Ennis GWB: Summary of Initial Characterisation.

Note that parts of the western and northern GWB boundaries will alter. This description is written for the current status.

| Hydrometric Area | | Associated surface water features | Associated terrestrial | Area | | |
|------------------|--|--|--------------------------------------|--------------------|--|--|
| Local Authority | | | ecosystem(s) | (km ²) | | |
| 27 - Fergus | | Rivers: Fergus, Castlelodge*, Castle, Millbrook, Ballygriffy, Poulacorry, | Ballyallia Lake | 341 | | |
| | catchment | Carheeny, Claureen or Inch, Clareen, Moyree, Druminshin, | (000014), Lough | (Note: this | | |
| Clare | & Galway Co. | Craggaunboy, Shallee, Spancehill, Carrownanelly, Owenslieve. | Cleggan (001331), | value will | | |
| | Cos. | Loughs: Rockforest, Templebannagh, Coolreash, Ballyeighter, | Ballyogan Lough | decrease | | |
| | | Ballinlisheen, Water, Muckanagh, Gorr, Turkenagh, Monana, Ballyogan, | (000019), The East | when the | | |
| | | George, Ballynacaugh, Parkeighteragh, Moyree, Salannacutteen, | Burren Complex | RBD | | |
| | | Cullaun, Shandangan, Ballyportry, Inchiquin, Machreenfin, Boy, | (001926), Ballycar | boundary | | |
| | | Knockaundoo, Nabrichoge, Garr, Ballyteige, Atedaun, Hennessy, | Lough (000015), | is | | |
| | | Caheraphuca, Cragmoher, Dromore, Shanvally, Ballycullinan, Raha, | Ballycullinan Lake | finalised.) | | |
| | | Nagall, Reagh, Loughaunore, Curraderra, Namuck, Faunrusk, Keelaun, | (000016), Fergus | | | |
| | | Cloonleen, Licknaun, Stonepark, Ballyallia, Cappagh, Cleggan, | Estuary and Inner | | | |
| | | Ballymaley, Ballymachill, Loghaun, Curtaun, Ardamullivan, Carheeny, | Shannon, North Shore | | | |
| | | Cregg, Scarriff, Beg, Skehanagh, Girroga, Ardnamurry, Tooreen, | (002048), Termon | | | |
| | | Dromdoolaghty, Cloonawee, Castletown, Kilbreckin, Naslatty, Edenvale, | Lough (001321), | | | |
| | | Ballybeg, Killone, Laghtyshaughnessy, Loughannirra, Awock, Colman's, | Cahircalla Wood | | | |
| | | Doo, Aslaun. Fiddaun, Termon*, Bunny*, Travaun*, Loum*, Avatia*, | (001001), Moyree River | | | |
| | | Mannagh*, Briskeen*, Duff*, Skeardeen*, Castle*, Skaghard*, | (000057), Dromore | | | |
| | | Augnrim [*] , Oona [*] , Awaddy [*] , Pollifern [*] , Monreagn [*] . | woods and Loughs | | | |
| | | (Loughs and rivers marked with * may be in an area that becomes part of | (000032). | | | |
| | The CWD is also | the Western RBD.) | the nextherm next next rest | a ta ahaut | | |
| ~ | Plum in the couth | Igated in a N-S direction, and is about 34 km long. It is about 20 km wide in | The northern part, narrowing | WP the | | |
| iųd | 8 km in the south | a very low gradient of 0 0000 (K T. Cullon & Co. 2001). Cround elevation | g. In the lower part of the G | wB, the | | |
| ra | to just over 120 r | a very low gradient of 0.0009 (K.1. Current & Co., 2001). Ground elevation AOD . The highest ground ecours along the western boundary, at the context of t | at with the Namurian rocks | of the | | |
| 000 | Craggouphov GV | MAOD. The highest ground occurs along the western boundary, at the conta- | upland karst area of the Pur | or the | | |
| lol | This occurs at an | provimately 60 m AOD. Drainage is good, except in the very lowest areas no | apt to the estuary. There are | a number | | |
| <u> </u> | of sinking stream | proximately of mAOD. Dramage is good, except in the very lowest areas in | ext to the estuary. There are | a number | | |
| | Aquifer | The majority of the GWB comprises an Pk^c . Regionally important karsti | fied aquifer dominated by c | onduit flow | | |
| | categories | Along the eastern margin of the GWB there are narrow hands of Lm . I | cally important aquifers wh | hich are | | |
| | categories | generally moderately productive and small areas of L : Locally important | t aquifers which are moder. | ately | | |
| | productive only in local zones. There are small areas of L1 acuifer in the very south of the GWB also | | | | | |
| | Main aquifer | Dinantian Pure Bedded Limestones form most of the aquifers in the GWR There are small areas of Dinantian | | | | |
| | lithologies | Pure Unbedded Limestones in the east and very south of the GWB. | | | | |
