



Historic England

# Strategic Stone Study

A Building Stone Atlas of the  
Isle of Wight

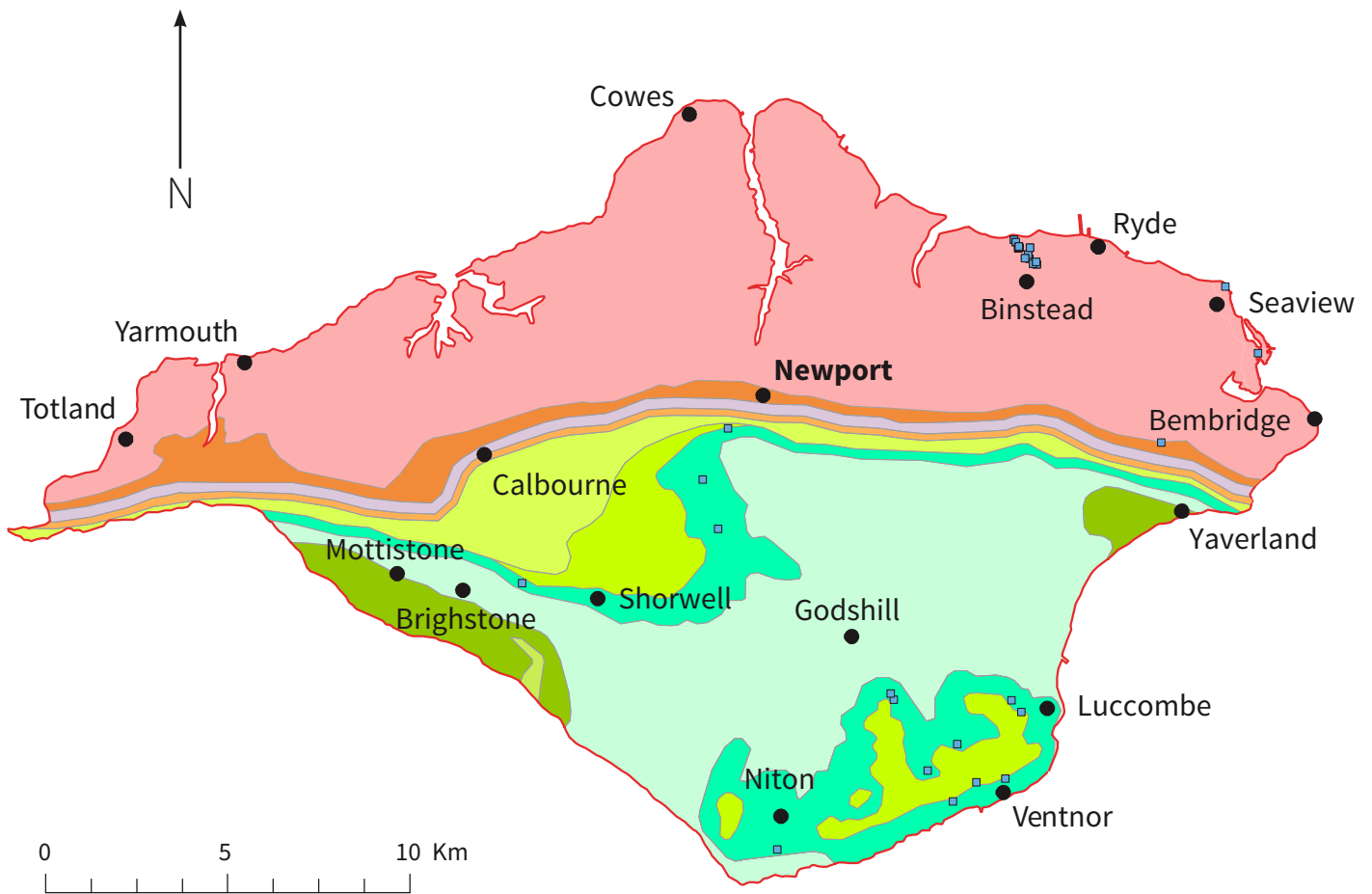
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PERIOD	GROUP		FORMATION / MEMBER	BUILDING STONES
QUATERNARY	Various		Various including ‘Clay-with-Flints’	<ul style="list-style-type: none"><li>Tufa</li><li>Ferricrete (Heathstone)</li><li>Quaternary Flint, Beach Pebble Flint, Field Flint</li></ul>
TERTIARY (PALAEOGENE)	Solent Group		Bouldnor Formation	<ul style="list-style-type: none"><li>Bembridge Limestone (Bembridge Stone, Wight Stone)</li><li>Binstead Stone (Binstead Limestone)</li><li>Bembridge Limestone Slate</li><li>Quarr Stone (Featherstone, Featherbed Limestone)</li><li>Nettlestone Sandstone</li><li>Headon Limestone</li><li>How Ledge Limestone</li></ul>
			Bembridge Limestone Formation	
			Headon Hill Formation	
	Barton Group		Becton Sand Formation	
			Chama Sand Formation	
			Barton Clay Formation	
	Bracklesham Group		Boscombe Sand Formation	
			Branksome/Selsey Sand Formations	
			Marsh Farm Formation	
			Wittering and Poole Formations	
	Thames Group		London Clay Formation	
	Lambeth Group		Reading Formation	
UPPER CRETACEOUS	Chalk Group	White Chalk Subgroup	Portsdown Chalk Formation	<ul style="list-style-type: none"><li>Chalk (Chalk Block)</li><li>Quarry Flint</li></ul>
			Culver Chalk Formation	
			Newhaven Chalk Formation	
			Seaford Chalk Formation	
			Lewes Nodular Chalk Formation	
			New Pit Chalk Formation	
			Holywell Nodular Chalk Formation	
		Grey Chalk Sub-group	Zig Zag Chalk Formation	
	West Melbury Marly Chalk Formation			
LOWER CRETACEOUS	Selborne Group		Upper Greensand Formation	<ul style="list-style-type: none"><li>Chert</li><li>Upper Greensand Sandstone</li><li>Ventnor Stone (Freestone, Firestone, Hearthstone)</li><li>Green Ventnor Stone, Ventnor Foxstone</li><li>Bonchurch Stone</li></ul>
			Gault Formation	
	Lower Greensand Group		Monk’s Bay Sandstone Formation	<ul style="list-style-type: none"><li>Monk’s Bay Sandstone (Carstone, Ironstone)</li><li>Sandrock</li><li>Ferruginous Sandstone</li></ul>
			Sandrock Formation	
			Ferruginous Sand Formation	
			Atherfield Clay Formation	
	Wealden Group		Vectis Formation	<ul style="list-style-type: none"><li>Wealden (‘Paludina-type’) Limestone</li><li>Wealden Mudstone</li><li>Wealden Conglomerate</li></ul>
Wessex Formation				

