

CASE STUDY 3B – KENT, UK

Case Study Area: Kent, UK

Main geomorphological types: Soft cliffs, shingle and sandy beaches.

Main coastal change processes: Coastal erosion, cliff instability, flooding and breaching.

Primary resources used: Art, Archaeology.

Summary: The study site includes the weak sandstone and chalk cliffs of the Isle of Thanet at Reculver and Pegwell Bay to the north, and barrier beaches at Deal and Walmer on the east coast. To the south there are unstable weaker cliffs at Folkestone. Art resources have been used to see the rate and scale of change over the past 200-300 years, and the archaeological resource has been used to look further back at change since the last Ice Age.

Recommendations: Coastal managers should use these resources when predicting future rates of coastal change as they provide hundreds of years' worth of data to assist in the understanding of the rate and scale of change. Further work into historic maps and charts as well as photographs is recommended as this can provide even more detail particularly from the 19th Century.

Coastal managers face an ongoing battle to moderate impacts from the sea in the face of a changing climate and pressures from human use of the coastal zone. The challenges that lie ahead are forecast to increase while resources are being forced to go further.

This case study report is part of the technical report on the Arch-Manche project, which quantifies the value of under-used coastal indicators that can be applied as tools to inform long term patterns of coastal change. In addition, it provides instruments to communicate past change effectively, model areas under threat and interpret progressive coastal trends.

Kent is one of six UK case study areas for the Arch-Manche project. This report introduces the study area and why it was chosen as part of the project, the results of the archaeological and palaeoenvironmental study are then presented along with the results of the art study. The analysis of these results and the potential for demonstrating the scale and rate of sea level change are then outlined. Further detail of the project methodology is available in [Section 2](#).

Within the Kent area the archaeological and palaeoenvironmental resource and the available art resource have been researched, ranked and analysed. The extents of the detailed study areas are shown in Figure 3B1 below. The area considered for archaeology and palaeoenvironment has been selected to provide a representative range of types of evidence across time spanning from the Palaeolithic through to more modern coastal heritage. The art, photograph and map case study area encompasses a broader stretch of the coastline to reflect the various coastal morphologies and features which have been depicted over time.



Figure 3B1. Map of the Kent study areas, the archaeological area is shown in red and the art area in blue.

3B.1 Introduction to the Kent Study Area

The archaeological study area of Kent runs along the eastern coast of the county, from Margate in the north, to Dover in the south. It incorporates the major settlements of Broadstairs, Ramsgate and Deal, and the most easterly point of the county at North Foreland. In the north, the study area covers the historic Isle of Thanet, which is characterised by steep low level cliffs and small sandy bays. Settlements continue up to the seafront in Margate. South of Ramsgate, the River Stour enters Pegwell Bay is a generally lower lying siltier basin area from which a narrow beach runs along the coast as far south as Kingsdown. Here the chalk ridge that runs along the south of the country rises up to form the White Cliffs of Dover.

The art study site extends from the historic ruin of Reculver Church, to the east of Herne Bay on the North Kent coast, eastwards, past the seaside resorts of Margate, Broadstairs and Ramsgate, and south from Pegwell Bay, past Deal and Dover, to the southern boundary of the site at Folkestone; a total distance of approximately 80km (50 miles). The site is located entirely in the County of Kent in the south-east of England, and is bounded on the north by the mouth of the River Thames, to the east by the North Sea, and to the south by the Straits of Dover. The coastline of the study area is predominantly composed of chalk, for which its White Cliffs are particularly famous, although there are also outcrops of sands and clays, which over-lie the extensive deposits of the chalk within an area known as the Weald of Kent.

The north western end of the study site is marked by the famous ruin of St Mary's Church at Reculver, which is the principal landmark along a 10 mile (16km) stretch of coast between Herne Bay and Margate; this is the first art case study location to be considered (B1). Passing the open coastline of Minnis Bay, one reaches Westgate-on-Sea and then the popular seaside resort of Margate, which forms the second art case study site (B2). Rounding North Foreland, the coast runs south past the resort of Broadstairs and Ramsgate, to the south of which is

situated Pegwell Bay. At Pegwell Bay the important Pre-Raphaelite artist, William Dyce (1806-1864), painted an iconic view and this location forms art case study B3.

South from Ramsgate, past Pegwell Bay, the extensive Sandwich Flats and the golf links lead down towards Deal, with its fine castle built by King Henry VIII in 1540, and shaped like a Tudor rose. The coastal scene at this location was painted by William Daniell in the early nineteenth century, and forms art case study B4 (Daniell and Ayton, 1814). Just to the south of Deal a further fortification, Walmer Castle, also built during the reign of Henry VIII, forms art case study B5. From Walmer, the coast continues southwards towards the entrance to the Straits of Dover, and then past the port of Dover, before reaching the southern boundary of the East Kent study site at Folkestone, which represents art case study B6 (see Section 3B.5.3 Art Field Data Gathering Results).

3B.1.1 Geology and Geomorphology of the Area

Kent is the most south easterly county in England, being bounded by sea on three sides. It is located just 21 miles (30km) from the coast of continental Europe and is separated by the Straits of Dover. The main physical features of this region are determined by a series of ridges running west to east across the County that are the relics of the 'Wealden Dome', a denuded anticline, which stretches across the County and which resulted from the mountain-building of the Alpine Orogeny, when its outer ripples caused the formation of the Paris Basin, the Weald and the Hampshire-Dieppe Basin; these movements occurred between ten and twenty million years ago.

The Wealden Dome was formed of a layer of chalk, which overlies earlier deposits of the Upper Greensand, the Gault Clay, the Lower Greensand, the Wealden Clay, and the Hastings Beds. The top of the dome was eventually eroded away, leaving weathered ridges or valleys depending on the durability of the strata, and exposing them further to the processes of weathering and erosion. The North Kent coastline at the west end of the study area sees outcrops of London Clay and then, moving eastwards, the Thanet Beds, before reaching the chalk which extends round the headland between Margate and Pegwell Bay. To the south of this, a further outcrop of the Thanet Beds can be seen extending down past Sandwich towards Deal, whereupon the main outcrop of the chalk occurs round past Dover towards Folkestone.

The eastern part of the Wealden Dome was lost as a result of coastal erosion, and the White Cliffs that can be seen at Dover outcrop at the point where the North Downs meet the coast. The coastline of Kent is changing continuously due to coastal erosion, which leads to cliff falls, coastal instability problems, and longshore drift transports beach material round the coast. Most of the coastline has been designated on account of its nature conservation interest and, except in those locations where significant development has taken place, a policy of allowing continued erosion of the cliff lines is encouraged to support biodiversity. Most of the conservation designations also recognise the earth heritage (geological and geomorphological) importance of the cliff features.

There are also important geomorphological features within the littoral and sub-littoral chalk zones, which support key marine communities. The preferred policy of allowing cliff retreat on the chalk cliff frontages should provide for continued exposure of chalk platforms as the cliff retreats in response to sea level rise. Shingle beaches along part of the frontage are also important on account of their nature conservation and geological significance.

Historically the area of Thanet, around the towns of Margate and Ramsgate, was an island, separated from the mainland by the rivers Wanstun and Stour. Approximately 1,000 years ago,

silting of the Wanstum blocked its mouth and today it is little more than a drain. The River Stour, which used to open into the sea in a considerable channel, also began to silt up approximately 1,200 years ago. Land reclamation in the Post Medieval period caused the development of a spit and an increase in sediment in the area of Pegwell Bay, which eventually closed the channel off so that the river exits into the sea in a narrow channel through mudflats and marsh (Wessex Archaeology, 2011: 39). The coast west and south of Thanet has extended by some two miles in the last 100 years.