| | Variationa | | | | | |
| | Key structures | structures Gentle ENE-WSW trending anticlines and synclines dominate and there are numerous N-S cross faul | | | | |
| | | approximately 10.20° There is a deep seated area of deformation the E | argue Shear Zone, which tre | onde in a | | |
| | | approximately 10-20. There is a deep-search area of deformation – the r | The faulting is not easily re- | cognised on | | |
| | | the surface although there are subtle indications of it. The fracturing over most of the area is principally in the | | | | |
| | | N-S and E-W directions and this controls zones of high nermeability. New | ar the Fergus Shear Zone for | and aves are | | |
| fer | | IN-5 and E-w directions and this controls zones of high permeability. Near the Fergus Shear Zone, fold axes are rotated slightly anticlockwise because of the lateral movement along the fault | | | | |
| lii. | Key properties | Karstification is ubiquitous in this GWB As with most karstic systems r | ermeability and transmissiv | vity data are | | |
| Αq | ney properties | very variable. Transmissivity in karstified aduifers with conduit flow can range from $<1 \text{ m}^2/d$ up to a few | | | | |
| pu | | thousands of m^2/d . Due to groundwater being generally concentrated in c | onduits, very low vielding of | or failed | | |
| y a | | wells can occur adjacent to very high vielding boreholes. Groundwater tr | avel times through the cond | uits are | | |
| 60 | | rapid (up to 240 m/h in the Lower Fergus Valley) although it appears that | t flow in the east-west direc | tion may be | | |
| eol | | slower than that which is north-south. A dye-tracing study at the Poulado | wer spring indicates N-S tra | avel times of | | |
| G | | 141-181m/h and E-W travel times of 67-149 m/h Ranid velocities recorded for groundw | | area imply | | |
| | flow through relatively sizeable conduits. Storativity in this acuifer is lo | | v (effective porosity $\sim 1.5-2$. | 5%). | | |
| | | (data sources: Pook Unit Group Aquifar Chapters Clare CWPS and Sou | naa Danauts saa vafavanaas |) | | |
| | Thickness | (aata sources: Rock Unit Group Aquifer Chapters, Clare GWPS and Source Reports, see references) | | | | |
| | 1 mexiless | groundwater flows in an enikarstic layer a few metres thick and in a zone | of interconnected solutions | llv_enlarged | | |
| | | fissures and conduits below this. Work relating to the flooding around Fr | in the connected solution | (1) suggests | | |
| | | that "karst features are generally 10 metres below ground level." Deeper | groundwater flow can occur | r in areas | | |
| | | associated with faults. On Aughinish island, on the south side of the Shar | non Estuary there are very | deen | | |
| | associated with radius. On Augminish Island, on the south side of the Shannon Estuary, (~ 60 mbs) conduits that relate to an ancient baselevel. There may be such conduits in | | ch conduits in this area but | they are not | | |
| | | known: field work would be required to confirm their presence or otherw | ise. | and y are not | | |
| | | | | | | |
| | | | | | | |

| | Lithologies | [Information to be added at a later date] | | |
|----------|--|---|--|--|
| g Strata | Thickness | Subsoil thicknesses over the GWB range between 0 m and 15 m. Median subsoil thicknesses in the area, according to the GSI database, are approximately 7 m. Outcropping rock is extensive, particularly in the north of the GWB; the percentage area of outcrop decreases southwards. In the catchment area of the Drumcliff spring (northwest of Ennis), Deakin (2000) reports that drumlins are common. | | |
| rlyin | % area aquifer near surface | [Information to be added at a later date] | | |
| Ove | Vulnerability | Vulnerability ranges from Extreme to Low. In the north of the GWB, vulnerability is predominantly Extreme with areas of High vulnerability. In the south of the GWB, vulnerability is mainly High, with areas of Extreme vulnerability. Across the whole GWB, there are NE-SW orientated small areas of Moderate vulnerability. In the very south of the GWB, adjacent to the estuary, there is an area of Low vulnerability. | | |
