THE BUILDING STONES AND SLATES OF KILLIN

an investigation of stone for the built heritage

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Killin, building stone, slate, quarry, resources, built environment.

Front cover
Main Image: Service building with slate roof adjacent to Killin Hotel. Smaller images (left to right): Highland Border slate; Villas, Main Street, Killin; 1901 historic OS map of Killin; Falls of Dochart Bridge, Killin; Geology map of Killin area; typical Killin building stone; outcrops of local stone type, near Killin.

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SUMMARY

The village of Killin lies in an area of dramatic landscape and mountain scenery. The use of local stone in the buildings gives a direct connection to this landscape and reflects the local geology, comprising mostly metamorphic rocks of Precambrian age –dominantly limestone, meta-sandstone, mica schist and meta-igneous rocks. All of these (with the exception of the Loch Tay Limestone which was used for soil improvement) were used in buildings and structures within the Killin Conservation Area.

The stone masonry in the village is classified into five categories; (1) cottages (mostly harled) built of random rubble from field and river boulders and surface rock outcrops, (2) two storey buildings with irregular coursed rubble walls of meta-sandstone and mica schist with large dressings of silver-grey slabs of actinolite schist, (3) and (4) larger late 19th century buildings with dressings of Central Belt sandstone used in combination with squared rubble walling of local actinolite schist and meta-sandstone. The 5th masonry category represents relatively late buildings constructed using distinctive imported stone types (e.g. whinstone, granite, red sandstone). These categories are broadly chronological in order and reflect the development of architectural form along with improving transportation of materials over time.

A number of different roofing slate types are also observed; mostly dark coloured Scots slate (both Highland Border and West Highland slate) giving a distinctive appearance to roofs. More uniform purple Welsh slate was used for some later buildings.

Examination of the A-listed Dochart Bridge shows it is constructed largely from stone extracted from outcrops in the immediate river bed. A phase of major repairs involved replacement of slabby mica schist copestones on the parapet by large square blocks of basic igneous rock, probably imported into the village.

Only one building stone quarry has been identified in Killin, a small quarry to the south of the Dochart Bridge which was worked in the late 19th century supplying meta-sandstone block for villa construction (Type 4 above). The distinctive actinolite schist was probably obtained from a quarry in an igneous intrusion nearby in the Loch Tay Limestone. This quarry has not been located. Although a significant number of small scale quarries are recorded in the Loch Tay district, none appear to have supplied building stone to Killin. All these quarries are now closed and there are no active quarries in the area.

Due primarily to the durable and impermeable nature of the local stone, most buildings in Killin are generally in good condition. The main threats are water penetration through lack of maintenance and poor quality repointing using hard cement mortar. Matching stone for repairs and new construction is likely to be difficult to obtain, although several active aggregate quarries in other parts of the Highlands might supply similar stone. Replacement sandstone needs to be carefully matched to the original, and petrographic characterisation is recommended to identify the closest match. No slate quarries are active in Scotland today, and replacement slate with broadly similar characteristics (including variable sizes to produce diminishing courses) can be obtained from a number of quarries in Cumbria, Wales and overseas (e.g. Spain).

CONTENTS

1. INTRODUCTION & AIMS OF THIS STUDY

The British Geological Survey was commissioned by the Loch Lomond & Trossachs National Park to undertake a building stone audit of the Conservation Area in Killin. A map of the area is shown in Fig. 1. The aims of the project were:

1. To provide an overview of the principal stone and slate types used in Killin Conservation area by undertaking on-site visual surveys of properties to identify the principal stone types used throughout the area, including roofing materials. A photographic record illustrating the principal building materials is to be provided.

2. Identification of the original sources or quarries where stone has been obtained, and potential sources of new stone for repairs and for new construction which would be 'in keeping' with the historic built environment. As well as examination of buildings, this work involves research using geological maps and historical references.

3. A detailed assessment of the stone types used in the Category A listed Falls of Dochart Bridge, including identification of the original source of the stone and potential sources for future repairs.

The purpose of this work is to provide baseline information on the different stone and slate types used in the Conservation Area, and to discuss their origin and relationship to the historical evolution of the village. These data can then be used to inform future decisions on the selection of materials for repairs and new construction which are in keeping with the historic built environment and retain the special character of the conservation area and its surroundings.

This report presents the results of the audit. The work was carried out during a number of site visits to Killin where visual surveys of buildings in the conservation area were undertaken. All the survey work was carried out from areas of public access; there was no access to private property or to the inside of buildings. A detailed study of geological records and historical maps was made in order to characterise the geology of the district and identify possible former sites of stone extraction. This was followed up by visits to potential sites to establish the presence of former quarries and the potential for reopening and providing future supplies of stone.

Following a brief description of the historical development of Killin in Chapter 2, this report gives a summary of the geology of the district, describing the main rock types in the area (Chapter 3). The results of the building surveys are presented in Chapter 4 where the building stone types are divided into five distinct categories. For each of these, the masonry type is described in detail and illustrated using photographs of several key example buildings of each type. It should be noted that this work does not document the stone types of every building in Killin; it was only intended to provide an overview of the different masonry types present in the Conservation Area. The different types of roofing slate used in the area are similarly described and divided into categories. A detailed description of the stone masonry in the A-listed Falls of Dochart Bridge is given in Chapter 5, illustrated with photographs and including identification of the original sources of the stone.

Chapter 6 presents the results of the research into sources of building stone, identifying quarries throughout the district. The sources of the various stone types used in Killin are identified either as specific quarries, or the likely geological formations where the stone is most likely to have come from. Finally, the information is summarised in Chapter 7, including an overview of the contribution that stone makes to the overall character of the distinctive built heritage of Killin.

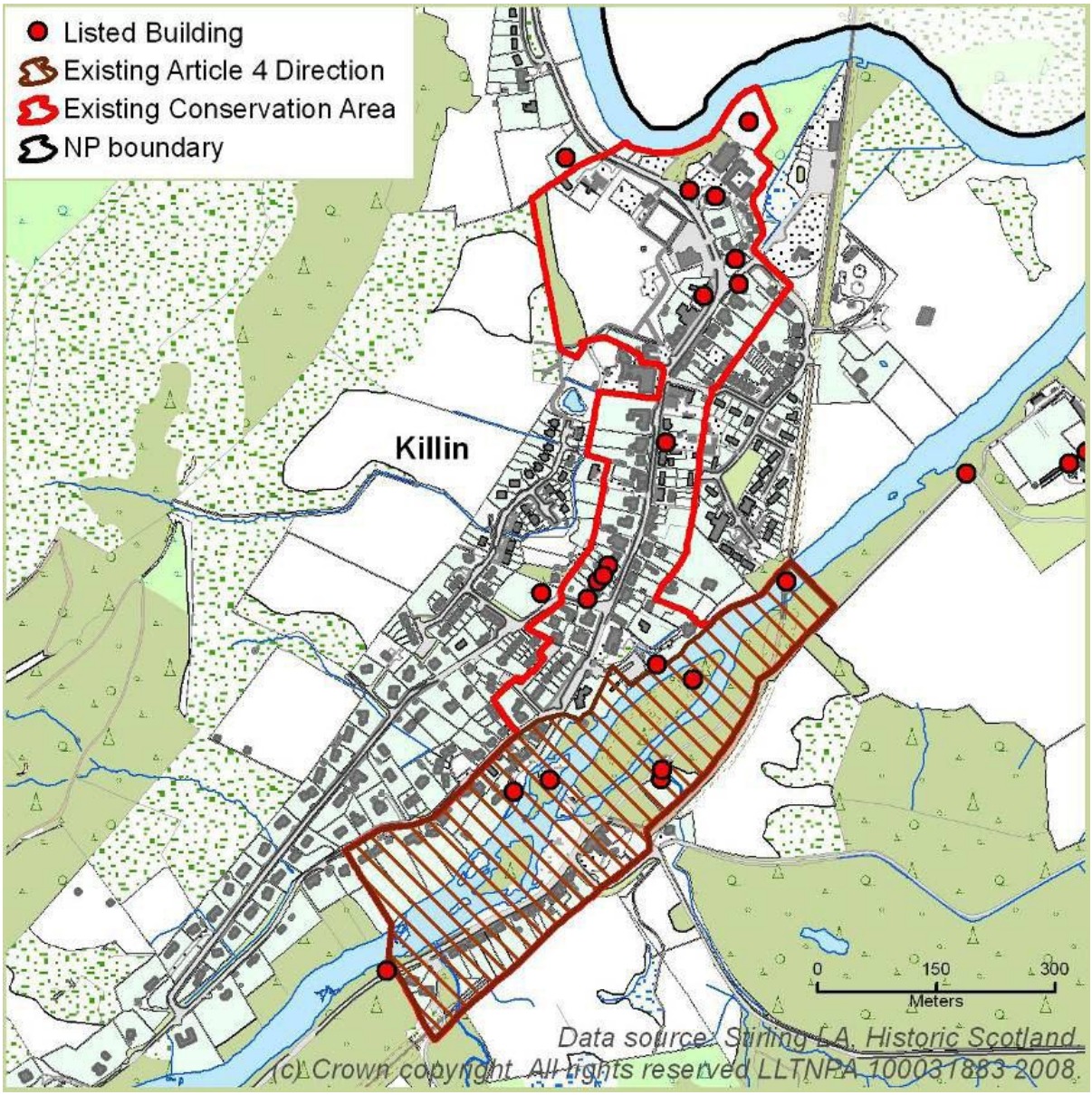


Fig. 1: Map of the Conservation Area in Killin, also showing Listed Buildings (map provided by Loch Lomond & Trossachs National Park).

2. HISTORICAL DEVELOPMENT OF KILLIN

The village of Killin lies at the western end of Loch Tay in the confluence of rivers Lochay and Dochart. It occupies a strategic geographical location near the junction of Glen Dochart, Glen Lochay and Glen Ogle. It is located close to the important military road which linked Stirling and Fort William and functioned as an important crossing point linking the central lowlands of Scotland with the west Highlands. Killin thrived as a trading point and developed as an important centre during the 18th century, particularly for the textile industry. The Statistical Account for 1793 states that in the Parish of Killin (being the wider area including Tyndrum, Crianlarich and other settlements) there were 63 Weavers, 38 Tailors, 36 Wrights, 26 Shoemakers, 20 Flax Dressers, 10 Smiths, 9 Masons, 8 Coopers, 4 Hosiers and 1 Dyer. In the late 18th century, Killin held six annual fairs where goods were purchased for transportation to Glasgow and other manufacturing towns in the south (A.J. Watson *The linen trade, ancient and modern*, London, 1864: 509).

Early Killin clearly benefited greatly from its geographic position and good communications. The current Bridge of Dochart has two date stones (much weathered); one dated at 1760 and the other at 1831. The New Statistical Accounts of 1834-45 noted the excellent communications in the Parish due to the good roads and bridges. At this time, a weekly courier was travelling to Stirling, and monthly to Glasgow and Crieff; in the summer, there was a thrice-weekly coach between Killin and Dunkeld, and one daily from Killin to Loch Lomond to meet the steamer.

The earliest Ordnance Survey map from 1867 (Fig. 2) shows a small village with buildings focussed around the Dochart Bridge crossing, flanking both sides of the River Dochart with a second early nucleus to the north on Main Street where the markets and industry developed. Some of these early buildings survive today as single story cottages in Grey Street and Main Street, albeit mostly much altered.

Killin saw a large expansion following the opening of the Callander to Oban Railway in the second half of the 19th century. In 1870, the railway had opened as far as Glenoglehead, immediately increasing traffic and trade of goods into Killin. The Killin Railway, a short branch line from Glenoglehead, opened in 1877. From Callander the railway would have connected to Dunblane along the Dunblane, Doune and Callander line (opened 1858) and then onto Stirling along the Scottish Central Railway (opened 1848) and finally to either Glasgow or Edinburgh on the Edinburgh and Glasgow Railway (opened 1842). This made a great change to the way of life in the village, not only in terms of the transportation of materials, but also as tourism became increasingly fashionable, the town expanded with the construction of more and larger buildings. With the railway, the importation of building stones increased and new stone types were introduced into the area from the Central Belt.

