Rockhopper secured a partner for its Sea Lion discovery. This success still gives investors much to buy into; however, the reality is that with no drilling likely in either basin until late-2014, a lack of near-term drill catalysts may keep investors away for some months.

## Oil possible in Southern Basin

All four wells drilled in the Southern Basin encountered gas or gas/condensate, although studies indicate that oil prospects are possible in the basin. Analysis of source rock by both Falkland Oil and Gas (FOGL) and Borders indicates that oil prospects should exist elsewhere in the basin, with FOGL generating a model of the distribution of oil and gas windows across its licences. We now expect the focus in the south to shift to the Cretaceous and to pinpointing oil-prone prospects. Activity in 2013 will concentrate on 3D seismic acquisition, with FOGL having already completed a survey over Diomedea, a potential oil prone Cretaceous fan.

## Darwin development

While proven technology exists to develop Darwin, a development in the relatively harsh environment of the southern basin will not be without its challenges. A farm-out to a partner with proven development expertise, such as that achieved by Rockhopper and FOGL in their farm-outs to Premier Oil and Noble Energy respectively, would enhance investor confidence in Borders' ability to successfully progress the project.

## 2013 catalysts from potential farm-outs

With no further drilling until at least late 2014, and production from Sea Lion and Darwin not expected until 2017 and 2019/20 respectively, news in 2013 is expected to focus on potential farm-outs for Borders or Desire and 3D seismic results. Success for Borders now hangs on its ability to secure a farm-out on favourable terms; however, if this can be secured, we believe it is most likely to provide a material share price catalyst for investors in the near term.

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### Analysts

Elaine Reynolds +44 (0)20 3077 5713  
Ian McLelland +44 (0)20 3077 5756

[oilandgas@edisongroup.com](mailto:oilandgas@edisongroup.com)

### Companies named in this report

Argos Resources  
Borders & Southern Petroleum  
Desire Petroleum  
Edison International Spa  
Falkland Oil and Gas\*  
Noble Energy  
Premier Oil  
Rockhopper Exploration  
*\*Edison Investment Research client*

## What can we learn from 2012?

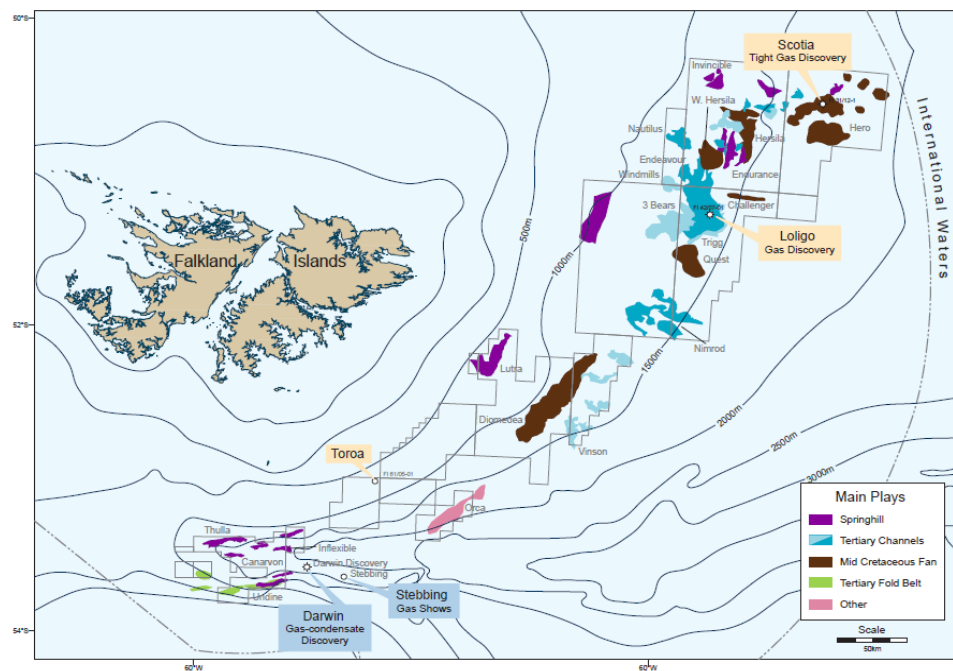
2012 was an active year for the oil industry in the Falklands. Four wells were drilled in the previously unexplored Southern Basin, while a number of farm-outs were successfully concluded, bringing larger players Premier Oil, Noble Energy and Edison International to the region. Following on from our February 2012 Sector report Falklands oils: Kicking up a storm in the South Atlantic, we look at the outcome of 2012's activity in the region and discuss what the findings say about the potential for future discoveries there. To reflect recent activity in the Falklands, we look more closely at the southern basin operators, and provide a brief overview of those in the northern basin.