| Recharge | Main recharge mechanisms Est. recharge rates | Both point and diffuse recharge occur in this GWB. Swallow holes and collapse features provide the means for point recharge. Linear/ point recharge occurs along river reaches and where rivers sink underground. Surface water draining off the low permeability Namurian rocks to the west of this GWB sinks into the aquifers of this GWB. Diffuse recharge will occur over the entire GWB via rainfall percolating through the subsoil. The lack of surface drainage in several parts of this GWB indicates that potential recharge readily percolates into the groundwater system. In low-lying areas with a high water table in this highly transmissive aquifer, there can be some rejected recharge, i.e. a proportion of the effective rainfall is rejected due to lack of storage space in the aquifer. During winter, the 'drainage system' of the aquifer can be overwhelmed by the volume of rainfall, and flooding is common in the area around and to the south of Ennis. <i>[Information to be added at a later date]</i> | | |
| harge | Important springs and high yielding wells (m ³ /d) | Elmvale Spring (27,600 m³/d – low flow discharge)* Aglish Spring (1296 m³/d – mean flow)* Shandangan Springs (4320 m³/d – mean flow)* Rinnamona Springs (1469 m³/d – mean flow)* Drumcliff WS Springs (15,000 m³/d – safe yield est.) Pouladower boreholes (6735 m³/d) Pouladower Spring (10,000 m³/d – low flow, 62,400 m³/d – high flow)* Scarriff/ Tubber GWS (yield 218 m³/d, abstraction unknown). Note: springs marked with an * are proven to or are probably fed by groundwater originating in the upland | | |
| | Main discharge mechanisms | karst area of the Burren GWB. The main discharges are to the streams and rivers crossing the body and to the large springs found within the body. In winter groundwater will discharge to the many turloughs found in the area. | | |
| | Hydrochemical Signature | Groundwaters within this GWB have a calcium-bicarbonate hydrochemical signature. Hydrochemical analyses indicate that groundwater at Drumcliff WS spring is Moderately Hard ($151-250 \text{ mg/l}$ as CaCO ₃), with alkalinities of $180-272 \text{ mg/l}$ (as CaCO ₃) and conductivities of $290-560 \mu$ S/cm. At the Pouladower spring groundwater is also Moderately Hard water ($151-250 \text{ mg/l}$ as CaCO ₃), with alkalinities of $140-185 \text{ mg/l}$ (as CaCO ₃) and conductivities of $290-560 \mu$ S/cm. At the Pouladower spring groundwater is also Moderately Hard water ($151-250 \text{ mg/l}$ as CaCO ₃), with alkalinities of $140-185 \text{ mg/l}$ (as CaCO ₃) and conductivities of $314-462 \mu$ S/cm. These values are all lower than would normally be expected from a typical limestone aquifer water, suggesting that the groundwater residence time in the carbonate environment is relatively short. At Drumcliff, the coefficient of variation of conductivity is high, and this suggests rapid response to recharge with flow in large conduits. | | |
| Dis | | Water quality at Druncliff fluctuates throughout the year with the poorer quality analyses being returned during the winter months and during periods of heavy rainfall. Colour, turbidity and iron have all exceeded the EC Drinking Water Directive maximum admissible concentrations (MAC) on occasion almost every year. Total coliforms and <i>E. coli</i> are also often present. Aluminium has also been found to exceed the MAC (max 0.31 mg/l Al; Sept 1994) although concentrations in the Groundwater Protection Scheme project analyses were less than the Guide Level in both cases. Nitrate concentrations are always low (<10 mg/l NO ₃) and chloride levels range 20-45 mg/l Cl which are slightly higher than the background levels (10–20 mg/l) but are still not a cause for concern. At Pouladower spring, water quality is generally relatively good with low levels of chemical contaminant indicators such as chloride, nitrate and potassium. Bacteriological analyses however, often show the presence of faecal coliforms (<i>E. coli</i>), although this is typical in a karst spring, due to the presence of sinking streams, extreme vulnerabilities and rapid subsurface velocities. Colour is the main problem parameter with respect to the EU drinking water requirements and it often exceeds the MAC. Iron is not as much of a problem as it is at Drumcliff Spring and is seldom at a level which is cause for concern. | | |