The late 19th century expansion of the village resulted in a distinctive change in architectural style and materials. The 1901 Ordnance Survey map (Fig. 3) shows this expansion particularly with the development of Main Street, characterised by a series of large villas erected along the western half of Main Street. The Loch Tay station was closed to passengers in September 1939 with the railway closing entirely by 1965. As motor transport became dominant the village continued to expand, with more modern development particularly in the south and west, and north and east parts of the village (Fig. 4)

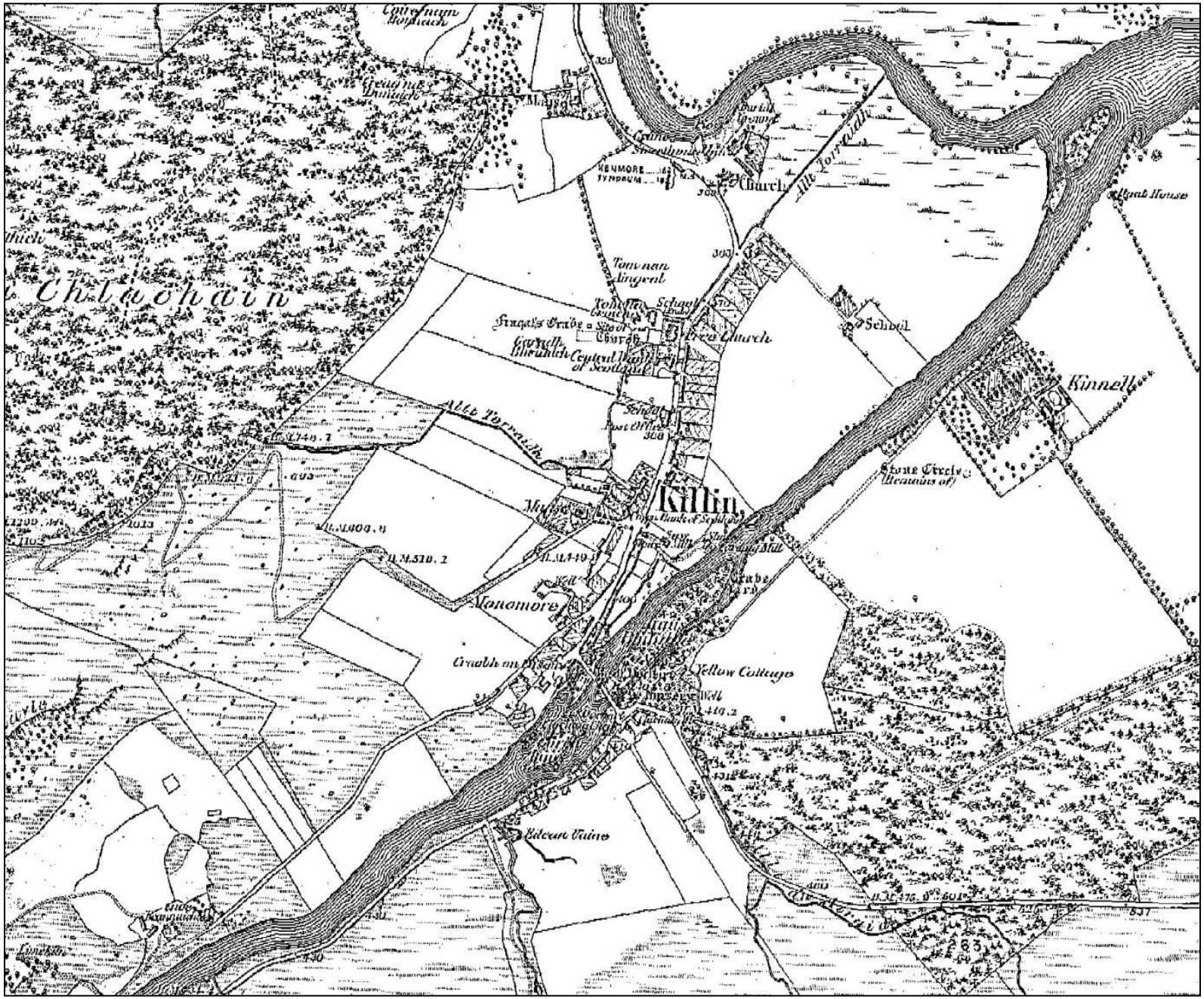


Fig. 2: 1867 Ordnance Survey Map showing the early concentration of development around the Bridge of Dochart and to the north along Main Street. In the late 18th century, Killin held several fairs a year for trade of produce, and thrived due to the good communications including roads and bridges.

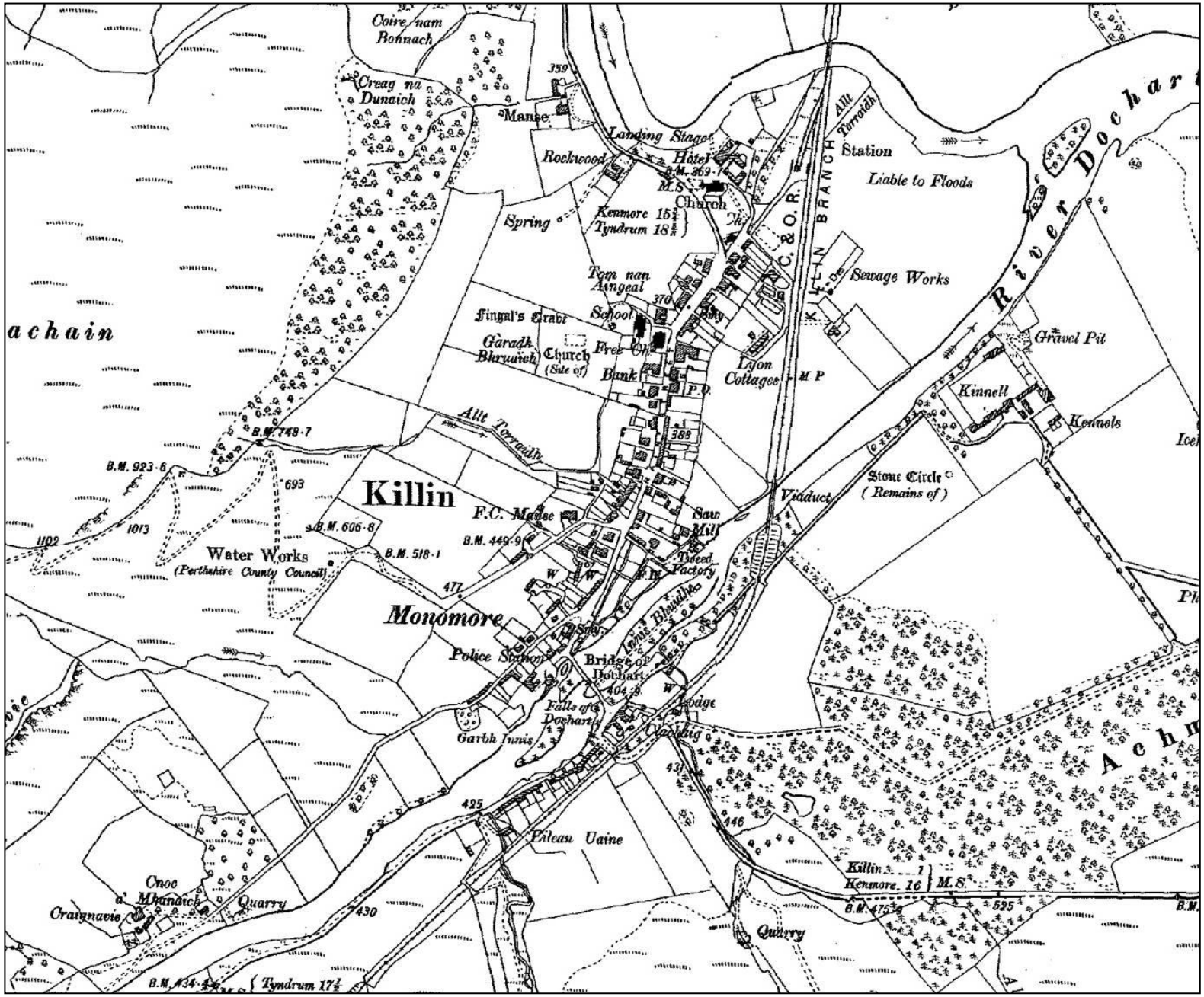


Fig. 3: 1901 Ordnance Survey Map showing expansion of the village mostly concentrated along the Main Street. Development was stimulated by the arrival of the railway, located directly east of the village, terminating northwards at Loch Tay bringing trade and tourists to the Highlands.

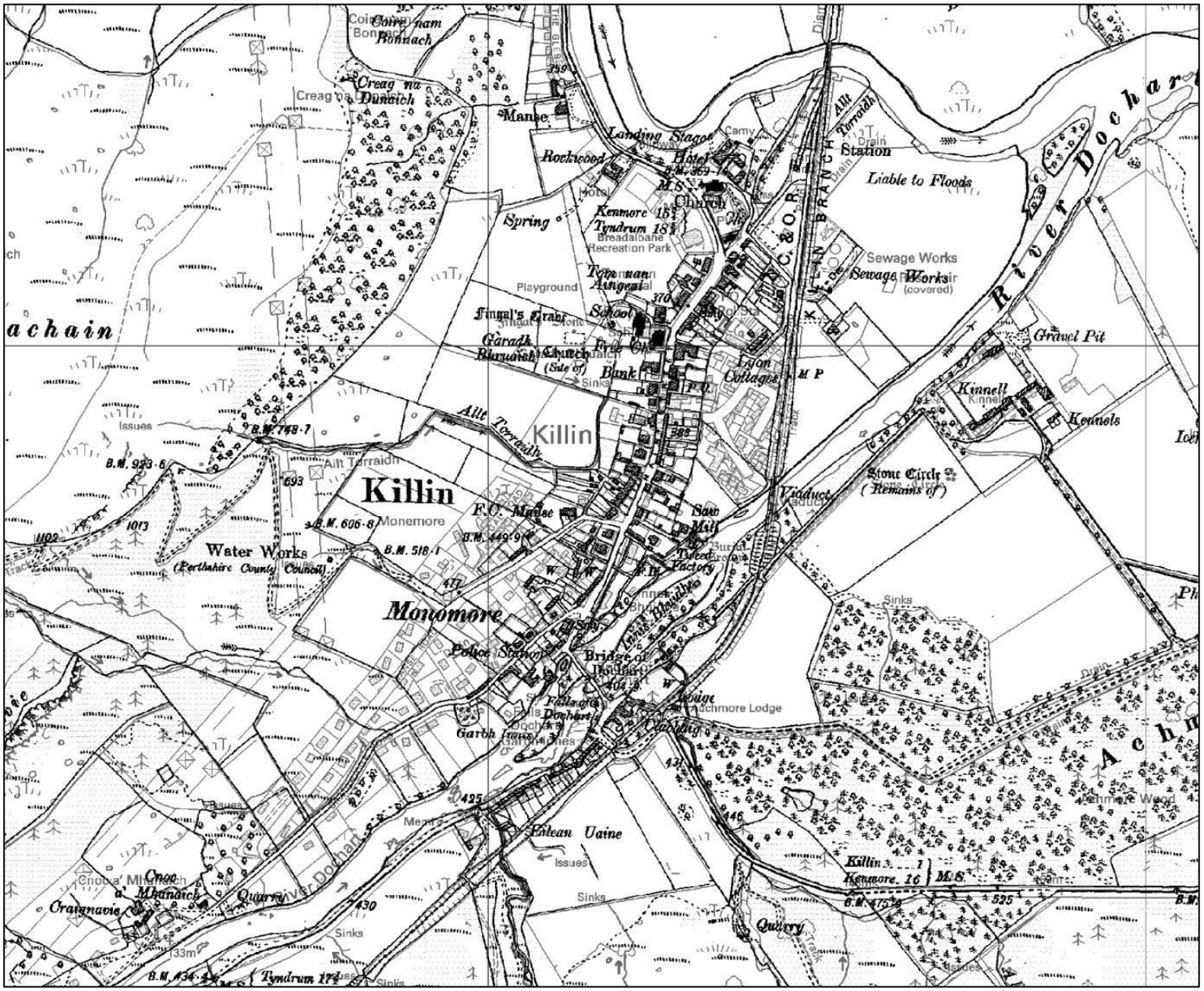


Fig. 4: Present day map with 1901 OS map overlay illustrating the development of the area over the last hundred years. Most of the development has occurred beyond the Conservation Area with the majority of the construction to the southwest and north and towards the now closed Killin Railway.

