QGC
A BG Group business

PINELANDS 2012: 2D Seismic Survey
Interpretation Report

13 December 2013

PINELANDS PROJECT

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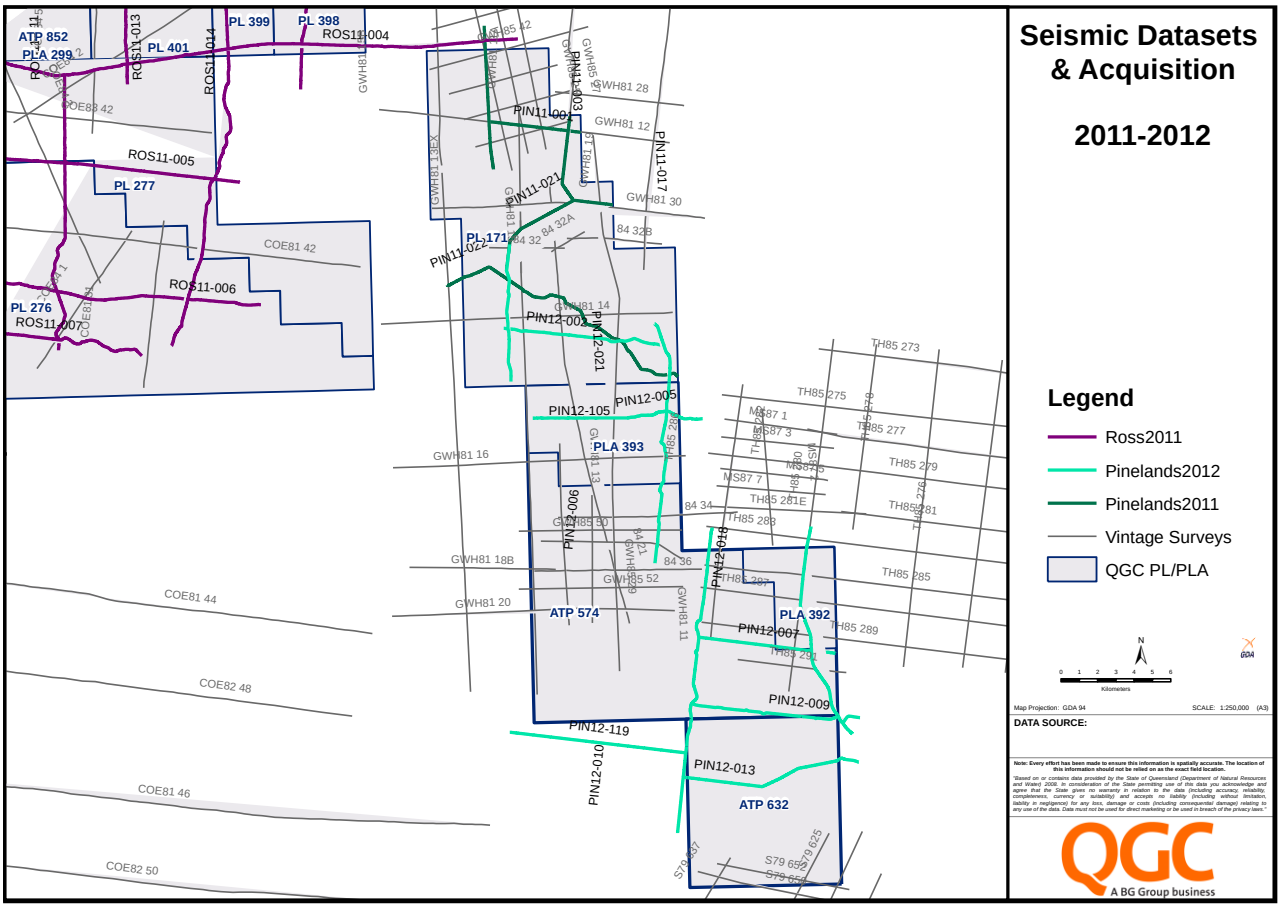
1.0 INTRODUCTION

1.1 Scope of Seismic Survey and Interpretation

The Pinelands 2012 survey and associated interpretation area is approximately 20km x 32km and located between Miles and Wandoan. The Pinelands 2012 seismic survey was acquired within ATP 574 (QGC 37.625%, BGI 28%, Senex Energy 30%, CNOOC 3.5%, Tokyo Gas 0.875%), ATP 632 (QGC 63.75%, BGI 30%, CNOOC 5%, Tokyo Gas 1.25%) and PL171 (Roma Petroleum 80%, Victoria Petroleum 20%). QGC are the operator in all these tenements.