3B.1.2 Summary of the Archaeology and History of the Kent Study Area

The majority of settlements in the north of the study area were originally centred on mills and fishing harbours. Urbanisation has absorbed most of these settlements so that a near continuous urban area runs around the coast as far as Pegwell Bay. Inland, agriculture activity appears to have been taking place since the Bronze Age. To the south, Sandwich was an important Medieval port, whilst inland Richborough and smaller settlements along the River Stour have Roman origins. Roman roads follow the edges of the river's floodplains.

The southern part of the study area is the closest part of the isle of Great Britain to mainland Europe and as such has an extensive history of maritime trade and military defences. Dover may have been in use as a port since the Bronze Age and flourished in the Roman period. During the Medieval period it was one of the Confederation of Cinque ports, along with Sandwich, allowing it special rights and near guaranteeing it extensive trade.

The proximity to France has also necessitated defences – some of which were centred on the defence of the ports. Dover Castle was constructed in the 12th century, whilst to the north, Deal and Walmer castles were constructed during the reign of King Henry VIII. The area was further fortified in the 19th century and heavily reinforced during the World Wars, particularly in the Second World War.

Early Prehistory (Palaeolithic and Mesolithic)

Throughout the Lower and Middle Palaeolithic periods, Kent was part of a larger landmass that connected the present day British Isles to mainland Europe, and the coastline that we know today did not exist. A number of finds in the form of handaxes suggest that early humans (likely *Homo Heidelbergensis*) were in the area, possibly migrating across the landscape between ice ages. With the beginning of the Upper Palaeolithic and the arrival of anatomically modern humans (*Homo Sapiens Sapiens*) in around 40,000 BC, some of the earliest archaeological evidence of settlement is found in the study area. There are two possible sites on the Isle of Thanet, both identified by flint scatters (The Museum of Thanet's Archaeology). Further south two other flint scatter sites may similarly indicate working sites (HER).

Further inland a number of Mesolithic occupation sites have been identified, such as a cave system in Royal Tunbridge Wells (Kent County Council). In the study area however, Mesolithic records are patchy and no features have been accurately dated to the period. A number of prehistoric cropmarks and some earthworks have been identified, but they cannot be reliably dated and are generally believed to be from later prehistory (HER). A number of findspots of a variety of flint tools demonstrate a presence; within the study area these mainly take the form of flint axeheads. A macehead was also discovered on the north coast of the Isle of Thanet (Lawson & Killingray, 2004: 9).

Neolithic, Bronze Age and Iron Age

As prehistoric peoples became more sedentary in the Neolithic period, a number of new forms of archaeological evidence become apparent in the study area. Several sites, including a

hearth, pits, stakeholes and enclosures have been identified. A number of burials also exist in the area of Thanet and cropmarks suggest a number of Long Barrows may have once existed in the area (although none of the sites are confirmed) (The Museum of Thanet's Archaeology). A possible causewayed enclosure at Ramsgate (HER) and another just inland of the study area near Tilmanstone (Lawson & Killingray, 2004: 11) may represent the earliest examples of monuments in the study area. Numerous Neolithic pottery and flint axes findspots may also suggest habitation sites (Lawson & Killingray, 2004: 11).

The archaeological record suggests that settlements were more numerous in the Bronze Age. This is supported by the increased number of burials (some 25 such sites or cemeteries are present in the study area) as well as an increase in finds and other indications of usage. Thanet appears to have been an area of some importance in the newly evolving metal working industry, particularly by the late Bronze Age (Lawson & Killingray, 2004: 14). Some evidence of field systems and enclosures suggest possible occupation sites at Thanet, Deal and further inland towards Canterbury (Wessex Archaeology, 2011: 43). The site of Thanet, at South Dumpton Down, may represent one of the first defended settlements in the country (Lawson & Killingray, 2004: 15). Plant remains found at Guston near Dover show that the crop emmer was cultivated in the area throughout the first millennium BC. A Bronze Age boat, discovered in Dover in 1992 and dating to approximately 1600BC, is the largest prehistoric artefact known in Kent and is argued to suggest possible maritime trade with Europe (Williams, 2007: 97). This is further supported by the import of gold into Kent, the scatter of bronze artefacts found on the seabed in Langdon Bay and the similarity of many European bronze artefacts to those found in Kent (Williams, 2007: 114).

By contrast, there is somewhat less evidence of early Iron Age settlement in Kent. Bronze Age field systems and settlements show little sign of subsequent re-use and there are significantly fewer identified Iron Age sites than Bronze Age (Williams, 2007: 102). There are few hillforts from the early Iron Age period; one potential site near Worth and one near the Bronze Age defended settlement at Dumpton on Thanet (Lawson & Killingray, 2004: 17). Only one fort from the late Iron Age can be found in the study area; an unverified camp under Dover Castle (Williams, 2007: 119). In the later Iron Age other settlement sites are more prominent and better recorded. Settlement is relatively dense along the north coast of Kent and Canterbury appears to have become a site of some economic importance, although it was most likely still a collection of separate settlements rather than a formally laid out town (Williams, 2007: 121). The Late Iron Age also sees more formal trade taking place with Europe and the introduction of new cultural values (such as hygiene, burial styles and fashion) recognisable in the archaeological record. The county was the seat of power of the Cantiaci (or Cantii) tribe (this tribe probably gave their name to the Roman title of Cantium, which later became Kent (Williams, 2007: 138)). Although little is known about the political relations with Gaul, there appears to have been trade with the Roman Empire and it is suggested that a Gaulish leader claimed sovereignty over much of Kent (Williams, 2007: 130).

Roman Period

Richborough, which was an island surrounded by sea on three sides during the Roman era, is widely believed to be the site of the earliest Roman landings in AD43. The presence of 1st century ditches there suggests an attempt to secure a beachhead before expanding into the south east of England. The site developed into a civilian settlement of some size, including temples, amphitheatres and numerous dwellings. A large (25 metre high) arch was constructed on the main road to London and a port was developed on the River Stour which, along with Dover port to the south, became a major trading port (Kent County Council). A fort was established at Dover to provide safe anchorage for the Roman Navy. In the 3rd century a

number of so-called Saxon Shore forts were constructed around the south east coast to defend against Saxon raiders. Both Richborough and Dover were reinforced in this way, the Dover fort replacing the earlier 1st century fort.

This activity has left extensive archaeological evidence in the study area. Of two lighthouses built on the heights above Dover, one remains extant in the grounds of Dover Castle (archaeological evidence of the other also remains). Extensive remains of the fort exist in the grounds of buildings and were preserved underneath the A256 bypass when it was built. Extensive remains of Richborough fort are also extant, although the silting up of the channel means that some sections of wall that originally abutted the coast are now two miles inland. The HER records more than 550 individual Roman era findspots in the study area, seven separate settlement sites, numerous cemeteries and burials, farmsteads and an aqueduct.

Medieval Period

A number of different types of earthworks within the study area can be dated to the Medieval period. These include holloways and trackways, field boundaries, early examples of ridge and furrow farming, square and circular enclosures and defensive structures (Wessex Archaeology, 2011: 45).

Agriculture appears to have become more formalised during the Medieval period, with a number of field systems that were likely defined by earthen banks and ditches. These are particularly evident around the River Stour and Richborough. Additionally almost 200 hay stack stands; raised circular earthworks used to store hay above the floodplain) were mapped as part of the Rapid Coastal Zone Assessment (RCZA). Again, the majority of these are congregated around the River Stour (Wessex Archaeology, 2011: 45). Salt was another growing industry around the Kent coast, and saltmounds frequently appear in the study area. The mounds, used in a similar way to Haystacks, sometimes survive as extant monuments, or more commonly as cropmarks. Many salt houses and other agricultural buildings were listed in the Domesday book, and evidence for some of these timber structures can still be found in roof timbers. Monastic granges and tithe barns also survive. A large number of enclosures also attest to the growth in agriculture in this period.

