

Quaternary deposits - Jersey: description of 1:25 000 Channel Islands Sheet 2

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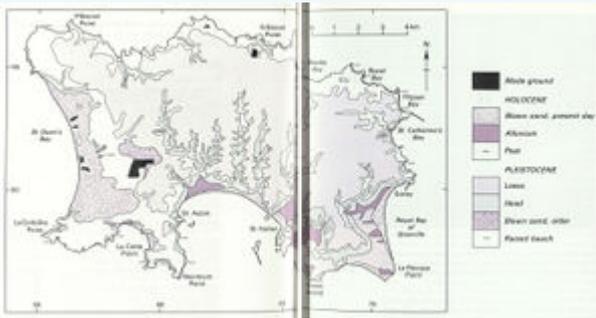


Figure 19 Geological sketch map showing drift deposits of Jersey.

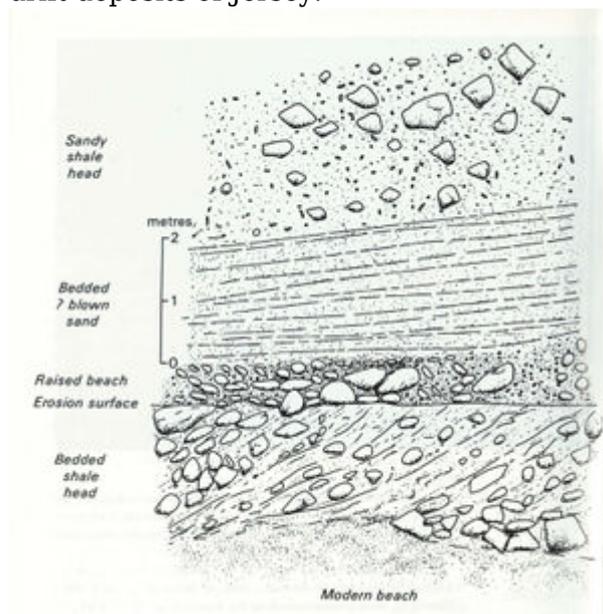


Figure 20 Sketch section of the drift deposits at Belcroute, St Aubin's Bay.



Plate 20 Deposits of the 18 m raised beach overlying Fort Regent granophyre at Snow Hill, St Helier. (A13707).



Plate 21 Head deposits overlying the south-west granite at Beau Port, St Brelade. (A13713).



Plate 22 Loess resting on diorite and overlain by blown sand and Neolithic soil at Green Island, St Clement. (A13714).



Plate 23 Dunes of blown sand at Quennevais, St. Brelade. (A13660).

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Chapter 8 Quaternary deposits

The deposition of the Rozel Conglomerate was followed by a long period which has left no sedimentary record in Jersey. The major elements of the present outlines of the Channel Islands resulted from faulting, probably in Mesozoic times. Eocene (Lutetian) marine limestones beneath the sea to the north, west and east of Jersey are down-faulted against the older rocks of the island, and it is likely that intermittent uplift of the island as a block bounded by submarine faults continued from the late Mesozoic to the late Cenozoic. The planation surfaces that are prominent in the higher parts of the island probably originated during pauses in the uplift; their age is uncertain, but they may have been formed in the Neogene rather than the early Pleistocene, on the evidence of the low altitude of the Plio-Pleistocene deposits of the southern Cotentin peninsula on the French mainland about 35 km east of Jersey (Lautridou, 1982).

The youngest rocks in the island are of Quaternary age and include sediments of both the Pleistocene and the Holocene (Flandrian). They reflect the changing climates and sea levels from the Middle Pleistocene, when the earliest of these sediments was laid down.