### Southern Basin campaign delivers mixed results

Before the start of the first deepwater drilling campaign in the Southern Basin, the key questions for the area were:

- Is there a working hydrocarbon system in the region?
- What phase of hydrocarbons are likely to be present?
- What is the reservoir quality and can the basin be commercial?

**Exhibit 1: Location map**



Source: Falkland Oil and Gas

At the end of the drilling campaign, these issues were partly addressed. All four wells, ie Darwin and Stebbing for Borders and Loligo and Scotia for FOGL, encountered hydrocarbons, thereby proving a working hydrocarbon system across all four play types drilled. This is a remarkable achievement for a frontier basin with an acreage area of over 69,000km<sup>2</sup>. By comparison, Cairn Energy drilled eight wells in its 102,000km<sup>2</sup> acreage offshore Greenland in 2010/2011 with little success.

However, the hydrocarbons found in all four Falklands wells were wet gas or gas/condensate, which disappointed the market and left the potential presence of oil in the basin a key unknown. In addition, three of the wells found poor reservoir quality due to either thin bedding as in Loligo and

Stebbing, or low permeability as in Scotia. However, the drilling campaign did result in the Darwin gas condensate discovery, with a mid-case recoverable estimate of 190-210mmbbl.

## **Cretaceous coming to the fore**

So what did we learn from the campaign? Both Borders and FOGL tested a Cretaceous and Tertiary play, although the geological features of each were distinctly different. Loligo was drilled in the Tertiary channel play and Stebbing tested the Tertiary fold belt, but both encountered fine-grained and thinly bedded sands. Such thin sands make reservoir evaluation difficult and any subsequent development more challenging. Based on these findings, Borders has chosen to focus for now on its Cretaceous discovery, Darwin, and its portfolio of neighbouring similar prospects. Similarly, while FOGL hopes to identify thicker sands on Loligo once it obtains new 3D seismic there, we expect the company to increase its focus on its Cretaceous prospects in the near term.

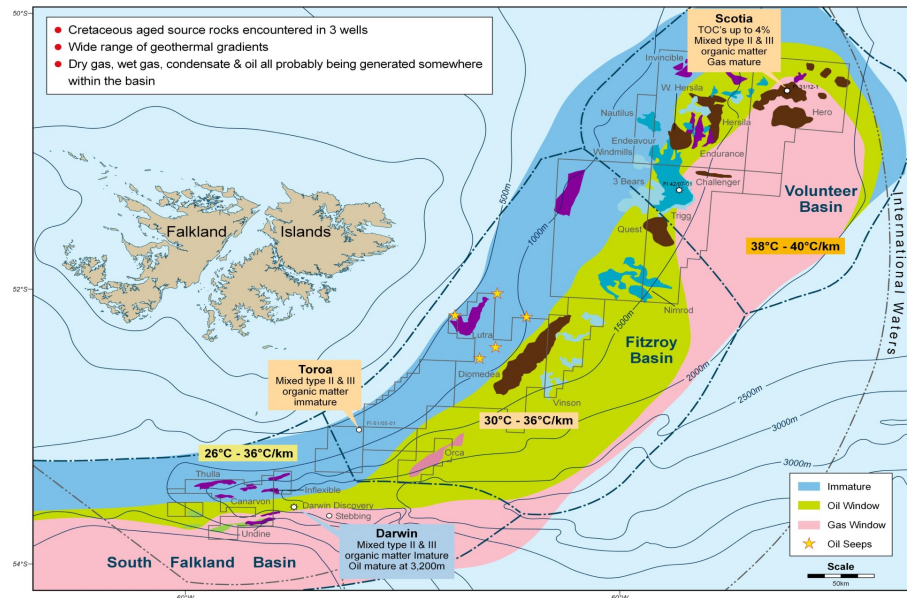
Both Darwin and the 2010 BHP well Toroa have demonstrated that good-quality sands can be present in the Cretaceous, pointing to the potential for the presence of similar Cretaceous sands elsewhere in the basin. However, the sand quality found in Scotia was poor due to low permeability. FOGL now believes this was caused by a significantly higher-than-expected geothermal gradient in the well. The resulting high temperature caused minerals in the rock to go into solution and then be deposited in the pore spaces, thereby reducing permeability.