A number of buildings from the Saxon era survive only as cropmarks. More prevalent are a number of cemeteries on Thanet, first discovered in the 18th and 19th centuries, which may represent a small part of much larger burial areas that date to the Saxon era (The Museum of Thanet's Archaeology). A motte and bailey castle built near to the site of Richborough Roman fort most likely dates to the period after the Norman Conquest, although it has not been reliably dated (Small, 2002: 21). Similarly, it is likely that an early motte and bailey castle was built at Dover during King William's reign. Nearby on Thanet, several churches date to the Norman period and are testament to the rising influence of the church in Kent and across the country (The Museum of Thanet's Archaeology).

The establishment of the Cinque Ports in 1155 AD was extremely beneficial to two ports within the study area; Dover and Sandwich. The Cinque Ports were required to be on hand for military action in the event of a war and in return received generous tax exemptions and trading rights. With these privileges both ports flourished, as did their subsidiary (or 'limb') ports. Ringwould, Margate, Broadstairs, Birchington, Ramsgate, Sarre, Reculver, Stonar and Deal all served as limbs of Sandwich and Dover (Lawson & Killingray, 2004: 52).

The Medieval period would also mark the end of some of these ports. Gradual land reclamation and natural silting of the Wantstun Channel meant that by the end of the 15th century, the

channel was no longer navigable to shipping. Eventually the Isle of Thanet would become part of mainland Britain and the historic ports of Richborough, Sarre, Stonar and Sandwich were no longer accessible to ships. Archaeological evidence of some of the sea defences built to reclaim land still remain extant today, including the Monk's Wall north of Sandwich, an earthen wall that created local conflict when built in the 13th century, as it accelerated the silting of the channel (The Museum of Thanet's Archaeology).

The ports also required defending and Dover Castle was substantially reinforced in the 12th century as a stone keep. Inner and outer baileys were also built, turning the castle into one of the most reinforced sites in the country. This strength meant that Louis VIII of France was unable to take the castle despite a three month siege in 1216AD (Dover Town Council).

Post-Medieval Period

As in the Medieval period, agriculture continued to play an important role in the region and several earthworks are likely date to the Post-Medieval period. Additionally, it is highly likely that many Medieval features continued to be used well into the Post-Medieval period. By the 17th century the county was covered in small field enclosures and agriculture dominated the landscape (Lawson & Killingray, 2004: 70). This increased the prosperity of the market towns; most were inland but within the study area Margate evolved as a market town (Lawson & Killingray, 2004: 66).

Urban growth in Kent increased rapidly and by the end of the 16th century, over one third of the county's population lived in towns (Lawson & Killingray, 2004: 70). Both Sandwich and Dover had populations of approximately 4,000 people each, compared to Canterbury (the largest town in Kent) which had 5,000 people (Lawson & Killingray, 2004: 66). Of England's seventy towns with over 2,000 inhabitants, ten were in Kent (Lawson & Killingray, 2004: 70). Inland, new industries stimulated this growth, but on the coast it was maritime trade that continued to benefit the towns. Despite the silting of its harbour, Sandwich was able to maintain trade links with the Baltic and Low Countries up to the 17th century, but Dover soon expanded to become the South-East's principal cross-channel port (Lawson & Killingray, 2004: 67). Hythe, to the south west of the study area was the next most prosperous, but Folkstone, Ramsgate and Margate also saw trade and benefitted from the fishing industry. By the dawn of the 18th century Margate and Ramsgate had surpassed all other ports in Kent and saw by far the greatest proportion of shipping traffic in their harbours (Lawson & Killingray, 2004: 91).

Both Dover and Langdon priories were dissolved by Henry VIII in the 16th century (Lawson & Killingray, 2004: 80). As was the case at many of the other dissolved monasteries around the country, it is possible that stone from the buildings was re-used in coastal defences built in the period between 1539 and 1545. As hostilities with Europe increased (due in part to Henry's break from the Roman church), defence became an important issue on the Kent coast and the sheltered anchorage of the Goodwin Sands. Three 'Device Forts' – large stone artillery castles – were built along a 2.6 mile stretch of coast, at Deal, Sandown and Walmer (Lawson & Killingray, 2004: 92). An earthen rampart and three earth artillery positions linked the three forts (Pastscape). Sandown, the smallest of the forts, was slowly eroded by the sea; by 1785 the moat had been breached by the sea. The fort was repaired in 1808 but by 1882 it had been almost completely demolished. Today only the foundations remain; likewise, the earthen rampart has been totally removed (Pastscape). Dover Castle was substantially reinforced during the reign of Henry VIII, with the addition of a moat bulwark. Further massive expansion took place at the end of the 18th century; large bastions were added to the outer defences. A substantial redoubt – the Dover Western Heights – was constructed on the other side of Dover

(just outside of the study area) and Dover became a garrison town during the Napoleonic Wars (Lawson & Killingray, 2004: 136).

Both Dover and Ramsgate ports were completed in their modern form in the late 18th and early 19th centuries. This further improved their prosperity, whilst north shore towns like Margate and Whitstable grew as seaside resorts, aided by the development of steamships and railways. In 1854, Deal and Sandwich ceased port operations, but Ramsgate became one of the major modern ports (along with Dover and Folkestone) (Lawson & Killingray, 2004: 129).

Modern

A considerable number of coastal features dating to this period are military coastal defences established during the World Wars. The proximity to the European coast means that a wide range of military sites were constructed in the study area, ranging from anti-invasion constructions, coastal defence, passive and active anti-aircraft defences and airfields.

In addition to a seaplane base in Dover, of which some buildings still survived in 1997, a number of grass airstrips were established in the study area during the First World War; four were at Thanet, one at Walmer and another near Dover (Lawson & Killingray, 2004: 141). One of the Thanet airfields was RAF Manston, which was used in both the First and Second World Wars. Its location meant that aircraft based there took part in many notable engagements during the wars and was the base of the first RAF jet fighter squadron. After the war it became a civil airfield, however, this continued re-use means that little of the original airfield infrastructure survives.

Between the wars, two sound mirrors (an early form of aircraft detection) were built at Fan Bay near Dover, and Joss Gap at Thanet. The Fan Bay mirrors were buried by Kent Council after the Second World War and may still survive in the Cliffside (Burridge, 1997: 24).

Between Birchington and Hythe a near continuous line of anti-invasion, anti-aircraft and coastal defence was constructed during the Second World War, a great deal of which still survives today. Numerous pillboxes of different designs were constructed on the waterfront and inland to counter possible invasions (the HER records well in excess of 100 pillboxes in the study area). Coastal batteries of different sizes were built, in many instances adjacent to, or on the site of existing coastal defences (such as the Tudor forts). Although many of these defences survive, the majority are in a state of dilapidation. A radar station at Dover was an early target during the Battle of Britain, but remained in service throughout the war (Lawson & Killingray, 2004: 142).

The vast majority of the wrecks within the study area date to the modern period. Most of these are ships sunk as a result of military action during the world wars (HER), although there are some exceptions. A pair of hulks sunk on the eastern shore of the River Stour may have been placed to prevent coastal erosion (Wessex Archaeology, 2011: 48).

3B.1.3 Archaeological, Palaeoenvironmental and Coastal Heritage Resources Consulted for the Project

In researching the archaeology, palaeoenvironment and coastal heritage of the east Kent coast, a number of existing databases, archives and publications were consulted. Authoritative general histories of Kent were provided by An Historical Atlas of Kent (edited by Terence Lawson and David Killingray) and The Archaeology of Kent to AD 800 (edited by John Williams). These two texts, along with an online archive of material from the Museum of Thanet's Archaeology (maintained by the Trust for Thanet Archaeology), provided much information on the background history and archaeology of Kent.

East Kent has benefitted from a Rapid Coastal Zone Assessment (RCZA) Survey that has been informed by the National Mapping Programme. English Heritage have recognised that there is a lack of understanding of the archaeology of the nation's coastal areas and that the historic environment needs to be integrated into coastal management schemes. The result is a series of RCZAs that have been commissioned along the English coast. The Kent RCZA has drawn preliminary data from the National Mapping Programme, a project that seeks to enhance knowledge of particular areas by assessing a wide range of aerial information (including historic and modern aerial photography, Lidar data and other similar materials such as historic maps) in order to identify previously unrecorded sites. This has provided information on a wide range of newly identified sites in the study area that have helped confirm the understanding of the area's history so far gathered from other sources.