| | | Elsewhere in the limestones in the catchment area, similar problems with <i>E. coli.</i> , iron, colour and turbidity are reported (Coxon and Drew, 1998). The Namurian rocks to the west of the area, or the sandstones and overlying peat to the east, may be the origin of some of the suspended matter, although there may also be a contribution from ancient infilled unconsolidated deposits in karst depressions and/or the epikarst. | | |

| Groundwater Flow Paths | There is no intergranular porosity or permeability in the rocks of this GWB. Dissolutional enlargement of bedding planes and the N-S and E-W joints has created permeability. The GWB is highly karstified; localised high permeability zones give rise to rapid groundwater velocities. Groundwater is likely to flow in three main hydrogeological regimes: |
|---------------------------|---|
| | (1) an upper, shallow, highly karstified weathered zone, known as the epikarst, in which groundwater moves quickly, through solutionally enlarged conduits, in rapid response to recharge; (2) a deeper zone, where groundwater flows through interconnected, solutionally enlarged conduits and cave systems which are controlled by structural deformation (principally in the north-south and east-west directions) and bedrock lithologies. Groundwater flows along the less permeable, cherty units until it intersects a vertical fissure; and (3) a more dispersed slow groundwater flow component in smaller fractures and joints outside the main conduit systems. |
| | The epikarst is thought to be relatively modern, being formed after the last ice age, while the deeper karst is likely to be a remnant of not only recent solution, but also glacial and pre-glacial solution. All three groundwater flow regimes will be hydraulically connected in places with the degree of interconnection depending on the presence of less permeable bedrock units and the faults and joints associated with the structural deformation, particularly the north-south and east-west fault systems. K.T. Cullen & Co. (2001) concluded from drilling a programme in the Ennis area that karstification is generally limited to 10 m or less below the ground surface. |
| | Deakin (2001) considers that lithological variation in the form of the cherty Ballard Member of the pure limestone Burren Formation has a strong influence of the location of the Pouladower Spring, and also forms a barrier between this spring and the Drumcliff spring 2.5 km to the south. |
| | Runoff from the adjacent Namurian Craggaunboy and Lissycasey GWBs is acidic due to the shales and overlying peaty subsoils and it quickly dissolves the carbonate limestone rocks. This has resulted in a ring of swallow holes, sinks and large cave systems at the boundary between the two units where karstification processes are still active today. Numerous examples of this occur around the Burren where runoff from the Namurian rocks sinks underground into the limestones within a short distance. |
| | It is probable that a high proportion of the flow to the springs is in direct-route, underground, solutionally enlarged conduits in the limestones, with a somewhat lesser contribution from the smaller, more diffuse network of fissures and conduits in the surrounding rock. The proportion of flow travelling through large conduits will vary with different water levels: there is likely to be more flow in the diffuse fissures at lower water levels. Heavy rainfall can cause temporary high water levels in the shallow epikarst zones, and pulses of recharge can displace material which is normally relatively undisturbed. Bacteria are a common problem in karst areas as groundwater travel times are so short and vulnerability generally extreme. The fluctuations in colour and bacteria and, occasionally, iron, are all typical of a karst environment with a rapid 'flashy' response to rainfall events and short residence times. |
