Reading Geological Society

Kent Field Meeting Report

Tuesday 6th to Friday 9th May 2025

Leaders:

Ken Cole (RGS)

Geoff Downer (OUGS)

&

Simon Drake (Geopark Ambassador)

RGS Field Meeting to Kent and East Sussex

6-9th May 2025

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Following a successful trip to the Kentish Ragstone at Boughton Monchelsea in 2024, we recognised that Kent was a large county that held a great geological variety that could not be covered effectively in single or two day trips. As such we planned a four day field meeting to look at just some of the geology that Kent and the adjacent area has to offer (Figure 1). Geoff Downer, who had lead the 2024 trip agreed to take us to Reculver east of Herne Bay to see the basal Cenozoic and the use of local Kent building materials since Roman times (Day 2). We also had a recommendation that Simon Drake ran interesting field classes and we asked him to take us to see the geology of Folkestone Warren and to explain the geoengineering challenges of this landslip prone area (Day 3). Simon would also take us on a mapping class, to explain how to observe geology in the field and translate this information to produce a geological map (Day 4). The first day was led by our own Ken Cole to the Wealden at Pett Level, east of Hastings. Ken had recommended that Peter Austin lead, but unfortunately due to poor health Peter could not oblige so Ken stepped in with guidance from Peter.

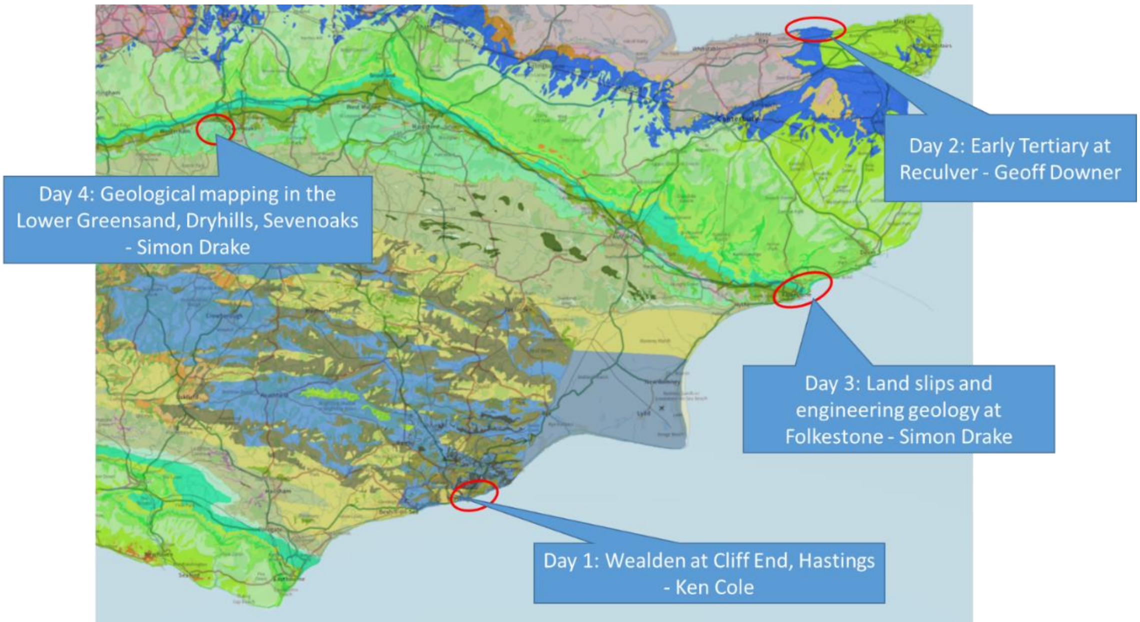

Figure 1 Geological map of Kent and the adjacent areas with the locations of the 4 days.

Tuesday 6th May 2025 - Pett Level, East Sussex

Leader Ken Cole (RGS)

Introduction – The Wealden Group

During the Lower Cretaceous, between 100.5 and 145 Ma, Britain was part of the European landmass. Southeast England was covered by meandering rivers, extensive flood-plains, lakes and lagoons. Rivers flowing from the London Uplands and the west brought huge quantities of sand, silt and mud, which were deposited in the Weald Basin. These sediments form the Ashdown, the Wadhurst Clay, the Tunbridge Wells and the Weald Clay formations.

Wealden sediments are now exposed through much of the SE of England as the later sediments (clays, greensands and chalk), which were laid down after sea levels rose later in the Cretaceous, were eroded away after the formation of the Wealden anticlinorium. The anticlinal structure formed as a result of the collision of the African and Eurasian plates during the Alpine Orogeny in the Tertiary.

Winchelsea Beach Café

GR - TQ 91249 15659; 50°54′31″N, 000°43′08″E; W3W - seasons.hides.herring

The group met initially at the Winchelsea Beach Café where Ken outlined the itinerary for the day before we moved on to the start of our walk along the beach from Cliff End (TQ 88830 13098) to the Haddock's Reverse Fault (TQ 88501 12490) about a kilometre further on. He described the features and fossils we would hopefully emcounter but included a warning that because the area is prone to landslips and the vagaries of the tides, apart from the faults, he did not know for sure what we would see until we actually got onto the beach.

Ken explained that during Wealden times the climate in this part of Britain was sub-tropical and the low lying land in the basin was home to a great variety of plants and trees including conifers, cycads and horsetails. He also flagged that dinosaur footprints had been found in this locality, but hopes were not high.

On the beach at low tide there was also potential to see the remnants of Pleistocene woodlands.

Pett Level

GR - TQ 88868 13326; 50°53′19″N, 000°41′02″E; W3W - initiated.aquatics.pitching

A short drive and walk took us to the beach. A rock by the footpath at Cliff End was of coarse grained sandstones, probably from the Lower Greensand. In one sample it was thought by some as a possible footprint specimen, but not all were persuaded (Figure 2).

Just along the beach, a major operation to protect the cliffs from further falls was in progress immediately beside the first major fault – the Cliff End Fault (Figure 3). Here, in the cliff the Wadhurst Clays have been dropped by about 3 m to the north-east against the cliff forming Ashdown Sands. A number of other features within the larger fault were discussed by the group – several smaller faults and a possible graben were noted.

