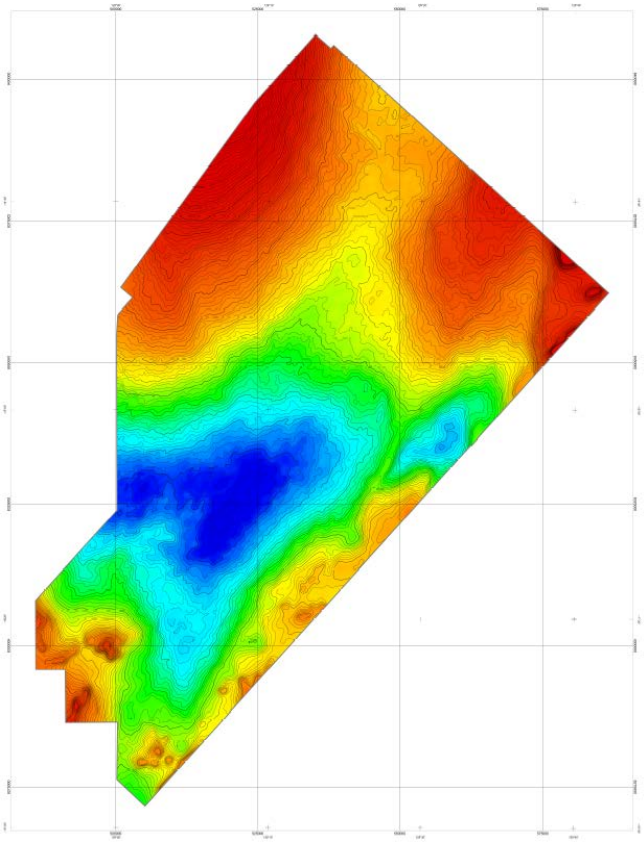
2013 AERIAL SURVEY IN THE BONAPARTE BASIN

BEACH ENERGY LIMITED



Final Operations Report
EP126, 135, 138, EL 386 & NTC/P10
Bonaparte Basin

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1.0 INTRODUCTION

The 2013 Bonaparte Basin Aerial Survey in the Northern Territory and Western Australia recorded 15,732 line km of gravity gradiometer and high resolution magnetic data in EP's 126, 135, 138, NTC/P10 & EP 386 (in Western Australia). Recording commenced on the 24th January 2012 and was completed on the 18th March 2012.

The following datasets were acquired:

- Full Tensor Gravity (FTG)
- Magnetic Field
- Lidar
- Gravity Measurement Assembly (GMA)

The objective of the survey was to provide a detailed regional view of the Bonaparte Basin sedimentary section within the permit areas and to enhance the regional geophysical framework in order to locate exploration wells.

The participants in the Joint Ventures at the time of the survey were as follows:

EP 126	**%**
Beach Petroleum (NT) Pty Ltd	25
Territory Oil and Gas Pty Ltd	75
EP 135	**%**
Beach Petroleum (NT) Pty Ltd	50
Territory Oil and Gas Pty Ltd	50
EP 138	**%**
Beach Petroleum (NT) Pty Ltd	25
Territory Oil and Gas Pty Ltd	75
NTC-P10	**%**
Beach Petroleum (NT) Pty Ltd	50
Territory Oil and Gas Pty Ltd	50

Table 1 ***Survey Statistics***

Bonaparte Aerial Survey	
Start Date	24th January 2013
End Date	18th March 2013
Line km	15,732km
Line Spacing	500m, 42 degrees
Tie Line Spacing	2500m, 132 degrees

The contracting groups involved in the survey are summarised in Table 2.

Table 2 ***Contractors***

Operation	**Contractor**
Field supervision	Matthew Zengerer
Gravity Tie	Haines Surveys
Data acquisition	Arkex
Data processing	Arkex

The following sections provide a summary of the acquisition and processing of the survey.

2.0 FIELD OPERATIONS

2.1 Location

The 2012 Bonaparte Aerial Survey was conducted within EP's 126, 135, 138, NTC/P10 & EL 386 (in WA), south west of Darwin, in the Northern Territory and Western Australia. Figure 1 shows the locations of the lines and the various permits. Table 3 lists the survey boundary coordinates.

Approximately 45% of the survey area was conducted over water with the remaining 55% over pastoral land and scrub.