Table 1. Summary (Interactive) of stratigraphical names applied to Cretaceous and Cenozoic sediments on the Isle of Wight

# Isle of Wight Bedrock Geology Map



## Isle of Wight Bedrock Geology



# Lower Cretaceous

## Wealden Group

### Wessex Formation

#### Wealden Conglomerate

The Wessex Formation only crops out in two separate coastal areas on the Isle of Wight: in the west, extending from Shippards Chine and Hanover Point to Shepherds Chine; and in the east around Sandown and Red Cliff. The sequence as a whole comprises a range of mainly soft, varicoloured mudstones and unconsolidated sands, with occasional harder bands of indurated sandstone, sandy conglomerate and pebbly conglomerates (at the base). It is the latter which have been locally utilised as a building stone and these generally comprise pale red or dark reddish-coloured pebble-conglomerates containing calcareous clasts.

The conglomeratic bands are moderately hard and resistant and have provided a local source of rubblestone for buildings and walls in the villages of Brook, Mottistone, Brighstone and Yafford in the west. They are occasionally evident in Sandown and the village of Yaverland to the north-east. Many of the blocks of these conglomeratic beds which are seen in old buildings were probably obtained from the local beaches and coastal landslips.

### Vectis Formation

#### Wealden Mudstone

Wealden Mudstone is seen only in the area immediately surrounding its outcrop on the foreshore at Yaverland. It is a homogenous, brown, dense, iron-rich mudstone which occurs as one or more thin layers varying from 10-15 cm thick. The mudstone is commonly intensely bioturbated and contains moulds of fossil gastropods. It breaks into distinctly 'brick-shaped' pieces along planes of weakness created by thin layers containing these fossil moulds. The Wealden Mudstone is used very locally at Yaverland as a constituent of the WWII concrete defensive structures. The concrete was mixed on-site using the available beach material as aggregate.

#### Wealden Limestone

The Wealden Limestone has a similar outcrop pattern to the Wealden Conglomerate. The main beds of the Wealden Limestone used for building stone purposes are thin, grey or brown-coloured, coarsely fossiliferous, freshwater or lagoonal limestones. They occur mostly in light grey beds commonly 10-20 cm thick. The uppermost layer comprises densely packed disarticulated valves of oysters, while lower beds contain silty calcareous horizons of disarticulated valves of the bivalve *Filosina gregaria*, and less commonly, small gastropods such as *Viviparus infracretacicus*. These strata resemble the fossiliferous 'Paludina' limestones that occur in the Wealden Group of the Weald area of south-east England, most notably in West Sussex.

The limestones are moderately hard, resistant and durable and have provided a local source of rubblestone for building and decorative purposes in the villages of Brook, Mottistone, Brighstone and Yafford. Some of the limestone slabs have also been used as paving stones in the Sandown area.



Wall at Mottistone Manor containing greyish blocks of Wealden Conglomerate with buff or brown blocks of Ferruginous Sandstone and dark purple, angular blocks of Monk's Bay Sandstone (Carstone)



## Lower Greensand Group

### *Ferruginous Sand Formation*

#### **Ferruginous Sandstone**

The Ferruginous Sand Formation forms much of the inland outcrop of the Lower Greensand Group across the southern part of the Isle of Wight. It occurs in a broad tract of land stretching from Compton Bay and Chale Bay (in the west) via Godshill and Arreton to Shanklin and Sandown (in the east). It varies in thickness from approximately 75 to 160 m.

Unweathered, the Ferruginous Sandstone is a fine- or medium-grained sandstone, which is pale grey to greenish coloured when fresh. Upon weathering, the sandstone turns a very attractive and distinctive, ochreous orange-yellow colour.

The sandstones are typically heavily bioturbated and sometimes contain fossil plant debris. Some sandstones are weakly cemented and make relatively poor building stones. At outcrop, such sandstones may be associated with layers of calcareous, phosphatic or pyritic concretions that contain fossils.

Ferruginous Sandstone is of variable quality from the building stone perspective. The poorly-cemented, fine-grained sandstones weather easily, whereas the harder, better-cemented sandstones produce a good quality building stone that is used locally but extensively in villages (mainly) and small towns across the outcrop area. Where used, Ferruginous Sandstone is employed as uncoursed rubblestone blocks and, occasionally, as dressed ashlar. One of the wings of Wolverton Manor, near Shorwell, is built of Ferruginous Sandstone. Other particularly fine examples of the use of this stone can be seen in the village of Shorwell. 'Tuberous' ironstone concretions from the Ferruginous Sands are frequently employed in the rococo ornamentation of gate pillars and garden walls near Sandown Bay.

### *Sandrock Formation*

#### **Sandrock**

Sandrock occurs in two areas in the south of the Isle of Wight: in a generally narrow, sigmoidal outcrop extending from Compton Bay (in the west) to Culver Cliff (in the east) and in a wider outcrop around the northern margin of the Southern Downs from Chale Bay (in the west) to Shanklin Chine (in the east).



Oak Cottage, Shorwell constructed in the C18th mainly of irregular or roughly dressed blocks of mainly Ferruginous Sandstone with minor amounts of Sandrock, Carstone and Upper Greensand Sandstone.



Sandrock comprises pale brown or buff coloured sandstones of variable grain size, which form part of coarsening upwards cycles along with mudstones and pebble beds. Characteristically, blocks of Sandrock display small- to large-scale cross-bedding features; the finer-grained varieties also exhibit lamination and bioturbation structures. The formation reaches a maximum thickness of 70 m.

In common with other sandstones from the Lower Greensand Group, Sandrock is of variable quality from a building stone perspective. The more durable beds are used extensively but locally across the outcrop both as uncoursed, rubblestone blocks and occasionally as dressed ashlar.

