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THE RIO ALGOM/IVERNIA WEST AIRBORNE TEM AND MAGNETIC SURVEY (1997) OVER THE PORTUMNA AND CLARE AREAS

March 2002

Department of the Marine and Natural Resources

Roinn na Mara agus Acmhainní Nádúrtha

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INTRODUCTION

In June 1997 Rio Algom and Ivernia West flew a 509 line km magnetic and electromagnetic survey over three areas encompassing approximately 194 km^2 (Figure 1).

Block	Line km	Approx. Area (km^2)	Propspecting Licences covered by Survey
Clare	151	57	3787, 3788, 3643, 3679
Portumna	358	137	1377, 2563, 2561, 3273, 1378, 2860

This survey is the seventh in a series of surveys, acquired over four years ago, which are due for public release in fulfilment of the 'Open Skies' policy of the Exploration and Mining Division (EMD). The Division acknowledges the cooperation of Rio Algom Exploration Inc. (now BHP-Billiton) and the assistance of PGW Europe Ltd.

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 two Geoterrex reports. The Portumna survey interpretation is discussed in a report by Rio Algom.

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	Clare 400m Portumna 400m
Flight Line Direction	Clare 0° Portumna 145°
Tie Line Spacing	Clare 3000-4000m Portumna 3000-4000m
Mean Terrain Clearance	120 m
Nominal Survey Speed	120 knots (62 m/s)
Total Survey Area	194 km^2
Total Line Km	509 line km
Magnetometer	CS-2 Cesium Vapour
Sensitivity	0.00l 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	64 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 25 seconds) of the diurnal field was removed from the data. The regional magnetic field (IGRF) was also removed. 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. A proprietary algorithm, to improve trends along anomalies, was applied. The data was then microleveled and gridded using a modified Akima spline interpolation.

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. Corrections for flight direction asymmetry (de-herringboning) were applied to the final decay constant and apparent conductivity grids.

EM Decay Constant Calculation

The EM time decay constant was calculated from the z-coil data by fitting channels 9 to 17 (approx. 0.703 – 3.073 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. Anomaly listings for the two areas are provided in Appendix G of the Geoterrex reports. The Rio Algom interpretation report for the Portumna Block also highlights and describes anomalies for ground follow-up. Hardcopy anomaly maps were provided and scanned in EMD.

Apparent Conductivity Calculation

Apparent Conductivity was computed for the Clare block only from the z-coil on-time channel 1 and off-time channels 7 to 20.

Grid and Map Generation

Grids were submitted in grid exchange format (gxf). As it was not clear what type of gridding algorithms were used, the residual magnetic and EM decay constant grids were re-gridded by EMD. Grids were produced from the IGRF_REMOVED channel using a minimum curvature interpolation and are identified by an 'emd' label in the filename. The decay constant database channel (ZTAU) was also re-gridded by EMD using a minimum curvature interpolation. The original submitted (IGRF removed) magnetic grids and (asymmetry corrected) 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

Geosoft polygon files (*.ply) for each survey area are included on the CD. The files are in ASCII format and can be opened in any text editor to view survey boundary coordinates (in ING).

Anomaly Listings

Anomaly listings for the two areas are provided in Appendix G of the Geoterrex reports. The Rio Algom interpretation report for the Portumna area also highlights and describes anomalies for ground follow-up.

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 pages 7 to 9. The processed magnetics and EM data is released on CD in Geosoft format.

Processed GEOTEM and Magnetic Data (Geosoft GDB)

Database	Number of Channels	Approx. Size (Mb)	File Name (.gdb)
Clare magnetics & EM	16	0.98	clare_mag_em
Clare EM	64	3.2	clare_em
Portumna magnetics & EM	15	1.4	port_mag_em
Portumna EM	64	6.2	port_em

Grids

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

Block	Grid	Grid Name	Grid cell spacing (m)	Format
Clare	Residual magnetic field	cmag	100	gxf
Portumna		pmag	100	gxf
Clare	Decay constant (z-coil ch 9-17)	ctauz	100	gxf
Portumna		ptauz	100	gxf
Clare	Decay constant (z-coil ch 9-17) corrected for asymmetry	cdetauz	100	gxf
Portumna		pdetauz	100	gxf
Clare	Apparent conductivity from z-coil	ccond	100	gxf
Clare	Apparent conductivity from z-coil corrected for asymmetry	cdecond	100	gxf
Clare	Residual magnetic field	clare_tmi_emd	100	grd
Portumna		port_tmi_emd	100	grd
Clare	Decay constant (z-coil ch 9-17)	clare_ztau_emd	100	grd
Portumna		port_ztau_emd	100	grd