Figure 2 Possible dinosaur footprint in a block of Folkestone sandstone used for coastal defence.

Figure 3 View of the Cliff End normal fault down throwing to the NE from the SE. In the footwall (left) are sands of the Ashdown Formation, against which are down faulted silts and mudstones of the Wadhurst Clay Formation and the uppermost part of the Ashdown Formation.

The Pleistocene Forest

As the tide was well out we were able to walk further down the beach towards the sea. Luckily for us, much of the sand had been washed away from the beach uncovering a Pleistocene fossil forest including some large logs (Figure 4). Although we did not find any, it is also possible to find fossilised seeds and nuts in this location; in the past evidence of human activity has been found, including flint tools.

Figure 4 Fossilised Pleistocene log on the foreshore.

Ashdown Sandstone

We continued our walk along the beach and examined the fallen blocks from the Ashdown Sandstone. We found ripple marks, cross-stratified sandstones, lags of bivalves and burrows (Figure 5, Figure 6).

Figure 5 Thalassinoides-like burrows.

Figure 6 Lag of Neomiodon bivalves.

A section of the cliff at ground level shows packages of climbing ripples inter-bedded with structureless siltstones and fine sandstones (Figure 7). At the bottom of the section there is evidence of flaser bedding, and sand ripples have been draped by mud and silts (Figure 8). As we walked towards the Haddock's Fault it was clear that the apparently flat bedded, ripple sandstones where actually on inclined bedforms (clinoforms) that formed the fill of large, broad scours or channels (Figure 9).

The climbing ripples suggest the flows transporting sand where close to saturation and hence the sands where being deposited in vertically aggrading (climbing) bed forms. This together with the monospecific shell lags and simple burrow systems suggest deposition into standing bodies of water on a delta. The channelling is likely to be sinuous distributary channels cutting through the delta top.

Figure 7 Cross section of delta deposits with climbing ripples.

Figure 8 *Symmetrical ripples drapped by mud and silt.*

Figure 9 *Large-scale scours or channels.*

Wadhurst Clay Formation

Along the foreshore Ken pointed out pieces of the Cliff End Bone Bed which were derived from above the sands of the Ashdown Formation from higher up the cliff. The Cliff End Bone Bed is part of the Wadhurst Clay Formation and is of Valanginian age 132.6-137.7 million years old. Various fish, shark and reptile remains and some rare Early Cretaceous mammal teeth have been found. In our samples small dome shaped teeth were identifiable and samples were collected for closer investigation on returning home.

Haddock's Fault

As we rounded Cliff End Point the coast line cut back revealing a large fault plane (Figure 10). This is Haddock's fault, a reverse fault that brings the Ashdown sandstone up against the Wadhurst Clay. The fault trends NW-SE. On closer examination slip planes are clearly seen with steeply inclined slickensides.

Ashdown Sandstone in the hanging wall of Haddock's Fault

Our final stop was to examine blocks of Ashdown sandstone with discontinuous vertical traces (Figure 11). Ken explained that these had been interpreted as the root traces of the lycopod Isoete (quillwort). These plants are aquatic to semi-aquatic and grow in clear ponds and slow moving streams. This would be consistent with deposition on a delta top setting with ponds between the distributary channels.

We finished our first day by thanking Ken for his stalwart efforts in standing in for Peter Austin, he had done a great job in explaining the geology of this fascinating part of the Wealden succession.

Figure 10 Haddock's fault, a reverse fault, with the hangingwall (up thrown) to the left and the footwall (down thrown) to the right. The slip planes are clearly visible and are slickensided.

Figure 11 Isoetes (quillworts) in a block of Ashdown Sandstone.

Report by Carole Gregory, photos from Carole Gregory, Roger York and Ross Garden.

Wednesday Morning 7th May 2025 - Reculver

Leader Geoff Downer (OUGS)

We started the second day at Bishopstone on the eastern side of Herne Bay. The objective of the morning with Geoff Downer was to walk down to the ancient settlement at Reculver across the agricultural land which drops off from the higher ground of London Clay down to the low land in the Thanet Formation. Reculver is on the north Kent coast, with Margate eastwards along the coast.

Whitsum Channel overview

GR TR 21461 68911; 51°22′34″N, 001°10′51″E; W3W unravel.professed.verb

From the view point looking east and SE, Geoff pointed out that the low agricultural land around Reculver and extending SE. This low ground is close to or below sea level and historically separated the mainland from the Isle of Thanet. This was called the Wantsum Channel.

The geology of the area was important historically. The Romans, who invaded Britain in AD43, built two forts at either end of the Wantsum channel. The fort to the east is Richborough and the western one was called Regolbium - now Reculver. The forts defend the safe harbour in the Wantsum Channel which may have been situated at Reculver.