## **Monk's Bay Sandstone Formation**

### **Monk's Bay Sandstone (Carstone, Ironstone)**

The distinctive dark brown, purple-brown or red-brown variegated Monk's Bay Sandstone (formerly called Carstone or Ironstone) is readily identified wherever it occurs in the southern part of the Isle of Wight. Apart from always being highly ferruginous, the sandstone varies lithologically from a coarse-grained, weakly consolidated quartz-rich sandstone ('grit') to a more fine-grained, often pebbly, sandstone and ironstone towards the top of the formation. The thickness varies north-eastwards across the Isle from 2 m up to nearly 22 m.



Farringford Lodge, near Freshwater, built around 1870 of Monk's Bay Sandstone (Carstone) with brick dressings





**Mottistone Church, built in the C12th and restored in 1863, is built mainly of a mixture of dark Monk's Bay Sandstone (Carstone) and paler Upper Greensand Sandstone.**

Sandstones from this formation are, once again, of variable quality; some are poorly-cemented, fine-grained sands which weather easily and do not make good building stone. More durable, harder, better-cemented sandstone beds also occur in the formation and these produce good quality building stones which are used locally, but extensively, in a number of small towns and villages throughout the outcrop area.

Examples of the use of Monk's Bay Sandstone can be seen at Yarbridge, Knighton, Arreton, Whitcroft, Rockley, Chilerton, Shorwell, Wolverton, Brighstone, Mottistone, Hulverstone, Farringford, Freshwater, Locksley, Wroxall, Luccombe, Whitwell, Blackgang and Yaverland. Where used, the Monk's Bay Sandstone is most commonly employed as large, irregularly coursed, rubblestone blocks; the intractable nature of these ironstones has meant that quoin stones, buttresses and window mouldings are commonly constructed in local brick or the finer local sandstones (from the Upper Greensand Formation) which are more suitable for dressing as ashlar.

## Selborne Group

### *Upper Greensand Formation* **Upper Greensand Sandstone**

The Upper Greensand Sandstone occurs adjacent to the Chalk Group outcrop on the Isle of Wight in two principal areas: a central outcrop that extends from Compton Bay (in the west) to Whitecliff Ledge (in the east) and a southern outcrop that occurs south of a line extending from Chale Bay and Blackgang (in the west) to Luccombe Bay (in the east).

The Upper Greensand Sandstone is a pale greenish-grey, fine-grained, glauconitic, calcareous or siliceous sandstone with spicular chert and small brownish phosphatic pebbles. It is often highly bioturbated, and contains a limited fossil fauna including serpulid worms, bivalves (scallops, oysters), ammonites and brachiopods. When weathered, the sandstones can become highly porous as the siliceous sponge spicules are gradually leached out and the stone surface flakes and spalls. The Upper Greensand Sandstone was the most important source of building sandstones on the Isle of Wight, and has been used since Roman times. It has seen extensive use at Shanklin (especially as ashlar, walling stone and as window dressings), Newchurch, Rew, Niton, Whitwell, Newport, Gatcombe, Wroxhall and Godshill. It is also the source of large ashlar and squared stone blocks for many houses in Ventnor, Bonchurch, St. Lawrence and Niton, as well as being employed in several historic and important buildings on the Isle including Appuldurcombe House, Arreton Manor, Yaverland Manor and Carisbrooke Castle.



**The C15th gatehouse to Carisbrooke Castle, near Newport, constructed of Upper Greensand Sandstone**





St. Catherine's Church, Ventnor, built mainly in the C19th of locally quarried Ventnor Stone

## Ventnor Stone (Freestone, Firestone, Hearthstone)

In the Ventnor area, the Upper Greensand Sandstone is named Ventnor Stone. The principal worked stone, commonly known as the 'Freestone', is only 1.2-1.8 m thick but can be traced in cliff and quarry sections along much of its outcrop and has been extensively worked in the Bonchurch and Ventnor areas.

Lithologically, Ventnor Stone is very similar to Upper Greensand Sandstone although there are a number of distinct named varieties (described below). Where the sandstone is cemented by silica, the resulting building stone is commonly termed 'Firestone' or 'Hearthstone' because of its resistance to high temperatures.

Ventnor Stone is an important building stone in Ventnor and is very widely used in many of the older and prestigious buildings and other structures in the town. It is a very homogeneous stone and readily cuts into quality ashlar or more roughly dressed squared blocks. Poorer quality rounded or irregular blocks of Ventnor Stone are often used in boundary walls in association with flint or chert nodules or other locally derived stones.



The Royal Hotel, Ventnor, constructed from squared blocks and ashlar of Ventnor Stone





Alternating squared and tabular blocks of Green Ventnor Stone laid to course in C19th cottages, Belgrave Road, Ventnor

### Green Ventnor Stone

This is a distinctly green-coloured variety of Ventnor Stone, so-called because of the higher concentration of green glauconitic grains present in the sandstone. Quarried only between Bonchurch and Ventnor, the principal quarry sources for Green Ventnor Stone were developed along the area known

as The Undercliff. Some of these were still active in 1921 and were subsequently occupied by the former railway station at Ventnor. Large blocks of Green Ventnor Stone ashlar and roughly squared stone are commonly seen in houses in Ventnor and surrounding villages.