Other specialist sites were researched with the aid of the county Historic Environment Record and the National Monument Record (via Pastscape). These are useful sources to track the history of a site over a long period of time. Researching 20th century military heritage sites in Britain has been made substantially easier by the Council for British Archaeology's Defence of Britain project (CBA 2006). Along the east Kent coast this has catalogued many dozens of sites that were not previously recognised, including temporary positions that left little or no remains immediately after the war. Although the levels of recording undertaken at sites differed in detail, Kent appears to have been very well researched, a fact borne out by the publication of a book (20th Century Defences in Britain: Kent) using the data gathered.

3B.1.4 Art History of the Area

One of the earliest and finest topographical paintings of the region was a '*View of Dover*' by Richard Wilson RA (1714-1782), a founder member of the Royal Academy. This work marked the start of a long tradition of coastal landscape art in south east England. Although 'schools' of artists did not develop around the Kent coastline as on the East Anglian and Cornish coasts, the region has a rich resource in terms of landscape paintings, watercolour drawings and illustrated topographical books. In the early 1820s William Daniell included numerous delicate aquatints of the Kent coast in his '*Voyage Round Great Britain*' (Daniell & Ayton, 1814).

After visiting Margate, Broadstairs, Ramsgate and the fortifications at Deal and Walmer Castle Daniell produced detailed depictions of the expanding ports and resorts including Dover and Folkestone. J.M.W. Turner was also working along the Kent coastline in the early nineteenth century producing watercolours for inclusion in '*Picturesque Views of the Southern Coast of England*' (Cooke, 1826). Over this period he painted at Margate, Ramsgate, Whitstable, Dover, Folkestone, Deal and Hythe in Kent. Later, the Finden Brothers also passed along this coast, whilst preparing their two volume '*Ports, Harbours, Watering Places and Picturesque Scenery of Great Britain*' (Finden & Finden, 1838), which contained steel plate engravings of the expanding coastal towns. James Baker Pyne RBA (1800-1870) also visited the North Kent coast painting two large oils of '*Whitstable Sands with Women Shrimping*' and '*Sunset on Whitstable Sands*' in 1847. Pyne was a self-taught artist and these two works show that he was a great admirer of Turner, who had also painted there. Pyne's views show one of the many Martello Towers built along this part of the English coast as protection against Napoleonic invasion.

At Margate on the northern tip of the Isle of Thanet, Thomas Rowlandson painted a view of the harbour wall and town from the sea in the mid-1780s. He painted there again in 1800 as the town was a subject for the artist when Ackermann published an engraving entitled '*The Pleasures of Margate*' after his drawing. John Rubens Smith painted a '*Panoramic View of Ramsgate, Kent*' in 1802 whilst, later, James Webb painted '*A View of Margate from the Pier*'

(1868). William Parrott painted '*No-Man's-Land, Margate*' in 1869; an attractive oil showing the indented chalk cliffline with the town behind.

Nearby, at Pegwell Bay close to Ramsgate on the east coast of Kent, the Pre-Raphaelite artist, William Dyce RA HRSA (1806-1864), painted his celebrated view of the Bay in 1858, illustrating the chalk cliffline, and the beach in minute detail. Later, Thomas Bush Hardy RBA (1842-1897) painted one of his best watercolours there entitled '*Shipping off Ramsgate*', whilst just to the north the marine and coastal artist, John Callow (1822-1878), painted '*A Breezy Morning at Broadstairs*'. A visit to the resort of Ramsgate provided the inspiration, in 1851, for the major work by William Powell Frith RA (1819-1909) '*Ramsgate Sands - Life at the Seaside*' (1854), which was exhibited at the RA in 1854 and was purchased by Queen Victoria. The town was also painted in watercolour by the landscape artist and engraver, Robert Brandard (1805-1862) in 1854. At Deal, Anthony Vandyke Copley Fielding POWS (1787-1855) followed in Daniell's footsteps and painted a watercolour looking northwards along the beach towards the castle with a fishing boat in the foreground. Just to the south at Walmer Castle, also located adjacent to the beach, the foreshore was painted by James Holland OWS (1800-1870) in 1850 and by Henry Pether (c.1801-1880) two years later.

The waters around the Kent coastline and the eastern English Channel, busy with shipping, provided subject matter for numerous artists. Marine painters Clarkson Stanfield RA (1793-1867), Anthony Vandyke Copley Fielding POWS (1787-1855), Dominic Serres RA (1722-1793), Nicholas Pocock OWS (1740-1821), Nicholas Condy (1793-1857) and Robert Cleveley (1747-1809) all painted views in the vicinity of Deal and off Dover. On land the early landscape and architectural watercolourist John Varley OWS (1778-1842) painted '*Cornfields at Folkestone*' (c.1820s), whilst Thomas Charles Leeson Rowbotham RI (1823-1875) painted the cliff-top scenery at Dover. Frederick William Watts (1800-1862) painted a fine pair of views of '*Dover Castle*' from Shakespeare Cliff and from above the town showing the militia marching up the steep hill towards the castle.

The Kentish chalk cliffs were a favourite location for the animal painter Thomas Sidney Cooper RA (1803-1902) with groups of cattle often depicted adjacent to the cliff edge thus allowing the beach and the sea to add to the composition. Another artist painting on the south Kent coast was Henry Pether whose '*Sandgate Castle near Folkestone*' looks along the coastline and out to sea by moonlight.

As the Kent coastal resorts expanded, the demand for high quality views, in the form of both paintings and also illustrated guide books, led to an influx of artists, whilst, later, on the introduction of colour picture postcards, artists such as Alfred Robert Quinton were commissioned to produce views of the coastal towns in the early twentieth century. Some of these views are remarkable for the detail they provide in terms of the sea fronts, coast protection structures and beach conditions.

3B.1.5 Art Resources Consulted for the Project.

In order to establish the art resource available for this study it was necessary to review the topographical paintings, drawings and prints held by the principal national, region and local collections covering the Kent coastal frontages. To achieve this objective, online reviews were carried out of the collections held at national level within key museums and art galleries including the Tate Britain, the Victoria and Albert Museum, the National Maritime Museum, the British Museum, the National Gallery and the Witt Library at the Courtauld Institute in London.

In addition the research established the location of relevant artworks contained in museums and art galleries in Kent, including Canterbury City Council Museums & Galleries, Dover Collections, Folkestone Museum, Maidstone Museum & Bentrif Art Gallery, Turner Contemporary - Margate, Margate Old Town Local History Museum, Ramsgate Maritime Museum and others. As part of the research it was necessary to contact museum and gallery curators and search available publications, as well as undertaking research on the Internet, taking advantage of new facilities such as the Public Catalogue's Foundation volume (Ellis, 2004) and the BBC *Your Paintings* website.

Additionally an assessment was been made of art from the study area contained in important publications and, in particular, catalogues of exhibitions at principal London galleries and also in Kent itself. The literature sources relating to works exhibited are comprehensive and comprise reviews of the artists and their works (eg. Graves, 1901), together with catalogues and dictionaries published by the museums themselves and interested publishers (e.g. the Antique Collectors' Club). The published works of this kind do, therefore, represent a considerable resource of assistance to this study (Wood, 1978; Russell, 1969; Archibald, 1980; Lambourne & Hamilton, 1980; Mallalieu, 1984; MacKenzie, 1987).

A brief review of historic maps was carried out, this involved an online search as well as downloading Ordnance Survey maps from the online service *Digimap*.

3B.2 Current Environmental Impacts, Threats and Coastal Management Approach

This section considers the current environmental impacts and threats along the Kent coastline and reviews the current coastal management issues and approaches.