FOGL partner Noble Energy is known to be particularly keen on the mid-Cretaceous fan plays and in April 2013, a 5,235km<sup>2</sup> 3D seismic survey was completed across FOGL's Cretaceous fan prospect, Diomedea, in its southern area licences. This is a significant survey area size and demonstrates the company's commitment to the prospect and the play. FOGL has yet to finalise its plans for the northern area licence 3D seismic campaign due at the end of 2013, but we expect that Loligo and mid-Cretaceous fan prospect Hersilia will be included.

## **Oil still possible in the south**

With high hopes from investors for a substantial oil discovery in 2012, it is not surprising that the share price of both Borders and FOGL collapsed when it failed to materialise in any of the wells. However, while gas or gas/condensate was encountered in all four wells drilled, it does not necessarily follow that the entire Southern Basin is gas prone. Both companies have been analysing data from the recent campaign to identify oil-prone areas in the basin. Borders carried out geochemical analyses on both the condensate and source rock from Darwin. Source rocks were encountered above and below the reservoir in Darwin, but the analysis shows they did not generate the hydrocarbons in this well. However, mapping these source rocks across the play indicates they are likely to have generated oil elsewhere in the basin. Furthermore, analyses of the gas/condensate samples taken in the well suggest the Darwin hydrocarbons were generated by two separate source rocks, one of which generated oil. Meanwhile, FOGL has analysed source rock data from Loligo, Scotia, and Toroa and used the results to generate a model of the distribution of oil and gas windows across its licences (Exhibit 2). A key finding of the 2012 drilling was that the geothermal gradient appears to vary significantly across the basin and this was fundamental to the new model.

**Exhibit 2: FOGL model distribution of oil and gas windows**



Source: Falkland Oil and Gas

On this basis, it can be seen that there is likely to be oil, gas and gas/condensate prospects across the basin. However, we would caution that, at this stage, FOGL's model is based on only four data points and therefore subject to modification as further data points are gathered once additional wells are drilled in the area. The model shows the green area is most likely to sit within the oil window, with Diomedea now identified as a potential oil prospect. A 3D seismic survey was completed across the area in April 2013, with fast-track results expected by Q313.

## Farm-outs boost confidence in the region

While operational activity focused on the Southern Basin in 2012, there has been no drilling in the North Falkland Basin since the end of 2011 and this is set to continue in the near term, with none of the companies active in this area planning to return with a rig until late-2014. However, Rockhopper successfully farmed down its assets to Premier Oil in 2012, securing funding and ensuring the development of its Sea Lion discovery. Premier clearly has the balance sheet strength to develop the Sea Lion field, and brings an established development team with experience of waxy crude. This makes it a particularly good fit for Rockhopper, and together with the farm-ins of Noble Energy and Edison International Spa to FOGL's blocks in the Southern Basin, is a clear endorsement of the prospectivity of the Falklands.

The entry of these companies into the region also puts to rest previous concerns that political tensions with Argentina might make it difficult to attract larger companies to farm in to the area. Furthermore, the drilling to date has demonstrated that it is possible to carry out operational activities in the Falklands serviced out of Aberdeen and without access to Argentinian ports.