As is commonly so, the age relationships of many of these deposits are obscure, and strict superposition of sedimentary units generally cannot be seen; thus the suggested sequence rests partly on geomorphological considerations rather than on the much more satisfactory criteria used for the hard rocks. Nonetheless the following succession, with estimated maximum thicknesses, has been recognised:

Holocene	Blown sand	20 m	Flandrian
	Peat and alluvium	10 m	Flandrian
Pleistocene	Loess	5 m	?Devensian
	Head	30 m	Devensian
	St Peter's Sand (older blown sand)	5 m	?Ipswichian
	8 m raised beach	3 m	?Ipswichian/Eemian
	Head	2 m +	?pre-Ipswichian
	18 in raised beach	2 m	?pre-Ipswichian
	30 m raised beach	2 m	?pre-Ipswichian

Except for the loess, which covers the upland plateau of the island, and the valley-side head deposits, these drift formations occur largely in coastal areas ([Figure 19](#)).

Pleistocene

Raised beaches

The gravels of the 30 m and 18 m raised beaches are assumed to be pre-Ipswichian. Neither beach has been firmly dated, although ages in the upper part of the Middle Pleistocene and in the lower part of the Upper Pleistocene seem probable.

The 30 m beach is known from only two localities: South Hill, St Helier [6510 4770], and St Clement [6869 4738]. Together these show a height range between about 25 m and 37 m above mean sea level (Keen, 1978b). Only at South Hill can the sediments of this beach be examined, and there they consist of a medium gravel of the local Fort Regent granophyre and, quartz pebbles.

The 18 m beach is present in caves on the north-west coast of Jersey and on fragmentary benches below cliffs which rise to the main plateau of the island, as at Jubilee Hill (Mont du Jubile), St Ouen's Bay [5750 5145] (Renouf, 1969), St Helier (Renouf and Bishop, 1971), and at St Clement. In the caves it either occupies a bench cut into the solid rock or forms a false roof, as it does around Grand Becquet [5750 5628], where the beach is a cemented cobble gravel of local rock types. The best exposure is at the former terminus of the Jersey Eastern Railway at Snow Hill, St Helier [6543 4838] ([Plate 20](#)), where medium gravel, composed almost entirely of local granite but with a few flint clasts (probably derived from offshore outcrops of Chalk), fills a pulley on the east side of the cutting. Both fine and coarse gravels are present at Jubilee Hill, and flints accompany the local rock types that make up the greater part of the deposit.

Recent work on the raised beaches of the south coast of England and South Wales, using the amino-acid racemisation technique (Davies, 1983; Davies and Keen, 1985), suggests that at Portland, Torquay, Swallowcliffe (Avon), and in Gower, beaches reaching similar heights to the 18 m beach of Jersey have ages of around $200\,000 \pm 20\,000$ years.

The 8 m raised beach on Jersey occurs widely around the coast, but its best exposures are in the south-west from La Corbiere Point [553 481] to St Aubin [606 482], in the north in Bonne Nuit Bay and Giffard Bay, and in the north-east from Rozel Bay [6965 5465] to Anne Port [7135 5110]. The beach material ranges in size from cobbles, as at Bouley Bay [6688 5495], to fine gravel and sand, as in the section north of Belcroute slip [6069 4810]. It consists largely of local rock types, but it also contains small quantities (less than 5 per cent) of flints, quartzite like that from the Grès Armoricaïn of Normandy and Brittany, and a few pebbles of Devonian limestone (Dunlop, 1911; Keen, 1975). It is very unusual to find flints or other exotic constituents of the raised beach larger than 5 cm in the long axis. The beach ranges in height from 11 m above mean sea level south of La Cotte Point [5928 4753] down to 3 m above mean sea level, as exemplified by the beach exposure [608 465] north of Noirmont Point, where cemented gravel occurs within the modern beach (Keen, 1978b).

