

EXPLORATION AND MINING DIVISION IRELAND

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THE BILLITON AIRBORNE TEM AND MAGNETIC SURVEY (1998) OVER THE LIMERICK AREA

August 2002



Department of Communications, Marine
and Natural Resources

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Resources**

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INTRODUCTION

In March 1998 Billiton Ireland Resources BV flew a 988 line km magnetic and electromagnetic survey over an area around Limerick encompassing approximately 237 sq km (Figure 1).

Block	Line km	Approx. Area (sq km)	Prospecting Licences covered / partially covered by Survey Areas
Limerick	988	237	449, 450, 2326, 2529, 2530, 2531, 2839, 2840, 2850, 3268, 3342, 3344, 3452, 3457, 3551, 3552, 3581, 3647, 3654

This survey was acquired over four years ago and is available to the general public in fulfilment of the 'Open Skies' policy of the Exploration and Mining Division (EMD). The Division acknowledges the cooperation of Billiton (now BHP-Billiton).

At this time EMD is primarily concerned with prompt data release and no attempt was made to reprocess or correct survey data. Data is released as submitted and no liability is accepted on the part of the EMD for data quality or accuracy. However, to facilitate ease of use, several grids are provided with an Ordnance Survey base map for ease of geographical reference.

Geoterrex conducted the survey using a towed bird magnetometer and the GEOTEM[®]III electromagnetic system. This consists of 3 receiver coils, the x-coil and y-coil axes along and perpendicular to the flight direction and a vertical z-coil axis.

Time domain electromagnetic (TDEM), magnetic, radar altimeter and navigation data was acquired during the survey. All processing was carried out by Geoterrex, which is now part of Fugro Airborne Surveys.

The survey specifications, data acquisition and processing procedures used, are outlined in the Geoterrex survey report. No interpretation report was submitted.

A listing of all digital and hardcopy data (databases, grids, maps and company reports) lodged with the Exploration and Mining Division is included in this publication and outlined below in the data listings section.

SURVEY EQUIPMENT AND SPECIFICATIONS

Flight Line Spacing	250m
Flight Line Direction	0°
Tie Line Spacing	2500m
Mean Terrain Clearance	120 m
Nominal Survey Speed	120 knots (62 m/s)
Total Survey Area	237 km ²
Total Line Km	988 line km

Magnetometer	CS-2 Cesium Vapour
Sensitivity	0.01 nT
Sample Rate	10 samples /sec
Mounting	Towed Bird
Sensor Height above ground	75 m

TEM Receiver	Horizontal & vertical coils
TEM Transmitter	Vertical axis loop
Cycle rate	75 Hz
Pulse width	2.082 msec
Pulse Delay	0.104 msec
Off-Time	4.480 msec
Sample Rate	4 samples/sec
Mounting	Towed Bird
Sensor Height above ground	70 m

Below are the window mean delay times (in milliseconds), from the end of the transmitter pulse, for a 75 Hz base frequency as listed in the Geoterrex report and readme file.

em1	-1.953	em11	1.146
em2	-1.562	em12	1.407
em3	-0.989	em13	1.693
em4	-0.416	em14	2.005
em5	0.163	em15	2.344
em6	0.235	em16	2.709
em7	0.365	em17	3.073
em8	0.521	em18	3.464
em9	0.703	em19	3.880
em10	0.912	em20	4.297

PROCESSING OVERVIEW AND MAP GENERATION

The information provided in this section was taken from the Geoterrex report and readme file for the survey (included on CD) and from examination of the data.

Magnetics Processing Sequence

A system lag correction of 3.6 seconds was applied followed by noise editing (de-spiking) and filtering. Appendix A of the Geoterrex report outlines the field processing sequence in more detail. The long wavelength component (greater than 79 seconds) of the diurnal field was removed from the data. The regional magnetic field (IGRF) was also removed. The data was tie-line leveled and then microleveled and gridded using a modified Akima spline interpolation. The data was resampled to 5 samples per second for inclusion in the final database.

Electromagnetics Processing Sequence

A system lag correction of 4.0 secs was applied followed by drift corrections to the off-time channels 5 to 20 and on-time channel 1. Each EM transient decay curve was de-spiked and the data was then noise filtered and smoothed. Appendix A of the Geoterrex report outlines the field processing sequence in more detail. The data was resampled to 5 samples per second for inclusion in the final database. It appears that the final data channels were not decultured. No corrections for flight direction asymmetry (de-herringboning) were applied.

EM Decay Constant Calculation

The EM time decay constant was calculated from the z-coil data by fitting channels 8 to 20 (approx. 0.521 – 4.297 msec) to a single exponential function. A slow rate of decay gives a high decay constant which indicates a better conductor.