3B.2.1 Review of Key Contributors to Coastal Change

The Kent coastline is extremely diverse, with dramatic white chalk cliffs, extensive lowlands and a mixture of large urban areas and agricultural land. There are also many designations along this coast for its heritage, landscape, geological and biological value including SPA's, Ramsar sites, SAC's, SSSI's and is an AONB. There are also many Scheduled Ancient Monuments, conservation areas and listed buildings.

As the coastline is extremely varied, there are a variety of contributors to coastal change. Generally the coast here is retreating, and the Shoreline Management Plans (SMPs) recognise that erosion and flooding is nothing new. A wealth of historical records demonstrate the loss of communities along the coast over the last few centuries and as such there is clear evidence of long-term natural change (South East Coastal Group, 2006, 2008). Although coastal change has been an ongoing process, the management of this has become increasingly difficult with climate change increasing the rate of sea level rise as well as the number and severity of storm events (South East Coastal Group, 2006, 2008).

As well as rising sea levels and erosion, the Kent coast also faces issues from limited natural input of sediment from offshore, partly due to development along the coast. Extensive areas of the coast have also been reclaimed for agriculture and development including the former Wantsum Channel. Erosion of the shoreline is well known and an ongoing process, however, alongside this the backshore, beach and nearshore zones are also changing with deepening of the seabed evidenced by narrower and steeper beaches. Defences may help slow down the retreating shoreline, but won't prevent lowering of the foreshore (South East Coastal Group, 2006, 2008).

The coastal defences which have been built on many of the Kent frontages mean that there are only limited sections which are free to erode therefore providing little material back into the shoreline system as beach building material. The construction of groynes also affects the alongshore transport of sand and shingle. These defences and groynes mean that much of the shoreline is generally 'unnatural', the extent of management along this coast means it would be very difficult to now revert to using natural evolution of the coast to manage the shoreline (South East Coastal Group, 2006, 2008).

3B.2.2 Summary of Current Coastal Management Approach

Coastal risk management issues within the East Kent coast study area have been considered in detail through a coordinated approach between Kent County Council, the coastal District and Borough Councils, which are the coast protection operating authorities, and the Environment Agency, together with other key stakeholders. For this frontage, two shoreline management plans (SMPs) have been completed, covering the coastline from the Isle of Grain at the mouth of the Thames Estuary, eastwards to South Foreland (South-East Coastal Group, 2008) and a second plan extending from South Foreland around the East Kent coast and westwards along the south coast as far as Beachy Head.

The shoreline management plans provide a broad-scale assessment of the risk associated with coastal processes, and present a policy framework to reduce the risks to people and the developed, historic and natural environments in a sustainable way. Beneath these over-arching shoreline management plans are coastal defence strategy studies a number of which have also been completed; they suggest how the SMP policies may be implemented in practice. This strategic approach has been coordinated by the South-East Coastal Group, one of a number of long established 'regional coastal groups' with a membership comprising local authorities, the Environment Agency, Natural England and other key organisations with a direct interest in coastal risk management.

This strategic approach is essential for a number of reasons. First, sea levels have risen in Kent by approximately 115mm over the last ten years, and 10% of Kent's population is at risk from coastal flooding. Over 160,000 people live in zones at risk from coastal flooding, and this has led to a substantial investment in coast protection and flood defence works. The predicted impacts of climate change require a strategic approach that has been put in place by those involved in coastal risk management within the county.

Due to the diverse geology of the Kent coastline the key contributors to coastal change are varied and as such the SMPs in place are adapted for different locations. As defined by Defra (Halcrow, 2006) each policy unit is assessed and the generic policy options are;

- Advance the Line (ATL);
- Hold the Line (HTL);
- Managed Realignment (MR);
- No Active Intervention (NAI).

Areas like the Isle of Thanet which are dominated by cliffs currently have a policy of NAI in many sections where the erosion of the cliff is providing a sediment source for the beaches and no new defences will be built. However, in more low-lying areas further south from Cliffs End to Oldstairs Bay flood defences will be maintained as the nature of the landscape means that flooding could inundate thousands of hectares of land. Further details on the SMP's can be found online at <http://www.se-coastalgroup.org.uk/>

3B.3 Archaeological and Palaeoenvironmental Ranking

This section outlines the results of the archaeological and palaeoenvironmental scoring from the Kent study area, followed by a discussion of the results. The scoring methodology applied is detailed in [Section 2](#).

3B.3.1 Results of the Archaeological and Palaeoenvironmental Ranking

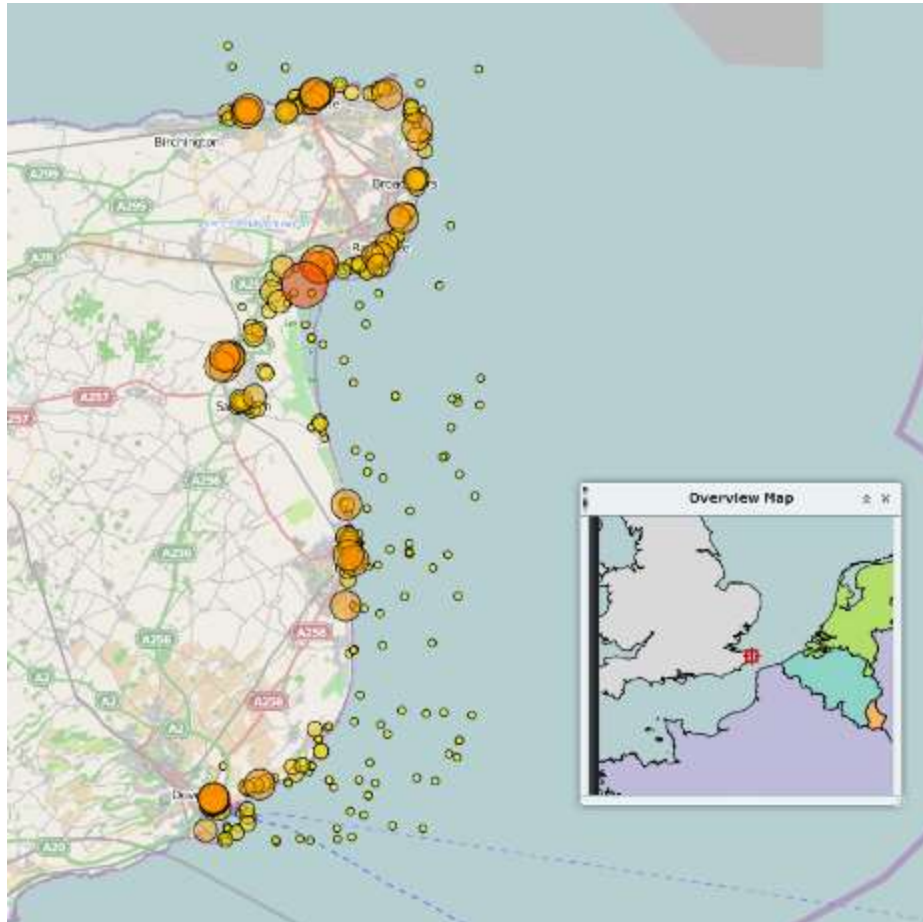


Figure 3B2. Map showing the distribution of archaeological and palaeoenvironmental sites within the Kent study area.

Within the Kent study area data was obtained from the local Historic Environment Record (HER), the National Record of the Historic Environment (NRHE), the United Kingdom Hydrographic Office (UKHO) and the English Heritage Peat Database. It should be noted that the data obtained from the HER was often limited, and where sites scored highly further research was then required in order to understand the full nature and extent of the site. Each data set went through a process of cleaning, in order to prevent the duplication of sites, this process is detailed further in the Methodology section. A total of 697 sites and records were assessed.

The highest scoring sites are listed in the table below, the total score has been normalised to give each site a score out of 100.