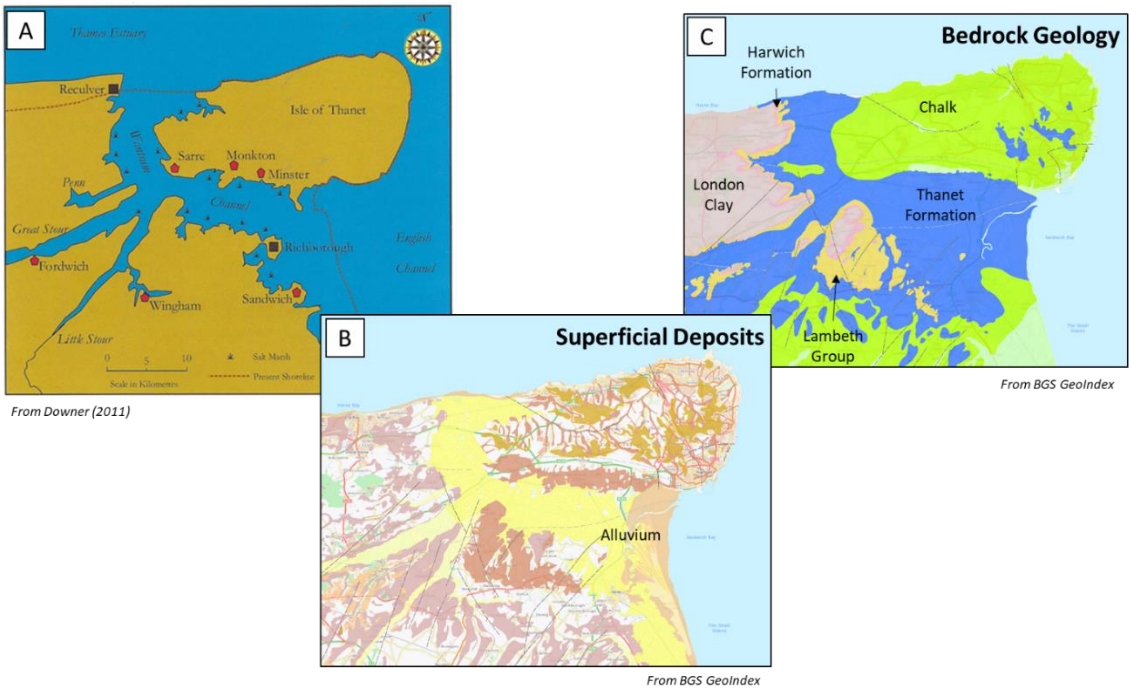

Figure 12 *A) Sketch map of east Kent showing the Whitsum Channel and the locations of Reculver and Richborough forts (from Downer 2011). B) The superficial geology of the area with the Whitsum Channel now largely filled with alluvium (from BGS GeoIndex). C) The bedrock geology showing the westward plunging chalk anticline formig the Isle of Thanet and the syncline between this structure and the northern limb of the North Downs cored by Thanet Formation at the surface (from BGS GeoIndex).*

Thanet was an island until about 1600, but is now a peninsular. The Isle of Thanet chalk headland is to the north of the main North Downs which dip northwards and forms the northern limb of the Weald anticlinorium. As such, the Isle of Thanet is an E-W trending anticline in the chalk which plunges to the west, while the southern end of the Wantsum Channel marks the syncline between Thanet and the North Downs (Figure 12).

The Wantsum Channel silted up over time an at Reculver the low ground is protected by beach sands and shingle sea defences. In 1953, high tides and storms made breaches in the defences and the whole area of the Whitsum Channel area was flooded.

Millenium Cross at Reculver

GR TR 22641 69291; 51°22′44″N, 001°11′52″E; W3W tidal.aged.into

On reaching Reculver, we viewed the Millennium Cross which is made of Portland Stone. While only erected in 2000, the cross is severely eroded on one side (Figure 13). Discussion ensued as to the causes. It was presumed that the weathering was due to the prevailing weather from the south-east, exacerbated by being salt-laden waters and salt recrystallization in the porous Portland Stone. Frost shattering also played a part.

Figure 13 The Millennium Cross at Reculver showing Geoff Downer describing the cross and the contrast in weathering on the eastern (unweathered) and western (highly weathered) sides.

Next to the Millennium Cross is the King Ethelbert Inn. Ethelbert was the first king of Kent. In 597 AD, during King Ethelbert's reign, St Augustine arrived at Thanet and introduced Christianity to the south of England.

Roman Walls at Reculver

From GR TR 22674 69271; 51°22′44″N, 001°11′54″E; W3W bagpipes.rating.rhino to GR TR 22862 69328; 51°22′45″N, 001°12′04″E; W3W tightrope.truth.swooning

We proceeded past the inn along the wall to the Roman fort. The wall by the inn has been extensively robbed out but as we progressed along the southern side of the fort we could see good examples of the wall and its constituent material (Figure 14). Walls sit directly on Thanet formation. What remains of the wall is largely the rubble core. Little of the facing stone material remains. In the core, the stones are all hand placed, not dumped in bucket-fulls. This was particularly obvious as the core material was often laid in sets and in some cases these are placed in herring-bone fashion with inclined cobbles. We could also see changes in the style and material used in the walls suggesting that the walls were built by a number of 'gangs' working with different stock piles of material. It is thought that building this way provided employment for soldiers and sailors from the Roman army and navy to keep them busy.

Figure 14 Core material in the southern wall of the Roman fort at Reculver.

There are gaps along the wall which Geoff explained were gateways. The gaps are wider than the original gateways because the stones used in such locations were of better quality and, therefore, were robbed preferentially.

The Roman fort enclosed by the wall had garrison blocks, granary, a large bath complex and basilica. There was an earth bank on the inside of the wall.

Sections of the wall were repaired during the Roman occupation. One section the eastern wall was repaired using Kentish Ragstone limestone and chert. There are also Roman tiles and blocks of a pinky coloured limestone. The latter is Bathonian Marquise Stone from the Boulongne area of northern France. The pink colour indicates that the limestone has been heated and coupled with the use of roofing tiles suggests that it was re-used from elsewhere following a fire. The Marquise Stone is a good quality facing stone and was also used in Richborough castle and some local churches.

Further along, the outer facing stones are visible. These are of Kentish Ragstone and remain because they were below ground level when robbing took place.

The core material is made of four principal rock types; flint, fine-grained, fossiliferous sandstones and siltstones, calcareous concretions and grey-green glauconitic sandy limestone.

Flint: Along the wall there were large cobble sized flints. As the chalk in situ is ~20 m below the surface at Reculver it is unlikely that the flint was mined or quarried. But glauconite impregnation of some flints suggests that the flint includes material taken from the Bullhead Bed at the base of the Thanet Sands.

Cemented, fossiliferous sandstone and siltstone: The fossiliferous sandstone and siltstone blocks where probably taken from the doggers in the coastal cliffs of Thanet Formation which are exposed immediately to the west of Reculver.

Calcareous concretions: These are septarian nodules and are probably from the London Clay which ourcrops a short distance to the west towards Herne Bay.

Glauconitic sandy limestone and chert: The blocks of glauconitic sandy limestone and chert are of Kentish Ragstone from the Hythe Formation on the Lower Greensand (see day 4). These may be from the Roman quarries in the Maidstone district which we visited in 2024, but Geoff thinks that a more obvious source was quarries at Hythe near Folkestone with transportation by sea through the Wantsum Channel.

St Mary’s Church

GR TR 2274 6936; 51°22′46″N, 001°11′58″E; W3W mango.still.abruptly

St Augustine arrived at Thanet in 597 AD. Around 610-620 a monastic site was founded at Reculver because of its remoteness. This early 7th century church had a nave, chancel and precepts on either side. Later the side walls were moved out and two towers added at the western end (Figure 15). The land was owned by St Augustine’s Abbey and what is now known as Canterbury Cathedral.