EM Anomaly Selection

EM anomalies were located by an automatic anomaly picking routine, using channel 12 (mean delay time 0.1407 msec) as a reference. X-coil channels 9-20 were then fitted to the vertical plate model to extract conductance and depth information. An anomaly listing is provided in Appendix G of the Geoterrex report. Hardcopy anomaly maps were provided and scanned in EMD.

Grid and Map Generation

Billiton submitted grids in grid exchange format (gxf), which were created using a modified Akima spline interpolation with a 50 m cell spacing. The processed magnetic and EM decay constant grids were re-gridded by EMD. Grids were produced from the final magnetics (MAG_FINAL) and decay constant database (TAU) channels using a minimum curvature interpolation (75m grid cell spacing) and are identified by an 'emd' label in the filename. The original submitted magnetic and decay constant grids were used to generate the EMD maps on an Ordnance Survey base.

All digital and hardcopy products are in the Irish National Grid (ING) coordinate system:

Datum:	TM65 / Airy Modified 1849
Ellipsoid:	Airy Modified 1849
	Major axis: 6377340.189
	Eccentricity: 0.081673374
	1/f: 299.3249646
Projection	Transverse Mercator
Central Meridian	-8.00.00.000
Latitude of origin	53.30.00.000
False Northing:	250,000 m
False Easting:	200,000 m
Scale factor:	1.000035

DATA LISTING

Geosoft polygon files of survey boundaries

A geosoft polygon file (*.ply) for the survey area is included on the CD. The file is in ASCII format and can be opened in any text editor to view survey boundary coordinates (in ING).

Parameter table files

Geoterrex supplied four waveform parameter table files, one for each survey flight, in ASCII format. These files provide information on the system geometry, the channel positions in time and the reference waveform. The waveform is used to remove the effects of the primary field on the received secondary signal.

Anomaly Listings

An anomaly listing is provided in Appendix G of the Geoterrex report.

Databases

The raw and final data was supplied in ASCII format and imported into Geosoft Database format (GDB) by EMD. Geoterrex readme files with channel listings are included on the CD and summarised on page 7. The processed magnetics and EM data is released on CD in Geosoft format.

Raw and Processed GEOTEM and Magnetic Data (Geosoft GDB)

Database	Number of Channels	Approx. Size (Mb)	File Name (.gdb)
Limerick EM and Mag	135	34	bill98_limerick

Grids

The following grids in gxf format were submitted by Billiton and reproduced where required by EMD in Geosoft grid format.

Block	Grid	Grid Name	Grid cell spacing (m)	Format
Limerick	Decay Constant (z-coil 8 – 20)	469tauz	50	gxf
	Total field magnetics (IGRF removed)	469tf	50	gxf
	Decay Constant (z-coil 8 – 20)	lim_tmi_emd	75	grd
	Total field magnetics (IGRF removed)	lim_ztau_emd	75	grd

Maps

All hardcopy maps submitted by Billiton for this release were scanned and stored in TIFF format. Maps produced in EMD, on an Ordnance Survey 1:50,000 base by permission of the Ordnance Survey of Ireland, are available on the release CD as uncompressed images in JPEG format, or in hardcopy format on request.

Supplied by Billiton

Block	Map Title	Filename	Scale
Limerick	Total Field Magnetism (I.G.R.F. removed) (sheet 1)	bill13.1.1	1:25000
	Total Field Magnetism (I.G.R.F. removed) (sheet 2)	bill13.1.2	1:25000
	EM X-Coil Anomalies (sheet 1)	bill13.1.3	1:25000
	EM X-Coil Anomalies (sheet 2)	bill13.1.4	1:25000
	Z-Coil Decay Constant (sheet 1)	bill13.1.5	1:25000
	Z-Coil Decay Constant (sheet 2)	bill13.1.6	1:25000
	Interpretation map with flight Lines	bill13.1.7	1:25000

Supplied by EMD on Ordnance Survey base

Block	Map	Filename	Scale
Limerick	Processed total magnetic intensity (IGRF removed)	lim_tmi_emd	1:50,000
	Z-Coil Decay Constant (channel 8 – 20)	lim_ztau_emd	1:50,000

These maps are available, on an Ordnance Survey 1:50,000 base, as scanned images (jpeg format) or in hardcopy format.

Company reports

The Geoterrex Logistics and processing report is included on the release CD.