## Way forward to 2014 drilling

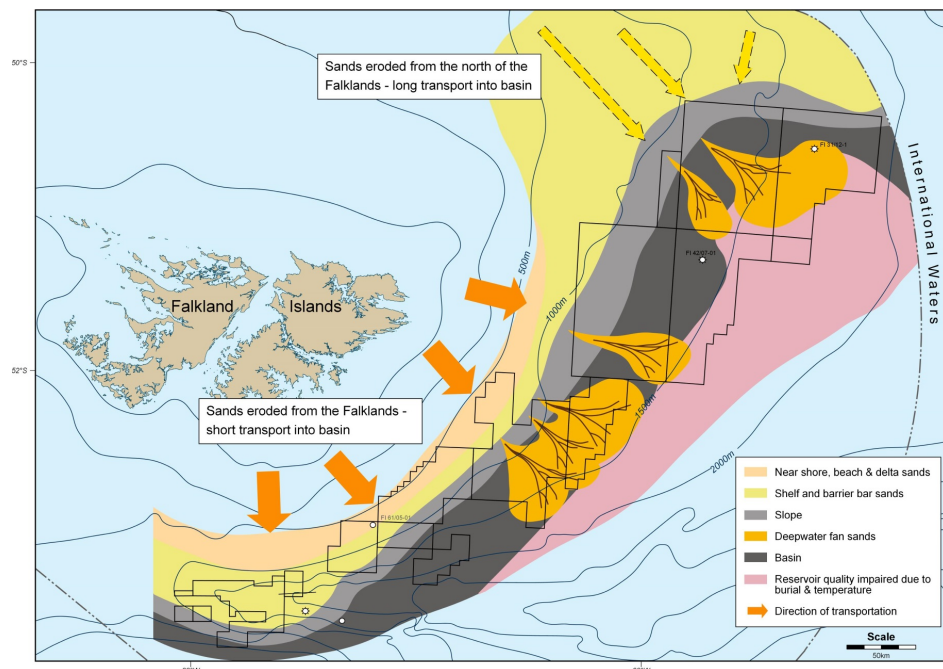
After a particularly busy year in 2012, from both a drilling and corporate structuring perspective, 2013 is proving to be quieter, with most of the focus on either 3D seismic acquisition in the south or pre-development work on Sea Lion in the north. However, all the companies involved in the region hope to participate in the next round of drilling, which is expected to start at the end of 2014.

### FOGL: Intensive seismic campaign in search for oil

Before the start of the drilling campaign, we highlighted FOGL as the most attractive of the Falklands exploration plays, driven by the sheer size of the Loligo prospect. The company subsequently successfully completed farm-outs with Edison and Noble Energy during 2012, thereby mitigating its downside risk and providing financial backup. The deals left FOGL fully funded to drill its two 2012 wells, and with sufficient funds to carry out its seismic acquisition programmes planned for 2013, together with the three to four exploration wells expected in 2014/2015. The involvement of Noble, in particular, brings a company with a history of discovering oil and gas and bringing it onstream within a short timeframe. Noble has also come on board with the clear intention of finding oil in the Falklands.

Although both Loligo and Scotia encountered gas-bearing sands, it was not possible to demonstrate flow potential or commerciality at either well due to the poor quality of the sands. While the company estimates that Loligo contains 50-100 TCF of gas in place, a future well would need to demonstrate commercial rates to determine how much of this would be recoverable. FOGL has updated its sand distribution model to incorporate data from the recent wells, with the resulting map of the Cretaceous reservoir shown in Exhibit 3.

**Exhibit 3: Cretaceous reservoir distribution**



Source: Falkland Oil and Gas

We highlight the pink area shown in Exhibit 3, which is believed to contain high temperature impaired reservoir like that encountered in Scotia. The discovery of a varying geothermal gradient across the basin was a key finding from the well data. This finding has been important in updating the model of the distribution of oil and gas windows (Exhibit 2). FOGL now believes that higher than expected temperatures have resulted in the generation of gas and gas/condensate prospects rather

than oil in certain parts of the basin, but with significant potential for oil still possible in the region. By combining the sand depositional model with the geothermal gradient data, the company hopes to be able to identify good -quality oil-prone sands, while 3D seismic acquisition should allow this model to be further finessed.

FOGL plans to carry out three separate and extensive 3D seismic surveys across its licences in 2013 and 2014. A >5000km<sup>2</sup> survey has recently been completed across the mid-Cretaceous Diomedea area signifying the importance of this prospect, which FOGL now believes could be oil prone. A survey across the northern area licences is planned for Q413. A notional drilling programme is outlined in Exhibit 4, although we expect this will be subject to change depending on the seismic survey results. Work to source a suitable rig has already commenced, with the target to finalise a contract in H213.

