# 1 Summary

Senergy was requested to provide an assessment of a portfolio of exploration assets in the North Falkland Basin (Figures 1.1 & 1.2), in which Desire Petroleum plc holds licence interests (Table 1.1). The technically recoverable prospective resource volumes presented in this report are based on a review of the interpretations by others conducted on the assets. These interpretations have been prepared for Desire Petroleum by 2 main consultancy companies, namely RPS and PGL (now part of Senergy). In preparing this report Senergy has not performed its own interpretation of raw data, but as part of this review has prepared independent calculations of in-place and potentially recoverable hydrocarbon resource volumes.

## 1.1 Regional Context

A summary of the regional setting and petroleum system in the North Falkland Basin is reproduced below and in more detail in Section 3, in order to give the reader a context in which to understand the prospect specific work which is the subject of this report (Sections 4 to 14**)**, and to understand how the regional work has influenced the prospect risk assessments, particularly with respect to reservoir and hydrocarbon charge risk quantification. A critical assessment of the regional data has not formed part of the work undertaken by Senergy in preparing this report. In this regard we used the published work of the British Gelogical Survey (BGS), Shell and the United States Geological Survey (USGS). We have also had access to petroleum system work undertaken on behalf of Desire Petroleum by PGL/Senergy.

The North Falkland Basin formed in the Late Jurassic to Early Cretaceous as a continental rift associated with the opening of the South Atlantic, and contains a thick Tertiary and Cretaceous sequence which overlies probable Jurassic and older sediments (Figures 1.3 & 1.4).

A world class Lower Cretaceous lacustrine shale, oil-prone source rock has been proven in the northern part of the basin (Figure 1.5). Data from previous drilling suggest that the source rocks are immature within the upper part of the Lower Cretaceous section and pass through the peak oil window and into the gas mature window in the lower parts of the sequence. In addition a deeper oil and gas-prone source interval was encountered in the gas window in one of the wells drilled in 1998.

Reservoir quality sandstones are proven in the Lower Cretaceous (Aptian) and are predicted to be present based on compelling seismic and geological model evidence in the Lower Cretaceous (Barremian) and Jurassic sequences. Depositional environments range from fluvio-deltaic and alluvial fan to lacustrine fan sandstones for these primary reservoir targets in the basin.

The 6 wells drilled to date were all completed as part of a single drilling campaign in 1998. Apart from confirming the presence of mature oil and gas source rock, five of these wells encountered oil shows and well 14/5-1 is reported to have discovered a potentially significant gas accumulation.

There are still considerable uncertainties inherent in the interpretation of this under-explored basin, especially concerning the extent of the source rock intevals which could extend further south than currently mapped. Furthermore, the most likely hydrocarbon phase in the southern area is unknown and could be oil or gas. On balance an oil phase is considered to be more likely and all volumes have been calculated for a single phase liquid, although it is recognised that this is likely to be a simplification.

The Desire Petroleum portfolio of high graded prospects in the North Falkland Basin belong to a variety of “play categories” which have aspects of trap type, reservoir target and hydrocarbon charge mechanism shared in common (Figures 1.3 & 1.4). Success in one prospect in a play would probably significantly reduce the risk of other prospects in that play type. Most of the 14 play types recognised in the basin have not been previously tested.

## 1.2 Prospects & Net Prospective Resources

The assets reviewed include exploration prospects and leads located in the North Falkland Basin (Figure 1.2). Senergy was requested to review the high graded prospects in detail and has briefly considered the potential of the other leads and prospects:

- **High Graded Prospects**: there are 10 undrilled exploration prospects namely Ann, Liz, Alpha, Ninky, Dawn, Jacinta, Rachel, Helen, Beth, Pam.

- **Other Prospects and Leads**: there are numerous other prospects and leads including Anna, Ruth, Kate, Jan and Barbara at various stages of evaluation and which could become drillable prospects in the event of success in the first drilling campaign.

The un-risked potentially recoverable prospective resource volumes net to Desire Petroleum as of 1 January 2009, together with the estimated geological chance of success (COS), are summarised in the table below.

| High Graded Prospects: Un-risked Prospective Recoverable Resources | | | | | |
|---|---|---|---|---|---|
| | Net to Desire Petroleum (MMbo) | | | | Risk Factor or COS* |
| | P90 | P50 | P10 | Mean | |
| Ann | 17 | 70 | 177 | 89 | 18% |
| | 9 | 26 | 67 | 34 | 11% |
| Alpha | 89 | 331 | 1070 | 489 | 6% |
| Liz | 45 | 260 | 783 | 362 | 17% |
| Dawn | 30 | 97 | 253 | 124 | 8% |
| Jacinta | 60 | 437 | 1931 | 797 | 6% |
| Helen | 14 | 44 | 116 | 57 | 9% |
| | 45 | 176 | 591 | 258 | 11% |
| Rachel | 38 | 230 | 630 | 294 | 15% |
| Beth | 38 | 166 | 495 | 227 | 9% |
| Ninky | 7 | 21 | 57 | 29 | 27% |
| | 7 | 21 | 57 | 29 | 27% |
| | 8 | 22 | 56 | 28 | 27% |
| | 8 | 22 | 56 | 28 | 27% |
| Pam | 18 | 56 | 151 | 73 | 11% |
| | 20 | 68 | 180 | 88 | 11% |
| **Resource Totals**** | **455** | **2050** | **6671** | **3004** | |

* Risk Factor or COS is the chance to find the P90 volume

** Totals do not take account of prospect dependencies and have been arithmetically added

The resources are reported in accordance with the 2007 Petroleum Resources Management System prepared by the Oil and Gas Reserves Committee of the Society of Petroleum Engineers (SPE) and reviewed and jointly sponsored by the World Petroleum Council (WPC), the American Association of Petroleum Geologists (AAPG) and the Society of Petroleum Evaluation Engineers (SPEE).