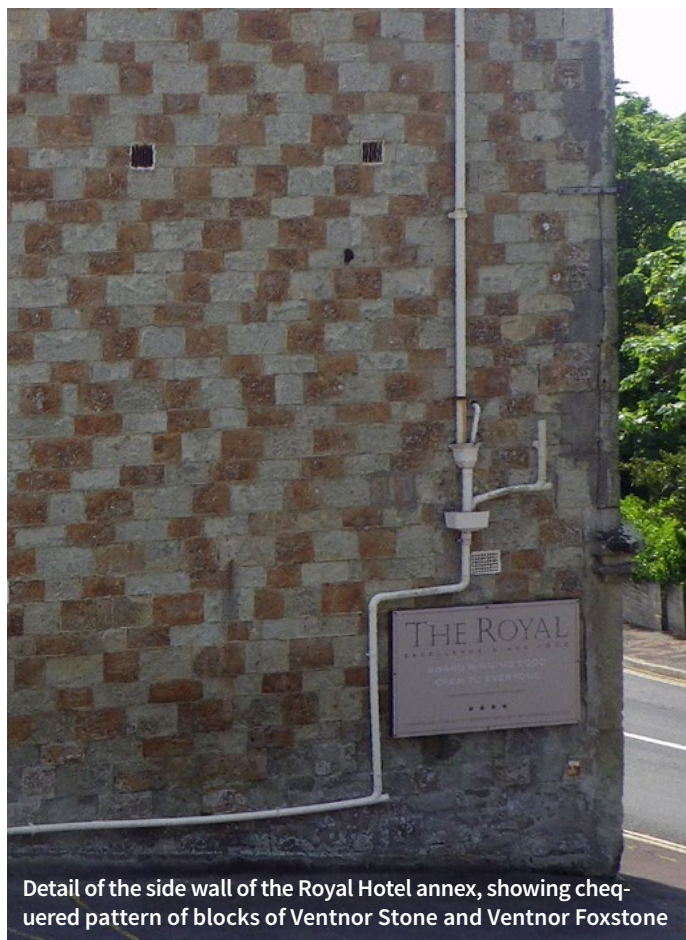




Annex to the Royal Hotel in Zig Zag Road, Ventnor, built of alternating blocks of Ventnor Stone and Ventnor Foxstone

### Ventnor Foxstone (Ventnor Foxmould)

A distinctive variety of Ventnor Stone with a characteristic brown/red-brown surface colouration, quarried only in the Ventnor area. It was widely employed in Ventnor and nearby towns, typically being seen in prominent C19 and C20th buildings where it is utilised as roughly squared blocks (often alternating in a decorative chequer-board pattern with Ventnor Stone and Green Ventnor Stone).



Detail of the side wall of the Royal Hotel annex, showing chequered pattern of blocks of Ventnor Stone and Ventnor Foxstone

### Bonchurch Stone

This is a massive, pale-grey to pale-buff coloured variety of Ventnor Stone which is only slightly glauconitic. It was quarried only at Bonchurch and saw mainly used as ashlar or roughly squared blocks in buildings and boundary walls in the Bonchurch and Ventnor area, and in some churches elsewhere on the Isle, for example at Freshwater.



The Grotto (or Well-house) entrance to Peacock Vane along Bonchurch Village Road, built in the 1830s of local Bonchurch Stone

### Chert

Chert occurs in the uppermost part of the Upper Greensand Formation (below the Grey Chalk Subgroup) where the main Chert-bearing beds occur as part of cyclic units of alternating layers of hard nodules or concretions interbedded with softer, grey-green, glauconitic sandstone. Chert is more common in the Upper Greensand of the southern Downs than in the equivalent strata of the central Downs of the Isle. The Chert beds are particularly well exposed at Gore Cliff, Niton, where they can reach a thickness of 7.3 m.

Chert is an extremely finely-grained variety of quartz, typically occurring nodules or concretionary masses, but occasionally as layered deposits. It is often dark coloured, green, grey or brown. Like flint (which is dark grey or black), Chert is very hard and resistant, and breaks with a conchoidal fracture, typically



producing very sharp edges. It may sometimes contain fossils of bivalves or sponge spicules, while thin veins of pale blue-grey, microcrystalline quartz and small crystal-lined cavities are common.

From the C17th onwards, Chert has commonly been used as a building stone on the Isle of Wight in both agricultural and non-agricultural buildings, especially in the boundary walls of estates and farmland. A line of villages including Godshell, Rookley and Alverstone have older properties utilising Chert owing to the proximity to the central Downs outcrop and exposures on the northern flanks of the south Downs. To the

south, Chert can be seen in walls flanking roads around Shanklin Old Village, St. Lawrence, Bonchurch, Ventnor, Niton and Chale as well as in older farm buildings inland, close to the southern Downs outcrop.

Due to its hardness and the irregular manner in which it breaks, Chert is a difficult stone to work. Larger blocks tend to be used close to outcrop, where they are often employed as irregular, angular capping stones on walls which themselves are either constructed of smaller Chert nodules or Upper Greensand Sandstone.



Wall constructed of irregular Flint and Chert nodules in Kings Bay Road, Bonchurch





Attractive use of Chalk 'Block' in the C18th Old Library (Olde Shoppe) and adjoining cottages, North Street, Brighstone

## Upper Cretaceous

### Chalk Group - White Chalk Subgroup Chalk ('Chalk Block')

Although often regarded as a relatively soft building stone elsewhere in southern England, much of the chalk within the steeply dipping sections on the Isle of Wight has been secondarily hardened due to re-cementation during tectonism. This has led to its wide use as a durable, resistant building stone on and adjacent to the extensive chalk outcrops of central and southern areas on the Isle.

Hard, white chalk is one of the most distinctive and easily recognised building stones employed on the Isle of Wight. It is a white to very pale grey, typically massive, limestone, sometimes containing fossil bivalves (inoceramid oysters), echinoids and occasionally crinoids, brachiopods and belemnites. The total thickness of the White Chalk Subgroup

on the Isle is approximately 400 m.

Many houses, farms, barns and churches on and adjacent to the chalk outcrops on the Isle were commonly, at least in part, constructed using chalk. There is marked variability in its use: random rubble and polygonal chalk rubblestone patterns being common in some cottages, while coursed and squared, chalk ashlar blocks ('Chalk Block') being employed in others. Examples of the use of chalk building stone can be seen in Arreton, Downend, Havenstreet, Newchurch, Mottistone, Winford Cross and particularly Brighstone.

### Quarry Flint

In addition to its importance as a source of hard, white chalk for building stone, the White Chalk Subgroup succession on the Isle of Wight also yields Quarry Flint ('fresh' Flint). This is an extremely fine-grained (cryptocrystalline) and hard form of silica containing microscopic, quartz-crystal aggregates. Quarry Flint typically occurs as irregularly-shaped nodules, usually 10-20 cm across, or as (sub)rounded pebbles and



# Tertiary (Palaeogene)

## Solent Group

### *Headon Hill and Bembridge Limestone formations*

The Solent Group on the Isle of Wight contains a number of Palaeogene-aged limestones which have been long recognised as valued building stones; this includes such well-known types as Quarr Stone, Bembridge Limestone and Binstead Stone. Some of these building stones have been employed since Roman times and large quantities were exported from the Isle for extensive use on the mainland, especially during Medieval times.