The Pinelands 2012 survey ties to existing surveys carried out in this area, principally Pinelands 2011 (PIN11), Surat Basin 1978 (SB78), Tin Hut (TH85), Wandoan (84), and Wandoan and Conloi (GWH81). Figure 1.1 shows the new survey in relation to vintage surveys in the area. The Pinelands 2012 survey was acquired as an extension to Pinelands 2011, which was also acquired for QGC. It is suggested that this report is read in conjunction with the Ross-Pinelands 2011 seismic report which includes the Ross 2011 survey to the immediate west and northwest of Pinelands 2011.

Figure 1.1: Map showing the location of the Pinelands survey and vintage surveys.



1.2 Survey Objectives

The objective of the surveys is to deliver a continuous and high quality seismic dataset throughout the Surat Basin tenements within the QGC coal seam gas Central and Southern Development Areas. To define, at a minimum, the gross horizons that characterise the Walloon coal measures including:

- Near top and bottom reflectors and time thickness,
- The structural configuration of the Walloon Subgroup reservoir unit, and
- Any structural trends within basement that affect the deliverability of gas from the reservoir.

Secondary objectives include:

- More detailed intra-Walloon interpretation, including coal and other facies with intra-Walloon reflectors and attribute analysis,
- Resolving surrounding aquifers for input into the reservoir model and water models,
- Investigating potential effects of dewatering and gas saturation of the coal fracture systems, and
- Mapping potential conventional reservoirs in each area.

The anticipated benefits of the seismic include:

- Assessing the impact of faulting on reserves, connectivity and production from the Walloon coals,
- Better understanding of the production trends in mature areas,
- Better understanding of the interaction and relationship between the Walloon coal measures and surrounding aquifers,
- Improved direction and optimisation of routine exploration and appraisal work,
- Developing improved depth/structure maps by time to depth conversion,
- Well planning, depth prognosis and risk assessments, and
- For hydraulic-fracture risk assessments

1.3 Survey Details

The program was carried out over 17 days out between 19 October 2012 and 12 December 2012. QGC contracted GeoKinetics to acquire the seismic data. The program covered a total of 111.83 km (recoding length) with 9521 VPs. Table 1 shows the final line statistics and dates for the surveys.

A full field operations report is attached in Appendix A.

Table 1: Pinelands 2012: Final survey statistics

Line	Start Date	Finish Date	Recording Length (Total: 111.83 km)
PIN12-013	19/10/2012	19/10/2012	9.99 km
PIN12-119	20/10/2012	21/10/2012	9.71 km
PIN12-018	21/10/2012	23/10/2012	12.16 km
PIN12-010	23/10/2012	25/10/2011	17.22 km
PIN12-007	26/10/2012	27/10/2012	7.54 km
PIN12-005E	27/10/2012	28/10/2012	4.32 km
PIN12-005W	11/12/2012	12/12/2012	10.95 km
PIN12-006	29/10/2012	1/11/2012	13.63 km
PIN12-009	8/12/2012	9/12/2012	9.72 km
PIN12-002	10/12/2012	10/12/2012	8.97 km
PIN12-021	11/12/2012	12/12/2012	7.62 km

1.4 Data Processing

All newly acquired data is put through a full pre-stack processing sequence that focuses on increasing the signal to noise ratio and preserving the acquired frequency bandwidth of the data so that resolution of the target horizons and associated faulting is optimum. These surveys were processed in a consistent manner with the nearby Ross and Pinelands 2011 surveys. The processing report compiled by CGGVeritas is attached in Appendix B.