In the south-west of the island the 8 m raised beach gravels normally rest on head, rather than on a smoothed surface of solid rock. Such a sequence can be seen clearly at Portelet Bay [6015 4710] and Belcroute Bay [6070 4825] ([Figure 20](#)), where the beach is separated from the rock platform by up to 2 m of head, presumably pre-Ipswichian in age. At Portelet the coarse boulder beach, with clasts up to 40 cm in the long axis, is composed entirely of local rock types. The finer gravel in Belcroute Bay contains small amounts of flint and quartzite. At both Belcroute and Portelet the beach gravel is overlain by about 2 m of sand; at Portelet the sand is poorly stratified and passes up into head, but at Belcroute it is well bedded, with individual layers up to 2 cm thick. It is uncertain whether these sands are water-laid and thus part of the beach proper, or small accumulations of blown sand formed during the retreat of the sea from its highest level.

Along the whole of the north coast of Jersey the wave-cut notch associated with the 8 m raised beach is the main feature defining the cliff base. Gravel of the 8 m raised beach occurs in Bonne Nuit Bay [6422 5588], at the Belle Hougue cave [6560 5640] and north of the jetty at Bouley Bay [6688 5495]. At the last locality a beach of rhyolite cobbles overlies 2 m of head as at Portelet. In Bonne Nuit Bay, beach gravel is visible at the base of the head, and 200 m east of the jetty [6424 5589] a beach gravel strongly cemented by ferruginous minerals occurs within the modern beach in the same way as that at Noirmont Point. Only in the cave known as Belle Hougue I does the 8 m beach contain any molluscan remains; here nine species of Mollusca are preserved in stalagmite, and indicate a sea temperature at the time of formation of the beach up to 3°C above that of the present English Channel (Zeuner, 1940). This suggests that the 8 m beach was deposited during the Ipswichian/Eemian interglacial, which is known to have been warmer than the present (Shackleton and Opdyke, 1973). This age is supported by amino-acid ratios from shells of *Patella vulgata* (Linne) from the raised beach at Belle Hougue, which suggest correlation with other 8 m beaches of probable Ipswichian age in England and Wales (Davies, 1983), and by U-series dates from the stalagmite cement of this beach, which have yielded an age of 121 000 +14,000/-12,000 years, closely similar to that generally agreed for the Ipswichian/Eemian in Europe (Keen and others, 1981).

In the north-east the 8 m beach generally rests on a rock platform and consists of up to 1 m of gravel overlain by head. The clearest exposures occur around Belval and north of Rozel [6962 5460] but small patches of beach occur discontinuously in the base of the head along the whole coastal section from Rozel to Gorey. The beaches here are mostly of fine gravel or sand containing few cobbles. As in the southwest, most (more than 90 per cent) of the constituents are of local origin, but flints and quartzites also occur.

St Peter's Sand (older blown sand)

The St Peter's Sand, which occupies a hilltop position around the eastern part of Jersey Airport, is possibly of similar age to the 8 m raised beach. There are no sections in the sand but temporary exposures and auger holes indicate a maximum thickness of 5 m. The deposit is a well-sorted, structureless and iron-cemented sand of quartz and feldspar. Its stratigraphic relations are obscure but it appeared to underlie the loess in a road cutting [5937 5052] in the southernmost part of its outcrop. Thus, if the loess is Devensian, a pre-Devensian age for the sand is possible. Because it is well sorted, an origin as blown sand seems probable (Keen, 1975) and this sand sheet is perhaps an Ipswichian counterpart of the Flandrian sand in the same area.

Head

Head occurs at the foot of cliffs along the south-west, north, and north-east coasts of Jersey. It also forms undissected cones and fans beneath the blown sand at St Ouen's, St Aubin's, and St Clement's bays, and at the Royal Bay of Grouville, and it mantles valley sides inland, where it has been derived mainly from the loess of the plateau surface. As a whole the head is unsorted and composed of the reworked weathered remnants of the local solid rocks.

