British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

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COUNTY FERMANAGH

Mineral Resource Map of Northern Ireland

Mineral Resources

Scale 1:100 000

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This map is one of a series of six maps comprising the Mineral Resource Map of Northern Ireland, commissioned by the Department of the Environment (Northern Ireland).

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SAND AND GRAVEL

Superficial deposits

Glaciofluvial and glacial deposits

SANDSTONE

Other sandstone

CONGLOMERATE

Conglomerate

IGNEOUS AND META-IGNEOUS ROCKS

Dolerites, lamprophyres, and their metamorphic equivalents (meta-dolerites and meta-gabbros) suitable for high specification aggregate

META-SEDIMENTARY ROCKS

Psammites

LIMESTONE

Limestone - Carboniferous

DOLOMITE

Dolomite

MINERAL WORKINGS (as at 23.03.12)

Carn (Lst) — Extent of valid (extant) planning permission (name, mineral commodity)

Cashel (Lst) — Extent of expired planning permission (name, mineral commodity)

Building stone quarries (including historical)

Mineral commodity

Cla	Clay and shale	Ign	Igneous/meta-igneous rocks
Lst	Limestone	Peat	Peat
San	Sand	Sag	Sand and gravel
Sit	Slate	Sst	Sandstone

METALLIC MINERAL OCCURRENCES

Symbol indicates elemental occurrence

Symbol	Element	Symbol	Element
Ba	Baryte	Cu	Copper
Fe	Iron	Mo	Molybdenum
Pb	Lead	Zn	Zinc

ENVIRONMENTAL DESIGNATIONS (as at 23.03.12)

International nature conservation designations (SACs, SPAs and RAMSAR sites)

National nature conservation designations (ASSIs and NNRs)

Scheduled Monument

MINERAL CONSTRAINT (as at 23.03.12)

Area of Constraint on Mineral Developments

ADMINISTRATIVE AREAS

Local Government District

WARNING: Please be aware that the printed colours may differ due to the settings of the plotter used.

MINERAL RESOURCES MAP OF NORTHERN IRELAND

A key aspect of sustainable development is the conservation and safeguarding of non-renewable resources, such as minerals. There is a need to ensure that these resources are not needlessly sterilised by other development thus leaving insufficient supplies for future generations. The purpose of the maps in this series, therefore, is to show the broad distribution of those mineral resources which may be of current or potential economic interest. The maps are intended to assist strategic decision making in respect of mineral extraction and the protection of important mineral resources against sterilisation. They are based on the best geological information, much of which is scattered and not always available in a convenient form. The maps have been produced by the collation and interpretation of mineral resource data principally held by the Geological Survey of Northern Ireland.

The Geological Survey of Northern Ireland and counterpart The British Geological Survey have produced the maps via a digital database. The database, which holds information for the whole of Northern Ireland at 1:50 000 scale (digitised to county boroughs), was completed in 2012 and a series of six digitally generated maps at a scale of 1:100 000 are available. The mineral resource data depicted on these maps are also available in a digital format for use within a Geographical Information System (GIS).

Mineral resources

Mineral resources are natural concentrations of minerals which might now, or in the foreseeable future, be of economic value. The assessment of mineral resources is, therefore, a dynamic process which must take into account a range of factors. These include geological reinterpretation as additional data becomes available, as well as the continually evolving demand for minerals and changing technological, social, land use, environmental and environmental factors. Consequently, the economic potential of mineral resources is not static, but changes with time.

Generally, a mineral resource is known to exist within the boundaries outlined by geological mapping, which may be supplemented by more in depth geological data. Mineral Resource data depicted on the map shows the inferred extent of a mineral resource. Inferred resources are those defined from available geological information and assumed but not verified geological continuity. They have neither been evaluated by drilling or other sampling methods, nor had their technical properties characterised, on any systematic basis.

Limitations

The mineral resource data presented are based on the best available information, but are not comprehensive and their quality is variable. The inferred boundaries shown are, therefore, approximate. Mineral resources defined on the map assume that they will be worked by open excavation and that they will be worked to the full depth of the geological deposit, but take no account of planning constraints that may limit their working. Much of Northern Ireland is covered by thick superficial deposits of peat and glacial till, neither of which is shown on the main map. This overburden would need to be removed prior to the working of many of the bedrock resources depicted. Peat, as a mineral resource, is included on an inset map. Till is not considered to be a resource although it may contain small sand and gravel deposits. The economic potential of specific sites may be affected by factors such as environmental impact, land use, and the likelihood of obtaining permission for a planning application for mineral working. Areas are shown on the map as having no mineral resource potential, but some isolated mineral workings may occur. The presence of these operations generally reflect very local or specific situations.