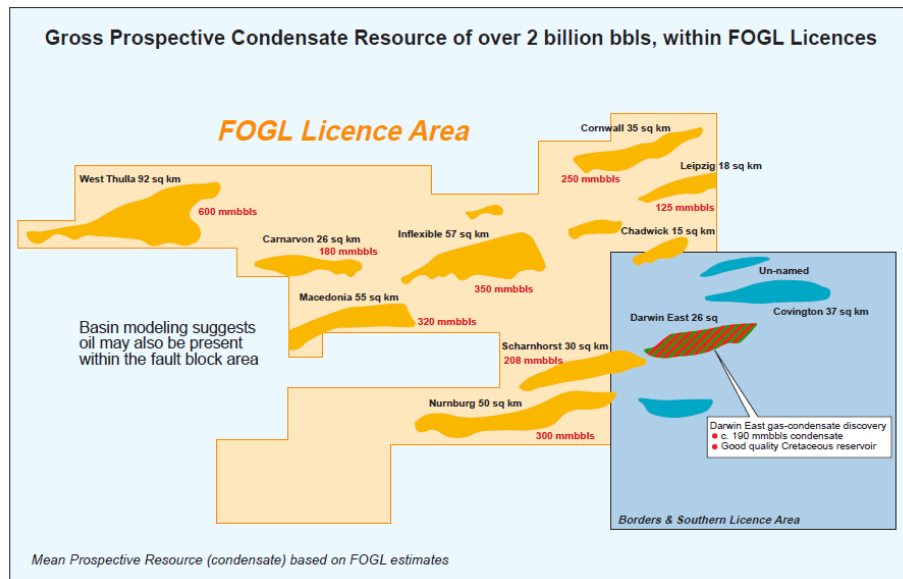
**Exhibit 4: FOGL planned work programme**

	2013				2014				2015			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<b>Diomedea 3D survey</b>												
Acquisition	[Red bar: Q1-2013]											
fast-track results	[Orange bar: Q3-2013]											
Resource assessment	[Green bar: Q4-2013]											
<b>Faultblock 3D survey</b>												
Acquisition	[Red bar: Q2-2013]											
fast-track results	[Orange bar: Q3-2013]											
Resource assessment	[Green bar: Q4-2013]											
<b>Northern Area Hersilia-Loligo 3D survey</b>												
Acquisition	[Red bar: Q3-2014]											
fast-track results	[Orange bar: Q4-2014]											
Resource assessment	[Green bar: Q1-2015]											
<b>2014/15 drilling programme</b>												
Rig contracted	[Blue bar: Q3-2013]											
Notional programme (subject to 3D results)												
well 1: Diomedea Fan Complex	[Orange bar: Q4-2014]											
well 2: Hersilia Fan Complex	[Orange bar: Q1-2015]											
well 3: Nurnberg (Fault block play)	[Orange bar: Q2-2015]											
well 4: Loligo Complex appraisal	[Orange bar: Q3-2015]											

Source: Falkland Oil and Gas

A further 3D seismic campaign for FOGL started in April 2013 and will cover a minimum of 1000km<sup>2</sup> in its southern area licences containing a number of fault block prospects de-risked by Borders' Darwin discovery, including Inflexible, Scharnhorst, Nurnberg and Chadwick. Darwin is estimated to contain between 190-210mmbbls of condensate and encountered good-quality Cretaceous reservoir.