Report Title	Filename (.pdf)	No. of pages
Logistics and Processing Report of the Airborne Magnetic & GEOTEM Electromagnetic Multicoil Survey of areas 1 and 2 over the Limerick Area	billr13_1	114

GEOSOFTE DATABASE CHANNEL LISTING

Limerick Magnetics and Electromagnetics Database

CHANNEL NAME	DESCRIPTION	UNITS
X	Easting	metres
Y	Northing	metres
FID	Fiducial	seconds
RAD	Radar altimeter	feet
BARO	Barometric altimeter	feet
GPS	GPS elevation	cm
RAW_MAG	Total field magnetics (raw)	nT x 100
DIURNAL	Diurnal magnetics	nT x 100
IGRF	IGRF	nT x 100
MAG_FINAL	Total field magnetics (processed)	nT x 100
COMP	Applied compensation = difference before and after leveling	nT x 100
V_GRAD	Vertical gradient	nT/km x 100
PRIMARY_FIELD	Em primary field	uv
POWERLINE_MONITOR	Powerline monitor (x-coil)	uv
RAW_X1 to RAW_X20	Raw EM channel X1 to X20	ppm
RAW_Y1 to RAW_Y20	Raw EM channel Y1 to Y20	PV/m ²
RAW_Z1 to RAW_Z20	Raw EM channel Z1 to Z20	ppm
X1 to X20	Processed EM channel X1 to X20	ppm
Y1 to Y20	Processed EM channel Y1 to Y20	PV/m ²
Z1 to Z20	Processed EM channel Z1 to Z20	ppm
TAU	Decay constant from z-coil channels 8-20	μsec

SURVEY LOCATION

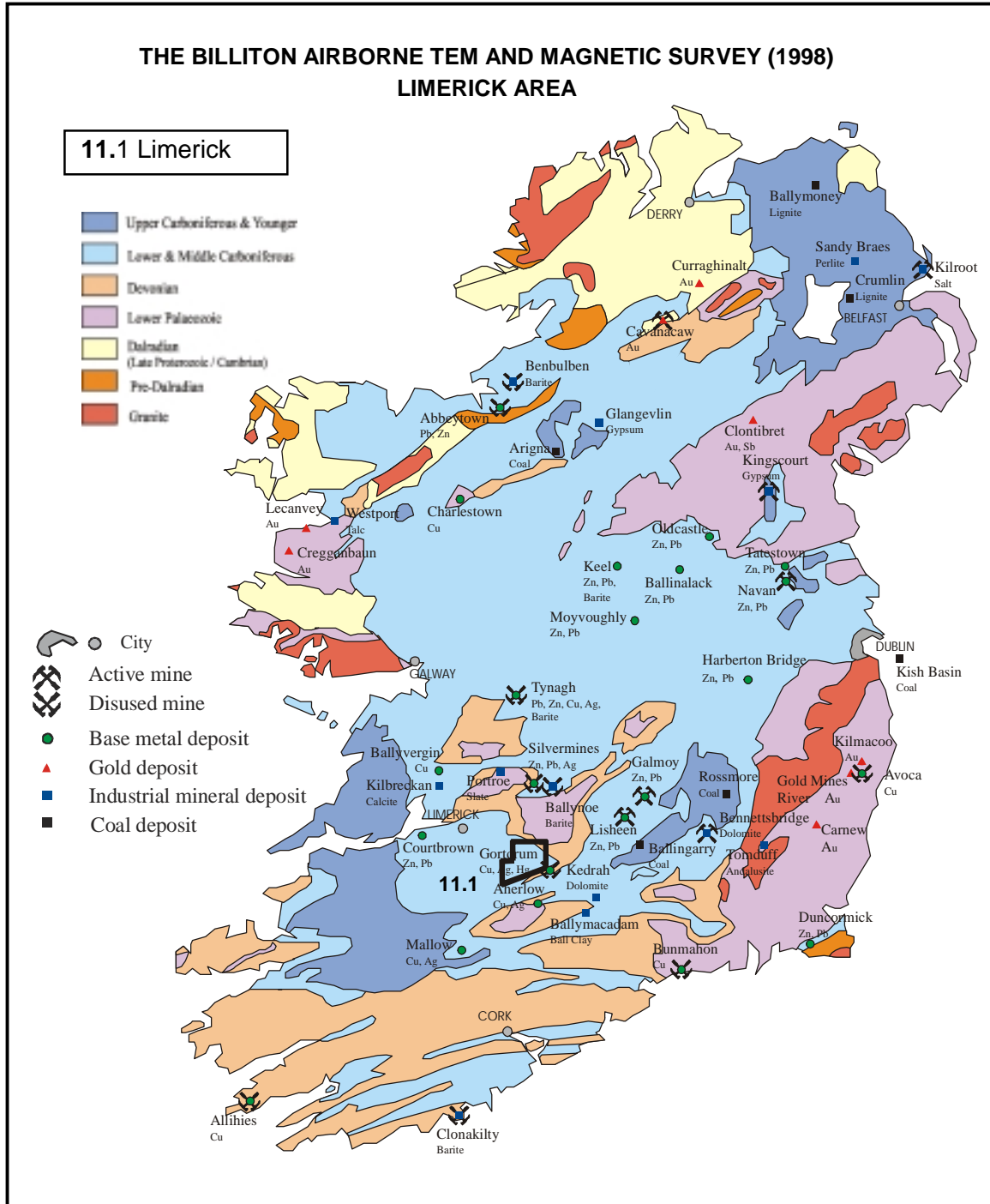


Figure 1. Location of the survey area on a simplified geology map of Ireland.