However, despite their relative fame as quality building stones, the outcrop characteristics and precise stratigraphical origins of some of these Palaeogene limestones remain uncertain. Some of these limestones unquestionably occur as isolated lenses and, historically, they have been quarried as such. Recent studies also indicate that some named limestone types merely represent 'facies variants' of the same stone and these visibly grade into each other over very short distances, or even within the same block of stone. Furthermore, particular names, such as 'Bembridge Limestone' have been applied in a broad and often varying sense to different stones.

For the primary purpose of their description in this Atlas, therefore, these Palaeogene limestones are assigned to the 'Headon Hill and Bembridge Limestone formations' – a derived (litho)stratigraphical unit name with a necessarily broad application.

### How Ledge Limestone

How Ledge Limestone crops out only at Headon Hill and the adjacent coastal sections between Hatherwood Point and How Ledge. It is a relatively hard, durable limestone which forms a distinct, resistant and prominent unit that is up to 2 m thick.

The How Ledge Limestone is a fine-grained, cream to pale brown (fawn) coloured, shelly limestone containing well preserved fossils of freshwater gastropods. It is distinguished from other similar Palaeogene-aged limestones by its more massive structure with fewer fossil cavities. This limestone was evidently quarried historically, but only for occasional local use as a rubblestone.

Rear view of the C19th Southgrove Terrace in Ventnor, constructed of irregular knapped Quarry Flint and Quaternary Beach Pebble Flint nodules

cobbles; occasionally, it is also found as weakly banded tabular sheets or layers up to 20 cm thick. Fresh flint nodules have a white outer cortex with a darker coloured (black, dark grey) interior; they break with a distinct conchoidal fracture producing razor-sharp, fine edges. The nodules may contain cavities lined with small transparent quartz crystals (flint geodes); banded structures, formed from alternating layers of slightly different composition, may also occur on cleaved surfaces. Well preserved fossils (with fine shell details replaced by silica) may occur in or on the surface of some flint nodules; echinoids, sponges, bivalves and burrow-structures being the most commonly encountered types.

Quarry Flint is a very hard rock and is highly resistant to weathering. Consequently, Quarry Flint nodules are commonly employed as a building stone along parts of the outcrop in central and southern parts of the Isle of Wight. Larger flint nodules were often utilised for walls or as capping stones for walls; nodules of medium-size, both rough and dressed, were employed as a more general building stone, often in conjunction with brick or other materials. Particularly good examples of the use of Quarry Flint can be seen in Calbourne and in the Bonchurch-Ventnor areas.

The very hard, resistant nature of the flint nodules from which Quarry Flint is derived has resulted in their being recycled by natural processes into younger deposits; such flint (herein referred to as 'Field Flint' or 'Beach Pebble Flint' shows specific characteristics (see entries under 'Quaternary Flint').



## Headon Limestone

Headon Limestone is a fine-grained, pale brown, massive to concretionary limestone which is typically up to 6 m thick, but occasionally reaches 9 m in thickness. The hard concretionary limestone forms a prominent landscape feature at outcrop on Headon Hill, and can be traced inland towards Middleton. This is impersistent however, and the concretionary limestone facies is absent at Cliff End. Apart from containing fossils of freshwater gastropods (*Limnaea*, *Planorbis*, *Viviparus*) and occasional vertebrate (especially turtle) remains, the Headon Limestone is relatively structureless. A few beds may exhibit lamination, and if present, the siliceous concretions tend to occur in the lower parts of the unit where they can attain relatively large sizes.

Small quantities of the Headon Limestone have been quarried in the past from Headon Hill and the stone has occasionally been employed locally as a rubblestone in the Headon Hill – Totland area.

## Nettlestone Sandstone (Nettlestone, Nettlestone Grit)

Nettlestone Sandstone crops out on the foreshore at Nettlestone Point, Seaview, where it has been worked on a small scale. It is a finely-bedded, pale grey to buff coloured, flaggy, calcareous, fine-grained silty sandstone which characteristically displays well-defined, small-scale cross-bedding and ripple marks with occasional slump structures. The fossil fauna comprises various freshwater shells and the gastropod *Galba*. Some blocks of Nettlestone Sandstone may grade into a void-rich limestone similar to Quarr Stone (from which it can be readily distinguished by the characteristic presence of fine cross-bedding).

Nettlestone Sandstone is moderately resistant and has been



Roughly shaped tabular blocks of Nettlestone Sandstone in a wall adjoining Seaview Yacht Club, the Esplanade, Seaview



Appley Tower, Ryde, constructed in the C19th of coursed rubblestone with ashlar dressings. Various stones were used including a range of Palaeogene limestones (including Nettlestone Sandstone, Featherstone and Bembridge Limestone) with Upper Greensand Sandstone with occasional blocks of Monk's Bay Sandstone (Carstone)

used as a local building stone, mainly as tabular blocks or rubblestone in walls, especially in Seaview and Ryde. Some beds readily split into layers and it has also occasionally been employed as a roofing 'slate'.

## Quarr Stone (Featherbed Limestone, Featherstone)

Quarr Stone is one of the most famous of the Palaeogene limestones employed as a building stone. The outcrop extent of the stone was very limited, the principal source being restricted to an area encompassed by Binstead, Quarr Wood and Holy Cross church; this resource was largely worked out by the end of the C15th. Current opinion is that Quarr Stone probably belongs to the Bembridge Limestone Formation.

Quarr Stone is a pale grey to buff-coloured, coarsely-grained bioclastic, freshwater limestone. It contains abundant and characteristic fossils including bivalve shells (*Polymesoda*, *Cyrena*), gastropods and spherical egg cells (*oogonia*, which reach 1 mm across) of the freshwater algae *Chara*; small brown-coloured fossil turtle bone fragments also occur. The highly fossiliferous



nature and texture of Quarr Stone immediately distinguish it from other building stones used on the Isle; it is also more dense, compact and durable than Featherstone.

Featherstone (or Featherbed Limestone) is a variant of Quarr Stone which is relatively light and highly porous. Like Quarr Stone it is a pale grey to buff-coloured, coarsely bioclastic, freshwater limestone. However, it can be distinguished by its characteristic laminar texture which results from the presence of layers of closely packed, broken and abraded, fossil bivalve and gastropod shells. When cut across the bedding, this stone reveals a very distinctive feather-like appearance (hence its name). The framework of fossil shells and calcite cement give this limestone its strength as a building stone; the higher percentage of void space (greater than Quarr Stone) makes Featherstone relatively light and easy to cut as a freestone.