Figure 15 The western end of St Mary's Church, Reculver viewed from the east.

The church is now a ruin because by the early 1800s coastal erosion meant that the sea was encroaching. A request has made to the Archbishop of Canterbury to demolish the building. This began in 1809 and materials from the church were used in the new parish church was built on the hill above Reculver at Hillborough. Two thousand tons of stone and more than 40 tons of lead were taken from the church.

In 1810, Trinity House took over the ownership and maintenance of the two towers as these were key navigation aids for ships entering the Thames estuary. The site is now owned by English Heritage.

We spent the reminder of the morning looking at the remaining walls of the church and the towers are formed by a great variety of building materials (Figure 16).

Figure 16 An assortment of building materials in St Mary's church including flint, Kentish Ragstone, Palaeocene sandstone, Jurassic limestone and Roman tiles.

Some of the key materials used were:

Caen Stone (Bathonian) from Caen in Normandy. This limestone is a fine-grained, well sorted bioclastic freestone occasionally with fossils. Caen Stone is a high calibre freestone that was used in England following the Norman conquest as quarries in Normandy where owned by William I and the Norman nobility.

Marquise Stone (Bathonian) from the Boulogne area of northern France. This creamy white oolitic and pelletal limestone contains fecal pellets. The stone was used by the Romans but also imported for the building of St Augustine's Abbey, Canterbury in the 12th century.

Purbeck Marble (Barremian) from the Isle of Purbeck in Dorset is a freshwater limestone full of small *Viviparous* shells. This would have been a high status stone originally used for decoration and imported by sea.

Kentish Ragstone (Aptian) from Hythe or Maidstone areas in Kent. This pale grey-green, fine grained sandy limestone contains quartz and minor glauconite material is seen in the Roman walls and is also common in the church suggesting that it may have been robbed from the old fort. It can be differentiated from the Reigate Stone in that it weathers with convex outer faces.

Reigate Stone (Albian) from mines in the Upper Greensand of the Reigate area of Surrey. This very fine grained, calcareous sandstone with quartz and white mica (muscovite) was used in door arch on the western end of the church. It shows the end product of extreme weathering eroding with concave surfaces.

Flint (Coniacian-Santonian) is present in weathered and unweathered forms and is probably primarily from the Seaford Chalk but may have been collected from beaches and fields on the Isle of Thanet. There is also glauconite-coated flint from the Bullhead Bed at the base of the Thanet Formation (Palaeocene). The Bullhead Bed is 20m below current surface at Reculver, on top of the chalk and presumably this material is from the Isle of Thanet or collected from local beaches.

Cemented Thanet Sandstone and London Clay Septarian Concretions (Palaeogene-Eocene) described above were used widely and were probably obtained from local cliffs.

Tufa (Pleistocene-Recent) is a limestone formed at natural springs deposit associated with the chalk.

In some places, **London stock bricks** have been used to 'replace' Caen Stone as a repair material and **Roman bricks and tiles** are commonly reused in the church walls.

Following a chilly morning we lunched in Reculver.

Report by Susan Barr, photos from Ross Garden

Wednesday Afternoon 7th May 2025 - Reculver

Leader Geoff Downer (OUGS)

The afternoon was a traverse back along the foreshore from Reculver towards Bishopstone. The section dips gently to the West and we traversed up dip through the Thanet Formation (Montrose Group), the Woolwich beds of the Upnor Formation (Lambeth Group) finishing in the Oldhaven beds of the Harwich Formation and then London Clay Formation of the Thames Group.

Thanet Sand Section from Reculver to Bishopstone Glen

GR TR 22267 69163; 51°22′41″N, 001°11′33″E; W3W jiggle.baguette.tastes to GR TR 20696 68724; 51°22′29″N, 001°10′11″E; W3W utensil.profited.skims

Exposure of the Thanet Sands was excellent (Figure 17) and while outwardly these were not as obviously spectacular as the Ashdown Sandstone at Pett Level (Day 1) the outcrop revealed a number of interesting features. The sands are very fine to fine-grained and bioturbated with little evidence of primary fabrics preserved. However, lags and clusters of bivalves were common. Typically, the bivalves were disarticulated and generally deposited in stable convex up positions. However, locally pockets of sand-filled, articulated bivalves were found (Figure 18).

The Thanet Sand contains flat calcite-cemented doggers.

Figure 17 The Thanet Sand capped by Head deposits near Reculver.

Figure 18 Cluster of articulated bivalves in the Thanet Sands.

The character of the Thanet Sands suggested deposition in moderate to low energy, lower shore face or estuarine settings.

What was particularly puzzling along this section where lags of pebbles and cobbles in the sand-dominated succession (Figure 19). The clasts were predominantly of rounded, blackened flints which appear to mark the bases of sand-filled incisions. The fill of the incision was of yellow-orange sand of similar grain size to the Thanet Sands but without shelly lags.

It was unclear if these where incisions in the Thanet Sands. However, a cobble of subangular, Kentish Ragstone similar to that seen in St Mary's church indicated that these where more recent incisions (Figure 20). Further along the beach we saw similar lags of rounded, black flint pebbles towards the tops of the cliffs and Geoff explained that this was Head comprising pebbles eroded from the Oldhaven beds (Harwich Formation) and sands reworked from the Thanet, Upnor and Harwich formations.

The interesting question then arose as to why there was Kentish Ragstone at the base of one incision. If this observation is correct, then there was some speculation the cobbles might indicate that in Roman or more recent times these were small valleys cutting down to the beach onto which Roman fort or St Mary's church building material was dropped before the valley was filled with sand.

Figure 19 Thanet Sand at the base capped by sand rich Head deposits, with a discontinuous pebble lag at the contact.

Figure 20 Clast of probable Kentish Ragstone at the base of an incision into the Thanet Sand with capping of sand-rich Head.

As we progressed down the coast we came upon a prominent bed of blackened, rounded flint pebbles (Figure 21). Geoff indicated that the pebbles marked the base of the Oldhaven Beds in the Harwich Formation (Figure 21). On an overcast day, differentiating the Harwich, Woolwich and Thanet sands was difficult with only the pebbles at the base of the Harwich Formation forming an obvious divide. Clearly this was a section that could take further investigation.