The locations of extant or expired planning permissions for the extraction of mineral are shown. These have been supplied by the Department of the Environment. Due to the complex and historic nature of planning permissions, some digital outlines are not available and, therefore, may not be shown on the map. In addition, building stone quarries are also shown. Information on the location of building stone quarries was taken from the Natural Stone Database of Northern Ireland, developed by the Geological Survey of Northern Ireland. Environmental designation data are based on Crown Copyright and is reproduced with the permission of the Controller of Her Majesty's Stationery Office © Crown copyright and database rights. EMOU206.1 (2012). Many building stone quarries, digital outlines of the planning permission are unavailable and, therefore, are not shown on the map. While the compilers have tried to ensure that the site details are as accurate as possible, any map depicting the location of mines and quarries is a snapshot in time. Moving the extraction location as reserves become exhausted or a new extension starts production, and renaming of sites are regular occurrences, and in addition planning permission may cease to be extant.

The map is intended for general consideration of mineral issues and not as a source of detailed information on specific sites. The map should not be used to determine individual planning applications or in taking other decisions on the acquisition or use of a particular piece of land, although they may give useful background information which sets a specific proposal within context.

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LIMESTONE

Limestones are sedimentary rocks composed mainly of calcium carbonate ($CaCO_3$). Dolomites are limestones that contain between 10-50 per cent magnesium carbonate ($MgCO_3$). As well as being relatively hard and durable, most limestones and dolomites form bedded deposits which are generally easy to work. These properties mean that they are commonly worked for construction aggregate and building stone. Limestones are also valued for their chemical properties in applications such as cement manufacture, glass making, iron ore smelting, flue gas desulphurisation, as a soil conditioner, food supplement and filler. To fulfil the strict chemical limits applied to material used in these applications restricts extraction to high purity stone (> 97 % $CaCO_3$).

County Fermanagh is the largest producer of limestone in Northern Ireland accounting for approximately 66 per cent of total output. Limestones occur in a range of geological ages and environments in Fermanagh, although the most economically-important are Carboniferous in age. County Fermanagh is also host to potentially significant amounts of dolomite.

Limestones of the Carboniferous-age Tyrone Group form the most abundant and economically important limestone resource in County Fermanagh. These limestones generally form relatively thick, well-bedded deposits of consistent quality which are easily worked. As a consequence these rocks are, or have been worked in a number of quarries across the county (including Crieve Hill, Sliabh and Rockfield quarries), primarily for crushed rock aggregate, but also for building stone and lime production.

Dolomitic limestones occur in restricted outcrops in the south of the county, near to Belmore Mountain. A body of dolomitic limestone with an MgCO$_3$ content of 27-42 per cent occurs within the Darby Limestone Formation, either side of the Belcoo Fault. This dolomite is currently exploited at the Creenahoe quarry for crushed rock aggregate, concrete block manufacture and the production of lime. Dolomitic limestones also occur in close proximity to Lettar Bridge (MgCO$_3$ content of 35-38 %) and Keenaghan Lough (MgCO$_3$ content of 7-43 %). These are currently not exploited.

BUILDING STONE

A wide range of rock types are used as a source of building stone for masonry, field walling, roofing and flooring purposes, all of which give a specific character to an area. The stones can be used as coarsely dressed 'rubble walling', however, there is a need for finer, more easily worked, stones for details such as mullions and sills on building work. The suitability of particular rock types depends not only on aesthetic qualities such as colour and textural consistency but also factors such as strength and durability, as well as other commercial considerations.

A wide variety of hard rocks are suitable for use as building stone including igneous, sedimentary and their metamorphic equivalents (igneous or sedimentary rocks that have been altered by heat and/or pressure). Many rock types suitable for building stone are also suitable for crushed rock aggregate (see text box on Crushed Rock Aggregates). Some units, notably the thicker sandstone formations, lend themselves to being used as a freestone or dimension stone as they can be worked in any direction without splitting or failing. A continuing supply of building stone is important for new build and conservation work.

Igneous and meta-igneous rocks

The Palaeogene-age igneous rocks of County Fermanagh comprise south-east – north-west trending dykes and sills of dolerite. These rocks have historically been used as a source of building stone across the county, with the largest single outcrop occurring in close proximity to the town of Garrison. The Garrison Sill is a large intrusion of dolerite that crops out over an area of approximately 15 km^2 at a maximum thickness of 30 metres. The sill was historically worked at Sliagarrow Quarry for building stone.

