



BHP BILLITON - GEMCO

GROOTE EYLANDT JUNE 2013 AERIAL SURVEY - LIDAR DATA AND CONTOURS

VOLUME 20818A01NOK

Summary

Project

Airborne LiDAR data was acquired at Groote Eylandt over the Main Mine Area and Eastern Leases from 9 – 12 June 2013.

Data

This volume contains:-

- “Unthinned” LiDAR ground strikes in LAS 1.2 format;
- “Thinned” LiDAR ground strikes in space delimited ASCII format; and
- 0.5m contours in Microstation DGN, DXF and ESRI SHP format.

Data is supplied in 2km x 2km tiles.

All data is supplied in terms of GDA94 MGA Zone 53 / AHD.

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1. PROJECT REPORT

Safety: No safety Incidents were reported during the project

Acquisition: Airborne Laser Scanning (ALS) data was acquired from a fixed wing aircraft over 4 missions from 9 – 12 June 2013. Delays in acquiring the data were due to low cloud over the project area.

Ground Support: GPS base station support was provided by AAM aircrew without incident. Ground check points acquired by the client allowed an assessment of the accuracy of the ALS data.

Data Processing: Reduction of the ALS data proceeded without any significant problems. Laser strikes were classified into ground and non-ground points using a single algorithm across the project area. Manual checking and editing of the data classification further improved the quality of the terrain model.

Further Processing: The contours supplied on this volume are designated “ENGINEERING CONTOURS”. They are compiled from a rigorous triangulation of the supplied data. No cartographic licence has been applied. They are intended to provide a visual representation of the terrain data.

Data Presentation: The data provided on this volume has been supplied in accordance with a specification agreed with the primary client. Subsequent users experiencing difficulties in handling the data should please contact AAM to arrange a more appropriate data presentation.

Further Issues: There are no further issues to report.

Project Contacts:

Client

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Company

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AAM Account Manager & Project Manager

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2. DATA INSTALLATION

Data format : DGN, DXF, SHP, LAS, ASCII
Number & type of media : One 32GB USB Flash Drive
Number of files on media : 117 Contour files in DGN
117 Contour files in DXF
468 Contour files in SHP
117 LiDAR Ground Point files in LAS
117 Thinned LiDAR Ground Point files in ASCII
Tile Layout in DGN and DXF
Readme file in PDF
Data formatted on : 17.07.2013, 18.07.2013, 22.07.2013
Disk volume : 20818A01NOK

README FILE

This document (README_20818A01NOK.PDF) is provided as an Acrobat file in this volume.

To open the file, double click on the PDF file to activate Acrobat Reader Software.

Adobe Acrobat Reader may be downloaded from:

<http://www.adobe.com/products/acrobat/readstep2.html>

LOADING NOTES

Data may be copied using a file copy utility such as Windows Explorer or similar.

FILE SIZES AND NAMES

Data is provided in tiles 2km by 2km to the following filenaming convention:

eg.

GE_LiDAR_e652_n8445.las GE_LiDAR- project abbreviation.
652 - coordinate easting (in thousands) of south west
tile corner.
8445 - coordinate northing (in thousands) of south west
tile corner
.xyz - laser strikes thinned (model key points), classified
as "ground".
.dgn - 0.5m contours in Microstation DGN (V8).
.dxf - 0.5m contours in DXF.
.las - laser strikes classified in accordance with ICSM
V1.2 LAS file standards.
.shp - 0.5m contours in shapefile format

A list of the files contained on this volume is listed in: 20818A01NOK_Filelisting.txt

LEGEND

Contour Files

<u>Level/Layername (DGN/DXF)</u>	<u>CONTOURTYPE (SHP)</u>	<u>Description</u>
50cm_Contours	MINOR	50cm_Contours
1m_Contours	BASIC	1m_Contours
5m_Contours	MAJOR	5m_Contours

LAS Files

LAS file point classification levels are formatted to comply with ICSM Standard LiDAR Point Classes. LiDAR Ground Points are supplied with this volume as Class 2.