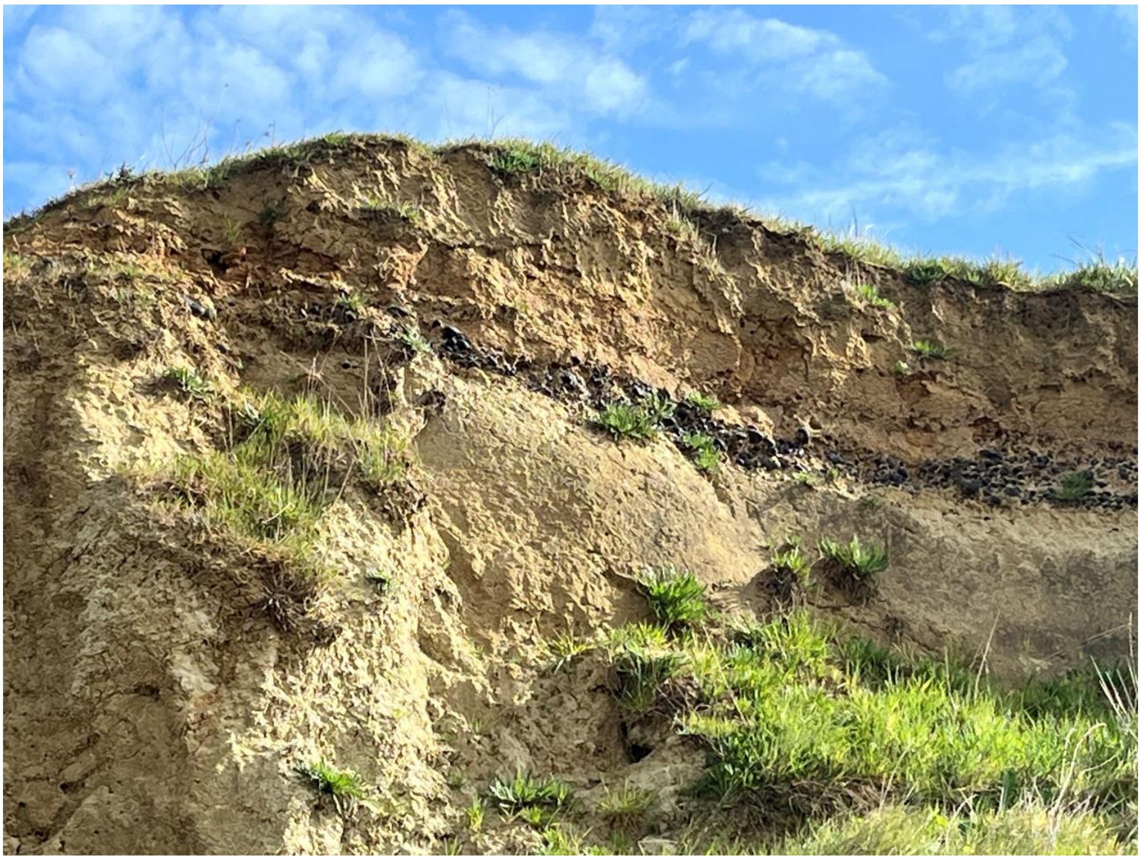

Figure 21 Pebble bed at the base of the Oldhaven Beds (Harwich Formation above the sands of the Woolwich Beds of the Upnor Formation.

Figure 22 Stratigraphical section at Bishopstone Glen, near Reculver.

The end of the section took us to where the London Clay dipped down to the beach level. Here we did not see the cliffs that we had visited in May 2023 with Roger York. The reason for this is that the cliffs, and more importantly the houses of Bishopstone above, are protected by a range of sea defences. Geoff explained that due to the need to protect this area from erosion a series of measures had been taken:

- Grading of the slope to reduce the overburden;
- Drainage to capture run off and channel flow out to the sea and reduce pore pressure deeper in the section; and
- Reinforced concrete walls at the base of the cliff to reduce further erosion and act as a weight on the toe of the slope to reduce the likelihood of rotational slip.

In contrast to the coastal defences that we would see at Folkestone Warren (Day 3 pm) these defences appear to be bearing up well. The London Clay section was largely stabilised and obscured by vegetation. This is great for the home owners of Bishopstone but less interesting for the keen geologists of the RGS.

Having walked along the promenade we took the path up the cliff to Bishopstone and return to the cars. Here we thanked Geoff for leading through the interesting and varied geology and archaeology of the Reculver area.

Report and photos by Ross Garden

Thursday Morning 8th May 2025 – Chapel-le-Ferne – Folkestone Warren Overview

Leader Simon Drake

We met our leader for the day, Simon Drake, at Capel-le-Ferne with the aim of looking at evidence of landslips, unconformities and hazard mitigation measures. Simon, a Geo Ambassador and volunteer, started by giving us an update on the North Downs National Park. He noted that there is a move to link the South Downs Way and the North Downs Way using the St Swithin's Way at Winchester. In addition, a team is preparing a bid, to be submitted later this year, to obtain GeoPark status for the cross-channel region covering the areas around Dover and Calais.

In the morning we visited two sites; Capel-le-Ferne for an overview of the area and The Warren to have a closer look at some of the sites seen from above.

Capel-le-Ferne

GR TR 25966 38522; 51°06′05″N, 001°13′34″E; W3W hoops.dried.boast

The geology of the area is mid to upper Cretaceous in age. The Albian Gault Formation is overlain by the Cenomanian Grey Chalk which in turn is overlain by the Cenomanian to Turonian White Chalk. The chalk is dipping about 1˚NE. The chalk is porous, bioturbation and jointed and has been subject to permafrost (cracking), all of which enable retention and water flow. Water percolates through the chalk before reaching the impervious Gault Clay. As the water does not leave the clay fast enough the overlying layers become saturated leading to instability.

The area is constantly moving with landslips being recorded since Roman times. Looking along the coast towards Folkestone landslips and slumping were seen. (Figure 23). An impressive kink was seen in the rail tracks on the line from Folkestone to Dover. (Figure 24).

Figure 23 Landslips of Chalk above Gault Clay from the vantage point at Capel-le-Ferne.