1.5 Geological Summary of the Survey Area

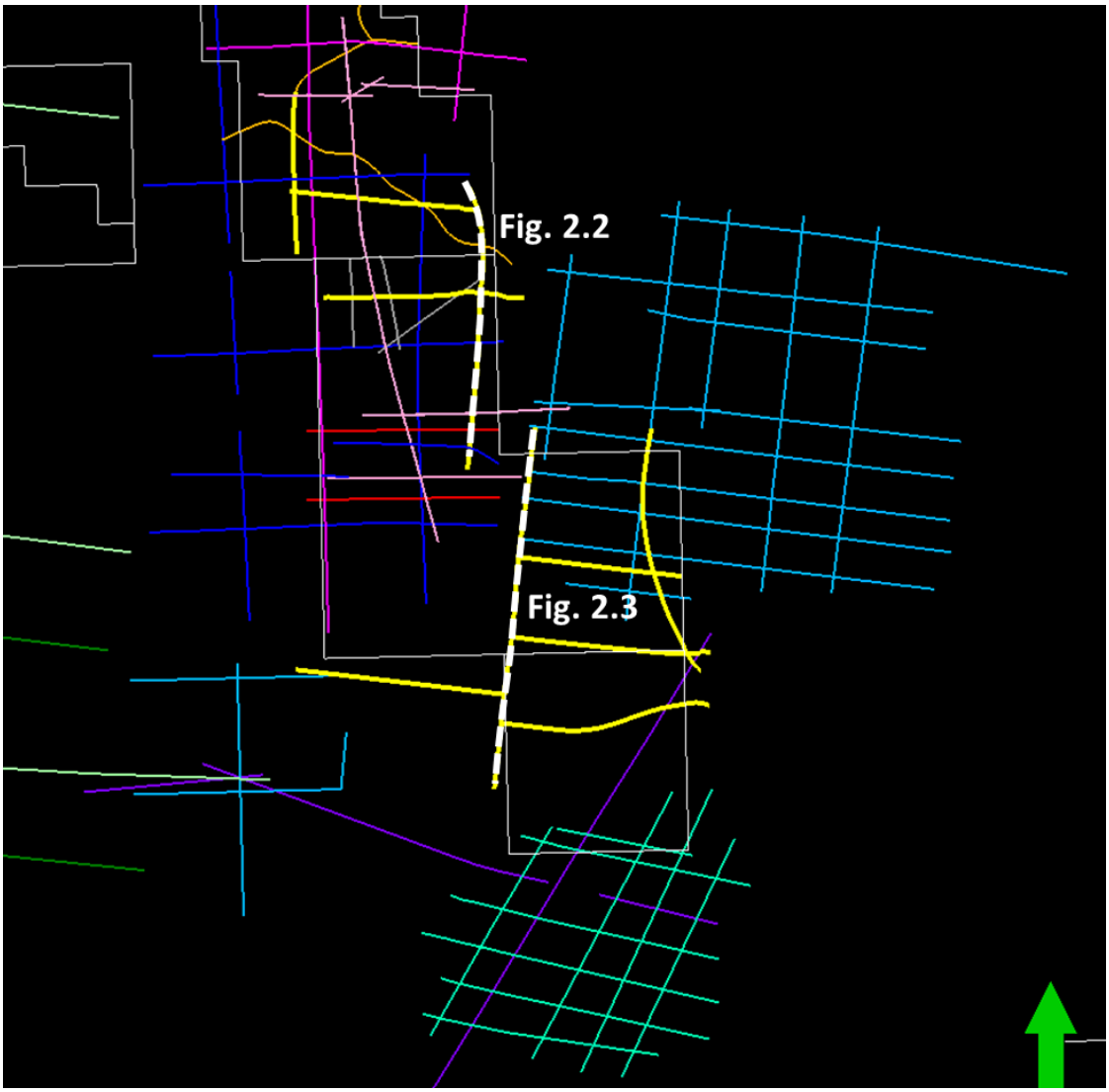
The Pinelands 2012 survey area is located on the shallowing north-eastern margin of the Surat Basin. To the northeast of the survey area the Walloon Subgroup outcrops as a result of Late Cretaceous–Tertiary tilting. The Jurassic is relative unstructured with a subtle anticline and syncline pair, trending NNE-SSW, passing through the Pinelands 2012 survey area. Beneath the base Jurassic uncomformity there is a thick succession of Permo-Triassic sediments that also dip to the south-west. Throughout this area, favourable permeability has been encountered in the coals of the Walloon subgroup.

2.0 INTERPRETATION

2.1 Introduction

The Pinelands 2012 survey intersects with lines from seven existing surveys: Pinelands 2011 (PIN11), Surat Basin 1978 (SB78), Tin Hut (TH85), Wandoan81, Wandoan84, V02 and Conloi (GWH81). The structural interpretation in this report incorporates these plus all the surveys in the vicinity of the Ross (ROS11) survey.