Table 3 ***Survey Boundary Coordinates***

WGS84, UTM Zone 52S		WGS84, Lat/Long	
Easting	**Northing**	**Latitude**	**Longitude**
586594.72	8362208.4	-14.48.46.5715	129.48.17.1280
505131.03	8271668.11	-15.37.58.4988	129.02.52.3352
500186.71	8276333.1	-15.35.26.6877	129.00.06.2696
500318.69	8286563.44	-15.29.53.7224	129.00.10.6969
491162.5	8286487.77	-15.29.56.1300	128.55.03.3683
491090.81	8295751.84	-15.24.54.6107	128.55.01.0820
485914.68	8295751.84	-15.24.54.5270	128.52.07.4144
485861.86	8308005.54	-15.18.15.7010	128.52.05.8926
500200.73	8323908.21	-15.09.38.2446	129.00.06.7268
500141.42	8354980.57	-14.52.46.8900	129.00.04.7328
500350.74	8358533.52	-14.50.51.2458	129.00.11.7365
502936.98	8361442.55	-14.49.16.5543	129.01.38.2667
500873.34	8363215.75	-14.48.18.8439	129.00.29.2186
524498.71	8395934.09	-14.30.33.4858	129.13.38.5262
535160.93	8407880.97	-14.24.04.2016	129.19.34.1910
537869.26	8405505.93	-14.25.21.3783	129.21.04.7549
538358.27	8406036.85	-14.25.04.0727	129.21.21.0592
586594.72	8362208.4	-14.48.46.5715	129.48.17.1280

2.2 Permitting

The NT Department of Resources were informed of Beach's intention to fly the geophysical survey in August 2012.

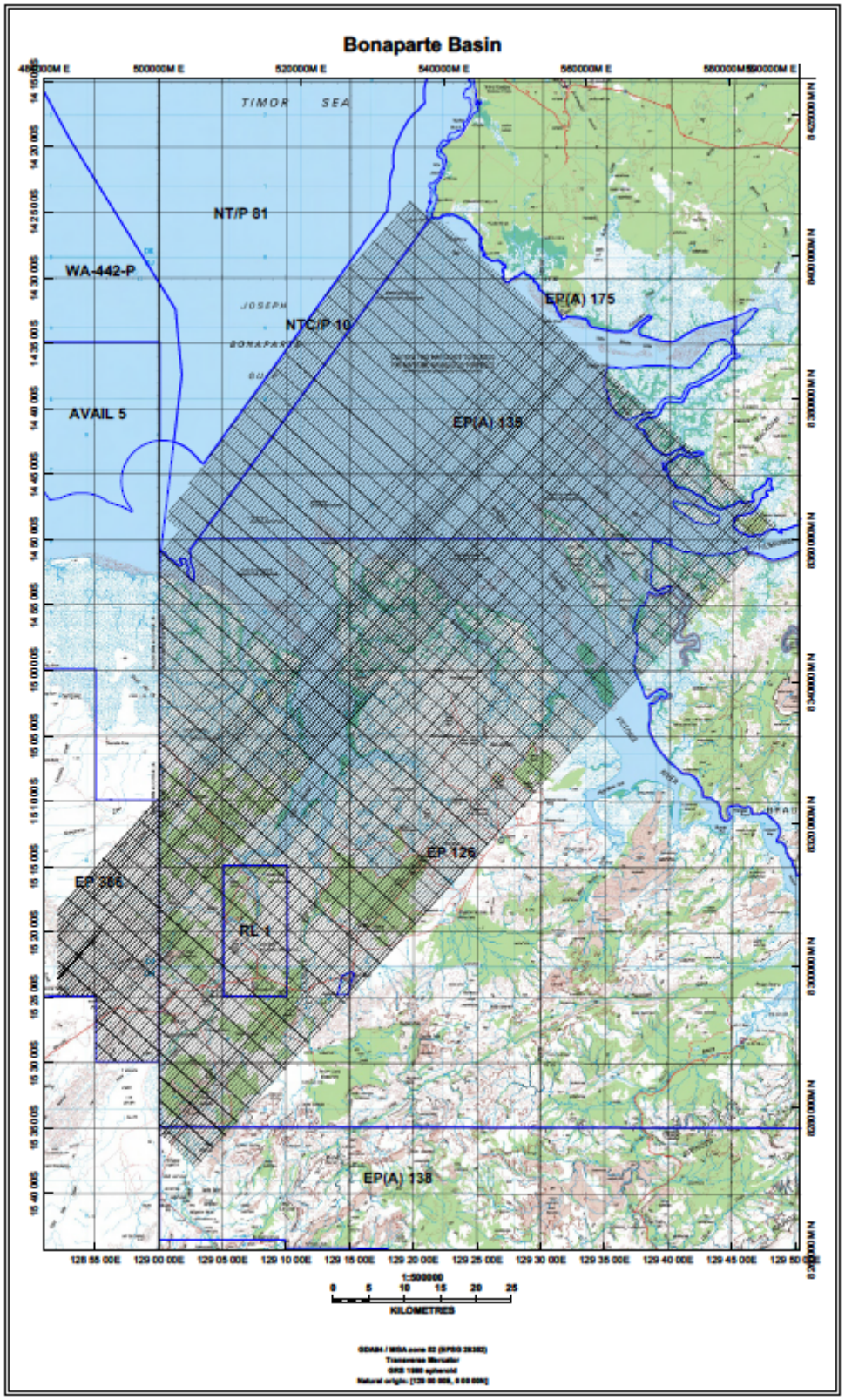
Beach and Territory Oil and Gas were awarded the NTC-P10 permit area in early 2013. Beach requested that the survey be extended into this area in February 2013.