Figure 24 Kink in the Folkestone to Dover railway caused by previous land slips.

Most landslips occur in the winter months following heavy rainfall. We discussed three types of disturbance; a direct fall from the cliff, slumping of existing slipped material and erosion by the sea.

At Capel-le-Ferne and eastwards towards House Hand Point clear evidence of movement was seen. Homes have been bought out by insurance companies as the buildings became unstable and movement in the road was clear to see. (Figure 25)

Figure 25 Cambering and fracturing of the Old Dover Road at Chapel-le-Ferne.

The sea wall at Folkestone Harbour was built in 1810. With longshore drift from the west shingle built up and erosion worsened on the eastern side (Figure 26). By 1820, the harbour was badly silted up resulting in the Harbour Company going out of business. The harbour was subsequently bought by the South Eastern Railway. They dredged the harbour and started a ferry service to Boulogne.

Figure 26 View to the SW to the sea wall of Folkestone Harbour where a sandy and shingle beach has developed on the far side and erosion of the Gault and Chalk is occurring along Folkestone Warren.

The railway line between Dover and Folkestone was built in the 1860s with several tunnels through the chalk to help bring passengers to the ferry service.

The area east of the Martello Tunnel in Folkestone is called the Warren due to the abundance of rabbits. It became a popular picnic spot known as ‘Little Switzerland’ because of the dramatic scenery. There was ground movement in 1878 destroyed part of the Martello Tunnel and there was further movement in 1896. In 1915, a major land slip resulted in the undercliff supporting the railway line moving seawards (Figure 27). Approximately 1.9 million tons of chalk covered about a mile of the track east of the Martello Tunnel.

Figure 27 The Great Fall 1915, picture courtesy of Network Rail

The seaward movement of the line was in the order of 100 feet. The speed limit on the rebuilt line is currently 20mph. It is highly likely that the railway line will be closed in the future due to damage from future slips.

More recent remedial actions included the installation of drains under the Warren and building of sea walls to reduce erosion by the sea as well as acting as a retaining wall. The area is highly monitored with a weather station, LIDAR surveys, adits, tilt meters and satellite image analysis. Satellite monitoring has shown a change in topography with down movement at the cliff top and an increase at beach level indicating rotational slip. The rotational slips in the Gault bring this soft easily erodable material to the surface below the high tide level where it is readily eroded.

A large concrete bench or ‘toe’ was constructed on the foreshore in 1948-52 in an attempt to weigh down the Gault Clay to stop slippage. However, the sulphur in the clay, produced by oxidisation of pyrite, and the sea water generates sulphuric acid which is causing corrosion of the cement under the bench leading to cracking and collapse of the concrete platform (Figure 28, note water draining from the cliff).

Figure 28 Concrete bench on the foreshore at Folkestone Warren designed to load the toe of the slips.

21 adits have been excavated into the cliff. These are lined by railway sleepers which are bending under the pressure. Drains take the water away from the cliff and drain onto the sea. Many of these adits are now becoming blocked with debris. The approach being taken to the managemnt of the cliff is one of ‘wait and watch’; solving problems as they occur.

Report and photos by Ailsa Davies

Thursday Afternoon 8th May 2025 – Folkestone Warren

Leader Simon Drake, Geopark Ambassador

In the afternoon we continued to be led by Simon Drake.

We drove down to Folkestone Warren undercliff near the Martello Tower along the old road beside the railway and parked in the small car park (TR 24564 37652) just before the site of the old Folkestone railway station.

Railway Tunnel Portal through the undercliff

GR TR 24358 37524; 51°05′35″N, 001°12′10″E; W3W diamond.seashell.promoting to
GR TR 25839 38265; 51°05′57″N, 001°13′27″E; W3W install.roadways.certainly

Our first visit was back up the road to just above the railway tunnel portal. There we were in the hollow between the Chalk cliff to the north and the top of the Chalk landslip that had rotated and slipped to the south (Figure 29). From our position above the tunnel portal we could see how straight the railway had been relaid, after the 1915 landslip, up to a gradual bend to the left: except that, just before the bend, the railway line had been kinked to the right before resuming the original bend (Figure 24). This demonstrated how the Warren is still active.

Figure 29 In the hollow behind the in situ chalk to the right and a rotated slip above the railway tunnel and to the left.

We then walked back along the road, parallel with the railway line. At one point the road dropped down sharply a few meters (Figure 30) and a side road showed a gap in the double yellow lines at the side and a patch on the road surface. These were evidence of more recent movement of slips. The slope on the road also had a tear showing even more recent movement.

Figure 30   Road by railway flexed over an old slip.

Figure 31   Gabions supporting the kink in the railway line.

The party continued along the road past the old station site observing gabions beside the railway (to support the line against small movements) and the array of sensors on the slip on the north side of the line (Figure 31, Figure 32). The railway went straight from the tunnel portal towards the east before curving to the left but, as seen at Chapel-le-Ferne, from the portal, we could see an slight kink to the right (south) in the railway just before the curve which may have resulted from later movement.

Figure 32 Movement sensors behind fence along the railway.

The members discussed the fault or joint planes that could be seen in the Chalk cliffs. We also had a clearer view of the orange clay with flints bed visible in places at the top of the Chalk cliffs. There was a discussion of the age of this bed as it is thought to be Palaeogene but could be up to Pleistocene.

The party continued on the road built for construction traffic when the concrete coastal protection was being built on the toe of the landslips. On the way we came across a sharp step diagonally across the path, shallow initially but rapidly deepening along the path and into the undergrowth at the side. Further along it became more shallow again. Simon explained this was a fault segment caused by extension where the footwall moves down unloading the hangingwall possibly allowing it to rebound upward (Figure 33). It also indicates that the railway could be liable to future movement.

Figure 33 An active fault segment with blue paint survey markers showing that the fault is active and down throwing to the left (south).

Coastal Defences

GR TR 25839 38265; 51°05′57″N, 001°13′27″E; W3W install.roadways.certainly to
GR TR 24767 37672; 51°05′39″N, 001°12′31″E; W3W funnels.sublime.butterfly

We continued down to the end of the path onto the concrete of the sea defences. Here we could see where movement had broken and displaced concrete slabs and the asphalt patch repairs (Figure 34).