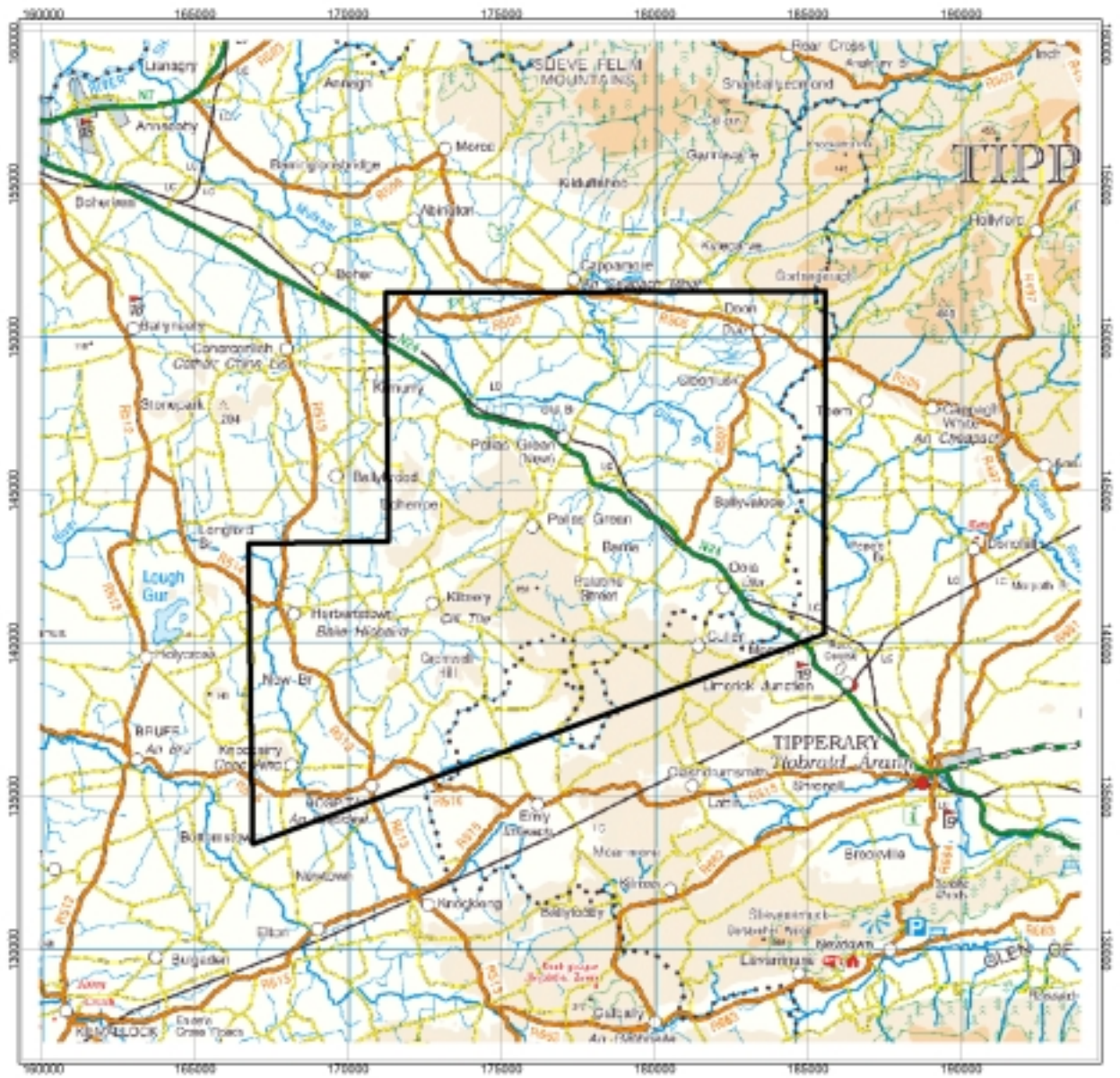


Figure 2. The Limerick survey area on a 1:250,000 Ordnance Survey base.