The recoverable volumes reported in this summary table are net to Desire Petroleum and reflect the potential volume within the licence. The gross resource and STOIIP[1] volumes for each opportunity are provided in the individual prospect descriptions (Sections 4 to 14) and in Tables 1.2 & 1.3.

Several of the high graded prospects possess elements of trap, reservoir or charge that impact on the potential of other prospects. The hydrocarbon charge model for the Alpha prospect requires the trap model for Jacinta to fail. Conversely, success in Jacinta would imply the lack of a charge for Alpha. The Pam prospect sealing fault also needs to be the migration conduit for Ann. The top seal for Beth could be compromised by the reservoir development in Liz prospect. These and other dependencies are discussed in more detail in the prospect description sections of this report.

## 1.3 Forward Drilling Plans

Desire Petroleum has informed us that advanced planning is in progress for a multi-well drilling programme to commence in the first quarter of 2010.

With the exception of Pam and Helen the high graded prospects have site surveys and are all candidates for the first drilling phase. There are several opportunities to test more than one prospect with a single exploration well; a well on Dawn would also test Jacinta; a Liz test will be deepened to tag the Beth reservoir target; the Ann, Helen and Ninky prospects all have more than one reservoir objective.

## 1.4 Scoping Economic Evaluation: Oil Case

A scoping economic evaluation was undertaken for a non specific oil field in the North Falkland Basin. A single stand-alone FPSO development with water injection was assessed for 3 conceptual recoverable resource sizes of approximately 50 MMbo, 150 MMbo and 400 MMbo. The export scenario envisages that oil would be transported via dynamically positioned (DP) shuttle tanker to the Argentinean terminals of Caleta or Comodoro Rivadavia. Tanker capacity was assumed to be 30,000 tonnes with a round trip time of 6 days.

The development cost estimates (Figure 1.6) were based on well cost information provided by Desire Petroleum and a development study conducted in 2008 by an independent consultant, Barrett. These costs are 2009 cost estimates escalated at 5% per annum and are only suitable for scoping economics. It was not part of the scope of this study to review these costs in detail.

[1] STOIIP is a volumetric estimate of stock tank oil initially in place in the reservoir. A notional recovery factor is applied to this in order to generate an estimate of the potentially recoverable prospective resource volume

In each case an exploration well and 4 delineation wells were assumed to be sufficient to confirm the field. Production wells were assumed to be horizontal completions, which initially flow at 7,000 bopd each. Consequently plateau production of 28,000 bopd (4 production wells for the 50 MMbo case), 70,000 bopd (10 production wells for the 150 MMbo case) and 140,000 bopd (20 production wells for the 400 MMbo case) were used as input to the economic model with plateau production for 2, 3 and 5 years respectively, declining at 25% per annum thereafter (Figure 1.7).

The economic results for 3 oil price scenarios of $50/bbl, $75/bbl and $100/bbl are summarised below:

| Oil Price Scenario | Case 1: 50 MMbo NPV @ 10% ($MM) | Case 2: 150 MMbo NPV @ 10% ($MM) | Case 3: 400 MMbo NPV @ 10% ($MM) |
|---|---|---|---|
| $50/bbl | **-86** | 802 | 3255 |
| $75/bbl | 296 | 1990 | 6202 |
| $100/bbl | 704 | 3170 | 9142 |

All scenarios assessed are potentially economically viable except for the low resource case of 50 MMbo at the low oil price scenario. A minimum economic field size for the low oil price is about 56 MMbo.

A sensitivity analysis for Case 2 (150 MMbo resources) at the base oil price scenario of $75/bbl (Figure 1.8) unsurprisingly indicates that the principal uncertainties affecting the economics are the resource size and the oil price.

It is assumed that if a licence is required to be extended that this will be granted by the relevant authorities. The applicable tax regimes for the Falkland Islands and Desire Petroleum have been used, although tax balances, tax synergies and CO2 tax have not been applied.

## 1.5 Methodology used in the Resource & Risk Assessment

The specific Senergy method used for calculating prospective resources is based on good industry practice (see Figure 1.9), but it should be emphasised that there is no single universally accepted method in use within the industry. The quoted P90, P50, P10 and Mean volumes are derived from probabilistic estimates generated using a ”Monte Carlo” statistical approach. A prospective resource size distribution is determined by the parameter input size ranges and their nature (eg whether normal, lognormal or other). The size of the distribution is particularly sensitive to the choice of “end member” P90 and P10 (i.e. 90% and 10% probability) input parameters especially for the key inputs of assumed hydrocarbon contact depth, reservoir thickness and recovery factor.

Senergy has estimated the geological COS for all prospects using a standard methodology which is based on the principle that an exploration prospect requires the 3 components of trap, reservoir and hydrocarbon charge to be present and effective. Risk values are assigned to each of these elements and these are multiplied together to give an overall COS. The risk assessment is related to the P90 inputs to the resource calculations (Figure 1.9). The assessment of COS has considered the risk of encountering large resource volumes, with associated high values for the critical P90 inputs i.e the low end of the resource distribution range has not been considered. This methodology relates COS to the input parameters associated with a specified volume, not just to the ability of the well to flow hydrocarbons to surface.

In some instances the geological chance of success has been modified by applying a “seismic modifier” factor to the geological risk assessment to take account of the results of special seismic processing and analysis.

The volumetric calculation parameter inputs for all prospects are summarised in Appendix 1.