3. ADDITIONAL SERVICES

Product Generation

AAM can perform the following additional services on the data contained on this volume if required:

Change horizontal datum	: to AMG other local grid
Alter geoid modeling	: by transforming ALS data to fit orthometric survey heights
Improve data classification	: by tailoring parameters to suit regional variations
Further classification	: assist building identification by further classifying non-ground strikes
Data thinning	: to remove superfluous points not adding to the terrain definition
Data subset	: by dividing the data into different tiles or polygons
Data presentation	: by creating contours, profiles, perspectives, flythroughs, colour-coded height plots etc.
Ground truthing	: by comparing the ALS terrain model with extra independent height data
Data gridding	: to convert the measured spot heights into a regular grid
Extra data	: extra data was collected beyond that supplied on this volume (see below)
Intensity Image	: greyscale image created from laser's intensity returns
Fly – Throughs / 3d Perspectives	Image draping /slope models

4. METADATA

SOURCE DATA

Item	Source	Description	Ref No	Date
Laser System	AAM	ALTM3100	20818A	09.06.13 - 12.06.13
Pulse Rate Frequency	AAM	50 kHz	20818A	09.06.13 - 12.06.13
GPS Base Data	AAM	Static GPS	20818A	09.06.13 - 12.06.13
Base Stn Coords	GEMCO	PSM located at Groote Eylandt airport	GDCA1	June 2011
Field Survey Data	GEMCO	RTK GPS	lidar test points_june13.dxf	12.06.13
			lidar_test1906.dxf	19.06.13

LASER DATA CHARACTERISTICS

Characteristic	Description
Format	DGN, DXF, SHP, LAS, ASCII
Contours	0.5m interval
Laser footprint size	0.36m
Laser mode	Single Pulse
Data thinning (Thinned Ground only)	Points not contributing to the terrain definition within 0.15m removed

REFERENCE SYSTEMS

	Horizontal	Vertical
Datum	GDA94	AHD
Projection	MGA Zone 53	N/A
Geoid Model	N/A	Ausgeoid98
Primary Reference Station	GDCA1 657784.205 E 8454748.843 N	GDAC1 13.37 RL

Note: On 01-01-2000, Australia formally changed its reference spheroid from AGD to GDA94, and its map grid from AMG to MGA. MGA coordinates are approximately 200m different from AMG.



This data is GDA-compliant

5. ACCURACY

PROJECT DESIGN ACCURACY

Project specifications and technical processes were designed to achieve data accuracies as follows:

	Measured Point	Derived Point	Basis of Estimation
Vertical data		0.15m	Project Design
Horizontal data	< 0.50m		System specifications
Test points	0.05m		Project Design / Survey methodology used

Notes On Expected Accuracy

- Values shown represent standard error (68% confidence level or 1 sigma), in meters.
- “Derived points” are those interpolated from a terrain model.
- “Measured points” are those observed directly.
- Accuracy estimates for terrain modeling refer to the terrain definition on clear ground. Ground definition in vegetated terrain may contain localized areas with systematic errors or outliers which fall outside this accuracy estimate.
- Laser strikes have been classified into “ground” and “non-ground”, based upon algorithms tailored for major terrain/vegetation combinations existing in the project area. The definition of the ground may be less accurate in isolated pockets of dissimilar terrain/vegetation combinations.

LIMITATIONS OF DATA

- Features depicted are as shown on the legend.
- The definition of the ground under trees may be less accurate.

DATA VALIDATION

- Ground data in this volume has been compared to 2221 test points obtained by field survey and assumed to be error-free. The test points were distributed in 9 groups across the mapping area and located on open clear ground. Comparison of the field test points with elevations interpolated from measured data resulted in:

Ref Point Site	No. of Points	Mean Difference (m)	Std Deviation (m)	RMS (m)
Site 1	37	0.128	0.054	0.139
Site 2	252	0.065	0.060	0.089
Site 3	253	0.071	0.037	0.080
Site 4	90	0.096	0.032	0.101
Site 5	105	0.109	0.033	0.114
Site 6	353	0.067	0.036	0.076
Site 7	156	0.012	0.034	0.036
Site 8	821	0.057	0.080	0.098
Site 9	154	0.042	0.043	0.087

The mean difference has been removed from the data. Final accuracy estimates after removing the mean offset yielded:

Ref Point Site	No. of Points	Mean Difference (m)	Std Deviation (m)	RMS (m)
Site 1	37	0.044	0.059	0.073
Site 2	252	-0.004	0.060	0.060
Site 3	253	0.002	0.038	0.038
Site 4	90	0.026	0.032	0.041
Site 5	105	0.039	0.033	0.051
Site 6	353	-0.002	0.036	0.036
Site 7	156	-0.057	0.034	0.067
Site 8	821	-0.012	0.080	0.081
Site 9	154	-0.028	0.043	0.038

USE OF DATA

- Intended use : Preliminary Design subject to final survey
- Intended use : Preliminary location
- Intended use : Exploration
- Intended scale of use : 1:1000

6. CONDITIONS OF SUPPLY

The data in this volume has been commissioned by **BHP BILLITON - GEMCO**.