3. GEOLOGY OF THE KILLIN AREA

Killin is located within the Southern Highlands of Scotland, geologically part of the Dalradian Supergroup; a succession of metamorphic rocks which were deposited as sediments mostly during Cambrian and Precambrian times (more than 500 million years old). These sediments have been transformed into metamorphic rocks such as schists or pelites (metamorphosed mudstones and siltstones) and psammites or quartzites (metamorphosed sandstones) as they were compressed and deformed during a major period of earth movements known as the Caledonian Orogeny which occurred between 490 and 390 million years ago.

The Dalradian rocks outcropping in the Killin area mostly belong to the Southern Highland Group and Argyll Group. The Argyll Group is older in terms of the age of sedimentary deposition (635-540 Ma), and comprises a succession of meta-sedimentary rocks; quartzites, pelites and limestones. The Loch Tay Limestone (a thick deposit of metamorphosed limestone with associated basic igneous rocks) separates the outcrops of the Argyll Group from the Southern Highland Group. The Southern Highland Group was deposited from c.540 million years onwards and consists of a succession of metamorphosed mudstones, siltstones, sandstones and volcanic rocks, now mostly mica schist, meta-sandstone (psammites) and Green Beds, respectively. In the Killin area the main metamorphic rock types outcropping are mica schist, meta-sandstone and meta-limestone (see geology maps – Figs. 5 & 6).

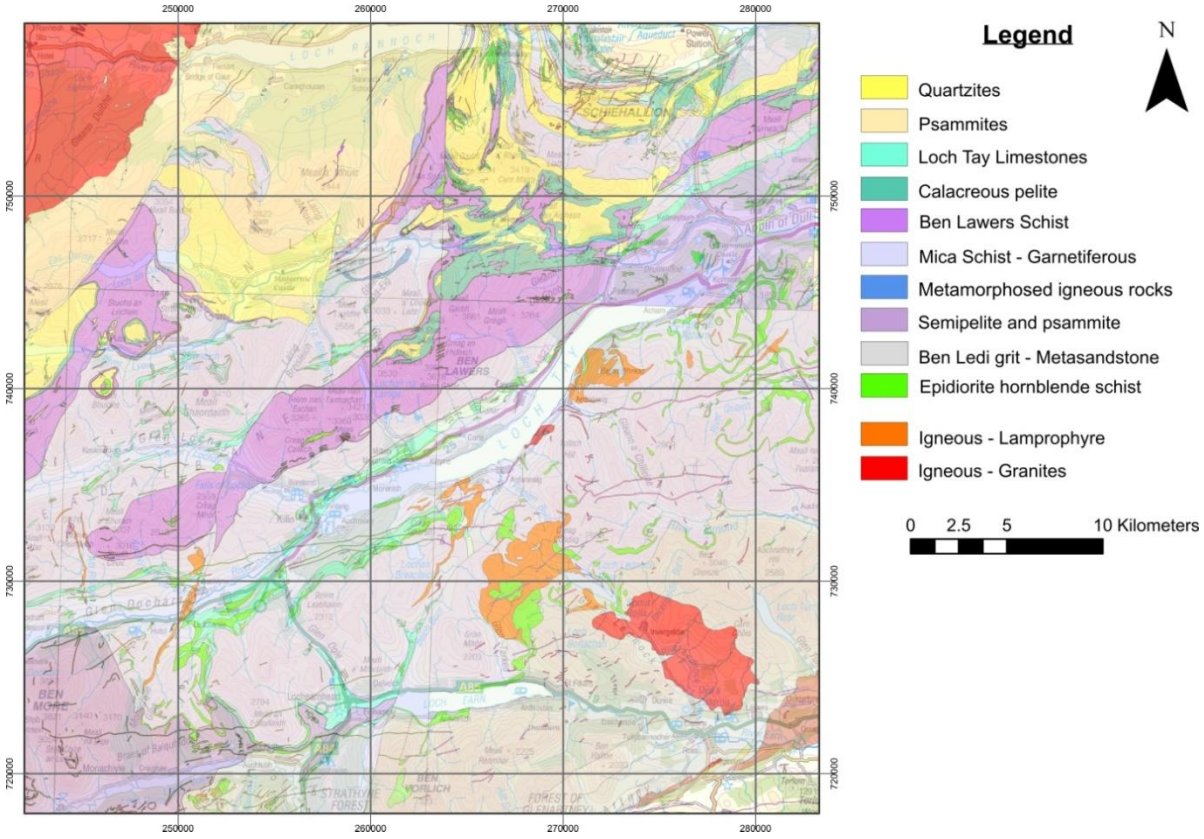


Fig. 5: Geology of the Killin district, notably the presence of the Loch Tay Limestone and mica schists in the Killin area.

In the mica schist of the Killin area, high temperatures and pressures resulted in the growth of new minerals from the original clays and mudstones; notably platy micas and deep red coloured garnets. A distinctive feature of metamorphic rocks in this region is the development of a foliated texture (foliation) which is defined by the alignment of mineral grains within the rock. This has resulted from the compressive pressure which has caused the grains to flatten or new minerals to form with an alignment perpendicular to the direction of compression. Mica grains are aligned along the foliation plane of the metamorphic rocks to give a *schistose* texture along which the rock is relatively easy to split.

In addition to the metasedimentary rocks of the Dalradian Supergroup there are also metamorphosed igneous rocks present within the area. These are mostly basaltic intrusions, known as epidiorite or meta-basites. In mineral terms, some of the basalts have been transformed into so-called amphibolite schists by the formation of the amphibole minerals hornblende or actinolite, the former producing very dark rocks and the latter producing pale silvery grey schists. These hornblende and actinolite schists are commonly associated with the Loch Tay Limestone, occurring as lenses typically several tens of metres in length. Most of these are too small to be shown on geology maps, but the presence of the Loch Tay Limestone at Killin suggests that actinolite schists and metabasites are likely to outcrop close to the village.

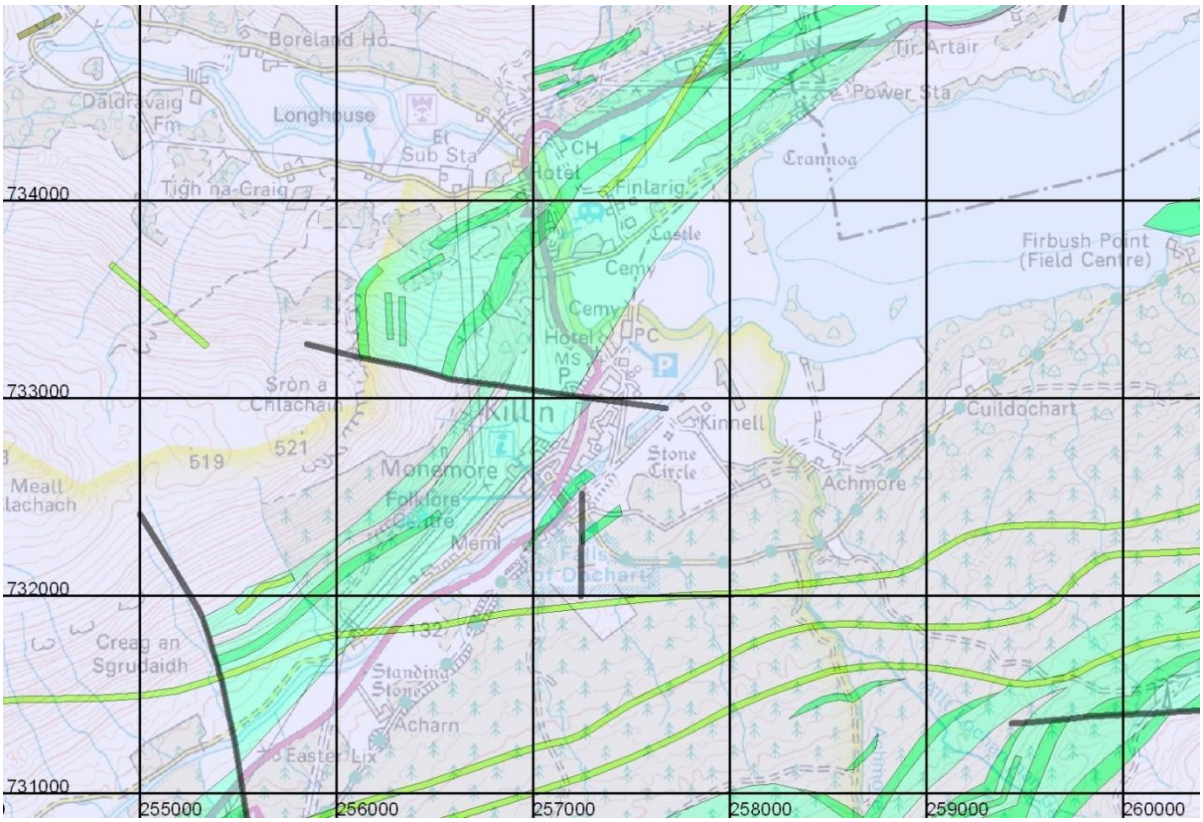


Fig. 6: Detailed geology of the immediate Killin area, dominated by mica schists and meta-sandstones (purple) and the Loch Tay Limestone (blue), the latter associated with metamorphosed basic igneous rocks including amphibolite and actinolite schists (shown as green bands). The three roughly east-west trending thin green bands are later (unmetamorphosed) basalt intrusions. It is likely that most of these rock types have been used by man; the limestone for agricultural improvement, and the mica schists, meta-sandstone, actinolite schists and basalts for building purposes.

4. BUILDING STONE AND ROOFING SLATE USED IN KILLIN

4.1 Introduction

This section reports the results of the stone surveys carried out in the Killin Conservation Area. The stone masonry types have been grouped into five categories, each having a distinct combination of walling stone and dressings. For each type, a number of key buildings are illustrated as typical examples. It should be noted that this is not a comprehensive record of all buildings in the Conservation Area, and is only intended to identify the different stone types present using specific examples to highlight the main features. Different types of roofing slate are described separately at the end of the chapter.

4.2 Masonry types

The five categories of masonry identified are presented below. The different types generally reflect the improving supply of building stone over time, and changes in architectural style from early single storey cottage dwellings to more complex large villas. For each category, the stone type is described, followed by the source of the stone, and examples of typical buildings are illustrated.

Masonry Type 1

Description

This is the earliest type of building stone observed in the village. It consists of a mixture of different stone types, all characteristic of the local geology. These are typically a combination of mica schist and meta-sandstone, with occasional vein quartz and whinstone (i.e. metabasite). The mica schist and meta-sandstone are typically irregular flaggy blocks ranging from silver or greenish grey to dark grey in colour, with natural joint surfaces often stained to a distinctive brownish colour.

The buildings are mostly single story cottages, likely to be some of the earliest stone houses in the village. They are mostly concentrated in a cluster around the Dochart Bridge, and in a small area to the north in Main Street.

Because of the relatively poor quality of the masonry it is highly likely that all the Type 1 buildings would have been lime harled in order to make them wind and watertight. Consequently, most of these buildings are still harled today (likely to be modern cement harling) which masks the original masonry underneath. It is also possible that other materials such as clay could have been used in their construction.

Source of the stone

The material is probably derived from field or river boulders and taken from local surface outcrops. All the stone types are characteristic of the local geology outcropping in the Killin area. The masonry shows little evidence of having been quarried in an organised way, in that the block size is generally irregular and small. For example the mica schist is present typically as small flaggy blocks which would have split naturally along the rough cleavage of the schist, and show only minimal signs of having been worked to produce masonry blocks. For this reason much of the Type 1 masonry is classed as random or irregularly coursed rubble.

Example buildings

Rows of early single story cottages, Main Street and Gray Street (Figs. 7 & 8).

These form some of the earliest buildings in the village (probably 18th century), constructed from random rubble of local stone and boulders; now all harled and painted. Many of the cottages are characterised by large boulder footings present at base of walls, a feature commonly used in very early cottages to help protect the structure from damp from the ground (as well as providing strong foundations). Alterations to the cottages over time have resulted in a break-up on the uniform appearance of the buildings which masks their historic origins. The cottages on Grey Street are masked by modern additions, replacement windows and harling, but show early features such as large boulder footings at base of walls and presence of thackstanes on chimneys (suggesting original thatch roofing).