APE uid	Site Name	Site Type	Period	Score – Sea Level	Score – Environmental	Score – Temporal Continuity	Total Score	Coastal Context
715	PEGWELL BAY – Submerged Forest	Submerged Landscape	Unknown	High	High	Medium	88	Hard Cliff
3029	DOVER - Castle	Coastal Defence	Medieval	Medium	Medium	High	77	Coastal
2563	WESTGATE ON SEA – Occupation Site	Monument	Early Medieval	Medium	Medium	Medium	66	Hard Cliff
2589	DEAL - Settlement	Monument	Bronze Age	Medium	Medium	Medium	66	Marine
2739	MARGATE – Settlement Remains	Monument	Iron Age	Medium	Medium	Medium	66	Hard Cliff
2745	DOVER - Hillfort	Monument	Iron Age	Medium	Medium	Medium	66	Marine
2747	MARGATE Settlement -	Monument	Iron Age	Medium	Medium	Medium	66	Marine
2748	MARGATE Settlement -	Monument	Iron Age	Medium	Medium	Medium	66	Marine
2750	BROADSTAIRS - Settlement	Monument	Iron Age	Medium	Medium	Medium	66	Hard Cliff
2776	DOVER - Settlement	Monument	Iron Age	Medium	Medium	Medium	66	Marine
2800	PEGWELL - Building	Monument	Medieval	Medium	Medium	Medium	66	Hard Cliff
2851	DOVER - Settlement	Monument	Early Medieval	Medium	Medium	Medium	66	Hard Cliff
2867	RICHBOROUGH Castle -		Unknown	Medium	Medium	Medium	66	Above high water
2883	MARGATE Settlement -	Monument	Roman	Medium	Medium	Medium	66	Hard Cliff
2884	RICHBOROUGH Temple -	Monument	Roman	Medium	Medium	Medium	66	Above high water
2911	BROADSTAIRS Tower -	Monument	Post Medieval	Medium	Medium	Medium	66	Intertidal
3001	RICHBOROUGH Temple -	Monument	Roman	Medium	Medium	Medium	66	Above high water
3030	RICHBOROUGH Settlement -	Monument	Roman	Medium	Medium	Medium	66	Above high water
3032	RICHBOROUGH Amphitheatre -	Monument	Roman	Medium	Medium	Medium	66	Above high water
3033	DEAL - Castle	Coastal Defence	Post Medieval	Medium	Medium	Medium	66	Marine
3034	DEAL – Sandown Castle	Coastal Defence	Post Medieval	Medium	Medium	Medium	66	Marine
3035	DEAL – Walmer Castle	Coastal Defence	Post Medieval	Medium	Medium	Medium	66	Marine

3036	MARGATE Settlement	-	Other Spot	Find	Iron Age	Medium	Medium	Medium	66	Hard Cliff
3044	RICHBOROUGH Settlement	-	Monument		Iron Age	Medium	Medium	Medium	66	Above high water
3067	WRECK		Wreck		Bronze Age	Medium	Medium	Medium	66	Hard Cliff

Table 3B1. Ranking results showing the highest scoring archaeological and palaeoenvironmental sites within the Kent study area.

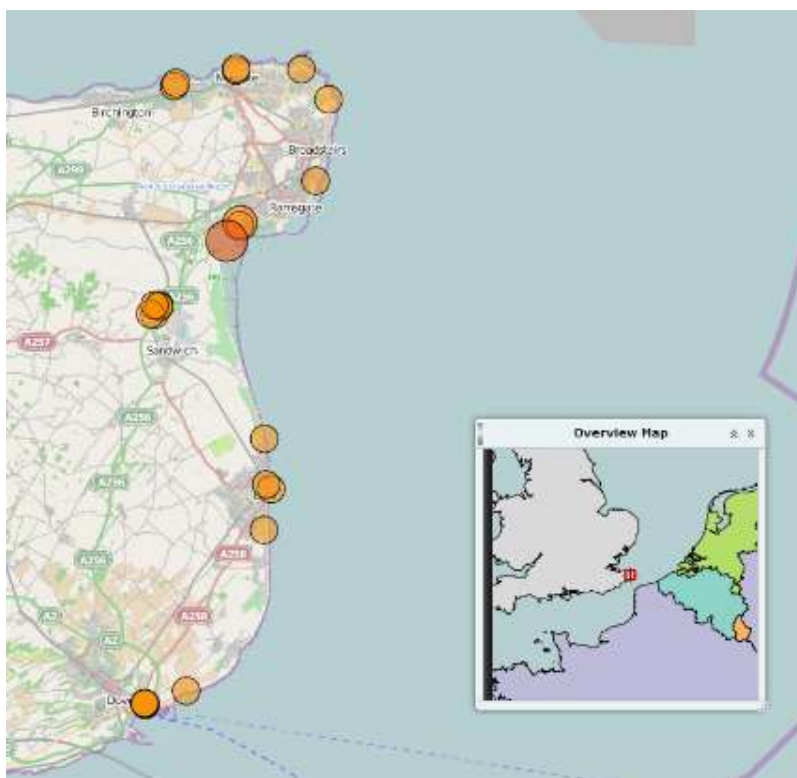


Figure 3B3. Map showing the distribution of highest ranking archaeological and palaeoenvironmental sites within the Kent study area.

Ranks for sea level change

	High	Medium	Low
Number of sites	1	148	548

Ranks for environmental change

	High	Medium	Low
Number of sites	1	31	665

Ranks for temporal continuity

	High	Medium	Low
Number of sites	0	102	595

Table 3B2. Results of the archaeological and palaeoenvironmental three ranking categories

3.3.2 Discussion of the Ranking Results

The majority of the sites that ranked highly in Kent, were either prehistoric settlement remains or military coastal defences, and are located around the major towns of Margate, Deal, Dover, and

Broadstairs.

The earliest of the coastal defences that scored highly is Dover Castle. Prior to the construction of a castle the site was originally an Iron Age hillfort, there is also evidence of Roman occupation with a Roman lighthouse dating from around 46-50 AD still relatively well preserved. A castle was later built by William the Conqueror and saw numerous reinforcements under Norman rule in the 12th century. Henry II built the medieval fortress which was maintained by his successors including Henry VIII in the 16th Century, whose fortification of the southern coast of England also led to the construction of Device Forts at Deal, Sandown and Walmer (Deal Castle and Walmer Castle are also depicted in historic artworks, see Section 3B5.3). The site was continuously occupied for nine centuries. Such dateable structures located on the coast can help improve our understanding of sea level and environmental change as associated geomorphological features can be monitored, they can also provide evidence of responses to changing climate.

Several sites which ranked highly are located in Richborough, although the site is now some distance from the sea, prior to the silting of the Wantsum Channel this area would have been at the southern end of the channel up until the early Medieval period and became an important natural harbour, its importance is demonstrated through the numerous Roman sites and finds in the area and is thought to have been the landing place of the Roman invasion. Such sites demonstrate that our coasts are not only affected by erosion and sea level rise, but also by siltation and gradual change.

Several Iron Age sites around Margate also ranked highly, this reflects their potential to provide information on sea level and environmental change as many have not been fully excavated. An Iron Age hillfort has been partially excavated, the site overlooks Margate harbour and finds suggest that the settlement was long lived.

Another of the high ranking sites is a submerged forest at Pegwell Bay. The peat deposits have been sampled however, there is currently no known date for the site. Further work is required in order to determine the nature and extent of this site to provide information on sea level and environmental change. Further prehistoric remains have ranked highly, several sites were recorded in the HER, again further work is required in order to understand the full nature and extent of these sites.

One possible wreck from the study area ranked highly, the site is located in Langdon Bay and includes over 350 bronze artefacts recovered from the seabed. It is thought that this may be the remains of a cargo vessel, although no vessel remains have been recovered. Based on the finds the site has been dated to around 1100BC and the items are thought to have originated from France. The site has been subject to systematic excavation, although affected by sediment from the construction of the Channel Tunnel the site has the potential to be used as a proxy against which sediment levels and changes in the coastline can be measured.