The data in this volume is provided by AAM Pty Limited (AAM) to **BHP BILLITON - GEMCO** under the client's Terms of Engagement, which require **BHP BILLITON - GEMCO** to assume beneficial ownership, subject to the following conditions:

1. This file (README_20818A01NOK.PDF) is always stored with the unaltered data contained in this volume.
2. The data is not altered in any way without the approval of AAM. The data may be copied from this file to another.
3. The data is not used for purposes beyond that explicitly agreed in the description of the Services provided by AAM.

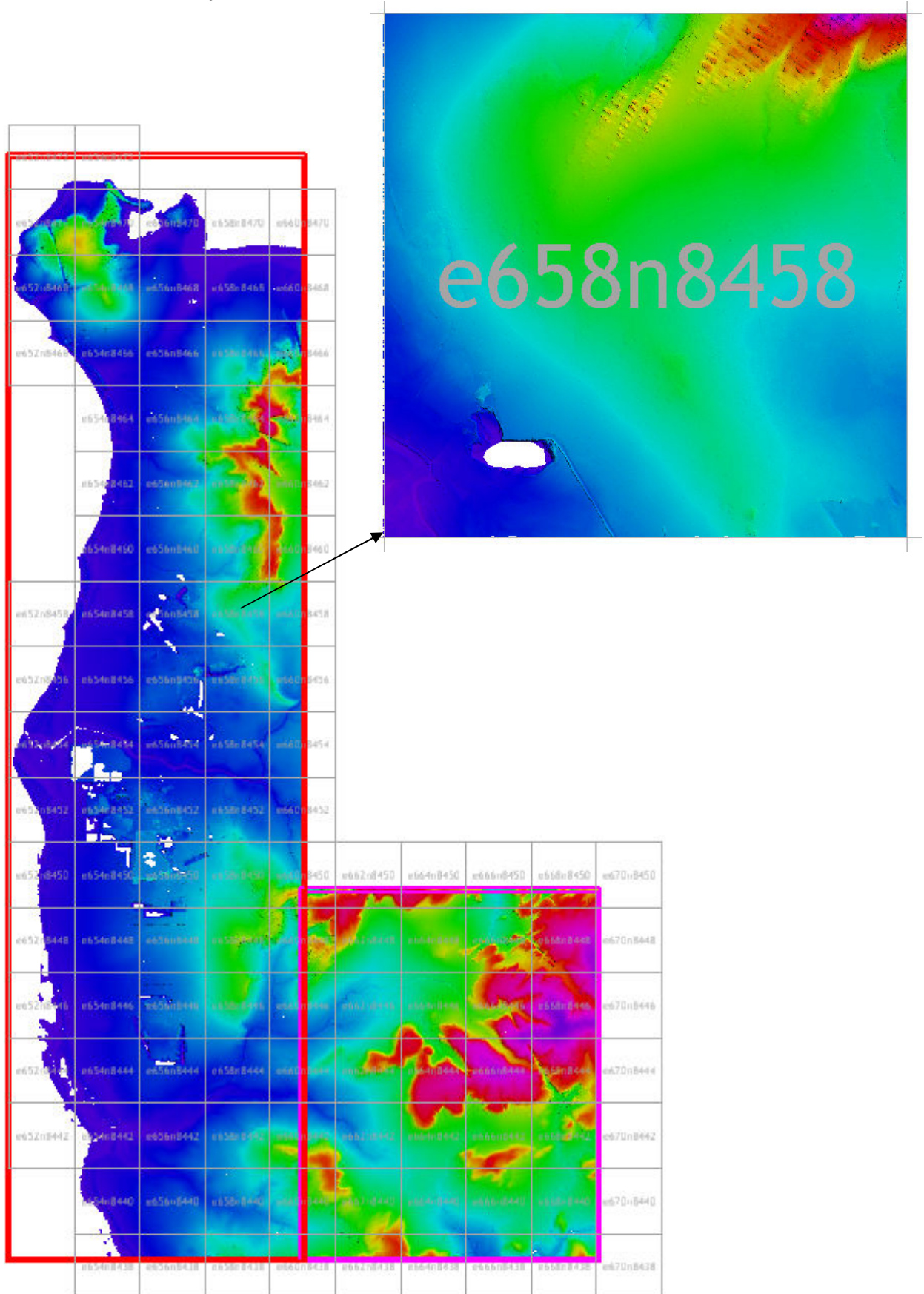
Any breach of these conditions will result in the immediate termination of the license issued by AAM, and **BHP BILLITON - GEMCO** will indemnify AAM from all resulting liabilities.

Any problems associated with the information in the data files contained in this volume should be reported to AAM Pty Limited. A complete list of project related contacts is listed on page 2 under the Project Report heading.

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7. VALIDATION PLOTS

Ground points viewed by elevation



0.5m contours