Fig. 7: Early cottages on Main Street, typical of Type 1 masonry.

Fig. 8: Early Type 1 cottages on Gray Street (No. 7 and 'Gracedieu'). Note the protruding large boulder footings at the base of the walls.

Killin Mill (Fig. 9)

This building is likely to have been originally harled but has been stripped to expose the original Type 1 masonry. It is believed that the current (B-listed) building was built c.1840 on the site of an earlier structure founded by St Fillan in 700AD. It is constructed of simple random rubble walling, dominated by slabs of flaggy mica schist, of relatively small block sizes. There are minimal dressings consisting of the same flaggy schist typically laid on end to forming arched surrounds to openings. The stone is identical to the rocky outcrops in the adjacent river bed, and is likely to have been obtained from this locality. The building has previously been painted, or possibly lime washed or harled at one time. A relatively recent porch addition appears to be constructed from reclaimed local stone with much cement pointing (the latter also characterising recent repairs to the main building).

Fig. 9: Killin Mill showing exposed Type 1 masonry dominated by flaggy mica schist, used as random rubble walling and for dressings around openings. Note the over-use of cement pointing for recent repairs which detracts from the original stonework.

Other examples

Other buildings constructed from this type of stone include Masons Hall on Manse Road (Fig. 10) and the Falls of Dochart Hotel (Fig. 11).

Fig. 10: Masons Hall (Manse Road), likely to be constructed of Type 1 rubble with harling. Note the prominent boulder footings to the wall.

Fig. 11: The Falls of Dochart Inn, likely to be constructed from Type 1 masonry.

Masonry Type 2

Description

This stone type marks a development in architectural style from the single storey cottage to larger two storey buildings, albeit still of an 'early' type with simple building form lacking ornamentation. The walls are typically random rubble, from mixed stone types of local origin (mostly mica schist and meta-sandstone) including field and river boulders as for Masonry Type 1. However, the stone dressings (e.g. rybat surrounds to windows and doors, and corner stones/quoins) are large slabs of silver-grey coloured actinolite schist.

The use of large blocks of actinolite schist is likely to have been adopted because the local rubble stone could not be obtained in large enough sizes to provide larger openings (as seen by the arched mica schist masonry around the small openings in the Mill). These larger blocks were necessary to allow larger window openings and more substantial structural elements. It is thought that these buildings are likely to be late 18th century to early 19th century, and mark a significant stage in the evolution of Killin's buildings from single story cottage dwellings to larger houses.

Source of the stone

No outcrops of actinolite schist have been observed in the village of Killin or its immediate environs, but it is one of the meta-igneous rock types likely to be associated with the belt of Loch Tay Limestone that crosses through the district. The large sizes of elongated blocks seen in the buildings suggest that the stone was specifically quarried and shaped (rather than collected as random stone from local outcries or boulders). It is therefore likely to have been locally quarried and transported into the village at a time of early expansion, when better quality stone was required than could be obtained from the immediate outcrops.

Example buildings

A number of significant early buildings in the town are characterised by this style. Many of these buildings are harled, but several have been stripped to reveal the underlying stone. The B-listed terrace of late 18th century two-storey housing at the south end of Main Street is mostly harled, though the southernmost building ('Birchbank') displays random rubble walling of mixed local mica schist with boulder footings to walls (Fig. 12). The dressings are a mixture of both actinolite schist and 'normal' mica schist stone types. At the north end of Main Street, 'Loch Tay Cottage' has random rubble walling of irregularly coursed mica schist and meta-sandstone, with dressings of large squared blocks of actinolite schist (Fig. 13).

Service buildings constructed adjacent to two different high status buildings in the village also show Type 2 masonry. The service buildings adjacent to the Killin Hotel are relatively low status buildings with less formalised rubble walling than other examples of Type 2 masonry, consisting of random rubble of flaggy mica schist and mixed boulders. However the dressings and corner stones (quoins) are large, carefully-worked squared blocks of actinolite schist, roughly tooled (showing chisel marks) to give a regular flat surface (Fig. 14). Secondly, the coach-house building behind the Tighnabruaich Hotel is constructed with random rubble walling from a mixture of local mica schist, meta-sandstone and actinolite schist, with large squared blocks of actinolite schist used for corner stones, lintels and door surrounds, showing roughly chiselled surfaces (Fig. 15).

Fig. 12: 'Birchbank', the southernmost of a B-listed terrace of late 18th century two-storey housing at the south end of Main Street, showing random rubble walling with distinctive large silver-grey actinolite schist dressed stone around windows and at corners.

Fig. 13: 'Loch Tay Cottage', north end of Main Street, constructed from irregularly coursed rubble walling of mica schist and meta-psammite, with distinctive large silver-grey coloured dressings of actinolite schist. The size, shape and consistency of the latter suggests that the actinolite schist has been specifically quarried and dressed.

Fig. 14: 'Low status' service buildings adjacent to the Killin Hotel showing 'informal' random rubble walling (mostly mixed mica schist and assorted boulders) with higher quality dressings of actinolite schist. The dressings have been carefully worked to give roughly squared block with flat outer surfaces.

Fig. 15: Detail of Type 2 masonry on the coach-house behind the Tighnabruaich Hotel, showing large squared blocks of actinolite schist used for dressings, with roughly chiselled surfaces. The random rubble walling is a mixture of local mica schist, meta-sandstone and actinolite schist.

Masonry Type 3

Description

This masonry type is a combination of 'imported' sandstone from outside the district with local mica schist and meta-sandstone, used for dressings and walling respectively. The appearance of sandstone coincides with the opening of the Killin railway line in the 1870s, when it was imported into the village from quarries in the Central Belt of Scotland. Large regular-sized blocks of imported pale coloured sandstone replaced the actinolite schist dressings, and the actinolite schist became relegated for use as rubble walling. This had a profound effect on the architecture of this time; building styles and appearance changed dramatically, culminating in the development of the large villas that typify the later stone buildings. This combination of imported sandstone and local stone characterises the rapid expansion of the village in the late 19th and early 20th centuries (Figs. 16 to 23).

In the earlier buildings of this type, actinolite schist is commonly intermixed with mica schist and meta-sandstone rubble, as roughly squared and irregularly coursed masonry (as seen in Fig. 16). In later buildings the actinolite schist rubble has become more formalised; squared and regularly coursed with a distinctive point-stugged tooling (Fig. 23). The actinolite schist is characterised by a silvery white colour when laid on bed, and a dark grey-brown colour when laid on edge, the latter caused by iron staining on natural joint surfaces. The point-stugged chisel work gives a particularly distinctive appearance on the dark coloured blocks where the tooling pierces through the surface staining to reveal the fresh silver-grey stone beneath, giving a 'speckled' appearance to the masonry.

In many buildings of this type the typical pattern is 'formalised' actinolite schist squared and coursed rubble masonry used for the front street elevation, whilst the rear elevations and gable ends retained a mixture of less formal local mixed mica schist and meta-sandstone. It is apparent that the actinolite schist quarry, formerly supplying the highest quality dressed stone, changed to provide squared rubble walling stone.

Source of the sandstone

The imported stone is a pale coloured quartz-rich sandstone with a greyish-white colour where fresh, weathering on external faces to a pale orange colour. This colour change is due to oxidation of minor iron minerals in the stone. The sandstone is typical of Carboniferous sandstone which was extensively quarried at numerous locations and widely used for building stone throughout the Scottish Central Belt. The orange coloured weathering observed on the outer faces of the sandstone masonry is indicative of the presence of carbonate and iron oxide minerals, more characteristic of sandstone from the west and central parts of the Central Belt (e.g. Stirlingshire and Glasgow areas). These so-called 'blonde' sandstones were extensively quarried at numerous locations.

Central Belt blonde sandstone would have been preferred to the local stone as it could be more easily worked and was available in large block sizes for dressings. The arrival of the railway in the second part of the 19th century clearly made the used of this stone affordable from this time, although it is significant that the local stone (mica schist, meta-sandstone and actinolite schist) were still used at this time as the main rubble walling stone.

Example buildings

Most of the buildings constructed with Type 3 masonry are large villas and commercial buildings, many in the northern part of Main Street. Typical examples of the villa buildings are Tighnabruaich Hotel, Tay View House, Fingal Villa, Craigbuie, Drumfinn House, Craigard Hotel and Fairview House; and commercial buildings Craiglea, Fassifern and the Smiddy Restaurant. These are illustrated in Figs. 16 to 23, and described in detail in the captions.

Fig. 16: Tighnabruaich Hotel (Main Street). Constructed using irregularly coursed actinolite schist and squared rubble walling on the front elevation, with mixed mica schist and meta-sandstone random rubble on the sides and rear elevation (right-hand image). The dressings are imported blonde sandstone. Note the presence of bay windows and large window openings on upper floor made possible by the large block size of the sandstone (such spans would not have been possible in earlier buildings using the local stone).

Fig. 17: Tay View House (Main Street). Constructed from irregularly coursed and squared actinolite schist rubble with blonde sandstone dressings on the front elevation. The gable ends are mixed mica schist and meta-sandstone rubble.

Fig. 18: Fingal Villa (Main Street). Constructed using squared and irregularly coursed actinolite schist rubble walling with sandstone dressings. The variable colour of the rubble masonry is due to the presence of natural iron staining on the surfaces of some blocks.

Fig. 19: 'Craigbuie' (Main Street). Showing squared and irregularly coursed actinolite schist rubble on front elevation with sandstone dressings. Side and rear elevations are mixed mica schist rubble. Note the occasional silver grey squared rubble block of actinolite schist which has been placed 'on edge'.

Fig. 20: Drumfinn House (Main Street). Constructed from squared and irregularly coursed actinolite schist on front elevation, with sandstone dressings. Gable ends mixed mica schist and meta-sandstone.

Fig. 21: 'Craiglea' (Main Street), constructed using irregularly coursed rubble of mixed actinolite schist and mica schist walling, with imported blonde sandstone dressings. The walling is characterised by occasional silver-grey squared rubble blocks where the actinolite schist has been placed 'on edge'. Detailed image shows contrast between grey actinolite schist rubble and large sandstone dressings (the latter with pale orange-brown weathering). Note also the point-tooling to the dark natural joint surfaces of the schist, revealing the light silver-grey colour of the fresh stone beneath.

Fig. 22: 'Fassifern' (Main Street), constructed using irregularly coursed squared actinolite schist rubble (note occasional silver-grey blocks 'on edge'), with blonde sandstone dressings. Note the relatively large window openings made possible by the large sandstone blocks, contrasting with earlier buildings in the village using only local stone.

Fig. 23: Smiddy Restaurant (corner of Main Street and Riverview), showing front elevation walling of irregularly coursed, squared actinolite schist rubble with a point-stugged tooled finish. Note the characteristic silver-grey colour of the actinolite schist when laid 'on edge', and the dark grey-brown colour when laid 'on bed'. The gable ends (and entrance) consist of the Type 1 random rubble mixture of mica schist, meta-sandstone, whinstone and quartz vein. The dressings are imported blonde sandstone, with punched tooling and drafted margins.

Masonry Type 4

This category is similar to Type 3, but with the actinolite schist rubble walling replaced by a 'formal' squared and regularly coursed meta-sandstone walling. This probably represents the opening of a local quarry very close to the village, where stone of sufficient quality and block size was present and worthy of working into squared block of regular course heights. Buildings of this type are mostly late 19th century/early 20th century buildings with imported Central Belt sandstone dressings. These buildings lack the actinolite schist in the front elevations (Type 3), implying that the new local supply was regarded of good enough quality to have superseded this material (note that the actinolite schist was never supplied with regular enough block heights to give regularly coursed masonry). It is worth pointing out that the precise dates of these buildings have not been established, and there may be overlap with the Type 3 buildings.

Source of the stone

Prior to Type 4, meta-sandstone was used exclusively as random rubble, probably crudely extracted from surface outcrops. This appears to represent a new supply of better quality material, possibly through rejuvenation of an existing stone source, or more likely the opening of a new quarry close to the village (it is also worth considering that this stone type could have become available as a result of railway excavations). The most likely source of the stone is the small quarry southeast of the village shown on the 1901 OS map, as discussed below in Chapter 6.