Sedimentary and meta-sedimentary rocks

Currently there are only seven active quarries in Co. Fermanagh which are known to produce building stone, all of which occur within the Carboniferous-age Ballyshannon and Dartry Limestone Formations. Numerous other quarries have historically produced building stone from the Carboniferous Limestones of Co. Fermanagh.

Sandstones of Carboniferous-age are extensive, particularly in the south-east of the county. Whilst these sandstones have historically been an important source of building stone within Co. Fermanagh, they are currently not exploited. Historically, numerous quarries have extracted building stone from the Cannore and Meenymore Sandstone Formations in Co. Fermanagh.

CRUSHED ROCK AGGREGATES

Crushed rock aggregates are a key component of construction materials such as concrete and asphalt where aggregate particles are bonded together by cement or bituminous materials. Loose aggregates are also used as a stable foundation or road/rail base with predictable, uniform properties.

A wide variety of hard rocks are suitable for use as aggregates including igneous, sedimentary and their metamorphic equivalents (igneous or sedimentary rocks which have subsequently been altered by heat and/or pressure). Their technical suitability for different applications depends upon physical characteristics, such as crushing strength and resistance to impact and abrasion.

High specification aggregates (HSA) are needed to produce skid-resistant road surfacing. They must have a high resistance to polishing. This is expressed as a 'Polished Stone Value' (PSV) of 58 or higher. HSA materials must also meet strict specifications for resistance to abrasion and fragmentation. Lower specification aggregates are suitable for less demanding applications such as construction fill and drainage media, a wider variety of rocks with lower specifications are acceptable.

This text box describes resources of crushed rock aggregate in County Fermanagh derived from igneous rocks, sedimentary rocks such as sandstones, together with their metamorphic equivalents. Limestones, which are an important source of crushed rock aggregate in Co. Fermanagh, are described in a separate text box.

Igneous and meta-igneous rocks

County Fermanagh is the smallest producer of basalt and other igneous rocks in Northern Ireland, currently accounting for less than one per cent of total production, the majority of which is used for aggregate.

Igneous rocks with high PSV occur within the Palaeogene-age intrusions such as the Garrison Sill near Glen Bridge, and dolerite dykes which cut across the western part of Fermanagh. Currently only Dromen Quarry extracts this type of material in Co. Fermanagh. Resources of other igneous rocks suitable for use as general purpose aggregate are found in only minor amounts in the county. In the north west of the county, close to the Tyrone border, the resource comprises predominantly Ordovician meta-basalts. Colton Quarry, in the north of Co. Fermanagh, is the only active operation exploiting these meta-basalts.

Sedimentary and meta-sedimentary rocks

Good quality HSA resources occur in the north of Co. Fermanagh in the form of Carboniferous-age gritty sandstones and greywackes. Resources are extensive, but are currently not exploited. The only HSA resource currently exploited is found near to Largy. Other Carboniferous sandstones and metamorphosed sandstones (psammites), particularly in the south-east and north-west of the county, have been previously worked for general purpose aggregate.

SUPERFICIAL SAND AND GRAVEL

Sand and gravel are defined on the basis of particle size rather than composition. In current commercial practice, following the introduction of the European standards in 2004 (BS EN 12620), the term 'gravel' (or more correctly 'coarse aggregate') is used to define particles between 4 and 80 mm. The term 'sand' (or more correctly 'fine aggregate') is used for material that is finer than 4 mm, but coarser than 0.063 mm. For use in asphalt, 2 mm is the break point between coarse and fine aggregate. Most sand and gravel is composed of particles that are durable and rich in silica (quartz, quartzite and flint).

The principal uses of sand and gravel are as fine aggregate in concrete, mortar and asphalt. The main use of gravel is as coarse aggregate in concrete. Substantial amounts of sand and gravel may also be used for construction fill.

The variability of sand and gravel deposits together with their possible concealment within or beneath till (boulder clay), means that it is difficult to infer their location and the likely extent of potentially workable resources.

Most workable deposits of sand and gravel formed at the end of the last ice age. They lie on top of the bedrock geology and are generally concentrated in river valleys where they were deposited either directly by ice at the margins of glaciers (glacial) or by meltwater flowing from the ice margin (glaciofluvial). Glacial ice-contact deposits tend to be poorly-sorted and of variable quality and thickness. However, glaciofluvial deposits are generally well-sorted and more predictable in terms of quality and quantity.

County Fermanagh is a small producer of sand and gravel, accounting for less than one per cent of total production in Northern Ireland.

Glaciofluvial sand and gravel deposits

These deposits are the products of deposition by glacial melt waters, and are typically complex, occurring as sheet- or delta-like layers above till deposits, or as elongate, irregular lenses within the till sequence. These are by far the most important type of glaciofluvial sand and gravel deposit due to their potential thickness (up to 30-40 metres) and general higher quality. Currently there is only one active sand and gravel operation, Letterbailey Quarry, working this type of deposit in Co. Fermanagh.