There was a significant delay in the project waiting for CASA approvals. An application was submitted to CASA in August 2012, but final approvals were not issued until 17th January 2013.

The details of the survey were submitted to the Traditional Owners of the land via the Northern Land Council on 3 October 2012.

Permission to enter the Bradshaw Field Training Area in the north east had to be obtained in advance and updated daily.

Figure 1 ***Line Location***



2.4 Survey Design

The survey block is an irregular stepped polygon, with the survey lines running south-west to north-east. Tie lines ran south-east to north-west. The block covered an area of approximately 6500 square km, with 15,732 line km flown.

The survey was flown on a single 3D drape at a minimum height of 152m above the topography. In Valleys near to peaks and ridges, the ground clearance was considerably greater than 152m due to climb and descent constraints.

2.5 Survey Schedule

The Arkex aircraft arrived in Australia on the 19th October 2012. Due to delays in obtaining The Civil Aviation Safety Authority (CASA) Air Operators Certificate the aircraft was not able to fly until the 17th January 2013.

There were a total of 8 calibration flights and 69 production flights. A daily flight summary can be found in the contractor's acquisition report.

Haines Surveys provided a GPS gravity tie at Kununurra Airport on the 4th and 5th February. The gravity tie comprised of a new gravity station. Full details are in the Haines report, appendix 4.

2.6 Health and Safety

Safety received a high priority from Beach Energy, Arkex and all sub-contractors during this survey. An induction was held prior to the start of the survey and to all new crew members on arrival.

The basic tenets of the Arkex HSE policy were:

- Daily toolbox meetings pre-work
- Weekly safety meetings
- Site specific Emergency response plan

The safety efforts were comprehensive and no Lost Time Injury's occurred during this project.

Table 4 summarises some key safety statistics for the project.

Table 4 ***Safety Statistics***

Safety Statistics	
Arkex Man-hours	4,992
LTI	0
MTI	0
First Aid / Medical Cases	0
Incident / Accident Reports	0
Equipment Inspections	98
HSE Meetings Conducted	8
Emergency Drills conducted	1

3.0 EQUIPMENT

3.1 Aircraft

A de Havilland Canada DHc6 Twin Otter Aircraft equipped with a tail stinger was used throughout the survey.

The following equipment was used on the aircraft:

- Lockheed Martin Gravity Gradiometer
- Lockheed Martin Gravity Measurement Assembly (GMA)
- RMS Systems DAARC Horizontal Magnetic Gradient System
- Riegl LMS-Q240-80i 2D Laser Scanner
- Applanix Pos AV 310 V5 inertial measurement unit and DGPS
- Novatel OEM5 Real Time DGPS with Omnistar demodulator

3.2 Calibration and Tests

The following tests and calibrations were performed prior to the commencement of the survey:

- Platform Accelerometer Calibration
- Platform Gyro Calibration
- Platform Calibration
- Gravity Gradiometer Instrument Scale Factor/Misalignment Calibration
- Gravity Gradiometer Instrument Bias Reset Calibration
- Gravity Measurement Assembly Scale Factor
- Gravity Measurement Assembly Misalignment

3.3 Control Line

A repeat line of approximately 30km in length was flown at the beginning or end of each production flight. This enabled constant monitoring of performance of each flight.

4.0 PROCESSING

4.1 Processing Sequence

Full Tensor Gravity (FTG), Magnetic Field, LiDAR and Gravity Measurement Assembly datasets were acquired in this survey. The following table summarises the processing sequence for each dataset. Full descriptions can be found in the contractors report.