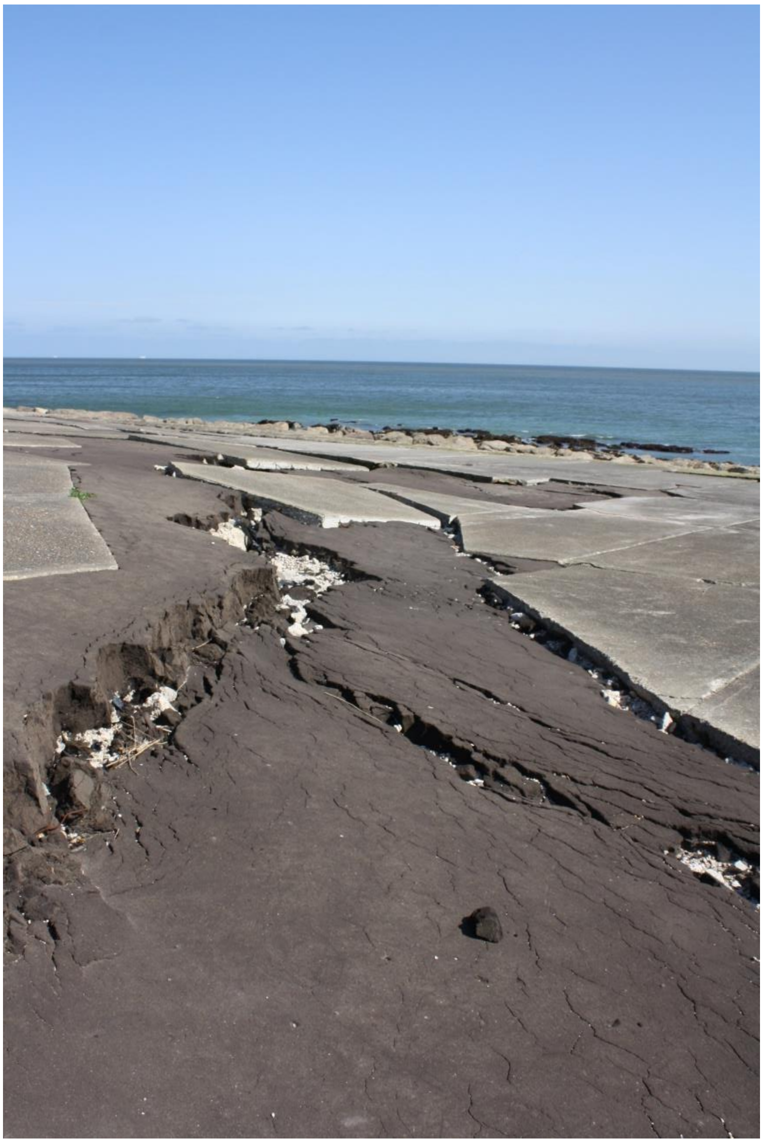

Figure 34 Displaced concrete slabs and asphalt caused by erosion of the toes of the slides

We also saw one of the 21 drainage adits (No. 8) that had been tunnelled horizontally in the Gault Clay up to the railway or, sometimes, up to the Chalk. About 13 of the adits were blocked but, later, while walking westwards along the defences we saw some with water draining out.

One slip had brought a large block of Chalk positioned by the concrete toe. This was called the “Horses Head” (Figure 35). It provoked some discussion because it appeared to be made up of several blocks. We discussed whether these where possibly earlier slips or, whether they could be slips formed during deposition. The former was considered more probable.

Figure 35 The Horse's Head -a large slipped Chalk block composed of a number of Chalk slump blocks.

The party continued walking westwards along the defences until we came to the path back up the slips to the road. Further along the concrete toe petered out leaving concrete groins at short intervals and we could see where the Gault was sometimes exposed on the shore. By this time, though, it was getting late so we did not visit the clay but used the path to return to the cars and, thence, back to our hotel.

Report and photos by Roger York

Friday 9th May 2025 – Dryhills Quarry Mapping Exercise

Leader Simon Drake

Our final day took us to a disused Kentish Ragstone quarry at Dryhills, outside of Sevenoaks. The Kentish Ragstone is a sandy limestone (or calcareous sandstone) from the Hythe Formation of the Lower Greensand Group.

The aim of our final day was to help to make members of the group feel confident to undertake mapping using the skills set out below:

1. Use of; a 10 figure GPS reference and the first two letters of the relevant OS map and Simon's own version of the BGS Roamer protractor to mark each location. NB 1:10,000 is the current undergraduate requirement, but the tool also aids mapping at 1:25,000 or 1:12,500 if required. NB at 1:10,000 a 1mm line on a map measures 10 m i.e. the error margin for the mapping process using a fine pencil.;
2. Estimating distance and bearing to a fixed point on an outcrop and mapping that location;
3. Observation from a distance of; 'weathered-in' and 'weathered-out' surfaces in different beds in the Hythe Formation at Dryhills to assess likely cement content;
4. Close-up examination of grain size, texture and lithology at the rock face using a hand lens and 10% acid solution;
5. Identification of fabrics (cross-stratification, bioturbation etc.) and structures (joints, faults, folds, way up structures etc.);
6. When to use a dotted line for poor exposures (<2%), how to estimate contacts from vegetation and breaks in slope and use of solid lines for good exposure (anything better than 50%), how to use exposures in stream beds and under brash etc.;
7. Recording the perimeter of man-made ground using parallel lines marking the strike direction around the margin;
8. Identification of strike, dip and true thickness of strata and the right-hand rule;
9. Use of sketches in field notes. Simon recommended using two pages of a sketch pad in landscape mode to allow space for notes at the side;
10. Use of colour coding of different rock types at each measured location on a map. He had seen a student select three coloured pencils held together with a rubber band so when he selected one it avoided losing the others in the field;
11. What to write in field notes such as; questions for the next day's mapping, the strike direction of contacts to follow next day etc;
12. How to mark up, bag and store hand specimens (to reduce the risk of damage or loss of annotation from rainwater or other moisture etc.);
13. Using strike and dip measurements to determine flow direction in volcanic rocks and/or cleavage in slates, phyllites, schists or gneisses;
14. Annotating a map with strike and dip measurements. Simon noted that strike is written as a three-figure number at the right-hand end of a T bar for sedimentary rocks and next to T bar ending in a ball for volcanic rocks. The strike of cleavage is marked with a triangle on the line;
15. Drawing a cross-section to test the mapping results before finalising the map at the end of the day using a 'Rotring' pen.