In the south-west the greatest thickness of head is about 15m, and the major sections are in Beau Port [579 481] ([Plate 21](#)), in the bays south of La Cotte Point [5945 4715], in Portelet Bay, and from Noirmont Point northward to St Aubin. Immediately south of St Aubin's Harbour the head has mainly formed by weathering of the Jersey Shale Formation; the largest clast size is about 30 cm, but the fragments are generally around 2 cm across; these coarser components rest in a matrix of silt derived from the loess and the weathered shale, and the silt is bedded, the beds being up to 5 cm thick with depositional dips of up to 30°. Elsewhere in the south-west the head is formed entirely of frost-shattered, angular fragments of the local granite; the maximum size of the clasts is controlled

by the spacing of the joints in the granite, the largest being about 2 m across, and the larger fragments are set in a gravelly matrix composed of granules of quartz and feldspar; except along the east-facing cliffs north of Noirmont Point, little loess occurs in this head.

In the north, the greatest thicknesses of head in Jersey lie against the high cliffs of volcanic rocks in Bonne Nuit and Bouley bays. The head thickness is related to the height of the cliffs, in the ratio of cliff height to head thickness of 4 or 5 to 1. The maximum head thickness is about 30 m, although the coastal exposures show rather less than 20 m. Below the outcrops of well-jointed rhyolite and andesite the head is very coarse, with clasts up to 2 m across in a matrix of finer fragments of volcanic rocks; there is little loess in these head deposits. At the base of the sections in the middle of Bonne Nuit Bay [6450 5585] and near the jetty [6415 5590] the head is composed of fine laminae of grey silt, perhaps indicating deposition in pools on the former foreshore left as the sea level fell at the end of an interglacial stage.

On the north-east coast, head occurs from Rozel eastwards to La Coupe Point [710 540] and southwards to Petit Portelet. In the northern part of this section the head is finer grained on the outcrop of the Rozel Conglomerate than it is elsewhere; the largest clasts measure 5 cm along their longest axis and are set in a matrix of loess. In the southern part, the clasts are composed of volcanic rocks and are up to 1 cm across in a matrix of loess; the best sections are at Petit Portelet, at Jeffrey's Leap [7160 5070], and north of Anne Port [7140 5130]. North of Belval Cove the loess content is sufficiently high to form discrete bands within the head; these are particularly well seen on the south side of the cove below La Coupe [7103 5385] as beds of loessic head up to 40 cm thick; such beds are distinguishable from primary loess by their deeper orange colour and by the few granules of Rozel Conglomerate that they contain.

Inland, on the relatively gently sloping valley sides, the head is only 2 to 3 m thick. It is generally a fine-grained deposit formed from reworked loess with incorporated granules of the local solid formations. This is best seen in the side valleys to the main south-trending valleys in the centre of the island, for example in road sections in St Peter's Valley and St Lawrence Valley; a road section at La Fontaine St Martin [6235 5240] shows 3 m of head on the upper part of the valley side.

The head is largely without faunal remains, but at La Cotte de St Brelade it has yielded a range of mammalian material, including *Mammuthus primigenius* Blumenbach, *Coelodonta antiquitatis* Blumenbach, *Ranvier larandus* Linne, and Rodentia, as well as Ayes, and tools and skeletal remains attributed to *Homo sapiens neanderthalensis* King. In coastal exposures south of St Aubin, palaeolithic implements have occasionally been found (Mourant, 1935; Keen, 1978a), providing evidence of man's presence during head deposition. At Fliquet Bay [7115 5350] the basal part of the head contains about 60 cm of stony, silty peat, which floors a gulley cut into the Rozel Conglomerate. This peat has yielded a fauna comprising 38 taxa of Coleoptera and a pollen spectrum, both of which suggest that the environment was subarctic immediately before the head was deposited, although they give no indication of age (Coope and others, 1980). A radiocarbon date for wood fragments from the base of the organic deposits gave an age greater than 25 550 years (Birm-955), so that the head in the north-eastern part of Jersey dates from before the last main cold episode of the Devensian (Weichselian) glaciation of northern Europe. Organic muds, up to 30 cm thick, occupying shallow depressions on the rock platform cut into the Jersey Shale Formation at La Vau Varin [6071 4834], south of St Aubin's Harbour, have also yielded pollen and Coleoptera (Coope and others, 1985); these confirm the indications of the Fliquet deposits that the climate immediately prior to the deposition of the head was sub-arctic. At Ecalgrain (Manche), on the Normandy coast, peat in a similar stratigraphic position to that at Fliquet has yielded an age greater than 45 000 years (Shotton and Williams, 1971), thus placing the overlying head in the early Devensian. The Jersey head is underlain by the ?Ipswichian/Eemian 8 m raised beach and overlain by Flandrian blown sand, so that the head as a whole is probably Devensian in age.