Table 5 ***Processing Sequences***

Dataset	Processing Performed	Summary
Gravity Gradient	Data QC	Overall quality of the navigation was assessed for each flight using Geosoft Oasis Montaj software
	Post Mission Correction	Gravity gradient data was extracted from the FTG output files and corrected for aircraft motion effects
	Crop and Clean	Non survey lines removed and re-flown lines validated for inclusion in the analysis. An automated noise threshold rejection routine was applied
	Re-sampling	The data was re-sampled in the time domain from 4 to 1HZ to reduce volume after an application of a filter at 0.3Hz
Gravity	Raw Gravity	Measured pulse rate extracted and converted to vertical gravity
	Navigation Merge	The vertical gravity was merged into the 10Hz post-processing lever-arm corrected GPS navigation
	Dynamic Corrections	The Eotvos corrections and the vertical acceleration of the aircraft were calculated and combined to form the dynamic correction, which was filtered and removed from the raw GMA data
	Filter and Lag	The dynamic corrected GMA data was filtered with Gaussian low pass 400 second filter and lagged by 10 seconds to correct the phase shift
	Latitude and Free-Air Corrections	Calculated to obtain Free-Air anomaly using GDA94 ellipsoidal heights
	Crop and Clean	The 10Hz data was filtered with a 400second Gaussian 1D FFT low pass filter and re-sampled to 1Hz.The turns and excessive noise was weighted out
Equivalent Source Processing	Concept	Where a set of observations are made in some position above the ground, a density distribution may be found whose gravitational field is identical to the measurements. The concept is used in the levelling and the observation surface regularisation operations
	Tidal Corrections	The maximum tide level over the survey was 7.67m. The tide correction was composed of two steps: to compute the maximum effect of the tides between the maximum tide and sea level; to compute a scale factor based of the measured tide levels
	Levelling	Removes a constant bias in the GMA and FTG dataset and approximates any time varying instrument drift
	Geographical Tensor Component Output	Instrument outputs are combined and rotated using operations in the Fourier domain to produce a preliminary Gzz product
	Tensor-incompatible Noise Reduction	Equivalent source predictions of the measurement are compared with the actual measurements and the outliers are weighed down
	Gravity Tie to AFGN	GMA data tied to Australian Fundamental Gravity Network using gravity base

		tie
	Terrain Correction	In areas of high relief, terrain signal dominates signal from depth of interest so a terrain corrected product was generated to assist qualitative interpretation
	Micro-levelling	Gzz and gz micro-levelled grids were produced by removing the residual line and tie line noise
	Calculation of Tensor Components	The complete set of gravity gradient components in the geographic frame was computed from the micro-levelled Gzz terrain corrected and no-terrain corrected grids
	Data Quality	The noise performance of the FTG was assessed
Magnetic Field	GPS Import	Locally differentially corrected GPS data, INS-derived pitch, and roll and yaw data were imported. Flight path trimming verified and finalised
	De-spiking	Spikes removed using a non-linear filter
	Diurnal Correction	The IGRF Earth model 2010 was removed from diurnal readings and filtered with no-linear de-spiking algorithm and low pass filter of 300 seconds
	IGRF Removal	The IGRF model 2010 was removed from the line data to create the Magnetic Anomaly
	Lag Correction	Parallax error is corrected according to testing
	Filtering	Several lines required a low pass Gaussian 15 second filter to reduce high frequency noise
	Intersection Levelling	A linear correction was first applied to the tie lines followed by levelling of the survey lines
	Gridding	Data was gridded at 100m sell size
	Micro-levelling	The final magnetic anomaly micro-levelled grids were produced by removing the line noise
	Reduction to Pole	Produced using a magnetic inclination of -44.2 degrees and magnetic declination of 3.1 degrees.
	First Vertical Derivative	Calculated in the Fourier domain
LiDAR	Point Cloud Extraction	Lidar range observations for each flight were converted to XYZ observations (point cloud). Projection to the working coordinate system was performed
	Validation and Cropping	Integrity of the point cloud datasets validated by cross comparison between flights. The data was then dropped and merged
	Classification	Identification of ground points using the geometric criteria
	DTM Building	Reduce data volume by removing unnecessary ground points
	SRTM De-trend	The raw SRTM dataset was re-sampled to 100m and dummy value were filled. A correction was applied by comparing the LiDAR DTM dataset and the SRTM dataset

4.2 Archived Data

All products are in the following coordinate system:

Horizontal Datum:	WGS84
Projection:	UTM Zone 52S
Units:	Metres
Vertical Datum:	GRS80 Ellipsoid

A range of Gravity, Lidar and Magnetic Field products were delivered. See the contractors processing report Appendix 2 for a complete list of products.

5.0 CONCLUSIONS

The 2013 Bonaparte Basin Aerial Survey was a technical and operational success. The data acquired was of an excellent standard provides information to further evaluate the regional geology and leads and prospects within the permit areas. The negative feature of this survey was the very long time take to obtain the Air Operators Certificate from CASA.