On the Isle of Wight, Quarr Stone has been used around Quarr, most notably seen within the walls of Quarr Abbey and the

local church (Quarr Abbey itself was mainly constructed from Binstead Stone). Upon the Dissolution of the abbey in 1536, the constituent Quarr Stone (and Binstead Stone) was sold for re-use, including the construction of Yarmouth Castle. Elsewhere on the Isle, Quarr Stone was used in other prestigious buildings, especially churches dating from Norman times and it can be seen in the surviving original Norman remnants of churches at Yaverland, Shalfleet and Calbourne. However, the younger stone fabrics of these churches are constructed from a range of other local stones, confirming that wider access to the Quarr Stone outcrop, even on the Isle of Wight, was restricted from relatively early times. In old sea-walls close to the foreshore at Ryde, blocks of Quarr Stone can be seen grading vertically into shelly Featherstone.

It should be noted, however, that the use of Quarr Stone on the Isle of Wight was relatively minor when compared with the large amounts of this stone that were exported for use on the mainland.



Blocks of Binstead Stone and Quarr Stone in the mid C16th walls of Yarmouth Castle. Some of this stone likely originates from the dissolution of Quarr Abbey in 1536





Alternating large and small squared blocks of Bembridge Limestone in C18th cottages, main road, Newbridge

## Bembridge Limestone (Bembridge Stone, Wight Stone)

Bembridge Limestone is one of the harder Palaeogene stones used for building and it has been regarded as one of the chief natural products of the Isle of Wight. It was certainly the most extensively quarried of the limestones from the Bembridge Limestone Formation for building purposes. It crops out along much of the north coast of the Isle between Totland and Bembridge. The principal quarries were in the Binstead and Quarr areas, although Bembridge Limestone was also worked from foreshore ledges at Bembridge Foreland and St. Helen's, where the stone was extracted in large, thick blocks (taking advantage from well-defined bedding planes and jointing). Such blocks, where seen in buildings, may contain surface boring marks produced by burrowing marine animals (indicating their shoreline origins). From 1938 to the 1960's, Bembridge Limestone was quarried from Chessel Quarry, near Wellow.

Bembridge Limestone is a fine-grained, pale grey to buff or pale brown, compact, relatively massive limestone which occurs in units up to a maximum thickness of approximately 8 m. Fossils are common but restricted in terms of species, and notably

include the freshwater gastropod *Galba* and the millimetre-sized, spherical *oogonia* (egg cells) of the freshwater algae *Chara*. Fossil land snails and occasional mammal bones also occur. The centimeter-scale rounded voids common in much of the rock used for building stone are moldic pore spaces arising from the dissolution of *Galba* shells.

Bembridge Limestone typically provides a good freestone building stone which could be used as large ashlar blocks laid to course and for quoins. Its use dates back to Roman times and it has been employed across much of the Isle, particularly in older C19th stone buildings in Ryde and East Cowes. Bembridge Limestone can also be seen in town buildings in Bembridge, Binstead, Quarr and St. Helen's, as well as in villages such as Shalfleet, Newtown and Totland. Arreton Church and Yarmouth Castle are two of the many buildings on the Isle which are constructed primarily of Bembridge Limestone, as are sea walls on the north coast of the Isle. Norris Castle is constructed largely of Bembridge Limestone, with mortar joints of flint shard galleting. Large and small, irregular, galleted blocks of coursed Bembridge Limestone are seen in cottages at Newbridge. Bembridge Limestone was also used as dressings





The remodelled C13th Church of the Holy Cross, Binstead, built mostly of locally sourced Binstead Stone

in association with coursed Flint nodules in Calbourne and as quoins in association with sandstone blocks from the Ferruginous Sands Formation at Shorwell.

Large quantities of Bembridge Limestone were exported to the mainland and it was much used in West Sussex.

### Binstead Stone (Binstead Limestone)

Binstead Stone derives its name from the area where the stone was quarried and is one of the harder Palaeogene stones used for building on the Isle of Wight. Its physical appearance and features are very similar to Bembridge Limestone and it may simply be a localised variety of this stone.

The use of Binstead Stone for building purposes dates back to Roman times. Binstead Stone is a homogeneous freestone which has typically been employed as large ashlar blocks laid to course; it has also seen use as roughly dressed or squared stone laid in irregular courses. Binstead Stone was widely employed in various buildings in Binstead itself, including Binstead Church and was the principal stone used in the original fabric of Quarr Abbey. Following the Dissolution of the Abbey, this limestone was sold for re-use in the construction of Henry VIII's Solent defensive forts at East and West Cowes, and also, in part, for the construction of Yarmouth Castle.

### Bembridge Limestone Slate

Bembridge Limestone Slate is a pale grey coloured, fine-grained, finely-bedded variety of Bembridge Limestone. It is a compact

stone with few structures other than traces of lamination and contains a similar fossil assemblage to, albeit less prolific than that of Bembridge Limestone. The thinly-bedded, slabby, relatively hard and durable nature of Bembridge Limestone Slate has enabled it to be used as a source of roofing 'slate' on the Isle. Archaeological studies have confirmed that several Roman villas used this stone for roofing. Occasionally, more modern buildings, such as farm building at Endfield Farm near Ningwood, also employ this stone type for this purpose.



Endfield Farm buildings near Ningwood, with tiled roofs partially constructed of Bembridge Limestone Slate



# Quaternary

## Quaternary Flint

Quaternary Flint is a widely used building stone on the Isle of Wight and has been employed in a variety of ways in a range of built structures across the outcrop area of the Chalk Group and in coastal towns and villages. As it is readily available in large quantities, it is one of the dominant building stone types used on the Isle.

‘Fresh’ Flint originates from the White Chalk Subgroup (see description of Cretaceous-aged Quarry Flint on pages 12-13), however, the stone also occurs in derived form – often in a more weathered, or ‘worn-looking’ state – within field brash (in areas underlain by White Chalk Subgroup strata) and other surficial deposits, including beach pebbles.