Figure 2.1: Pinelands area seismic base map. Surveys in the area are shown in different colours. Pinelands 2012 – yellow; Pinelands 2011 – orange; Conloi 81 – dark blue; Conloi 85 – red; Wandoan 81 – dark pink; Wandoan 84 – light pink; Tin Hut – light blue; Woleebee 81 – light green; Woleebee 82 – dark green; Surat Basin 1978 – purple; Surat Basin 1979 – Turquoise; V02 – grey. QGC ATP boundaries are shown in white. Seismic lines shown in Figures 2.2 and 2.3 are indicated by dotted white lines.



2.2 Well Ties

Integration of the processed seismic data pack with the recorded zero-offset VSP's is important to ensure mapping of the correct top and base coal events and surrounding aquifers. The petroleum well Pineview 1 has a VSP and is located within the survey area, although it is not located on a Pinelands 2012 seismic line. Velocity control is also provided by the QGC wells Woleebee Creek GW4 and Kathleen 20M which have VSPs and are located on nearby Ross 2011 seismic lines. The Ross survey is tied to Pinelands 2012 via the Pinlands 2011 survey.

Well ties have indicated that the processed seismic is reverse SEG polarity (increase in acoustic impedance is a trough). Individual coal seams in the Walloon subgroup are not individually resolved on surface seismic data, however intervals with high net coal result in strong seismic amplitudes. The high density of Walloon subgroup wells over the survey area has been used to inform the seismic interpretation. The Top Walloon reflection is typically a soft kick (peak), however where the first coal is thin and the base springbok sand is well developed it can be a hard kick (trough).

2.3 Faulting

Faulting in the Walloon subgroup is primarily normal faulting, however a small number of thin-skinned thrusts can be tentatively interpreted. Some of the normal faults show signs of having been reactivated, although reactivation is far less pronounced than in further south in the Surat basin. This is thought to be due to the thicker Permo-Triassic section in this area which has buffered the overlying Jurassic section from the reactivation of basement structures.

The majority of fault observed have throws of less than 50m and can therefore be expected to have lengths of a couple of kilometres or less. Consequently most faults are not observed on more than one seismic line, resulting in a high degree of uncertainty regarding their actual lengths and orientations. Although seismically small, throws up to 50m are considered relatively significant for the Walloon Subgroup; given the thinly layered stratigraphy there is considerable potential for baffles and barriers to production flow.

Figures 2.2 and 2.3 show two example seismic sections, the locations of which are indicated in Figure 2.1. A number of faults with small throws can be interpreted on the northern line (Figure 2.2) while no faulting is visible on the southern line (Figure 2.3). The latter section also shows the thick Permo-Triassic section that unconformably underlies the Jurassic and dips to the south-west.

Figure 2.2: PIN12-006: Northern S-N line. Seismic horizons shown are Top Walloon (blue), Base Taroom (orange), Top Evergreen (green) and Base Jurassic (purple).