Glacial ice-contact deposits

Formed by melt-water deposition beneath or adjacent to glaciers, these deposits are in general poorly-sorted and of variable thickness and quality. Glacial ice-contact deposits are normally less extensive than glaciofluvial outwash and sheet deposits. They are of limited extent with the largest group of scattered deposits located to the south-east of the county. Currently there is only one active sand and gravel operation, Gortnedden Quarry, working this type of deposit in Co. Fermanagh.

METALLIFEROUS MINERALS

The principal metals found in County Fermanagh are lead, zinc and copper, variably associated with baryte, principally hosted by limestone. Selected mineral occurrences to illustrate the diversity of metallic minerals in Co. Fermanagh are shown on the map.

Lead, zinc, copper and baryte

The limestone and associated rocks of north-east Co. Fermanagh, a continuation of those in the Clogher Valley area of adjacent Co. Tyrone, have been the focus of exploration for carbonate-hosted lead-zinc mineralisation. The geological environment of Carboniferous-age shallow water sedimentary rocks, in close proximity to a basin margin fault, is analogous to the Navan deposit in Co. Meath and the Silvermines deposit in Co. Tipperary. Exploration has been concentrated in the Darby area, consisting of occasional lead and zinc rich boulders within sandstone. Baryte-veins ranging in width from a few millimetres up to one metre are recorded from Carboniferous-age rocks in the area. These are generally barren but occasionally contain zinc. Exploration in the east of the county during the 1970s identified very minor mineralisation, consisting of calcite veining with an isolated occurrence of zinc, within limestone to the east of Donagh.

In north-west Co. Fermanagh, small quantities of lead, zinc and copper in thin calcite veins have been historically worked from the limestone east of Belleek and molybdenum occurs at Garvary Wood, north of Bleanaboy Bog. Exploration drilling in the Belleek area identified extensive minor mineralisation at two main levels. Disseminated copper mineralisation occurs in boreholes just above the basement rocks and zinc and lead mineralisation was found throughout a thickly bedded limestone. Minor mineralisation is also recorded from Carboniferous-age rocks from the northern shore of Kenaghan Lough and along the southern edge of the highly metamorphosed sedimentary rocks between Kenaghan Lough and Lough Scolban. The mineralisation is disseminated through the dolomite but occurs also as fracture fillings.

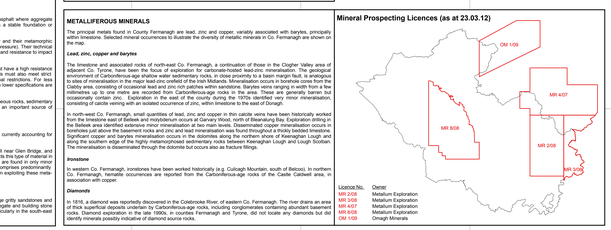
Ironstone

In western Co. Fermanagh, ironstones have been worked historically (e.g. Cuilcagh Mountain, south of Belcoo). In northern Co. Fermanagh, hematite occurrences are reported from the Carboniferous-age rocks of the Castle Caldwell area, in association with copper.

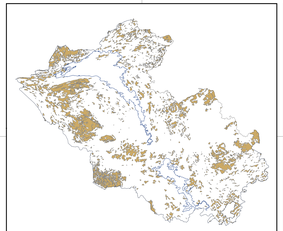
Diamonds

In 1816, a diamond was reportedly discovered in the Colebrooke River, of eastern Co. Fermanagh. The river drains an area of thick superficial deposits underlain by Carboniferous-age rocks, including conglomerates containing abundant basement rocks. Diamond exploration in the late 1990s, in counties Fermanagh and Tyrone, did not locate any diamonds but did identify minerals possibly indicative of diamond source rocks.

Mineral Prospecting Licences (as at 23.03.12)



Licence No.	Owner
MR 2/08	Metallum Exploration
MR 3/08	Metallum Exploration
MR 4/07	Metallum Exploration
MR 8/08	Metallum Exploration
OM 1/09	Omagh Minerals



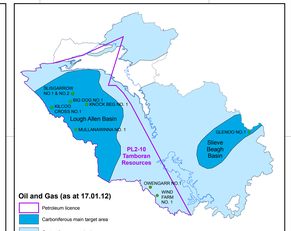
Distribution of peat in County Fermanagh

PEAT

Peat is an unconsolidated deposit formed by decaying organic matter which accumulates in a water-saturated environment such as a bog or moss. Bogs occur in areas where they are dependent on rainfall for supply of water or in sedimentary basins such as former lakes. Vegetation is characterised by acid-tolerant plant communities of which the genus Sphagnum is the most important. Peat is found in two forms, as lowland basin peat, which occurs in valleys and basins in areas of low relief and broad valley floors and (c) blanket bog, which occurs mainly in upland areas where conditions are naturally cool and wet.