Like Quarried Flint, Quaternary Flint is an extremely fine-grained, hard, resistant form of silica and makes a fine building stone. Flint walling is a common feature in many villages and towns on the Isle, the flint being used either as cobbles ‘in the round’, or as fractured cobbles (displaying their grey-brown, lustrous, interior), or as dressed or knapped and squared stones. Notable examples of the use of reworked, rounded or dressed flint nodules occur in Ventnor, Bonchurch and Calbourne; coursed flint nodules are often employed in association with dressings of Bembridge Limestone (e.g. in Calbourne) or Upper Greensand Sandstone ashlar (e.g. in Ventnor). Occasionally, distinctive fine flint shards were used for galleting, as seen at Norris Castle, East Cowes, for example.

Two main types of Quaternary Flint were used on the Isle of Wight.

## Field Flint

This type of flint occurs as irregularly-shaped nodules which form part of the field brash in areas underlain by Chalk (White Chalk Subgroup). The size of the nodules varies from 10–30 cm, however, larger nodules occasionally occur. The outer ‘skin’ (cortex) of the nodule is usually cream-coloured with a darker brownish or greyish interior which becomes white with exposure, as a result of fracturing. This ‘lightly weathered’ appearance helps distinguish Field Flint from the much ‘fresher-looking’ Quarried Flint, which has a white outer cortex and a very dark grey or black interior. Weathered flints, or those that have lain in soil or superficial deposits for a long period, may be variously discoloured or bleached, often with brown-stained interiors due to the precipitation of iron hydroxides

from percolating ferruginous water and in-situ oxidation of pyrite. Field Flint nodules may also exhibit freeze-thaw weathering features, such as cryofractures (hairline cracks) or pot-lid fractures (sub-spherical hollows).

Field Flint is the main flint type represented within the flint-work of village cottages and farm buildings which sit on the Chalk outcrop in the inland parts of the Isle. Historically, the stone was collected directly from the field surfaces or from field brash. Field Flint is used in a variety of ways for walling; typically, pieces were selected for shape and size and were laid in either random or coursed patterns. A notable example of its use is in the early C19th Gatehouse Lodge at Calbourne.



Early C19th Gatehouse Lodge to Westover Park, Calbourne, built of coursed Flint nodules with dressings of Bembridge Limestone

## Beach Pebble Flint

Beach Pebble Flint typically occurs as rounded pebbles and cobbles of flint which usually reach 10 cm in size, but are occasionally larger. The pebbles often exhibit a ‘frosted’ surface appearance or ‘chatter-marks’ (small surface cracks) caused by collisions with other beach pebbles.

Beach Pebble Flint is a widely used stone on the Isle of Wight, being employed mainly in coastal towns and villages, notably Ventnor, Bonchurch and Shanklin (where flint is often used in association with other stones such as Ventnor Stone or Bembridge Limestone). Beach Pebble Flint was typically used





Wall of Beach Pebble Flint laid roughly to course, Broadway, Sandown

for walling; pebbles and cobbles were hand-picked and sorted for size and laid to course, with the long axis oriented horizontally, vertically or at an inclined angle (thereby creating an imbricate pattern).

### Ferricrete (Heathstone)

Ferricrete is a dark reddish-brown coloured stone, which exhibits a distinctive conglomeratic or brecciated texture created by clasts or pebbles of sandstone, chert or flint set within a ferruginous sandy matrix. It is formed within soil and superficial deposits by the precipitation of iron oxides and hydroxides from ferruginous groundwaters and usually occurs in intermittent, irregular layers up to 50 cm thick. The ferruginous matrix is rather soft when freshly excavated, but this hardens when exposed to air. However, Ferricrete is often loosely cemented and typically breaks up on exposure to the agents of weathering, leading to the release of its constituent pebbles; this makes it a relatively poor rubble building stone.

The distribution of Ferricrete on the Isle of Wight is not well known. Its sporadic development is typically associated with Quaternary gravel and alluvial deposits in northern and western areas (extending between Cowes, Ryde, Foreland and Newport, in association with the Solent Terrace deposits) and in the vicinity of the River Medina (in association with the Medina Terrace deposits). Ferruginous gravels with extensive iron oxide cementation are also recorded near Headon Hill. In these areas, Ferricrete finds occasional and local use mainly as isolated blocks in wall fabrics.

### Tufa (Travertine)

Tufa is a magnolia or pale grey coloured, highly porous limestone. It is thought to have formed from the dissolution of Headon Hill Limestone (in the north of the Isle) and Chalk (in the south) as a result of rainwater percolation followed by the reprecipitation of the dissolved carbonate in springs and caves. The resulting tufa deposits were subsequently exposed by coastal erosion. Tufa is soft and crumbly when freshly-quarried, and easily cut into blocks, but upon exposure to air it quickly hardens to become a useful building stone.

Tufa is highly localised in terms of its development and has only been occasionally employed as a building stone on the Isle of Wight. Local sources of the stone were rapidly exhausted during the C1st in the wake of the Roman conquest; its later use was mainly by virtue of 'scavenging' from older buildings. It occurs at Totland Bay, in the cliff-top between Headon Hill and Widdick Chine, as blocks on the beach extending from Rocken End to Ventnor and in excavations at Ventnor.

Tufa was used as a building stone at Marvel Lane and Robin Hill, to the south and south-west respectively of Newport. It has also been found during excavations at several Roman villa sites, such as Combley, Newport and Brading. At Newport Roman Villa, tufa may have been employed as lightweight roofing for a bath house; its use in the foundations of the recently excavated Roman villa at Brading may suggest another Tufa source nearby. Elsewhere, Tufa may be seen sporadically in sea-walls near to Chalk and other limestone outcrops.



## Imported Stones

The import of building stones from the mainland for use on the Isle of Wight has been very limited until comparatively recent times.

The decorative limestones (‘marbles’) sourced from the early Cretaceous Purbeck Group in Dorset can be observed across the Isle in several churches dating from as far back as Norman

times. Purbeck Stone Slate has also been imported for roofing purposes at scattered locations on the Isle, mainly for use in higher status buildings. In contrast, despite the proximity of the famous Portland quarries in Dorset, relatively small amounts of this stone have been employed; its typical use was for carved decorative stone work, war memorials and sculptures.

A summary list of imported building stone types seen on the Isle is provided in Table 2.