Example buildings

Type 4 masonry is less common that the Type 3 category. Examples are the Bank of Scotland building (Fig. 24) and 'Pride of Place' (Main Street/Myrtle Grove). Both these buildings are distinguished by the presence of regularly coursed squared meta-sandstone rubble walling, and sandstone dressings.

Fig. 24: Bank of Scotland (Main Street). Constructed of Type 4 masonry with regularly coursed squared meta-sandstone rubble and blonde sandstone dressings. The meta-sandstone varies in colour from grey (fresh surfaces) to orange-brown (natural iron staining along joint surfaces). The extension on the south side of the building is cement block tooled to look like stone.

Masonry Type 5: (miscellaneous stone types)

This is a 'miscellaneous category' containing a range of different types of stone and architectural styles. Although mostly late 19th century and later, buildings in this category may straddle a wider time period and are geographically spread throughout the town. Some of these buildings are not stone masonry. The distinctive and, in some cases, unusual appearance of several these buildings is considered to be an important addition to the character of the village. Note that this section does not include 'non-stone' buildings such as the McLaren Hall which is cement block, made to look like stone.

Several examples of these buildings are illustrated below (Figs. 25 to 29), with details of the stone types given in the captions.

Fig. 25: 'Greenbank' (Main Street), constructed using irregularly coursed, squared rubble of dark grey uniform basic igneous rock of unknown origin (imported into the village). Dressings are imported blonde sandstone, weathered to a pale orange-brown colour. The gable ends of the building are local mica schist and meta-sandstone rubble.

Fig. 26: 'Lynedoch' (Main Street), a C(s) listed, late 19th century building (currently National Trust Offices). The dressings (painted) are a fine grained red sandstone of probable Corsehill/St Bees type, probably imported by rail from the south of Scotland. The walling is harled and unexposed (and therefore cannot be ascertained without further investigation). The historic photograph of Lynedoch (unknown date, Killin Heritage Group) illustrates the once exposed red sandstone dressings.

Fig. 27: Dreadnaught Buildings (Newsagent & Outdoor Centre, Main Street), a C(s) listed tenement building constructed c.1898. The walling material is obscured by cement render, with imported blonde sandstone dressings (window surrounds, quoins, moulded string courses and ground floor masonry).

Fig. 28: Dall Lodge Country House, constructed using irregularly coursed squared and snecked whinstone with imported blonde sandstone dressings. Sources of whinstone are present in the district (e.g. the metabasite quarry at Fearnan on Loch Tay)

Fig. 29: Killin Library is built using local meta-sandstone squared and snecked rubble, with dressings of grey granite allowing particularly large spans to the windows. The very long lengths of granite suggest it has been imported from elsewhere in Scotland (e.g. Aberdeenshire).

4.3 Roofing Slate

One of the objectives of this study is to identify the main roofing slate types used in historic Killin. Whilst most of the buildings in the Conservation Area are roofed with natural slate, a number of other materials were also observed (e.g. corrugated iron and concrete tiles) – these are not discussed further in this report. Additionally, it is apparent that some buildings have had the original roofing materials replaced; some of the older buildings have distinctive thackstanes on chimneys, indicating that they were once thatched. Other buildings have two distinct types of slate, where presumably repairs have been carried out using a different slate type (typically the later slate is Welsh and the earlier is Highland Border).

This section groups the slate types observed into distinct categories. Each of these is briefly described, giving typical examples and illustrations of the main features. The following results are based purely on visual observations of slate (using binoculars if necessary) from street level, plus occasional confirmation from closer examination of fallen slates from buildings. Because of these constraints it is possible that not all the identifications are correct. It is worth noting that West Highland slate and Highland Border slate are categorised under separate headings where it has proved possible to differentiate between them in the field; in cases where this is not possible they are grouped together under the heading 'Scots Slate (undifferentiated)'.

The section is divided into four groups; Highland Border slate, West Highland slate, Scots slate (undifferentiated), Welsh slate and 'Modern' slate. In chronological terms the geographically closest slate is likely to have been the earliest slate type used in Killin, and it is observed that some of the earlier buildings have Highland Border slate, whilst many of the later 19th century buildings have West Highland slate (which was presumably available by railway from the 1870s onwards). It is noticeable that many of the later 19th century and early 20th century buildings have Welsh slate, although West Highland slate was still used at this time. This chronological sequence varies in the case of replacement of earlier roofing materials (e.g. thatch), where the particular slate type used would depend on what was readily available at the time.

Highland Border Slate

Characteristics

Highland Border slate is commonly dark in colour, mostly grey, but also appearing green-purple grey and sometimes with a rather black 'sooty' lustre. It typically has a rough, irregular surface texture and thickness, giving it a distinctive appearance on a roof. It is always laid with random widths in diminishing courses. Additionally, there is typically a large range of sizes, such that the slate size at the roof apex can be unusually small. West Highland slate differs in having a more blue-grey colour, reflective 'silky' lustre with a crenulated surface, commonly contains pyrite, and is typically larger in size.

Highland Border slate is generally poorer quality and less resistant to weathering than West Highland slate; it is also more prone to biological colonisation and surface staining. In addition it can show some variability of colour on a roof, from dark greys to mid/light greys. The individual tiles are cut with 'shoulders' at the top (hidden) end, with a single nail hole. Highland Border slate can vary in colour with purple and light grey varieties –mostly from the quarries at Luss and Aberfoyle – although most is dark grey in colour. Examples of Highland Border slate are given below in Figs. 30 to 33.

The closest quarries of Highland Border slate to Killin are likely to be Aberfoyle or the Glens southwest of Dunkeld. The transportation route for slate prior to the railway is not known, although it is possible that slate from the latter quarries could have been transported to the east end of Loch Tay and thence by boat to Killin.

Fig. 30: Birchbank (Main Street). Highland Border slate roof with typical rough texture and variable grey colour, characteristic of this slate type.

Fig. 31: Larachbeg, Main Street showing dark grey rather dull 'sooty' appearance typical of Highland Border slate

Fig. 32: Service buildings at side of Killin Hotel with Highland Border slate showing typical rough surface texture and irregular widths.

Fig. 33: Rear elevation of Smiddy Restaurant (south end of Main Street) showing typical thick and variable texture, with random widths and diminishing courses (note particularly small sizes at top of roof). Note also biogenic colonisation and staining which is typical of Highland Border slate.

Highland Border Slate: Example Buildings

Name/Address	**Comments**
7 Grey Street	Single storey cottage with probable Highland Border slate roofing. Modern dormer windows.
Killin Mill	Highland Border slate, laid in random widths and diminishing courses.
Birchbank, Main Street	Roof materials appears to be Highland Border slate, though probably originally thatched (thackstane visible on chimney).
Loch Tay Cottage (North end Main Street).	Roofing material appears to be Highland Border slate.
'Smiddy', (South end Main Street)	Roofing is Highland Border slate on the rear elevations. Front elevation replaced with Welsh slate.
Killin Hotel Service buildings	Roofing material appears to be Highland Border slate
Larachbeg, Main Street	Roofing appears to be Highland Border slate

<u>West Highland Slate</u>

Characteristics

West Highland slate is typically dark grey in colour, commonly described as a blue-grey. It has a slight silky lustre, and surfaces are commonly crenulated and contain pyrite. Sizes can be large, and it is usually laid in diminishing courses with variable widths. The slates are relatively thick, which can give a 'rough' appearance to a roof. The individual tiles are cut with 'shoulders' at the top (hidden) end, with a single nail hole. It differs from Highland Border slate in often being larger, having a more reflective appearance, bluish grey in colour, with pyrite and crenulations on surfaces, and is less prone to staining and weathering. Examples of West Highland slate are shown in Figs. 34 and 35.

West Highland slate was quarried at Ballachulish and the slate islands at Easdale. Because of transport difficulties (the slate was taken by sea to western ports such as Glasgow); it is unlikely that West Highland slate was available in Killin prior to the railway in the 1870s.

Fig. 34: Masonic Hall, Manse Road showing West Highland slate roof (confirmed from examination of fallen slates) with typical dark blue-grey colour and rough appearance.

Fig. 35: McLaren Hall showing West Highland slate with typical dark blue-grey appearance and reflective lustre. (Note the walling is cement block made to look like stone).

West Highland Slate: Example Buildings

Name/Address	**Comments**
Tighnabruaich Hotel, Main Street	Roofing is West Highland slate.
'Greenbank', Main Street	Probable West Highland slate roofing.
Tay View House, Main Street	West Highland slate
Craigard Hotel, Main Street	West Highland slate
Fairview House, Main Street	West Highland slate

Masonic Hall, Manse Road	West Highland slate (identified from fallen slates)
McLaren Hall	West Highland slate (note walling is cement block made to look like stone)
Cottage, north side of Dochart Bridge by Mill.	Roofing mostly West Highland slate with replacement Welsh on front dormer.

Scots Slate (undifferentiated)

Characteristics

This category is for slate which shows the common characteristics of a Scots slate, but cannot be positively identified as either Highland Border or West Highland in origin. These common characteristics are: dark grey colour, rough surface texture and generally thick tiles, laid in diminishing courses and random widths. Examples are illustrated in Figs 36 & 37.

Fig. 36: Cottage, Main St showing typical Scots slate roof.

Fig. 37: Bank of Scotland, Main Street showing typical Scots slate roof with dark bluish-grey appearance and 'rough' surface texture.

Scots Slate (undifferentiated): Example Buildings

Name/Address	**Comments**
Falls of Dochart Inn	Scots slate with diminishing courses, random widths. Dark colour.
Dall Lodge Country House	Scots slate (undifferentiated)
Cottage Main Street	Scots slate (undifferentiated)
Bank of Scotland Main Street	Scots slate (undifferentiated)

Welsh Slate

Characteristics

The most commonly used Welsh slate in Scotland is typified by having a purple colour with a smooth surface and silky lustre. The tiles are usually of regular size and are relatively thin, being 'squared' in shape with two nail holes at the head end. The presence of small greenish-grey reduction spots is characteristic of Welsh purple slate such as Penrhyn. Note that Welsh slate of different colours (particularly dark grey) is also produced, although may not have been significant historically in Scotland. Welsh slate is likely to have been available towards the end of the 20th century, and in some cases in Killin, Welsh slate was used as a replacement for earlier slate types or when alterations have been carried out on a building. An example of Welsh slate is illustrated in Fig. 38

Fig. 38: 'Craiglea', Main Street, showing typical smooth texture, regular tile size and uniform appearance of purple Welsh Slate.

Welsh Slate: Example Buildings

Name/Address	**Comments**
Craigbuie, Main Street	Welsh slate
Smiddy Restaurant, South end Main Street	Welsh slate on the front elevation and over main entrance. Highland Border slate on the rear elevations. The Welsh slate may be a replacement.
Dreadnaught Buildings (Newsagent & Outdoor Centre, Main Street)	Welsh slate
Cottage, north side of Dochart Bridge by Mill	Replacement Welsh slate on front dormer. Most of is West Highland slate.

‘Modern’ slates

With the demise of all of Scotland’s slate quarries, all new slate is currently imported into the country. Some reclaimed Scots slate is available, although supplies are diminishing and it tends to be expensive. Most slate will last well over a hundred years, such that most new slate is only required for new-build construction or alterations to a historic building, or where slate is required that is in keeping with the original appearance. Several buildings in Killin have been re-roofed using concrete tiles which detract greatly from the historic appearance of the buildings (e.g. Fig. 39). Increasingly, Spanish slate is used as an alternative to Scots slate. In visual terms, some of this material has a similar appearance to traditional Scots slate, in terms of colour and texture (particularly the dark blue-grey of West Highland slate). When new, Spanish slate often has an ‘oily’ lustre, although this may change with age and weathering. One of the main problems with Spanish slate is the regular size of the individual tiles, where the lack of variable width and diminishing courses fails to replicate the irregular appearance of a traditional Scots slate roof (Fig. 40a); however, it may be possible to specify this in the near future. Welsh grey slate (Ffestiniog/Portmadoc) is becoming increasingly available in different sizes, which is designed to replicate the texture of a traditional Scots slate roof (Fig. 40b).