Loess

The loess is an orange-yellow to pale brown sediment in which 80 per cent of the particles are of silt grade ([Plate 22](#)). It is composed largely of quartz and feldspar, but it is calcareous in patches. At Green Island (La Motte) [6740 4596] decalcification textures (*limon à doublets*) can be seen. The lower part of this profile contains redeposited calcium carbonate in the form of discontinuous concretions (*lössmännchen*) of loess cemented by CaCO₃; it is around and within these concretions that a sparse molluscan fauna of *Pupilla muscorum* (Linne), *Oxyloma pfeifferi* (Rossmassler) and *Trichia hispida* (Linne) occurs. Mollusca of these species have also been found in calcareous loess, or very loessic head derived from it, at Portelet [599 472], St Aubin [606 485] and Belval Cove [7098 5275] (Keen, 1982). Bovine bones have been found in the loess at Pontac.

The main areas of loess in Jersey are in the centre and east of the island. The greatest thicknesses of about 5 m occur on the coastal plain in St Clement and on the plateau around La Hougue Bie [6830 5036]; it is about 3 m thick in St Lawrence and it thins westwards until, in St Peter and St Ouen, the cover is discontinuous. In places, as between Grouville church [6930 4854] and Gorey Village [705 500], the loess occurs on lee slopes facing east and north-east.

The well-sorted nature and lack of structure of the loess are consistent with an aeolian origin, and the sediment was perhaps derived from the floor of the English Channel exposed during a period of low sea level.

The age of the loess is not known, but the fact that it is overlain by blown sand—for example, at Green Island—indicates that it predates the Flandrian. The fauna, though sparse, suggests that accumulation took place in cool or cold climatic conditions, and thus points to an origin during one or more of the Pleistocene glacial episodes. Several periods of loess deposition are known to have occurred in Normandy (Lautridou, 1973, 1982) and, although no evidence of this has been found in Jersey, by analogy with Normandy it is possible that the lower levels of the Jersey loess are of considerable antiquity in the Pleistocene, especially in the east where the deposit is thickest.

Holocene

Peat and alluvium

Peat and alluvium are so closely related as to form one sedimentary sequence for the purpose of description. They occur as narrow deposits along most of the river valleys but the main occurrences are at the mouths of the major valleys from St Aubin to St Helier and Georgetown, and at Queen's Valley south-west of Gorey; smaller amounts of alluvium and peat are located at St Ouen's and St Brelade's bays, and at Grouville. The seaward edges of the alluvium and peat are commonly overlain by blown sand.

The thickest known deposits of peat and alluvium occur in the St Helier basin and at Grouville Marsh, where up to 8.5 m are present; the sediments are largely organic silts and muds, but peat layers up to 2 m thick also occur. The coastal peats at St Brelade's and St Ouen's bays are less than 1 m in thickness.

The sediments are predominantly freshwater in character, but most coastal areas show silt layers and pollen evidence, confirming that at least two episodes of marine transgression occurred during deposition (Birnie and others, in preparation).