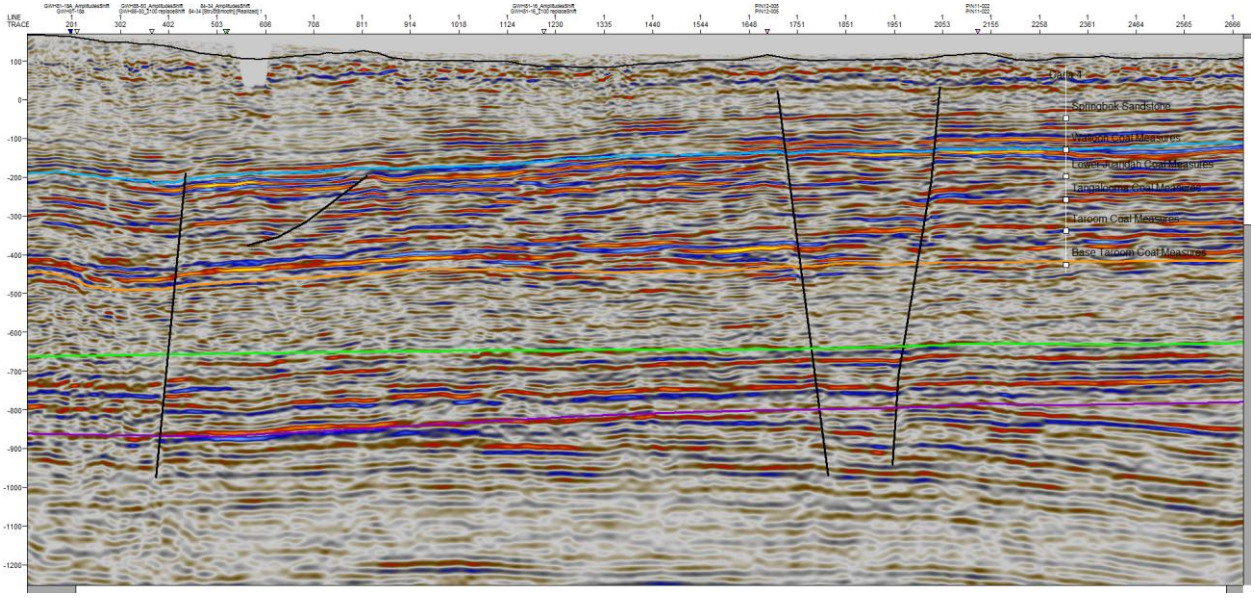
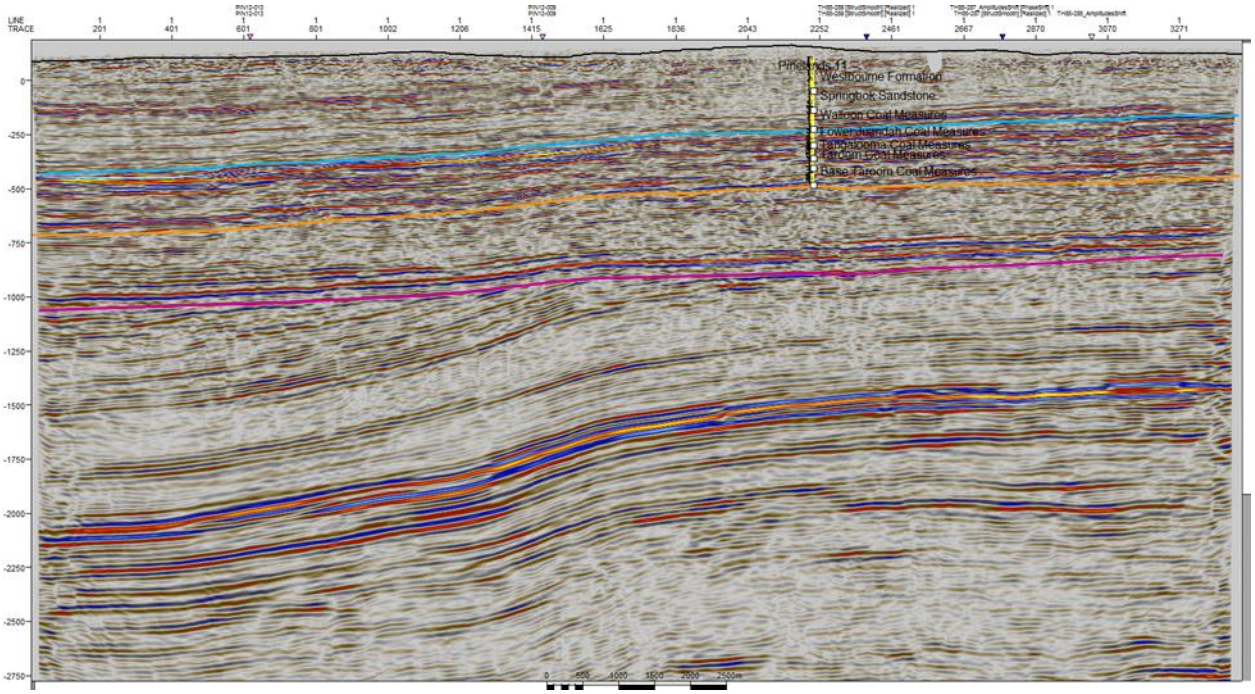


Figure 2.3: PIN12-010: Southern S-N line. Seismic horizons shown are Top Walloon (blue), Base Taroom (orange) and Base Jurassic (purple).