Fig. 39: Cottages in Main Street roofed using cement tiles, detracting from the overall appearance of the building.

Fig. 40: Recently constructed house (a: Left) using probable Spanish slate and recently re-roofed house (b: Right) using Welsh Ffestiniog slate. These have a similar colour to some types of Scots slate, but lack the random sizes (variable widths and diminishing courses), which fails to replicate the appearance of a traditional Scots slate roof.

5. BUILDING STONES OF THE FALLS OF DOCHART BRIDGE

5.1 Description of geology

There is a large rocky outcrop at the southern and western side of the bridge which is accessible when the river is low. There are two distinct types of rocks exposed in the riverbed bedrock, both of similar metamorphic origin, but differing in their mineral composition and sedimentary origin. These two rock types are likely to represent original interbanded mudstones/siltstone and sandstones which have been metamorphosed under the same metamorphic conditions to produce rocks with different characteristics. Both these rock types have been used as building stone (both rubble blocks and copestones) in the bridge.

The two rock types are:

Mica schist: Kyanite/actinolite mica schist with garnets, with an overall bluish silvery colour. Foliated schistose texture with common quartz veins. This stone ranges from a fine grained and mica-rich to a coarser 'gritty' variety with quartz grains. Likely to represent a metamorphosed mudstone/muddy siltstone.

Meta-sandstone (psammite): Metamorphosed sandstone, generally fine grained although with coarser 'gritty' bands. Weathers to give a distinctive orange-brownish colour.

5.2 Description of masonry on the bridge

The bridge is constructed almost entirely of very local stone types, probably derived from the adjacent outcrops in the river (Fig. 41). It is built mostly of irregular-sized flags of mica schist and more blocky meta-sandstone (Fig. 42). The mica schist varies from blue grey to black, having been split along cleavage planes. Meta-sandstone varies from fine to coarse grained (gritty), typically dark grey, often with a brownish colour on fracture surfaces caused by natural iron staining. The block height of the rubble masonry is variable, reflecting the range of bed thicknesses of the rocks found in the adjacent riverbed, typically c.70mm to 300mm; the most common heights being 130-150mm.

Fig. 41: Rock outcrop at southwest side of bridge, showing local meta-sandstone bedrock. The abundant natural vertical joints and horizontal bedding (cleavage) planes allow the rock to be easily extracted for rubble masonry blocks. Much of the Dochart Bridge is constructed from this very local material.

Fig. 42: Southern arch of bridge, west side, showing irregularly coursed random-sized rubble corresponding to the local meta-sandstone and mica schist bedrock on which the bridge stands. The walls are stained due to leaching of mortar from the inside of the structure. Note the discontinuity between the main bode of the bridge and the parapet wall, suggesting the latter has been rebuilt (albeit using largely the same stone types).

Both the main body of the bridge and most of the parapet walls are constructed from these stone types. The masonry has been used as random rubble, laid in irregular courses (Fig. 42). The bridge appears to have undergone several phases of both minor and major repairs. There is evidence for previous major repairs present at the south arch where several stages of build are visible (Fig. 43). Much of the parapet walls appear to have been repaired, both in historical and recent times, mostly reusing the original rubble walling stone (Fig. 44).

Fig. 43: The main body of the southern arch shows evidence of several phases of repair, some poorly detailed with thick mortar joints with flaggy rubble blocks type laid in irregular courses. The stone type is mostly local mica schist and meta-sandstone, probably largely re-used original masonry.

Fig. 44: South-west corner of bridge parapet with copestones (possibly original) of large flat blocks of local mica schist. Some blocks are loose/missing due to inadequate mortar repairs presumably following a vehicle strike. Most of the parapet wall is mica schist and meta-sandstone, probably reworked original masonry representing a 20th century repair.

A major phase of repairs has involved the use of new copestones of basic igneous rock (probable dolerite) which have a distinctive dark appearance and roughly squared shape, contrasting with the more flaggy original stones (Figs. 45 & 46). These roughly squared blocks have dimensions typically 240-300 high, 300-360 length. The dolerite is probably not a local (Killin) stone and is likely to have been imported into the area. The regular size and shape of the blocks suggests it has been formally quarried and worked, unlike the local schists and meta-sandstone which have been crudely extracted from local surface outcrops. These replacement copestones are present in several parts of the bridge, used on much of the east side, north of main central arch on the west side.

Fig. 45: Parapet wall on the south-eastern part of bridge with copestones of massive roughly squared blocks of basic igneous rock (probable dolerite), with dimensions typically 240-300 high, 300-360 length. The parapet wall itself is typical flaggy mica schist rubble walling of bed heights 90-100mm.

Fig. 46: The parapet on east side above the south arch is dominantly dark flaggy mica schist, with copes of massive dolerite. The large end-stones flanking the gateway to cemetery are large blocks of local meta-sandstone.

Many smaller localised repairs to the parapet walls appear to have been made in more recent times, probably as a result of vehicle strikes. These typically involve the crude reuse of the original stones with excessive use of cement mortar, and many of these repairs have subsequently failed resulting in loose blocks. At the northeast corner of the bridge the parapet appears to have been repaired several times (presumably repeated vehicle strikes) resulting in a mixture of copestone types of original flaggy mica schist and later replacement squared dolerite. Some of the mica schist copes are edge-bedded. Much of the repairs are poor quality with thick mortar joints which have failed resulting in loose stone (Fig. 47). The parapet wall here is typical mica schist. The retaining wall between the north end of the bridge and the mill is built from more random block sizes with roughly shaped copestones placed on edge (Fig. 48).

Fig. 47: Parapet at the northeast corner of the bridge showing repairs resulting in a mixture of copestone types of original flaggy mica schist and later replacement squared dolerite. Some of the mica schist copes are edge-bedded. Much of the repairs are poor quality with thick mortar joints which have failed resulting in loose stone. The parapet wall is typical mica schist.

Fig. 48: The retaining wall at the north end of bridge running westwards to the mill has more random block sizes with roughly shaped copestones placed on edge of both mica schist and meta-sandstone (varying in grainsize from fine to gritty).

Understood main bridge built 1760, part rebuilt 1831. In summary, most of the masonry in the bridge directly reflects the bedrock exposed in the river, suggesting that the building stone for the early and main phases of construction was obtained from the immediate locality. These mica schists and meta-sandstones typically form flaggy and irregular-sized blocks, used to give random and irregularly coursed masonry. Repairs to the bridge appear to have mostly reused the existing masonry (or further new stone of the same type from the immediate outcrops). One major phase of repairs to the parapet walls has involved the replacement of the original flaggy mica schist copestones with large roughly squared blocks of dolerite. This igneous rock has been worked and shaped to a different degree (i.e. more formal) than the other stones in the bridge, suggesting it could have been quarried elsewhere and brought into the village specifically for the repairs. The date of the dolerite repairs is not known. Several localised repairs to the parapet walls in more recent times (probably resulting from vehicle strikes) have been crudely rebuilt or patched using cement mortar, much of which is unsightly and some of which is failing.

6. STONE QUARRIES AND THE SUPPLY OF BUILDING STONE IN THE KILLIN DISTRICT

6.1 Historical evolution of stone building in Killin

In Killin, like many other parts of Scotland, the early buildings were constructed from local stone and directly reflect the geology of the district. The earliest buildings used stone from field and river boulders, and crudely extracted blocks from nearby surface rock outcrops. These buildings are generally simply constructed of random rubble using relatively small variably-shaped blocks, with relatively small sized window openings and with no to little architectural detailing.

This changed in the second half of the 19th century with the development of the railway network, when sandstone from the Central Belt became available, and was used for dressings (e.g. window and door surrounds, quoins) in combination with local rubble walling.

Over time, increasing requirements for larger buildings (and bigger windows, etc.) demanded better stone (i.e. larger and more consistent block sizes). Stone was quarried from specific local locations. These would have been small-scale quarries, operating intermittently depending on demand. The metamorphic and igneous rocks of the Killin district would have been difficult to work and extract as large blocks, such that these local quarries probably never developed into a significant industry.

With the arrival of the railways in the second half of the 19th century the scene changed dramatically, as large quarries in the Central Belt exploited more easily worked sandstones and utilised large workforces and mechanisation. The improved transport made this stone economically available and it quickly became the material of choice. The relatively large and easily worked block heralded the construction of larger and more architecturally ambitious buildings, satisfying the demands of the increasing tourist trade. Typically, the local stone continued to be used for the sides and rear of buildings, whilst the 'imported' sandstone was reserved for the structural elements (dressed stone at corners, surrounds to openings etc.) and architectural detailing. Following the First World War, Scotland's stone industry went into rapid decline and the majority of quarries closed, never to reopen.

6.2 Sources of stone used in Killin

The earliest buildings in Killin are constructed from local stone, mostly mica schist, metamorphosed sandstone (psammite), vein quartz and metabasite (metamorphosed basalt). These are typically random shaped blocks of variable size, indicating that little working has been involved in their production and they were most likely obtained from field or river boulders or from nearby surface outcrops. A number of natural rock outcrops are present close to the village, in the high ground on the west side of the village, in the river bed around Falls of Dochart, and to the north of the village in a series of crags in the wooded areas between the village and the Glen Lochay road.

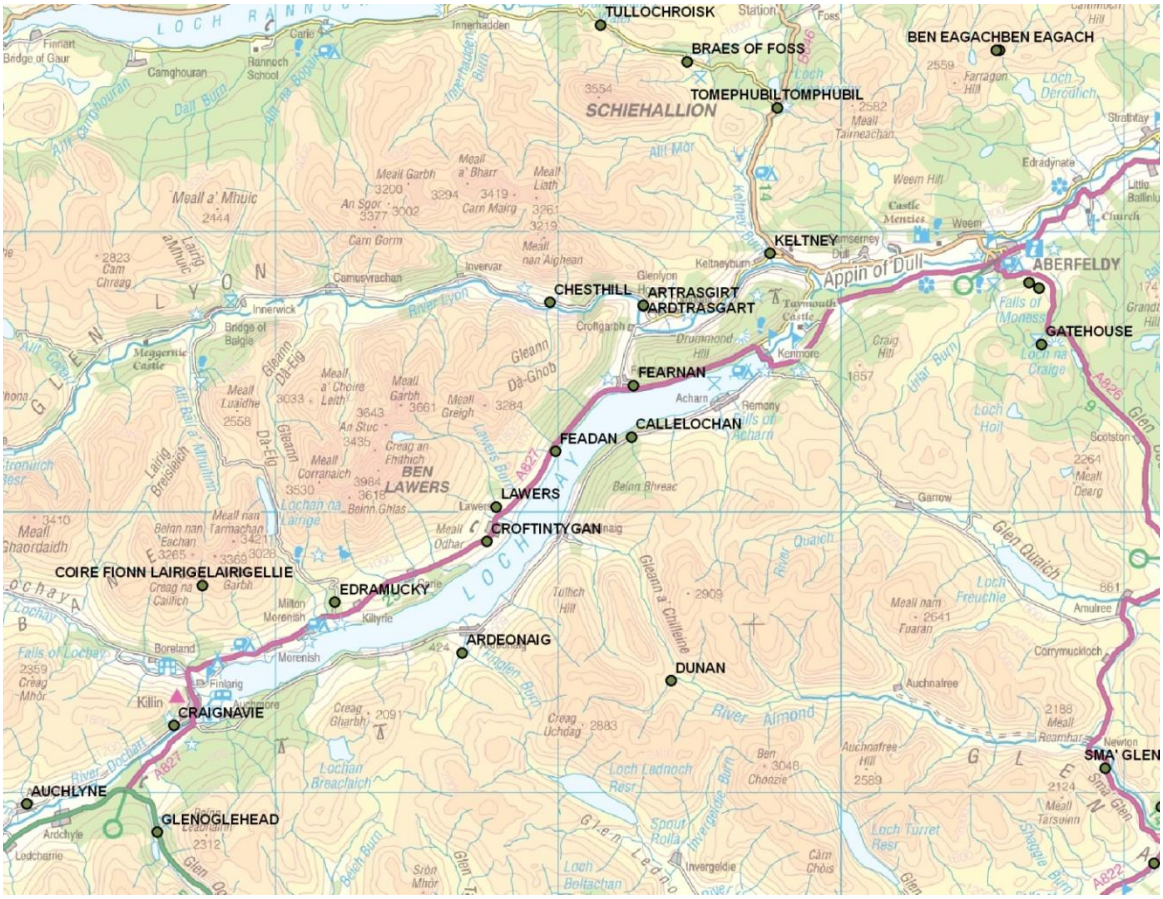
The silver-grey coloured actinolite schist, used consistently as large blocks for stone dressings, is likely to have been extracted from a specific quarry source. Actinolite schist is a variety of the local mica schist (containing the amphibole mineral actinolite), occurring as particular beds which outcrop along the north side of Loch Tay, commonly associated with the Loch Tay Limestone. A previous study of the building stone in Finlanrig Castle immediately north of Killin village[1] found that this stone type had also been used for dressings in this building, and concluded that the stone had been transported from a nearby (albeit unknown) quarry site. Given that the age of the castle is considerably older than the late 18th/early 19th century date of the Type 2 buildings in Killin, it is considered that the quarry source of the actinolite schist was likely to be close to the village, or that it was transported by boat from a quarry on the north side of Loch Tay.