Dryhill Quarry Nature Reserve, Sevenoaks

GR TQ 49711 55259; 51°16′37″N, 000°08′42″E; W3W pace.lower.them

Simon took us to four locations in the reserve, explained the sequence above and encouraged a discussion of the local geology. He drew on examples from many years of practical mapping of different rock types around the world and of teaching undergraduates. He recommended Richard Selley's facies analysis book (Selley, 1976) as an excellent field guide for mapping sedimentary rocks.

Locations 1 & 2 – Main quarry face

Location 1 - GR TQ 49780 55278; 51°16′37″N, 000°08′46″E; W3W dime.often.bolt
Location 2 - GR TQ 49774 55241; 51°16′36″N, 000°08′45″E; W3W cross.manliness.friday

We marked up this location on tracing paper (overlain on an OS map he provided) as **49780 55278** prefixed by TQ taken from the OS grid map title. Simon uses tracing paper in the field to prevent records and notes being washed away by rain. He recommended marking the corners of the overlay, with crosses for the grid intersections, so that the final data can transposed onto the actual map at the end of the day.

Simon obtained his GPS reference from a Garmin GPS locator and helped others who used the app, Clino or other apps to ascertain their location (NB some only record 8 figure numbers though). He noted that GPS, although widely available, can be slow in heavily vegetated areas and may not always be available as he found in Jordan.

Before moving into location 2 at the cliff face, he asked us to undertake a site bearing on Location 2. We determined the bearing (to the base of three trees on the cliff face) using our compasses. He noted how compass needles can be swayed considerably in the presence of magnetite or other metal and advised use of marker pencils covered in plastic rather than pens cased in metal. We raised the mirror at arms-length (to avoid altering the direction from our watches) towards the base of the trees on the cliff. We then read off the direction, after ensuring the red arrow on the compass was aligned with due North. The bearing was 90° E. He then estimated the distance away from the viewing point as 70m based on knowledge of his average step length. We then drew in a line of 7mm length on the map, (which on a 1:10,000 map corresponds to 70m) along that bearing and marked up **Location 2 ref TQ 49774 55241**.

Simon then asked us to comment on the ‘weathered-out’ beds and the ‘weathered-in’ beds at Location 2 (Figure 36). He suggested that the difference was due to the level of cementation in the beds. Members observed that the lower strata were light brown in colour and interbedded with more resistant layers. The upper beds where grey and massive representing a different depositional processes to those below.

Figure 36 Kentish Ragstone beds dipping to the right at Location 2 showing differences in the degree of cementation.

Simon then walked up to the quarry face and asked us to estimate the apparent dip from two perpendicular surfaces, we estimated an apparent dip of 25° at a bearing of 110°. This should be recorded as 25°/100°E until the true dip is finalised. After debate and practice we agreed a final bearing of 110˚ and a dip of 30˚.

Using a hand lens, we noted the grain size and sedimentary structures as described in the sequence above.

Simon gave us a useful analogy when considering the stage at which volcanic rocks formed. Less than 2mm (very coarse sand grade in sedimentology rocks) related to crystal sizes in flows at the start of the vulcanism. 2mm and more was equivalent to explosive ash flow (pumice) lapilli, whereas 256mm and larger related to large blocks found for example in the end stage collapse of a caldera.

As for the structure at Dryhills all we could say at this stage was that we assumed the sequence was ageing upwards and the structure was synformal as we did not have a way up marker. This should be documented in the field notes until further investigations clarified the way up.

Before walking along to Location 3 we practiced locating a dummy position for Manor Farm using the Roamer tool he had provided. The reference was TQ 49380 54182.

Location 3 – Roadside cutting

GR TQ 49778 55200; 51°16′35″N, 000°08′45″E; W3W form.riots.cabin

After lunch we stood in welcome shade to view a cliff face across the road leading to the old quarry at Location 4. Here Simon asked us whether the dip was the same as at Location 2? We noted that the beds were dipping northward into the face in the road section i.e. this was a strike section in contrast to Locations 1 and 2 which were close to dip sections. In addition we could see lode structures at the base of the thicker bands indicating that the beds were the right way up. The sequence here looked different to that at Location 2. However, care is needed in comparing dip and strike sections in these sediments and differences in appearance can also occur due to the age of the exposure (i.e. quarrying).

Figure 37 Simon Drake explaining the geology of the roadside strike section of Hythe beds at Location 3.

So, at this point we could now confirm the way up and that the structure between the two sites. This was either caused by a fault or a synclinal fold. Simon noted we would need to go back and try and find a contact between the two sites to be sure. He commented that whatever the structure the overlying sequence of dark reddish-brown sands above were contiguous so they postdated the structure. These were sands from the Clay with Flints seen at Folkestone the previous day.

Location 4 – Old pit in woods

GR TQ 50023 55159; 51°16′33″N, 000°08′58″E; W3W spared.former.snail

We walked further on into a wooded area and saw the final exposure (Figure 38).

Figure 38 Members of the RGS measuring dips and strikes at Location 4.

To measure the strike, Simon placed his clipboard over the surface to obtain an average surface, as the outcrop surface was undulating. He then used a Maxiclin (a Perspex compass which provides the strike direction with an inbuilt ball bearing which marks the dip direction). For those using a traditional clinometer you need to first put the edge-of the clinometer on your paper on the clipboard then align the bezel east west until the pointer falls down to north. Mark the line of the edge of the clinometer on your paper then remove the clinometer and take the bearing of that line.

Simon always uses the right-hand rule where your thumb points along the strike direction and your index finger points down dip at 90°.

Ross and the group thanked Simon for his leadership over the two days. Everyone agreed Simon had ensured that everyone could complete the sequence of tasks needed to draw a believable map including measuring strike and dip. Many commented on how the quality of mapping gadgets and training has improved for students today compared to their own mapping projects as students.

Mission accomplished!

RGS Field Meeting to Kent, May 2025

Report and photos by Angela Snowling