3.0 MAPPING

3.1 Time to Depth Conversion

A 3D velocity model has been built for the purpose of depth converting TWT surfaces for the purpose of building a 3D static reservoir model for reserves, connectivity and production forecasts. A two layer V0-K velocity model was build, using a fixed K (velocity-depth gradient) based on checkshot data, and smooth V0 surfaces based on fitting the well tops in the area.

3.2 Depth Maps

Figures 3.1 and 3.2 show depth maps of the Top Walloon and Base Taroom, relative to mean sea level (mSL)/Australian Height Datum (AHD). The Pinelands 2012 survey is included within the south-east quadrant of the maps. The Walloon subgroup interpretation from the Pinelands 2011 survey and part of the Ross survey area have been included in the depth maps to provide increased structural context. Figure 3.3 shows an uneroded isopach map for the Top Walloon to base Taroom interval, constrained using well data.

Figure 3.1: Top Walloon Depth Map. Pinelands 2012 shown in blue. Dots indicate the location of well tops using to constrain the depth map.

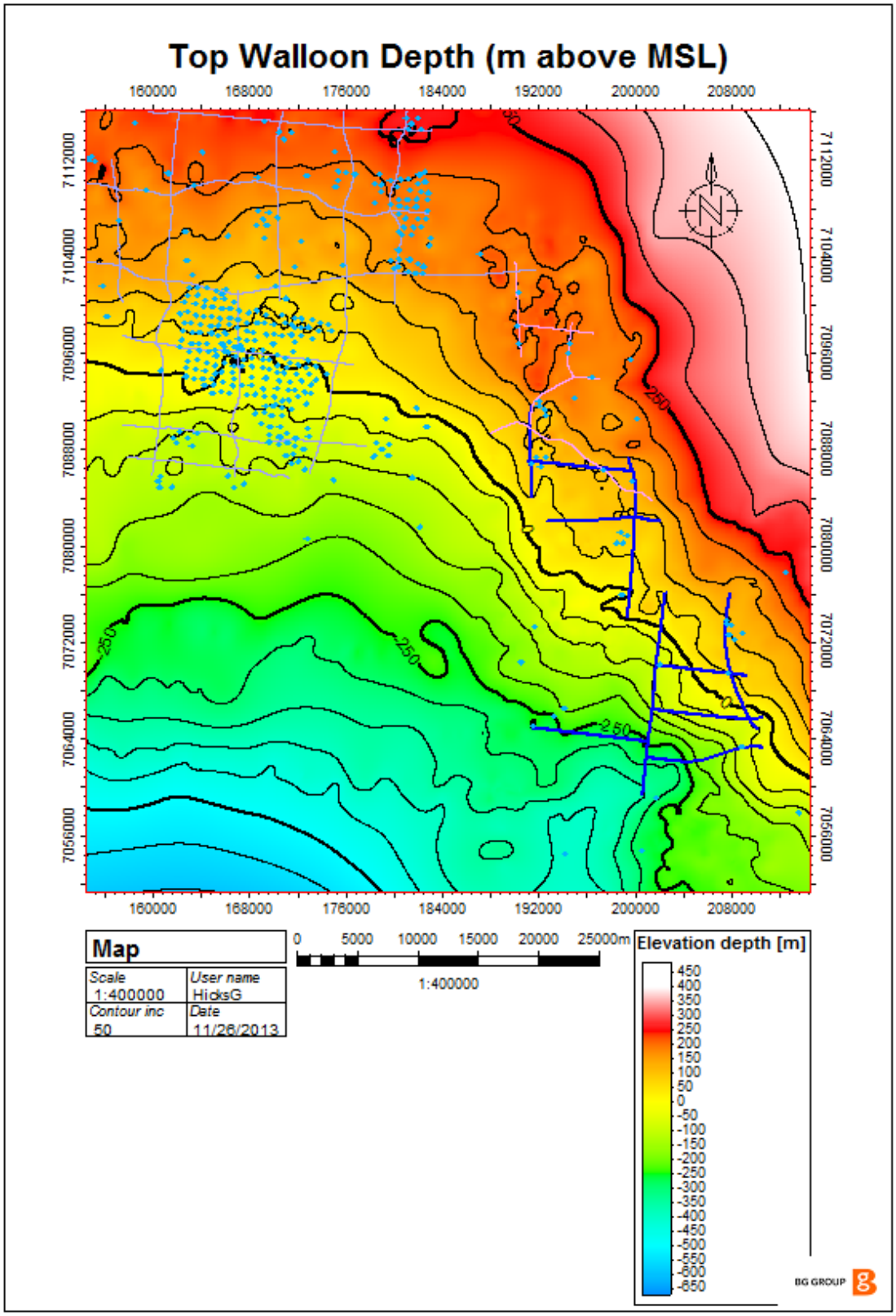


Figure 3.2: Base Taroom Depth Map. Pinelands 2012 shown in blue. Dots indicate the location of well tops using to constrain the depth map.