**Exhibit 5: FOGL Fault Block play**



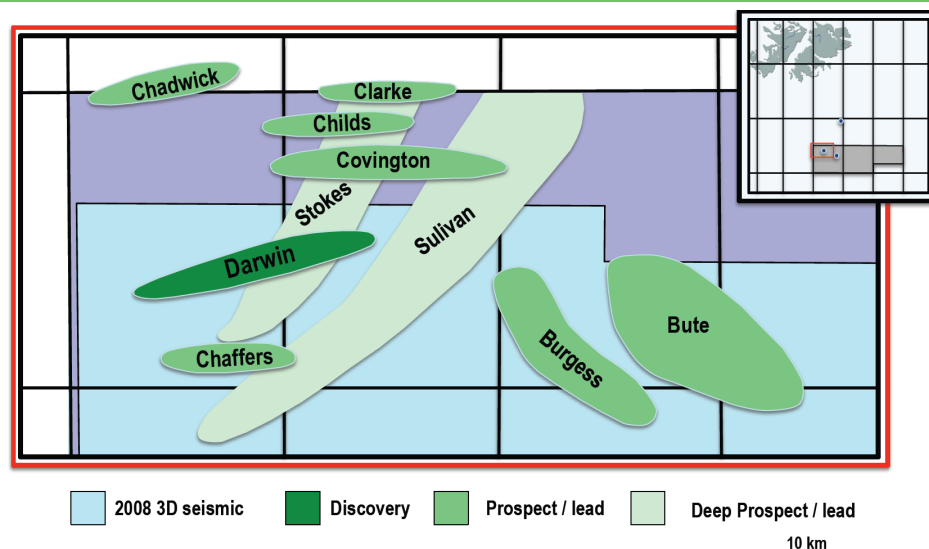
Source: Falkland Oil and Gas

FOGL is currently trading below its cash value of 43p/share and we expect it to stay around the current level until the drill programme is confirmed.

## Borders: Preparing for both exploration and development

With Darwin estimated to contain 190-210mmbbls recoverable condensate, Borders now holds a potentially economic discovery. The company hopes to return to the area with a rig in late-2014 to carry out a programme of two to three Darwin appraisal wells, together with two to three exploration wells at a total estimated cost of \$280-400m, depending on the extent of the programme. With a cash balance of \$56m at the end of 2012, Borders clearly needs to attract a farm-in partner to help fund this programme and has indicated that a data room has been set up for this purpose. This makes sense, as the company would incur in excess of 90% equity dilution if it funded Darwin on a 100% basis from debt and equity.

**Exhibit 6: Borders' early-Cretaceous prospects and leads**



Source: Borders & Southern Petroleum

In preparation for the next exploration programme, a new 1,025km<sup>2</sup> 3D seismic acquisition programme was completed in April 2013, with fast-track results due in around three months. The survey focused on Borders' prospects already identified on 2D to the north of Darwin. These are predominantly low-risk, tilted fault blocks similar to Darwin, where the key uncertainty will be hydrocarbon phase type. Prospects already identified include Chadwick, Childs, Covington, Chaffers, Clarke, Stokes and Sullivan. Additional prospects Burgess and Bute are mid-Cretaceous fans sitting in deeper water and as such are of more moderate risk. Many of these prospects have the potential to be larger than Darwin, as can be seen in Exhibit 6, and all lie within tie-back distance of each Darwin development. We suggest any potential partners will wish to have access to these new 3D seismic results before committing to any farm-in.

## Development plans: Existing technology with added challenges

Borders estimates at this stage that around three appraisal wells will be required to fully appraise Darwin. The field is split into East and West blocks, with the discovery well located in the East, so that the two wells planned for the West block would need to demonstrate that similar hydrocarbon-bearing sands exist in this area of the field. It is currently expected that development will be with 10 sub-sea wells (six producing and four gas injectors) tied back to an FPSO. Each well is planned to contribute 70,000mmscf/d, giving a condensate rate of 9,500bpd per well. Recycled gas will be reinjected to maintain the reservoir pressure above the dew point, ie the point at which liquids

condense in the reservoir. This technique is recognised in the industry as the method to maximise condensate recovery from a gas/condensate reservoir. The development is expected to be of similar scope and design to Noble Energy's Alen field offshore Equatorial Guinea, which is due onstream at the end of 2013 and utilises an FPSO to export the gas condensate. However, it should be noted that the Alen field sits in 73m of water, while the water depth at Darwin is significantly deeper, at 2111m. The Darwin development will therefore utilise existing technology and designs for developing gas condensate fields, but applied in a relatively harsh environment with a lack of local infrastructure. A screening feasibility study undertaken for Borders by E & P in Q412 acknowledged these issues, while concluding that such a development would still be technically viable.

A successful development is therefore feasible, but will depend on all elements, from appraisal through to development, coming together according to plan. If Borders can secure a farm-in partner with a significant field development pedigree, such as achieved by Rockhopper in its Sea Lion farm-out to Premier and by FOGL with Noble, it would go some way to convincing investors that the development can succeed.