Some of the sites can be used as markers from which to measure physical coastline changes; the most notably useful for this purpose being the buildings of Richborough which are known to have once been situated on the coast approximately 2,000 years ago. Other sites which ranked lower, but still have the potential to provide information on coastal change, include coastal defences, these include WWI and WWII gun emplacements, anti-tank blocks, pill boxes and air raid shelters, as well as historic buildings that are found all along the coast of the Kent study area, and can provide information on the rate of coastal change over the last century.

Many wreck sites were also assessed, although the majority are modern (1901-Present) in date, around seventeen Post Medieval wrecks were ranked, along with a single Iron Age wreck. Of more importance to the project is the Bronze Age wreck previously mentioned and two 20th century hulks that were sunk in the River Stour. The two hulks are believed to have been placed in the river to help reduce coastal erosion (RCZA).

3B.4 Ranking Artistic Depictions

The ranking system developed for artworks, historic photographs, maps and sea charts is set out in [Section 2.2](#). The ranking system has been applied to each of the selected artworks, which are described in more detail below. The focus of the Kent study area was on artworks, no historic photographs or historic maps were assessed within the framework of the project. Examples of available maps are presented below, these serve to highlight the potential for such resources to provide information on coastal change, further work is required in order to assess the accuracy and reliability of these resources.

Twenty four works of art from the east Kent art case study site were assessed. The highest ranking artwork, a detailed watercolour of Folkestone Beach, gained 70 points whilst several coastal aquatint engravings scored up to 55 points. These are followed by oil paintings from the early and mid-nineteenth century which, with the exception of the Pre-Raphaelite artists and their followers, generally provided less detailed information, and hence scored fewer points.

Artists tended to paint attractive or dramatic coastal locations as well as meeting specific demands of their patrons. On the east Kent coast they were drawn to the expending coastal towns and villages either on account of their locations or because of the interest in the activities of fishermen and their craft working along the shoreline. This has resulted in many of the sites of key geomorphological and coastal risk management interest being painted by artists particularly during the nineteenth century. Within the higher ranking artworks there are examples which include locations affected by coastal landsliding, marine erosion, flooding and beach change. Where a particular location has been painted by a limited number of artists or perhaps just one artist that work has been included to illustrate a particular feature or issue.

These differing coastal landforms and processes and their impacts on coastal residents, assets and infrastructure could not have been easily matched to the most informative works of art without the provision of the ranking system. The system has identified ten case study locations and at each at least one artwork has been examined in more detail below as follows:-

Case Study Number	Location	Artist	Date	Score type	Score period	Score style	Score enviro	Total Score
1	Reculver Church	William Daniell	1824	Aqua-tint	Early	Topog.	Detailed View	55
2	Margate	William Daniell	1824	Aqua-tint	Early	Topog.	Detailed View	40
3	Pegwell Bay	William Dyce	1858	Oil	Mid.	Topog.	Very Detailed View	62
4	Deal Castle	William Daniell	1824	Aqua-tint	Early	Topog.	Detailed View	55
5	Walmer Castle	William Daniell	1824	Aqua-tint	Early	Topog.	Detailed View	55
6	Leas, Folkestone	Alfred Robert Quinton	1920	Water-colour	Late	Topog.	Detailed View	70

Table 3B3. Highest ranking artworks within the Kent study area

A more detailed explanation of each site and the interpretation of the individual artworks is provided in the case study descriptions below. The assigning of scores to each artwork suggests names of those artists who have depicted different aspects of the east Kent coast across the timeline 1770-1920. These artists include William Dyce, William Daniell, Henry Pether and John Wilson Carmichael; they can be relied upon in terms of the accuracy of their depictions of the Kent coastline.

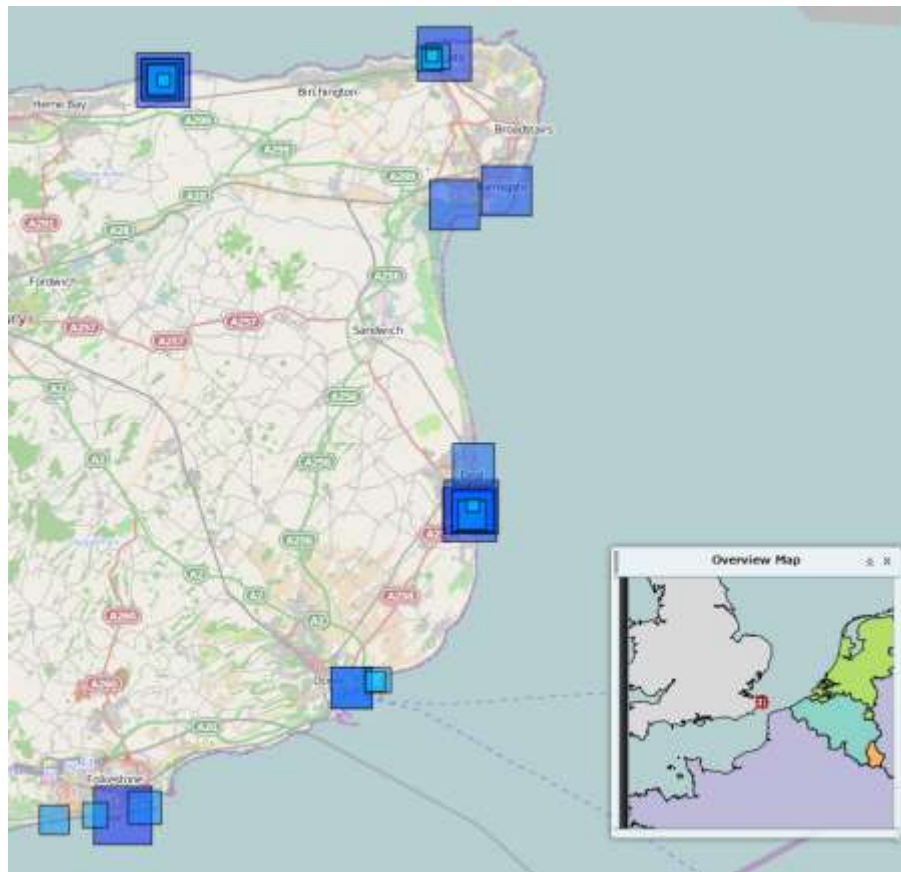


Figure 3B4. Map showing the distribution of artworks ranked within the Kent case study area.

3B.4.1 Discussion of Art Scoring Results

Parts of the east Kent coastline have been progressively developed over the centuries with some significant impacts on both coastal processes and the natural environment. Over the last ten years considerable efforts have been made to encourage improved coastal management and this has led to the development of risk management plans for the coast in support of the principle of sustainable development. As part of this process, thorough consideration has been given by the coastal group to natural hazards, and the resulting risks to people, property and the environment. Climate change is with us now and is going to exert an increasing influence on the lives of coastal residents over the next decades by affecting the severity of coastal erosion, flooding and landslide events.

Through the case studies the value of various artworks has been tested at sites of differing geomorphology. The combined approaches of desk-based research, museum and gallery searches and field visits have confirmed the added value of art from the period 1770-1920 to support other coastal surveying and monitoring technologies (e.g. Space-borne, air-borne, ship-borne and terrestrial). It is important to remember that artists in the late Georgian and Victorian eras worked for very demanding, wealthy clients who often sought exact views of the coastal

landscape to remind them of their visit. Before the days of photography precise images were, therefore, a prerequisite in most cases. The examination of the works of many artists painting the Kent coast testifies to their considerable artistic skills in capturing accurately the coastal topography.

Some of the artworks examined in these case studies show significant coastal change over time as well as telling the story of human intervention on the coast. Other artworks show very little change over the last two hundred years and this information is of equal interest to the coastal scientist. Importantly, in many cases the artworks also illustrate the nature of the natural undeveloped coastline and suggest what conditions might be experienced if coastal defences were not maintained in the future. This is particularly significant as along certain coastal frontages it will not be possible to continue to defend the coast as has been the case in the past for physical or environmental reasons.