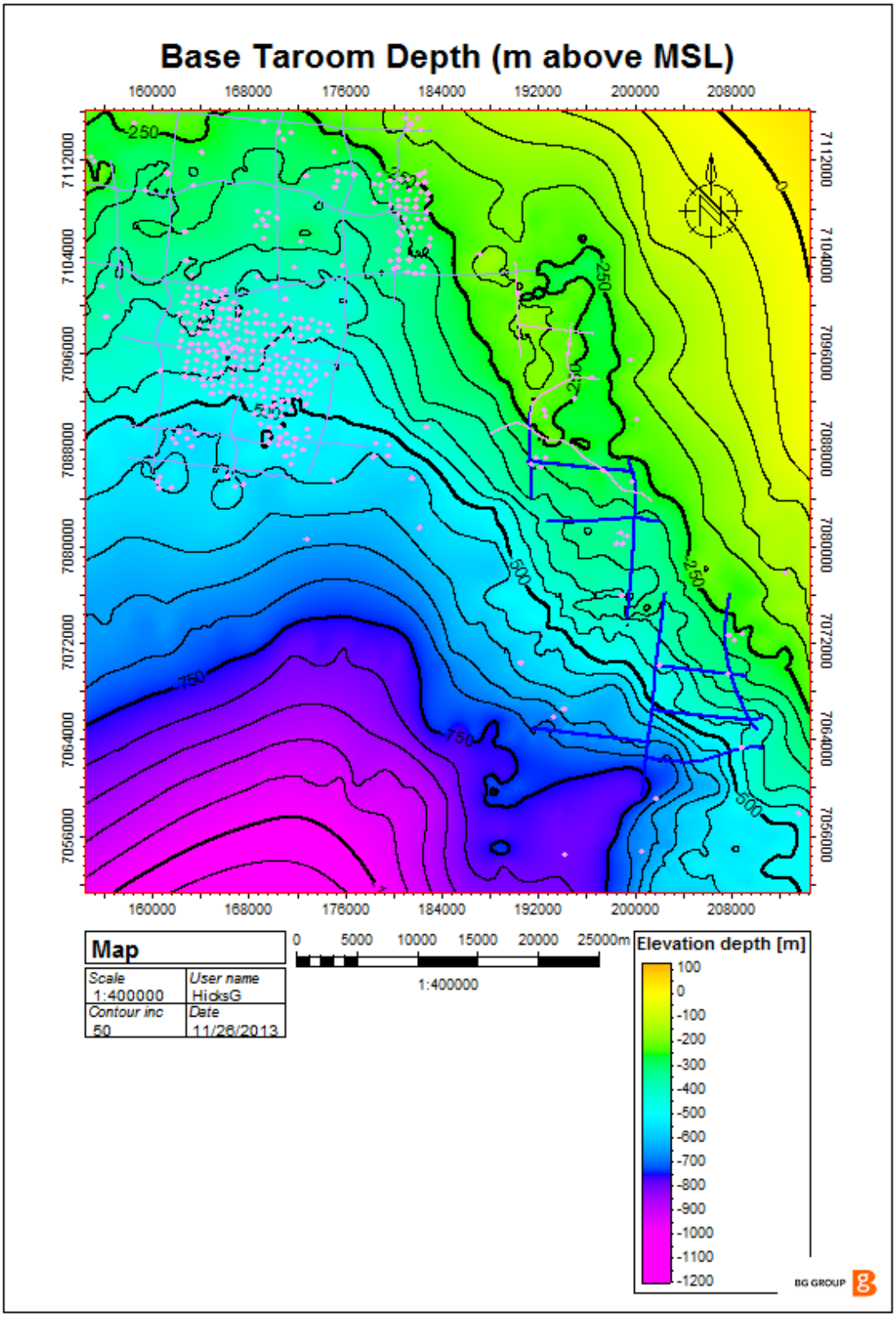
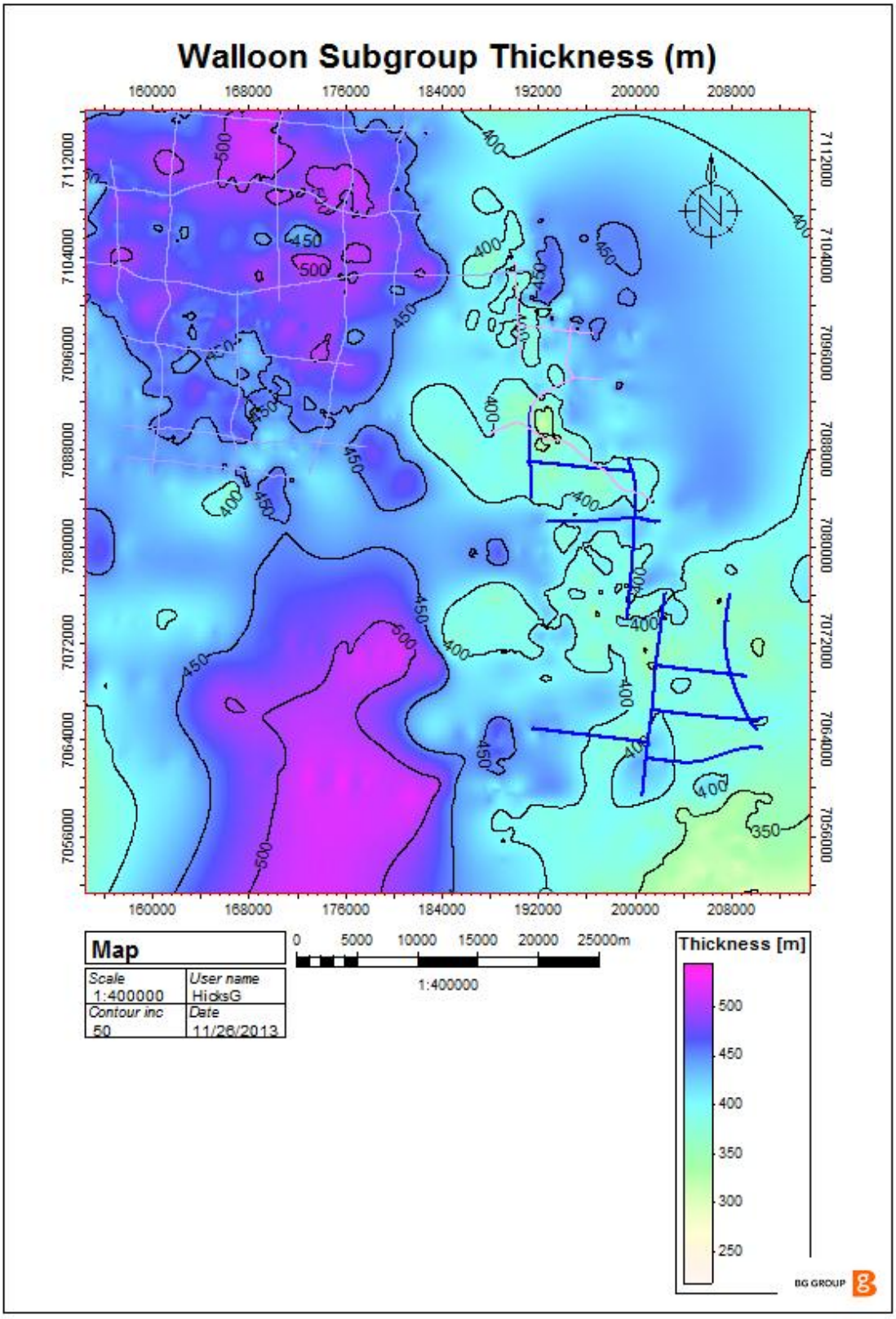


Figure 3.3: Walloon Subgroup thickness map. Pinelands 2012 shown in blue.



APPENDIX A1 – PINELANDS 2012 FIELD OPERATIONS REPORT (QGC)

APPENDIX A2 – 2012 BELLEVUE-PINELANDS-JEN&ARGYLE: FINAL REPORT (GEOKINETICS)

APPENDIX B – PINELANDS 2012: FINAL PROCESSING REPORT (CGG)