Although most widespread in the west and north of Northern Ireland, blanket bog also occurs in eastern upland areas. Peat depth is variable, with an average range of 0.5-3 metres being fairly typical, but depths in excess of 5 metres are not unusual. Lowland basin peat is found in the Lough Neagh and Lough Erne basins and in smaller areas in the valleys of major rivers and in older glacial deposits respectively. Peat bogs in Northern Ireland are relatively small and were never developed on an industrial scale for power generation as they were in the Irish Midlands. Whilst peat is cut locally for fuel, its main usage is as a horticultural growing medium, although its potential as a carbon sink has been recognised.

There are extensive resources of peat in County Fermanagh, and one extant planning permission for commercial extraction of peat (near Tattersallen).



HYDROCARBONS

Conventional oil and gas

Exploration for oil and gas in Northern Ireland began in 1965 and nine exploration wells were drilled in County Fermanagh between 1965 and 2007. Gas shows were recorded in all but one of these wells but no commercial production resulted.

The Lower Carboniferous-age rocks of southern Co. Tyrone and most of Co. Fermanagh form one of the two major provinces in Northern Ireland that are most prospective for oil and gas. The second prospective province comprises the Permian and Triassic (Permo-Triassic) age rocks beneath Lough Neagh and the Antrim Plateau.

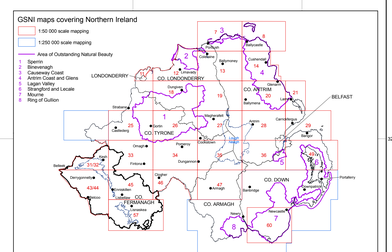
In west Co. Fermanagh, Carboniferous-age sedimentary rocks were deposited in the Lough Allen Basin. Extending across the border into the Republic of Ireland, this basin contains a thick succession of Lower Carboniferous shales, limestones and sandstones. The Benbulben and Bundoran Shale formations are potential 'source' rocks for both oil and gas, although gas is the most likely hydrocarbon to be present. The Bundoran Shale Formation also has shale gas potential (see below).

The main 'reservoir' in the Lough Allen Basin, into which any oil and gas generated from the source rocks might have migrated and become trapped, is the Mullaghmore Sandstone Formation. This is a 'tight' sandstone, with very low permeability, and would probably require horizontal drilling and enhanced recovery techniques to enable any gas to be produced in commercially viable quantities. The overlying Benbulben Shale Formation forms an additional effective 'seal' for any gas that may be present in the Mullaghmore Sst. Fm. Where the Mullaghmore Sst. Fm. is absent, the Glencar Limestone Formation, is another tight sandstone which has reservoir potential but is thinner and less widespread than the Mullaghmore.

Straddling the border of south Co. Tyrone with Co. Fermanagh is the Carboniferous Slieve Beagh Basin which contains the same rock units as the Lough Allen Basin. The Benbulben and Bundoran Shale Formations become thinner and less organic-rich towards the east, thus reducing their source rock quality. The Bundoran Shale Formation also has shale gas potential (see section below) where it is sufficiently deep. In 1993 the only exploration well in the Slieve Beagh Basin, Glenco No. 1, was drilled to 2106 metres depth without encountering any hydrocarbons.

Shale gas

Shale gas is recovered directly from mudrocks and shales which have previously been considered too impermeable ('tight') to allow economic recovery of gas. Unlike conventional gas, which collects in porous 'reservoir' rocks (such as sandstone) and is then extracted by drilling, shale gas is produced from the mudrocks and shales themselves. These rocks are porous mudrocks and shales. It can only be accessed with a specialised drilling and production technique, called hydraulic fracturing or 'fracking' which enhances the limited natural micro-porosity to free the gas from the rock for extraction via a borehole.

In Co. Fermanagh, the Bundoran Shale Formation in both the Lough Allen and Slieve Beagh basins is likely to be prospective for shale gas. The Lough Allen Basin is considered to be more prospective than the Slieve Beagh Basin. The rocks are also shallow in most areas to be prospective for shale gas. The Benbulben Shale Formation also immediately underlies the Darby and Glencar Limestone formations giving insufficient vertical separation between potential fracturing/producing zones and these shallow aquifers.

GSNI maps covering Northern Ireland