At the eastern end of Loch Tay, volcanic 'Green Beds' were used extensively for building in Aberfeldy, Kenmore and Taymouth castle. These were obtained from a series of quarries in the hills to the south of the settlements (the quarries south of Aberfeldy were linked to the town by aerial cableways so that the stone could be transported to the town -and further exported by railway). At Kenmore the same Green Bed formation was quarried at Bolfracks Hill and transported into the village for the construction of Taymouth Castle. Despite the presence of this high quality building material at the eastern end of Loch Tay, the Green Beds were not used in Killin, and are not the same rock type as the actinolite schist. This further supports the likelihood of the actinolite schist having been quarried close to Killin. Despite the above evidence, the quarry source of the actinolite schist has not been identified.

6.3 Quarries in the Killin area

Examination of historic sources and BGS databases has identified a number of former stone quarries in the district (Fig. 49). Quarries in the Loch Tay area appear to have worked several different stone types (see table in Fig. 49), most notably for limestone which was burnt for agricultural use. Although it was beyond the scope of this study to visit each of these quarries, it is considered unlikely that any of these supplied the basic metamorphic rubble building stone used most commonly in Killin (i.e. meta-sandstone/psammite, mica schist and actinolite schist). All of these quarries are closed today and many are infilled and difficult to locate.

[1] 'An archaeological survey of the remains of Finlarig Castle': Association of Certified Field Archaeologists Occasional Paper Number 83 2006.



Quarry Name	Easting	Northing	Lithology	Lithostratigraphy	Location
ARDEONAIG	266600	735000	Limestone	Psammite and Semipelite	Ardeonaig
ARTRASGIRT	273000	747390	Whinstone	Gritty Psammite	Artrasgairt, near Fortingall
AUCHLYNE	251200	729600	Granite	Semipelite	Auchlyne, near Ardchyle
BEN EAGACH	285600	756500	Unknown	Graphitic Pelite	Beinn Eagagach
BRAES OF FOSS	274550	756090	Igneous	Metalimestone and Pelite	Braes of Foss
CALLELOCHAN	272600	742700	Igneous	Semipelite	Callelochan
CHESTHILL	269700	747500	Granite	Calcareous Pelite	Chesthill
CRAIGNAVIE	256400	732400	Limestone	Metalimestone	Killin
CROFTINTYGAN	267480	738970	Limestone	Semipelite	Croftintygan
DUNAN	274000	734000	Granite	Semipelite	Dunan
EDRAMUCKY	262100	736800	Schist	Metalimestone	Edramucky
FEADAN	269900	742180	Hornfels	Metagabbro and Metamicrogabbro	Balnearn
FEARNAN	272660	744540	Metaigneous	Psammite and Semipelite	Fearnan
GATEHOUSE	287100	746000	Unknown	Psammite and Semipelite	near Aberfeldy
GLENOGLEHEAD	255800	728600	Limestone	Metalimestone	near Ardchyle
KELTNEY	277500	749250	Limestone	Psammite and Semipelite	Keltneyburn
LAIRIGELLIE	257400	737400	Igneous	Calcareous Pelite and Pelite	north of Finlarig
LAWERS	267800	740200	Limestone	Metalimestone	Lawers
SMA' GLEN	289350	730880	Igneous	Metasandstone	near Glenalmond
TOMPHUBIL	277750	754450	Limestone	Metalimestone	Tom Phobuill
TULLOCHROISK	271500	757400	Limestone	Metalimestone	near Crossmount
UNNAMED	287000	748000	Metamorphic	Amphibolite	Aberfeldy
UNNAMED	286650	748200	Unknown	Metalava and Metatuff	Aberfeldy

Fig. 49: Quarry locations in the Loch Tay area from the BGS quarries database. Table shows grid reference and rock type (Lithology = worked rock type where known; Lithostratigraphy = Main geological unit at locality). No data is available regarding which quarries extracted building stone, roadstone, agricultural limestone etc. All of these quarries are recorded as inactive.

At Killin itself, only two historic quarry sites are recorded. The Craignavie quarry to the southwest of the village lies geologically over the Loch Tay Limestone (Fig. 50, and see Fig. 6). This area has recently been cleared of forestry, though unfortunately the quarry is no longer visible (perhaps destroyed by forestry ploughing). It is likely that this was small quarry for agricultural lime production, unrelated to building stone. The second quarry (not present in the BGS quarry database) lies immediately south of the village close to the start of the South Loch Tay road c.400 metres southeast of Dochart Bridge, linked to the road by a former cart track (Fig. 50). This quarry is shown on the 1901 edition OS map, but does not appear on the earlier 1867 edition, so it may represent the rejuvenation of the local stone rubble following the arrival of the railways and the importation of sandstone dressings.

A field visit to the 'south' quarry shows that it is a small quarry with a worked area of c.10 by 18 metres and 2.5 to 3 metres deep (Fig. 51). Examination of the remaining faces suggests that there were probably less than 1.5 metres thickness of usable beds within this area, producing squared rubble with a maximum block height of c.250 mm. The stone is a meta-sandstone (psammitic schist), similar to that used as squared rubble in the later (Type 4 masonry) buildings in the village. It is considered that this was likely to be a quarry producing relatively small blocks of squared rubble for the local building market, probably supplying squared rubble walling for the villa development in the latter part of the 19th century. The quarry was not capable of producing large block for dressed stone. The quarry site lies in a stream bed which is likely to preclude reopening of the site as a source of stone. Furthermore, the relatively small block size of the stone is likely to produce large amounts of waste. It is considered that it should be possible to identify better potential areas of stone in the Killin area should the opening of a local stone quarry be required.

6.4 Future sourcing and supply of stone and roofing slate for Killin Conservation Area

The dramatic reduction in building stone and roofing slate quarries in Scotland during the 20th century means that the vast majority of stone used in Scotland today is imported into the country. This makes it very difficult to obtain stone of matching characteristics in order to retain the appearance of the historic built environment. It is therefore considered important that stone matching is carried out in advance of repairs, so that the closest matching quarry sources can be identified. In rare cases it may be possible to obtain local stone, closer to the original, from small disused quarries. In addition, large block can sometimes be obtained from aggregate quarries that are still common in many parts of the country, and are often the only active source of local stone.

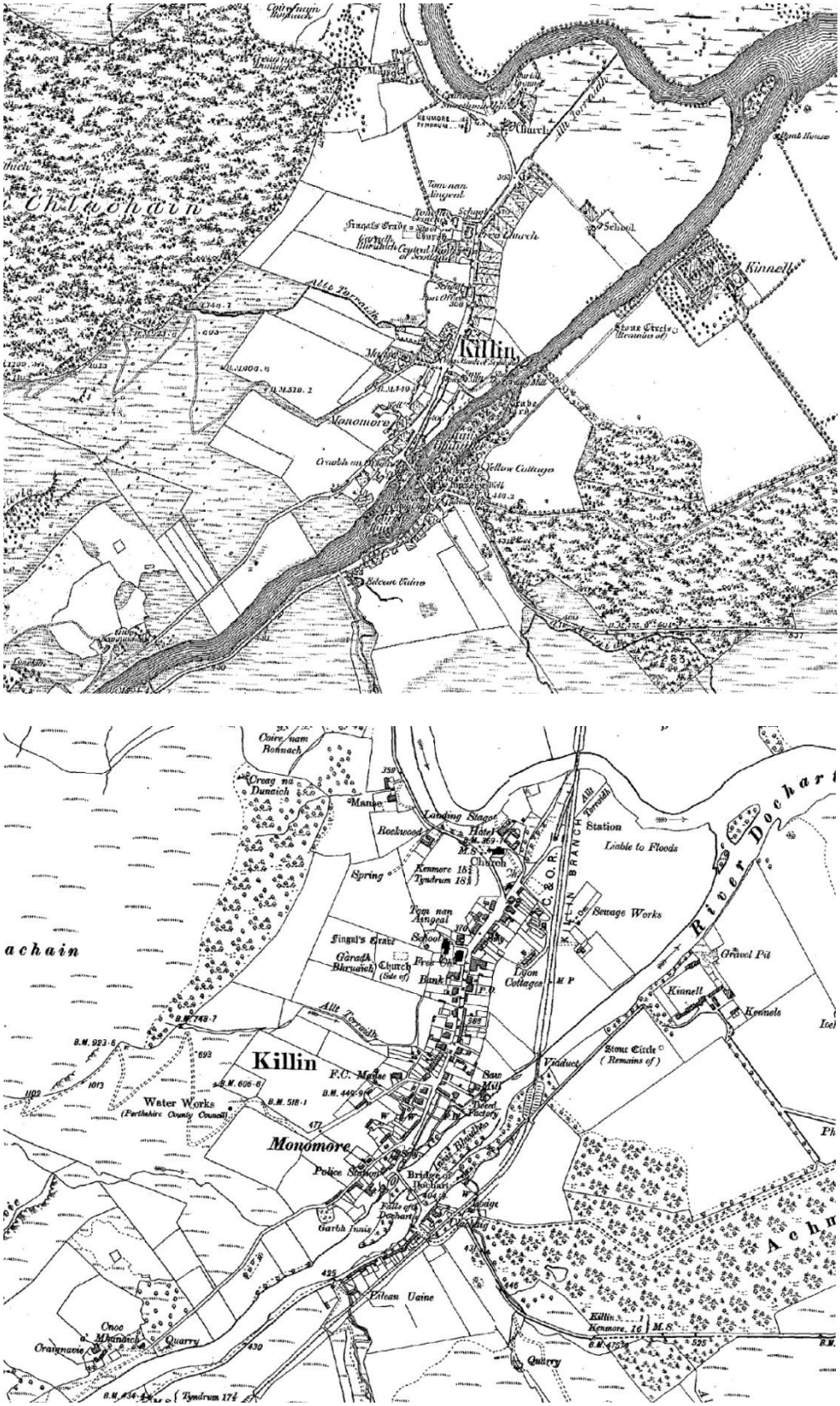


Fig. 50: Ordnance Survey 1867 (top) and 1901 (bottom) maps. No quarries are shown on the earlier map, although the presence of a limekiln (botton left-hand corner) suggests that limestone was probably being extracted southwest of the village at this time. Two quarries are shown on the 1901 map; one at Craignavie to the southwest (probably a limestone or sand and gravel quarry), and another immediately south of the village close to the South Loch Tay road which appears to have been a building stone quarry supplying meta-sandstone block to the vilage (see text for details).

Fig. 51: Former building stone quarry south of Killin (see previous map for location). This quarry is likely to have provided squared meta-sandstone block for walling. Right-hand image shows a vertical mark from a 'jumper', a typical tool used in building stone quarries in the 19th century (mark highlighted on image by arrows).

Local 'Killin stone' (meta-sandstone, mica schist, actinolite schist and metabasite)

There are no active dimension stone quarries in the Killin district, and there are no active dimension stone quarries that regularly produce meta-sandstone and micaceous schist rocks as building stone blocks. The BGS Directory of Mines and Quarries (last updated 2009) details a number of registered quarries extracting meta-sandstone and mica schist in Scotland. The most geologically similar and closest quarries are listed below. These quarries almost exclusively produced crushed rock, although some will provide large block for armour-stone which may be cropped to produce squared stone for walling. Note that these quarries have not been visited as part of this study, and some may be a better match than others to the Killin stone. Contact details for the quarries can be provided by BGS. This list does not include smaller-scale quarries which may be operated intermittently or for private use (e.g. Forestry Commission) which may exist in the Killin area and could contain more similar stone.