| | Despite the highly conduitised nature of the flow, a regional water table exists. The water table responds to the seasonal rainfall pattern. The seasonal variation is highest in the recharge areas and lower in the discharge areas. For example, at the Drumcarran More swallow hole, which links underground to the Pouladower springs, seasonal variation is 4.5 m. At a borehole near a spring in the same general area (Toberateaskan), the water level varies by about 0.5 m (K.T. Cullen & Co. Ltd.). At Corofin, next to the Fergus River between Inchiquin and Atedaun Loughs, the water table fluctuates from 1-3 mbgl over the year. In this low-relief area, the water table is generally not far beneath ground level. Over most of the GWB, groundwater levels are within 5 m of the surface. However, there are recorded water levels of between 10 and 27 mbgl. Some of these data can be explained by the location of the boreholes in relatively high areas. Some boreholes, however, are situated on or near river banks and indicate that there are areas within the aquifer isolated from the main conduits. In the main, boreholes with deep water levels have Poor or Moderate yields. |
| | Groundwater levels respond quickly to rainfall events due to the general absence of subsoil cover. In storm events, water levels in the swallow holes and other point recharge features back up and are higher than the true water table. This means that flooding in the Ennis area is generally not caused by the water table rising, but due to the inability of swallow holes to accept high recharge rates and transmit surface water into the subsurface. |
| | In the Ennis area, the regional flow pattern is towards the River Fergus. Groundwater contours elongate along the length of the tributaries, indicating high permeability zones along these features. Whilst the River Fergus is tidal in its lower reaches, the K.T. Cullen study (2001) indicated that, in the area near to the coast, there is no tidal effect on groundwater. |

| Since water Index for the gloandwater with spectra and vice versa. The regist Kver, the interactions of the sea. There are a number of sinks and rises along its coarse and, depending on climatic conditions, it any give the sea. There are a number of sinks and rises along its coarse and, depending on climatic conditions, it any give the base search based the groundwate system have not minited bases are search the prevention the search and register search and the search the search and the | Groundwater & | | There is an effective hydraulic interconnection between groundwater and surface water in the karst limestone: | | | |
|---|---|---|---|--|--|--|
| Under the transmission The area is a number of sinks and rises along its course and, depending on climatic conditions, at any given site the river water may be reducating the groundwater system or iters. Rivers crossing the limestone apartice have low summer baseflows, and flows are colten flashly. The effects of heavy rainfall can be seen in the varier or quality at Drunciff Spring within two days and this also highlights this sensitivity of the system. The events of active water on the groundwater system are seen in the limestone areas adjacent to the Upper Carbonitierous Cherre Shales. The shales, and overying sundstone and shale units, are of much lower permeability than the limestones, and most of the effective rainfall runs off in surface water streams to the lower streams to the lower areas a set in the interview. Surface water is not is barly conduct water that dissolves the carbonate rocks. This has resulted in a ring of swallow holes, sinks and ringe area systems at the boundary between the low units where extra string fragments into the kars fragmendwater system and potentially cancella a ring of swallow holes, sinks and ringe area systems within the GWB, including naturally eutophic loughs. Calcareous loughs and laking freq rundwater system and potentially cancels the springs. There are sveral groundwater does of the Craganuby and Lissystems (GWBs. The SE boundary is delineated on the basis of the orthere houndary of the GWB is complex: the western part of the northern boundary is delineated on the basis of the orthere houndary of the GWB is complex: the western part of the northern boundary is delineated on the basis of the orthere houndary of the GWB is complex: the western part of the northern boundary is delineated on the basis of the orthere houndary of the GWB is complex: the western part of the northern boundary. Groundwater rossen and offerent from the low land karst system or this coltes strathes water divide. • The | Surface water | | much of the groundwater will spend at least some time on the surface and vice versa. The Fergus River, for example, although it now has two artificial stretches of channel, at one time did not have a continuous path to | | | |