Turning to valuations, Borders is currently trading at around 18p/share, some 70% below the level it was trading at before the Stebbing well results were announced. However, this is still some way above its cash value of 7p/share. At this share price, the market is risk averse in valuing Darwin at around \$0.4/boe (based on a resource estimate of 210mmbbl). In reality, the discount probably indicates that the market is looking for greater certainty in the funding of the company's forward programme, and we would argue that this market discount is overly conservative.

Based on our current economic model for Darwin, we estimate that investors are ascribing a chance of success (CoS) to a farm-out deal under favourable terms of around 11-13%. While a successful farm-out cannot be guaranteed, we expect the CoS applied should be higher than this. A wide range of valuations among analysts broadly supports this view, with around two-thirds pointing to Borders securing a partner and unlocking value for Darwin.

## **Rockhopper:Sea Lion funded; Premier brings development clout**

At the start of 2012, we highlighted Rockhopper as offering upside with low technical and development risk from the development of Sea Lion. Having completed the appraisal of Sea Lion and opened a data room by the end of 2011, the company entered 2012 looking for a partner to help fund the field development. The farm-down of 60% to Premier Oil, when it came in July 2012, was generally seen as undervaluing the company at around \$5/bbl. However, the upfront cash payment of \$231m, a development carry of \$722m and a standby financing arrangement from Premier to cover any additional development capex, means Rockhopper is fully financed for the Sea Lion field. Development costs to first oil in 2017 are estimated to be \$3bn. We do not envisage further catalysts in the near term, although the company plans to return to the area to drill a minimum of three exploration/appraisal wells in late-2014. We expect that development drilling will follow on from the exploration programme using the same rig, hence most likely to commence in 2015.

Sea Lion brings around 200mmbbl net 2C resources to Premier Oil, which accounts for a material 28% of the company's combined 2P reserves and 2C resources. As such, the successful development of Sea Lion is of significant importance to the company and we expect it will bring its operational and development capabilities to bear in ensuring the target first oil date of 2017 is met. Premier has brought an experienced development team fresh from major development projects in Vietnam and Indonesia to work on Sea Lion. Its Chim Sao field in Vietnam contains waxy crude, so we expect the experience gained there will be used to plan the handling of the waxy crude found in Sea Lion.



## Desire Petroleum: Funding commitments in PL004b

Having farmed out two areas of its PL004 licence to Rockhopper in 2011, Desire has 40% of the Sea Lion extension and the Casper, Casper South and Beverley discoveries that are contained within PL004b. In November 2012, the company released an updated CPR highlighting an increased prospect inventory of 41 oil prospects and four gas prospects. With acreage in the East Flank fairway and to the south of Sea Lion, the portfolio here has been de-risked by drilling success at Sea Lion, which is reflected in almost a quarter of the prospects having a geological CoS of at least 30%. The company has now relinquished its southern licences to concentrate on these de-risked prospects in its northern licences. However, at end-2012, the company held cash of \$10.5m and cannot fund any further drilling in the area. It plans to fund future activity through a farm-out and this process has already commenced, with a data room opened in February 2013. Desire will need to fund its share of future partner activity in PL004b, which could include exploration wells at Zebedee and George in late-2014; we estimate this would cost Desire around \$36m net. In addition, the company will be liable for its share of the Sea Lion development costs, with the development currently estimated to be \$3bn to first oil. Unitisation talks have yet to commence with operator Premier but are likely to take place sometime after mid-2013. However, we highlight that any agreed share will evolve as further data are gathered through appraisal drilling. The company also hopes to drill on its high-graded prospects. The most likely candidates for this are the Jayne well, targeting six separate reservoirs and gross prospective resources of 405MMSTB, and the Isobel well with three separate reservoirs and gross prospective resources of 281MMSTB. However, at present, we expect that any funds raised will have to be prioritised towards the company's commitments in PL004b.

## Argos Resources: Still to drill a well

Argos has yet to drill on its acreage to the west of Sea Lion. The company is in the process of interpreting the final processed version of its 2011 3D seismic campaign, with the fast-track data incorporated in its CPR of October 2011. An updated CPR to verify a further increase in mapped prospectivity based on the final processed data will be available in Q213. In April 2013, the company received an extension on the terms of its licence to 25 November 2016, with a commitment to drill one exploration well by this date. Argos continues to look for an industry partner and until this occurs, we do not expect any catalysts from the company.

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