Active meta-sandstone/micaceous schist quarries:

- Ardchronie quarry, Ardgay
- Banavie quarry, Fort William
- Newforres quarry, Forres
- Achilty quarry, Contin
- Meadowside quarry, Kincraig
- Also others in Aberdeenshire

There are no known active quarries working actinolite schist in Scotland. It may be possible to obtain local stone from outcrops in the district, but it was beyond the scope of this study to investigate specific potential sources. Similarly there are no active quarries working metabasite. A significant former quarry at Fearnan on the north side of Loch Tay is likely to have once supplied metabasite block to the district, but it is considered unlikely to be capable of reopening. Today, whinstone is quarried for aggregate at numerous sites throughout Scotland, although it is possible to obtain dimension stone for building purposes (details of quarries available from Directory of Mines and Quarries/BGS).

Central Belt Sandstone

The pale coloured sandstone used for buildings in Killin following the arrival of the railway is likely to have come from the Scottish Central Belt. The composition of the stone corresponds with sandstone from numerous quarry sources in the central and western parts (e.g. Stirlingshire, North Lanarkshire, Glasgow area). Today, all these quarries are closed and most stone for repairs and new construction is imported from the north of England. It is recommended that if replacement stone is required for repairs to buildings in Killin that petrographic stone matching is undertaken to identify the closest matching currently-available stone types (for further details contact BGS). The use of red sandstone in the Lynedoch building is unusual for Killin, and this may represent a quarry source from the Scottish Borders (e.g. Corsehill) –again this could be verified and the closest matching stone for repairs identified by petrographic matching.

Roofing slate

As older slate roofs need to be repaired and replaced and new construction is required to fit into the historic built environment, there is an increasing need for slates that match the original slate types used in Killin. With the demise of the Scottish slate industry and the scarcity of reclaimed Scots slate there is a need to use imported slate. A number of slate types are currently in use that broadly mimic the appearance of Scots slate, such as blue-grey slates from Cumbria (e.g. Burlington slate), Wales (e.g. Portmadoc/Ffestiniog slate) and from overseas (e.g. Spanish). Similar slates from other suppliers and imported from other parts of the world are becoming increasingly available. To date, most of these replacement slate types have been used in uniform sizes, although many are available as different widths and sizes. The variable sizes of slates is considered an important element in replicating the appearance of a traditional Scots slate roof. Additionally, assurances need to be given that slate types not traditionally used in Scotland are capable of withstanding the climate and have undergone the relevant standard tests.

7. SUMMARY AND CONCLUSIONS: CONSERVING THE STONE CHARACTER OF KILLIN

7.1 Summary

The village of Killin lies in an area of dramatic mountain scenery. Historically, its situation at the head of Loch Tay and at the confluence of several major Highland glens made it of strategic importance both militarily and in terms of trade. The crossing point of the river Dochart was particularly important from early times and strongly influenced the early settlement pattern, which still exists today. The village became important for the textile trade, influencing the movement of this and other commodities from the Highlands to the major markets in the lowlands to the south. This fuelled the development of a thriving settlement in the 18th and early 19th centuries, dominated by small single storey cottages clustered around the bridge and the market area along Main Street. In the second half of the 19th century the arrival of the railway transformed the town, partly as a result of the popularity of the Highlands as a tourist destination, leading to the development of large villa properties.

The geology of Killin is dominated by metamorphic rocks of the Dalradian Supergroup –a mixed succession of Precambrian age. The district contains a range of rock types dominated by metamorphosed limestones, sandstones, mudstones and siltstones. Most of the rocks outcropping in the village are mica schist and meta-sandstone. Basic igneous intrusions also cut through the area. All these local stone types are reflected in the early buildings of the village.

Five categories of walling stone have been identified that define the development of stone buildings in the Killin Conservation Area. The earliest surviving buildings are single storey cottages, all of which are harled. These are constructed using a mixture of field and river boulders and stone obtained from surface outcrops, built as random rubble. The walls sit on a footing of large boulders which are visible today protruding from the face line of the building. The roofing material is likely to have originally been thatch as seen by survival of thackstanes in a few buildings. Most of these buildings have been rendered with cement and have other alterations such as dormer windows which mask their original form.

Type 2 masonry buildings represent an improvement in dwellings to two storey houses with large window openings, made possible by the use of large blocks of silver-grey actinolite schist, used extensively for window and door surrounds and corner stones (quoins). The walling stone in these buildings is the local mica schist and meta-sandstone, used as rubble and derived from local outcrops. The consistency of size and composition of the actinolite schist suggests it has been specifically quarried, most likely from a source close to the village.

Type 3 masonry represents the use of imported sandstone from the Scottish Central Belt following the arrival of the railway. This is a period of expansion of the village with the construction of large villa houses in the second half of the 19th century. The availability of sandstone allowed greater structural spans to give larger openings and a more ambitious architecture (bay windows etc.). The sandstone was used exclusively for dressings, whilst the walling was local schists; and in particular the actinolite schist, quarried previously

exclusively for dressing, was used for coursed squared rubble. This combination of imported sandstone dressings with local squared rubble is also seen in masonry Type 4 where local mica schist is used for rubble, but as quarried regular blocks (squared and coursed). This implies that the village had at least two local quarries to provide squared rubble block at this time.

The final category of stone walling type represents the 'miscellaneous' use of different stone types imported into the village, including igneous block for specific buildings such as Dall House and Greenbank which have front elevations of basic igneous rock; the library which has dressed stone of grey granite; and Lynedoch which has dressings of imported red sandstone. All these buildings represent the later stage of stone buildings, where transportation improvements and increasingly wider markets meant that more 'exotic' stone types from further afield could be used.

The A-listed Dochart Bridge forms a prominent feature in Killin and is one of the best known tourist attractions in Scotland. The early 1760 bridge construction used rubble stone extracted from the immediate rock outcrops in the river. These are a mixture of mica schist and meta-sandstone, both of which are used to construct the rubble walls; the former as irregular grey flaggy stones and the latter as angular blocks of darker brownish grey colour. Most of the masonry is irregular in size and uncoursed, suggesting it has not been formerly quarried and was likely extracted from nearby surface outcrops. There are two generations of copestone on the bridge parapet walls, both quite distinct. The early copestones are large flaggy blocks of mica schist again reflecting the local geology, probably extracted from a suitable bed nearby. A later generation of imported copestones of quite different appearance are roughly squared blocks of dark igneous dolerite. These are present over parts of the bridge, representing a major period of repairs (bridge date stone c.1831) with importation of new material from outside the village. More recent minor repairs to the bridge are typically poorly executed, involving the reuse of existing stone, and with much cement mortar, leading to unsightly repairs which have become unstable with much loose block.

Examination of databases and archive information relating to quarries in the Killin area has identified a number of quarries in the Loch Tay region. Many of these would have produced limestone for agricultural use, and igneous rock for roadstone, and it is likely that very few produced building stone. No quarry source for the actinolite schist used in Killin has been found. The volcanic 'Green Bed' stone quarried at the eastern end of Loch Tay (used extensively as building stone in Aberfeldy and Kenmore) is not seen in Killin, suggesting that stone sourced more locally to the village was used. Only two quarries have been found close to Killin itself; one being a former limestone quarry to the southwest of the village (Craignavie quarry), probably used exclusively for agricultural lime, and the second to the south of the Dochart Bridge. This latter quarry appears to have produced meta-sandstone block for building stone in the late 19th century. None of the quarries identified in the Killin district are open today.

7.2 The contribution of stone to the character of the village

The special character of Killin was recorded in an early quotation by John MacCulloch (1773-1835), who noted the unique setting of the village and the link between the buildings and the landscape:

"[Killin has] the most extraordinary collection of extraordinary scenery in Scotland, unlike everything else in the country, and perhaps, on earth, and a perfect picture gallery in itself, since you cannot move three yards without meeting a new landscape... Fir-trees, rocks, torrents, mills, bridges, houses,—these produce the great bulk of the middle landscape, under endless combinations..." (Statistical Accounts of 1834-45, vol. 10, p.1080).

The buildings of Killin directly reflect the local geology and provide a connection to the landscape. The history of the village can be tracked through the changing materials used in the buildings; the earliest 18th century buildings were constructed from field and river boulders and surface rock outcrops. Due to the limitations of these materials (small irregular block size etc.) these buildings are small, with minimal openings and are typically harled. Later buildings have a distinctive pattern of local meta-sandstone and mica schist for walling with large dressings of distinctive silver-grey slabs of actinolite schist. These were all obtained locally; the rubble walling from boulders and surface outcrops, whilst the actinolite schist was specifically quarried. Following the arrival of the railways in late 19th century sandstone from the Scottish Central Belt was used for dressed stone in combination with squared rubble walling of local actinolite schist and meta-sandstone, the former being quarried immediately south of the village.

The use of very local stone makes the buildings in Killin unique to that place. The change in building stone types over time also influenced the architectural form of the buildings. The distinctive so-called 'Breadalbane style' of architecture seen in Killin is only made possible by the combination of local stone walling, imported sandstone dressings and dark, irregular Scottish slate.

There are no sources of slate in the immediate area, such that early roofs were likely to have been thatched. However dark variable Highland Border slate is present on a number of the earlier buildings, suggesting that it was being transported at an early time, possibly from sources beyond the east end of Loch Tay. The arrival of the railways in late 19th century enabled the supply of West Highland slate and ultimately Welsh slate. All these types play an important part in the character and contribute to the fabric of the village.

The contribution of the different types of stone and slate to the character of the built environment in the Killin Conservation Area is illustrated in Fig. 52.







Fig. 52: Selection of images of different stone types and building styles in Killin, illustrating the importance of stone and slate in defining the character of the village. Because most of the stone types are from the local area there is a direct link between the buildings and the geology, rooting the village in its landscape.

7.3 Conservation of Killin's stone built heritage

Maintenance issues

Most of the building stone and slate used historically in Killin is robust and has, in general, weathered well. In particular, the local metamorphic and igneous rocks are relatively hard, impermeable to water and durable. Some poor quality stone (e.g. weathered field boulders) is likely to have been used in the early buildings (i.e. Type 1 masonry single story cottages) but have been protected by harling. Note also that some of these very early buildings may also have used earth, clay or turf in their construction which could be prone to decay (particularly if exposed to excess water).

Sandstone used in the late 19th century buildings is a more porous building stone, and will undergo decay if exposed to excess water or continual saturation. Lack of maintenance of rainwater goods (e.g. gutters, downpipes, flashings etc.) can lead to water saturation and decay of sandstone. The use of excessive de-icing salts is also a major cause of sandstone decay at ground level and around entrances.

The use of hard cement mortars for repointing and repairs has been observed in several buildings and structures in Killin. This is not only unsightly, but the over-use of these impermeable materials can trap water in the masonry joints leading to damp problems. Careful conservative pointing and in some cases the use of more permeable lime-based mortars are recommended to prevent this problem.

Supply of replacement stone and slate

There is a need for new matching stone for repairs to both existing buildings and for new construction (including extensions) in order to retain the appearance and character of the Conservation Area. There are no stone or slate quarries open in the area at this time. The metamorphic stone used for the rubble walls of buildings is local in origin. None of the historic quarry sites identified near Killin are considered capable of reopening, although it may be possible to identify particular outcrops in the district which are capable of providing appropriate stone. Some organisations (e.g. Forestry Commission) may already extract stone. A number of large aggregate quarries extract similar metamorphic rock in other parts of the Highlands, such that it may be possible to obtain stone from these (details given in earlier text).

Replacement sandstone must be carefully selected to be compatible in terms of composition, porosity, etc., to avoid issues of incompatibility of weathering which can cause accelerated decay of the original stone. Petrographic stone matching is recommended prior to specifying sandstone for repairs.

There are no slate quarries active is Scotland today, although a number of alternative slate types have broadly similar characteristics (see earlier text for details). Limited supplies of reclaimed slates may also be available.

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