The oldest peat and alluvium is found in the base of the fill in the main valleys; at Quetivel Mill, St Peter [6135 5120], the base of 2.65 m of organic mud has yielded a boreal forest pollen assemblage

dated by radiocarbon to 9670 ± 70 years before the present time (SRR-2639). The coastal peats are younger, with radiocarbon dates of 4030 ± 60 (SRR-2634) from the base of the peat at L'Etacq [5530 5435], and 3150 ± 90 (SRR-2637) at L'Ouaisné [5951 4761]; however, south of L'Ouzière [5650 5150], in St Ouen's Bay, the upper surface of 70 cm of peat is dated to 3984 ± 50 (SRR-437), so deposition here began earlier, perhaps prior to 5000 years before the present. At Don Street, St Helier [6539 4871], a peat 1.69 m below street level yielded a date of 2660 ± 70 (SRR-2638); this indicates continuing organic deposition at a time when peat accumulation at the coast had been stopped by blown sand deposition, as shown by a date of 3470 ± 60 (SRR-2633) from the top of the L'Etacq deposit.

Blown sand

The Holocene blown sand adjoins St Ouen's Bay in the west of Jersey, Grève de Lecq in the north, St Brelade's, St Aubin's and St Clement's bays in the south, and the Royal Bay of Grouville in the east. All these sand accumulations, except that in the west, are restricted to a coastal strip less than 500 m in width. Sand thicknesses of up to 27 m have been recorded at St Ouen's Bay, but the average thickness is probably 15 m or less.

At St Ouen's Bay ([Plate 23](#)) the blown sand is typically a quartz-feldspar sand with low shell content. The sand is largely structureless, except for a few gently dipping planar beds revealed in 'blow-outs' in Les Blanchés Banques [5750 4986]. Buried soil profiles appear as humic lines within the sand in this section, and are marked by the occurrence of the land gastropods *Cernuella virgata* da Costa, *Cochlicella acuta* (Muller) and *Pupilla muscorum* (Linne), and a few flint implements and Neolithic pottery shards.

At the northern end of St Ouen's Bay the sand extends 1.5 km inland from the coastline and in the south it has spread 3 km inland to Pont Marquet [593 495]; in both areas it reaches to the surface of the plateau. At the southern end of the bay the sand is up to 15 m thick where it is banked against the Middle Pleistocene fossil cliff, but its general thickness is less, around 10 m under the coastal plain and only 2 to 3 m on the plateau (Keen, 1981).

The radiocarbon date (SRR-439) from the surface of the peat that underlies the sand at L'Ouzière has shown that sand-blowing began in St Ouen's Bay after 3980 years ago and has continued intermittently to the present day. Although much of the sand has been stabilised by Machair vegetation, dune formation is active in the south of the bay north of La Carrière [5645 4959], where the wall built by German forces in 1940–45 has been buried to its top.

Blown sand occurs in patches at Beau Port, and at St Brelade's and L'Ouaisné bays where it overlies head. At St Helier blown sand rests on peat and alluvium below the Old Jail site [6470 4885]. As at St Ouen's Bay, the blown sand along the south coast is a quartz-feldspar sand with few structures, although at St Clement's Bay the sand contains some shell debris derived from the shell-sand of the beach. On the evidence of the radiocarbon date from the peat below the blown sand at L'Ouaisné [595 476] sand-blowing began after 3150 years ago, and continued through the Iron Age when the site at Ville-ès-Nouaux [6345 4985] was buried (Hawkes, 1938), to the present time.

The blown sand at St Clement's Bay connects with that on the east coast by way of a small deposit overlying the loess inland of La Rocque Point. The sand in the east is similar to that elsewhere in the island in being of limited landward extent and largely structureless, although with a greater shell content than in St Ouen's Bay. To the east of the mouth of Queen's Valley [7018 4939] the blown sand overlies the alluvial fill of Grouville Marsh, proving an age relationship like that in other parts of the island.

The deposition of the alluvium/peat sequence and of the blown sand were both related to the Flandrian rise in sea level. The alluvium and peat were deposited in meres or lagoons ponded behind the beach bar of the rising sea, and the blown sand accumulated as the Flandrian transgression reached its maximum and beaches became established in about their present positions.

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