Maps

All hardcopy maps submitted by Rio Algom for this release were scanned and stored in a compressed TIFF format, to keep file sizes manageable. Compression was carried out using Imaging for Windows, which is available under the Accessories menu in Windows. Black and white images were compressed using CCIT Group4 compression, which can be opened in all standard packages. 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 Rio Algom/Ivernia West

Block	Map Title	Filename	Scale
Clare	Apparent Conductivity Contour Map from Z-coil	rio8.1.1	1:25000
Clare	Geotem Electromagnetic Anomaly Map (X-coil) with Flight Path on Scanned Topobase	rio8.1.2	1:25000
Clare	Residual Magnetic Field Contour Map)	rio8.1.3	1:25000
Clare	EM Decay Constant Contour Map (Z-coil, Ch 9-17)	rio8.1.4	1:25000
Portumna	X-Coil GEOTEM Anomalies	rio11.1.43	1:25000
Portumna	Z-Coil GEOTEM Anomalies	rio11.1.44	1:25000
Portumna	GEOTEM EM Anomaly Map (X-Coil) with Flight Path on Scanned Topobase	rio11.1.45	1:25000
Portumna	Residual Magnetic Field Contour Map	rio11.1.46	1:25000
Portumna	EM Early-Mid Time Decay Constant Contour Map (Z-Coil, Ch 9-17)	rio11.1.47	1:25000

Supplied by EMD on Ordnance Survey base

Block	Map	Filename	Scale
Clare	Processed total magnetic intensity (IGRF removed)	clare_tmi_emd	1:50,000
Portumna		port_tmi_emd	1:50,000
Clare	Decay constant (z-coil ch 7-19) (asymmetry corrected)	clare_ztau_emd	1:50,000
Portumna		port_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 reports for both areas and a short interpretation report, for the Portumna area only, are included on the release CD.

Report Title	Filename (.pdf)	No. of pages
Geoterrex Logistics and Processing Report. Airborne Magnetic & GEOTEM Electromagnetic Multicoil Survey over the Clare Block	Rior8_1	42
Geoterrex Logistics and Processing Report. Airborne Magnetic & GEOTEM Electromagnetic Multicoil Survey over the Portumna Block	Rior11_2	109
Rio Algom review of Portumna GEOTEM 1997 Survey (Job 388) PLs 1377, 2561, 2563 and 3273	Rior11_3	9

GEOSOFT DATABASE CHANNEL LISTING 1

Clare and Portumna Electromagnetics Database

CHANNEL NAME	DESCRIPTION	UNITS
X	Easting	metres
Y	Northing	metres
FID	Fiducial	seconds after midnight
POWERLINE_MONITOR	Powerline monitor	uV
X1	Em channel X1	ppm
RAW_X2	Raw Em channel X2	ppm
RAW_X3	Raw Em channel X3	ppm
RAW_X4	Raw Em channel X4	ppm
X5	Em channel X5	ppm
X6	Em channel X6	ppm
X7	Em channel X7	ppm
X8	Em channel X8	ppm
X9	Em channel X9	ppm
X10	Em channel X10	ppm
X11	Em channel X11	ppm
X12	Em channel X12	ppm
X13	Em channel X13	ppm
X14	Em channel X14	ppm
X15	Em channel X15	ppm
X16	Em channel X16	ppm
X17	Em channel X17	ppm
X18	Em channel X18	ppm
X19	Em channel X19	ppm
X20	Em channel X20	ppm
Y1	Em channel Y1	ppm
RAW_Y2	Raw Em channel Y2	PV/m^2
RAW_Y3	Raw Em channel Y3	PV/m^2
RAW_Y4	Raw Em channel Y4	PV/m^2
Y5	Em channel Y5	PV/m^2
Y6	Em channel Y6	PV/m^2
Y7	Em channel Y7	PV/m^2
Y8	Em channel Y8	PV/m^2
Y9	Em channel Y9	PV/m^2
Y10	Em channel Y10	PV/m^2
Y11	Em channel Y11	PV/m^2

Y12	Em channel Y12	PV/m^2
Y13	Em channel Y13	PV/m^2
Y14	Em channel Y14	PV/m^2
Y15	Em channel Y15	PV/m^2
Y16	Em channel Y16	PV/m^2
Y17	Em channel Y17	PV/m^2
Y18	Em channel Y18	PV/m^2
Y19	Em channel Y19	PV/m^2
Y20	Em channel Y20	PV/m^2
Z1	Em channel Z1	PV/m^2
RAW_Z2	Raw Em channel Z2	ppm
RAW_Z3	Raw Em channel Z3	ppm
RAW_Z4	Raw Em channel Z4	ppm
Z5	Em channel Z5	ppm
Z6	Em channel Z6	ppm
Z7	Em channel Z7	ppm
Z8	Em channel Z8	ppm
Z9	Em channel Z9	ppm
Z10	Em channel Z10	ppm
Z11	Em channel Z11	ppm
Z12	Em channel Z12	ppm
Z13	Em channel Z13	ppm
Z14	Em channel Z14	ppm
Z15	Em channel Z15	ppm
Z16	Em channel Z16	ppm
Z17	Em channel Z17	ppm
Z18	Em channel Z18	ppm
Z19	Em channel Z19	ppm
Z20	Em channel Z20	ppm