| Pure Torugation of the set of | interactions | | the sea. There are a number of sinks and rises along its course and, depending on climatic conditions, at any | | | |
| input: aquifer have low summer baseflows, and flows are often flashy. The effects of heary system. Particular effects of surface water on the groundwater system are scen in the limestone areas adjacent to the Upper Carboniferous Clare Shales. The shales, and overlying sandstone and shale units, are of much lower permeability than the limestones, and most of the effective rainfall runs off in surface water streams to the lower lying limestones. The shaly rocks give rise to highly acidic water that dissolves the carbonate rocks. This has resulted in a ring of swallow holes, sinks and large cave systems at the boundary between the two units where karstification processes are still active today. Surface water flowing of the Namurian rocks in the west and the Devonian Sandstone and Impure limestones in the east are in the zone of contribution to the Druncliff and Pouladover springs. There are several groundwater-dependent cosystems within the GWB, including naturally cutrophic logge, clacarcous toughs and alkaline fins, and oligornophic calcarcous toughs. • The terrain in this GWB is generally flat-lying to gently undulating. It is bounded to the south by the costat with the low transmissivity Namurian rocks of the Crasgeunboy and Lissycasey GWBs, to the east by the lower transmissivity hybrigoelogical regime in the upland karst of the Bureran GWB area is o different from the lowald karst stres are the Groundwater roces-flows from the Bureran GWB in this GWB. • The entrihem the south of this surface water advide via a fairly complicated system of this GWB. • The eastern part of the northern boundary is a surface water advide with a fais of the Chapter of the digmed to the south of this surface water advide via a fairly complicated system of this GWB. • The ofWB pedopological regime in the upland karust of the Bureran GWB into this GWB. • | | | given site the river water may be recharging the groundwater system or vice versa. Rivers crossing the limestone | | | |
| Upper Carboniferous Clare Shales. The shales, and vortying sandstone and shale units, are of much lower permeability than the limestones, and merg proundwater system are seen in the limestone areas adjacent to the Upper Carboniferous Clare Shales. The shales, and overlying sandstone and shale units, are of much lower permeability than the limestones, and most of the effective rainfall runs of numbary between the two units where resulted in a ring of swallow holes, sinks and large care systems at the boundary between the two units where resulted in a ring of swallow holes, sinks and large care systems at the boundary between the two units where and hend power and impure limestones in the cast are orienthy on to the Drunnelff and Pouladower springs. There are several groundwater dependent ecosystems within the GWB, including naturally eutrophic loughs, calearoous loughs and alkaline fens, and oligotrophic calearoous turloughs. • The terrain in this GWB is generally flat clying to gently volualizing. It is bounded to the soundary between the two or the sais of topography, since the hydrogeological regime in the upland karst of the Craggaunboy and Lissycasey GWBs, to the east by the touter transmissivity intestones of the Cransen and rului - Newmarket-on-Fergus GWBs. The SE boundary is colincident with a surface water and implied groundwater divide. • The northern boundary of the GWB is complex: the western part of the northern boundary is a define aver calement of the BB boundary is a define aver accelement of the BB boundary is colincident with a surface water and implied groundwater divide via a fairly complicated system of undergonal enduster for the lowed the sais of fifteen the adjuster to the sais of the sais of fifteen the sais of the polyce setting in a highly stransmissive applice water calement of the BB boundary. Groundwater divide via a fairly complicated system of undergo have and shale units of the adjuster | | | aquifer have low summer baseflows, and flows are often flashy. The effects of heavy rainfall can be seen in the | | | |