Stone Name & Place of Origin	Source Stratigraphy	Stone Characteristics and Selected Examples of Use
<b>Purbeck Stone Slate</b> Isle of Purbeck, Dorset	<b>Lower Cretaceous</b> Durlston Formation, Purbeck Group	Grey or buff, heavy, fossiliferous, slabby limestones, typically employed in the form of a narrow strip or broad edging along the eaves of the roof adjoining clay tiles or pantiles. Examples can be seen in Mottistone, Wolverstone and West Court manors, King James Grammar School in Newport, cottages in Brook, Carisbrook Castle and Brighstone Church.
<b>Purbeck Marble</b> Isle of Purbeck, Dorset	<b>Lower Cretaceous</b> Durlston Formation, Purbeck Group	Dark grey to buff, shelly limestone, containing fossil <i>Viviparus</i> shells and other finely-broken shell material. Used mainly for internal church memorials, ledgers, columns, bases and capitals, especially in Godshell, Arreton and Shalfleet churches.
<b>Portland Stone</b> Isle of Portland, Dorset	<b>Upper Jurassic</b> Portland Stone Formation, Portland Group	Very pale, white, fine-grained limestone. Used occasionally as a freestone in classical façades and pillar work in the early C18 Appuldurcombe House and in various C19th or C20th civic buildings such as the HSBC and NatWest banks in Ryde and Ventnor.
<b>Carnmenellis Granite</b> Carnmenellis (including Carn Brea and Carn Marth), Cornwall	<b>Carboniferous-Permian</b> Carnmenellis Intrusion	Pale grey, leucocratic to mesocratic biotite-granite, often rich in feldspar megacrysts. A notable example of its use is as large blocks in the seaward-facing bastion walls of Sandown (Granite) Fort.

Table 2. Summary table of the main building stone types imported into the Isle of Wight

Further descriptions of the Isle of Wight’s imported building stones can be found in several of the references listed in the Further Reading section of this Atlas.



Portland Stone in C18th classical façades and pillarwork, Appuldurcombe House, near Wroxall







# Glossary

**Alluvial:** A sediment which has been eroded, transported by water and re-deposited in a non-marine environment.

**Anticlinal axis:** The hinge line of an anticline, a type of fold structure in rocks which is arch-shaped and has the oldest rocks in the core of the arch.

**Bioclasts:** Fragmentary fossil remains of marine or land organisms found in sedimentary rocks, especially limestones (which are termed Bioclastic limestones).

**Bioturbated:** Sediments that have been reworked or disturbed by burrowing organisms such as worms.

**Bivalve:** A mollusc with two shells, which may be marine or freshwater. Examples are cockles, clams, scallops, oysters.

**Brash:** Soil with high concentrations of pebbles derived from the underlying rock.

**Brecciated texture:** A rock texture that comprises broken up, angular rock fragments or clasts, set in a finer-grained matrix.

**Calcareous:** A sedimentary rock containing a significant amount (10–50 %) of calcium carbonate.

**Chalk:** A soft, white limestone, sometimes powdery, which was formed at the bottom of a sea during Late Cretaceous times.

**Chatter marks:** Small cracks and indentations on the surface of a flint or chert pebble (or sometimes on the surface of a Sarsen Stone) caused by collisions with other objects (usually pebbles).

**Chert:** An opaque, extremely fine-grained sedimentary rock composed of silica (quartz). It occurs as nodules (Flint), concretionary masses, or occasionally as layered deposits.

**Conchoidal fracture:** A smooth fracture surface, often occurring in a fine-grained rock such as Flint or Chert, which shows a curved pattern of fine concentric rings or ripples.

**Concretion:** A rounded or elliptical mass of harder rock occurring within a (usually softer) sedimentary rock.

**Cretaceous:** A period of geological time that lasted from approximately 145 million to 65 million years ago. It includes a number of important types of building stone such as Greensand, Flint and Chalk.

**Cross-bedding (or Current-bedding):** A structure in the layers (beds) of a sedimentary rock formed by the movement of water or air. The term is usually applied to sandstones and the feature itself typically resembles sets of lines which are inclined with respect to the bedding planes or form regular arc-shaped patterns.

**Echinoid:** A type of marine organism formed of calcareous plates, commonly called a sea urchin. Often found in Chalk sediments.

**Facies:** A term describing the principal characteristics of a sedimentary rock that help describe its mode of genesis.

**Ferricrete:** A dark reddish-brown coloured iron-oxide cemented layer formed in soil profiles or superficial (surface) deposits of Quaternary age. Typically, it contains rounded or angular pebbles of flint, chert or sandstone up to 6 cm in diameter.

**Flaggy:** A sedimentary rock, often a sandstone, which splits into slabs and may be used for paving.

**Flint:** A form of very hard, micro-crystalline quartz. Typically occurs in Chalk deposits as rounded or irregular shaped masses (nodules) and has a dark grey or black coloured inner 'core', with a white outer 'skin'.

**Galleting:** Flakes of flint set in mortar and used to fill the spaces between irregular flint nodules or other stones).

**Gastropod:** A mollusc with one shell, which may be marine or freshwater. Examples are whelks, snails, limpets.

**Geode:** A round rock which contains a hollow (often central) cavity, lined with crystals.

**Glaucanite:** A mineral composed of iron and silica. It often occurs in Cretaceous and Tertiary sedimentary rocks as small greenish coloured specks or grains. It gives the green colour to the rock type Greensand.



**Greensand:** A sandstone so-called because of the presence of the mineral glauconite.

**Ironstone:** A hard sedimentary rock cemented by iron oxide minerals. Often dark brownish or rusty coloured.

**Knapped Flint:** Worked flint which has been fractured (cleaved) to reveal the interior of the nodule.

**Lithology:** The description of a rock based primarily on its mineralogical and grain size characteristics e.g. sandstone, limestone, mudstone etc.

**Massive:** Describes a sedimentary rock which is homogeneous and lacks any internal structures (such as cross-bedding or ripple-marks) or fractures.

**Nodule:** A small, hard, rounded or elliptical mass within a sedimentary rock. Resembles a pebble or larger cobble.

**Quaternary:** A period of geological time that lasted from approximately 2.6 million years ago to the present Day. It includes the last Ice Age.

**Serpulid:** A fossil marine worm, with a straight, curved or coiled tube.

**Sponge spicules:** The elements that make up the supportive structure ('skeleton') found in sponges.

**Tectonism:** the process of deformation in the Earth's crust that produces the continents, ocean basins, plateaus, mountains, folded and faulted rock strata.

**Tertiary:** A period of geological time preceding the Quaternary which lasted from approximately 65 to 2.6 million years ago.



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