GEOSOFT DATABASE CHANNEL LISTING 2

Clare and Portumna Magnetics and EM Database

CHANNEL NAME	DESCRIPTION	UNITS
X	Easting	metres
Y	Northing	metres
FID	Fiducial	seconds
RAD	Radar altimeter	metres
GPS	GPS elevation	metres
PRO_MAG	Total field magnetics (processed)	nT x 100
DIURNAL	Diurnal magnetics	nT x 100
IGRF_REMOVED	Residual magnetic field	nT x 100
COMP	Leveling compensation	nT x 100
IGRF	IGRF	nT x 100
GRAD	RF vertical gradient	nT/km x 100
ZTAU	Time decay constant from z-coil (ch 9-17)	µsec
COND	Apparent conductivity from z-coil (for Clare block only)	µS/m
PRIMARY_FIELD	Em primary field	uv
POWERLINE_MONITOR	Powerline monitor	uv
Tx_PEAK_CURRENT	Tx peak current	a

SURVEY LOCATION

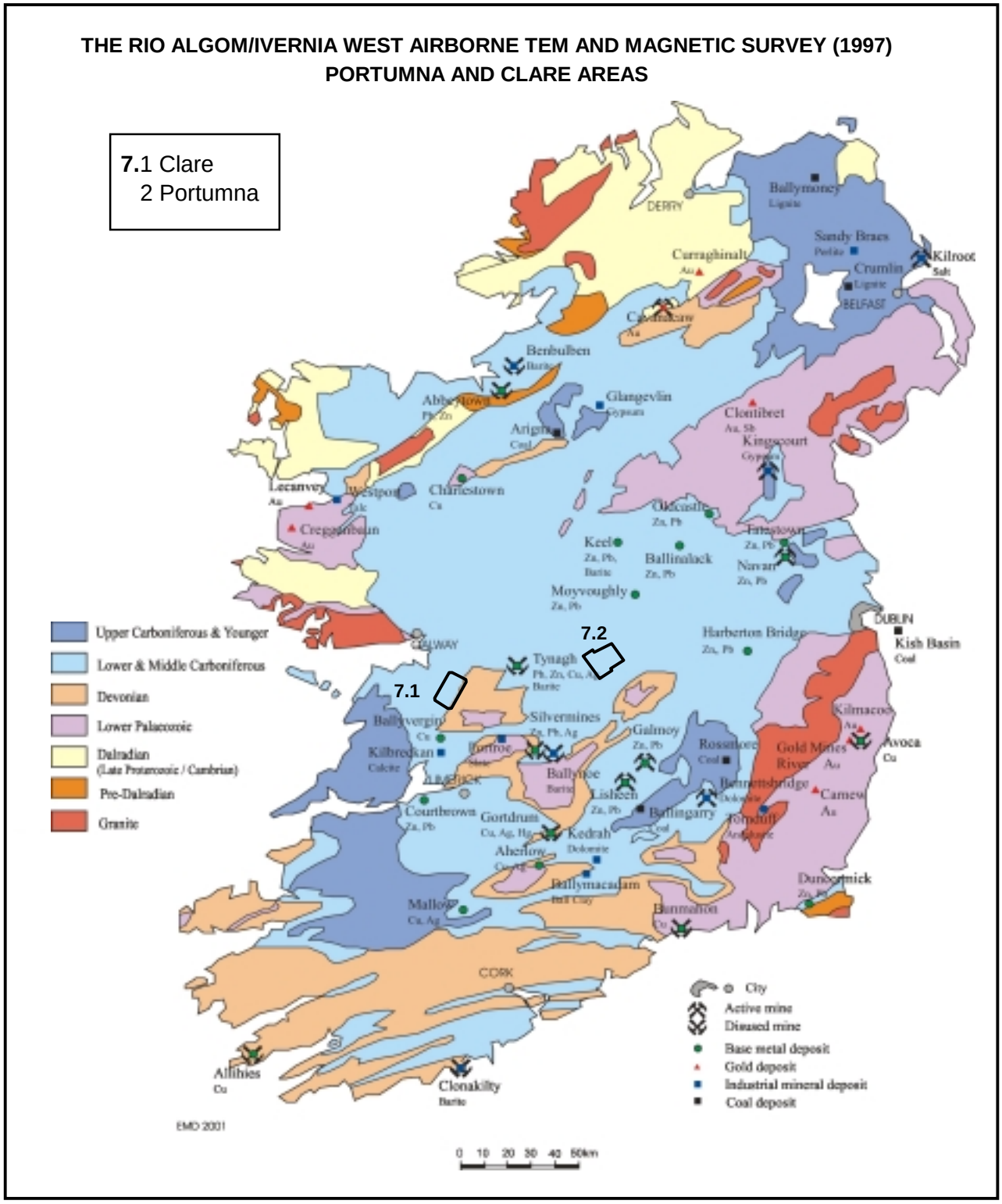

Figure 1. Location of the survey areas on a simplified geology map of Ireland.

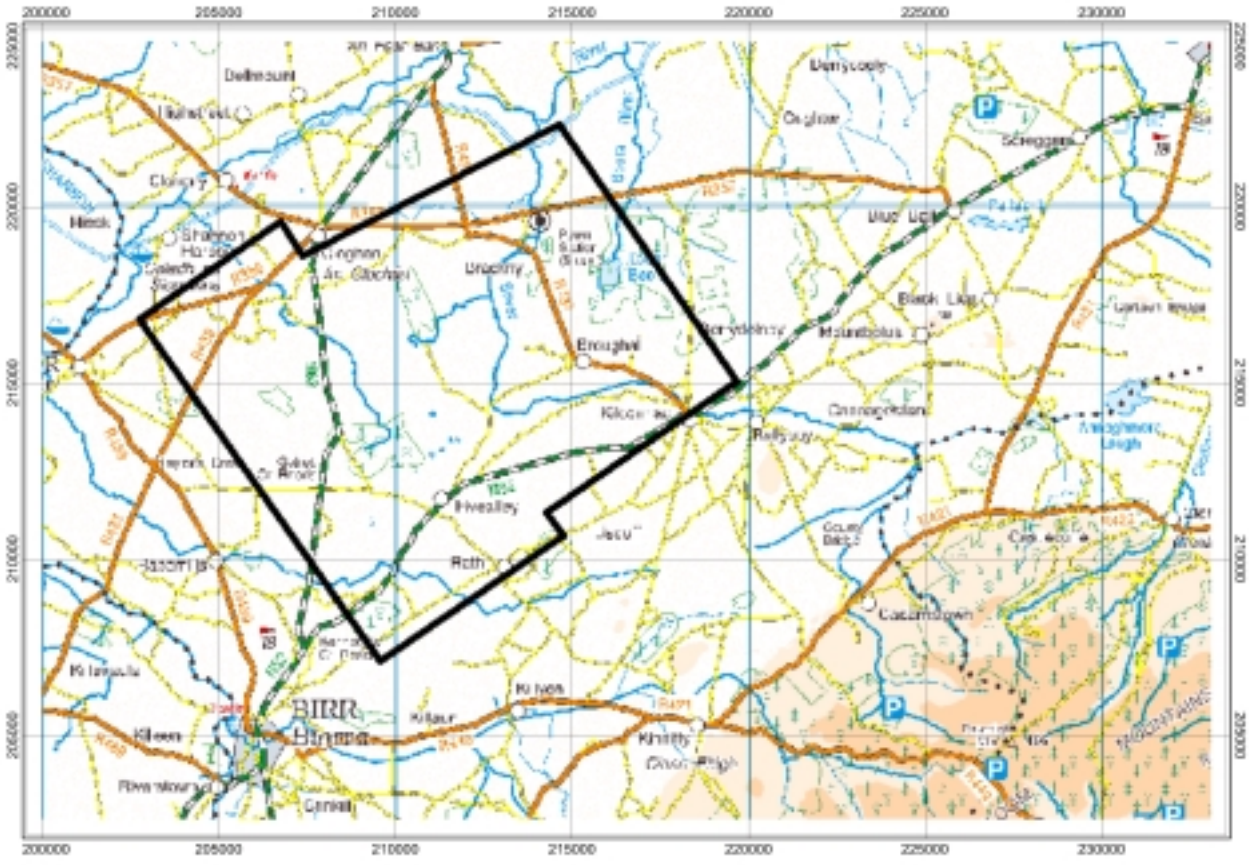

Figure 2. The Portumna survey area on a 1:250,000 Ordnance Survey base.

Figure 3. The Clare survey area on a 1:250,000 Ordnance Survey base.