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| Information | Coxon, C. and Drew, D. (1998) Interaction of Surface Water and Groundwater in Irish Karst Areas: Implications for | |
|-------------|--|--|
| Sources | Water Resource Management. Proceedings of IAH Congress, Las Vegas, Sept. 1998. | |
| | Deakin, J. (2000) Ennis Public Supply – Drumcliff Spring, Co. Clare. Geological Survey of Ireland Report to Clare | |
| | Co. Co., 13 pp. | |
| | Deakin, J. (2000) Ennis Public Supply – Pouladower Spring, Co. Clare. Geological Survey of Ireland Report to Clare | |
| | Co. Co., 13 pp. | |
| | Deakin, J. and Daly, D. (2000) County Clare Groundwater Protection Scheme. Geological Survey of Ireland Report to | |
| | Clare Co. Co., 67 pp. | |
| | K.T. Cullen & Co. (2001) Ennis Main Drainage and Flooding Study: Preliminary Report. Volume III, Part II, | |
| | Hydrogeology Final Report. Report for Ennis U.D.C. 51 pp. plus figures and appendices. | |
| | Aquifer chapters: Dinantian Pure Bedded Limestones; Dinantian Pure Unbedded Limestones. | |
| Disclaimer | Note that all calculations and interpretations presented in this report represent estimations based on the information | |
| | sources described above and established hydrogeological formulae | |

Figure 1: Groundwater hydrograph





Figure 2: Hydrochemical signature



Rock units in GWB

| Rock unit name and code | Description | Rock unit group |
|--------------------------------------|--|------------------------------------|
| Ballycar Formation (BC) | Dark grey fine cherty limestone | Dinantian Pure Bedded Limestones |
| Burren Formation (BU) | Pale grey clean skeletal limestone | Dinantian Pure Bedded Limestones |
| | bedded & massive fossiliferous | |
| Aillwee member (lower) (BUal) | limestone | Dinantian Pure Bedded Limestones |
| Aillwee & Maumcaha Members | | |
| (BUam) | Massive to thick bedded clean limestone | Dinantian Pure Bedded Limestones |
| Aillwee Member (upper) (BUau) | fossiliferous limestone with Davidsonia | Dinantian Pure Bedded Limestones |
| Aillwee Member (BUaw) | fossiliferous limestone with claybands | Dinantian Pure Bedded Limestones |
| Ballard Member (BUbd) | Fine-grained dark limestone with cherts | Dinantian Pure Bedded Limestones |
| Hawkhill Member (BUhh) | peloidal limestone with chert | Dinantian Pure Bedded Limestones |
| Maumcaha Member (BUmc) | massive limestone sparsely fossiliferous | Dinantian Pure Bedded Limestones |
| Oolitic limestone (oo) | | Dinantian Pure Bedded Limestones |
| Slievenaglasha Formation (SL) | Cherty limestone, crinoidal intervals | Dinantian Pure Bedded Limestones |
| | Crinoidal & cherty limestone & | |
| Tubber Formation (TU) | dolomite | Dinantian Pure Bedded Limestones |
| Cregmahon Member (TUcm) | Crinoidal limestone with cherts | Dinantian Pure Bedded Limestones |
| Castlequarter Member (TUcq) | monotonous limestone and dolomite | Dinantian Pure Bedded Limestones |
| Fiddaun Member (TUfd) | peloidal limestone | Dinantian Pure Bedded Limestones |
| Newtown Member (TUnt) | cherty limestone | Dinantian Pure Bedded Limestones |
| Cregmahon Member (TUcm) | | Dinantian Pure Bedded Limestones |
| Visean Limestones (undifferentiated) | | |
| (VIS) | Undifferentiated limestone | Dinantian Pure Bedded Limestones |
| Mudbank limestone (mk) | | Dinantian Pure Unbedded Limestones |
| Slievenaglasha Formation & | | |
| Mudbank limestone (mkSL) | Cherty limestone, crinoidal intervals | Dinantian Pure Unbedded Limestones |
| Waulsortian Limestones (WA) | Massive unbedded lime-mudstone | Dinantian Pure Unbedded Limestones |