The east Kent study focused on the use of historic paintings, however a review of historic maps, charts and photographs was carried out to highlight the potential of these data sources. Because of the dynamic nature of this coastline historic photographs can be a valuable resource with many historic photos containing depictions of the cliff with recognisable heritage features nearby, including churches, wells and houses. These can be compared to the modern situation and from this an accurate idea of the rate of erosion since the date of the photograph can be gained.

3B.4.2 Maps and Charts

As mentioned above it has not been possible to assess many historic maps or charts along the Kent coast as part of the project. A brief review of available maps was carried out to highlight the potential of this resource in improving our understanding of coastal change, however, these have not yet been assessed in detail for their reliability and accuracy.

Figure 3B5 shows a map of Dover by Rutger Hermannides in *Britannia Magna* from 1661. The map shows Dover Castle and the early harbour. Alongside the map is an aerial photograph of the area today.



Figure 3B5. The image on the left is a map of Dover from 1661 (courtesy of genealogy.rootsweb.ancestry.com, the image on the right is an aerial photograph of Dover from 2013 (courtesy of the CCO).

Figure 3B6 is a map of the Isle of Thanet from 1836, coastal structures such as piers and jetties are depicted, but there is little detail on the geology or geomorphology of the coastline. However, such maps often include illustrations of coastal sites, in this case there is a depiction of Ramsgate Harbour and North Portland light house. These images can also provide useful information on how the coast looked in this period.

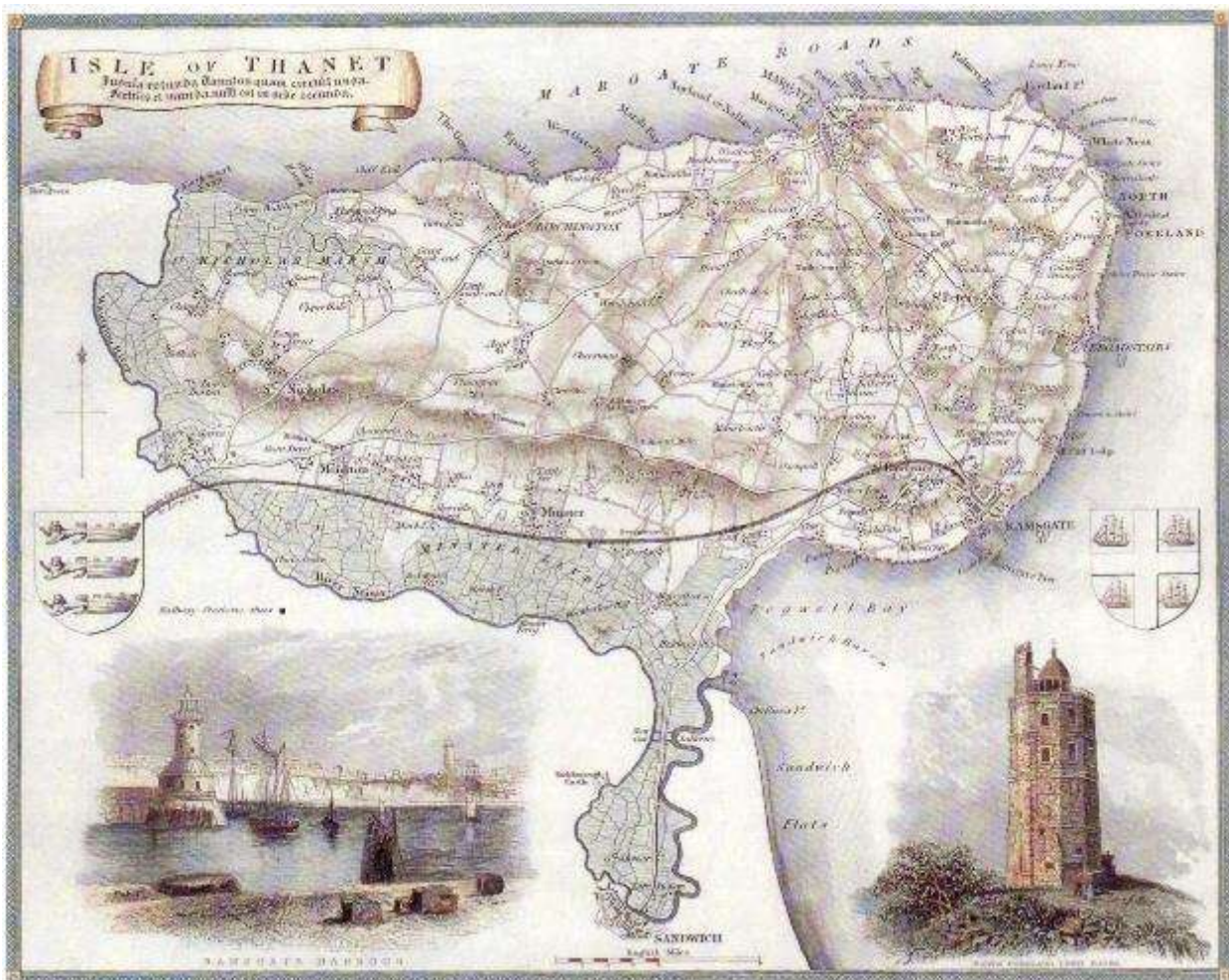


Figure 3B6. Map of the Isle of Thanet from 1836, from John Dower in Thomas Moule's *The English Counties Delineated*. (courtesy of genealogy.rootsweb.ancestry.com)

Such maps need to be assessed for their reliability and accuracy before being used to provide information on coastal change. A methodology for evaluating maps is outlined in [Section 2](#).

Another source of historic maps is from the Ordnance Survey. After fifty years spent on triangulation of the whole of England the first one inch OS Map was published in 1853. Although not recommended for developers these maps are extremely accurate. Several OS maps are used later to look at changes around Deal Castle, see Section 3B.6 below.

3B.5 Art Field and Research Studies

No archaeological or palaeoenvironmental fieldwork was carried out within the Kent case study area, this section, therefore, outlines the field studies undertaken as part of the art study.

3B.5.1 Key Research Questions to be Addressed from the Artistic Depictions

Having established, through the art ranking system that the images are likely to be true representations of the conditions that would be seen at the time they were painted, the research questions to be answered through examination of the artworks at the case study sites are:-

- What information can the historical images provide to support understanding of long-term coastal change?

- How can the potential of this resource be used most effectively by the end-user?

Following the ranking of twenty four artworks six examples have been the subject of more detailed analysis involving site visits. Art images were selected to reflect the varying physical conditions in this area of the coast. Site B1 at Reculver considers eroding, unstable cliffs and explores the chronology of coastal change and provision of defences. Site B2 at Margate reviews changes to the coastline as a result of nineteenth century development whilst Site B3 reviews cliff and foreshore change at Pegwell Bay. Sites B4 and B5 at Deal and Walmer Castle are interesting because they have fine castles situated at the back of the beach; here beach change is examined. At site B6 the Leas Beach at Folkestone is well documented in terms of historical images, and slope stability and beach management issues are examined. Each site considers the potential of the artwork to be used as a qualitative or quantitative tool to support our understanding of long term coastal change and coastal management more widely.

3B.5.2 Approach to Information Gathering and Fieldwork for Assessing Coastal Artworks

Where it has been practical to gain access and relevant to the study, present day photographs were taken in the field to try, as far as possible, to match the views painted by the eighteenth, nineteenth and early twentieth century artists. It also provided the opportunity to assess the conditions of the cliffline and beach and changes that may have taken place over time. In terms of work in this field each of the locations has been visited and photographed in varying weather conditions. Inspections were timed to coincide with Low Water and a walk-over survey was made along the beach and base of the cliff returning along the cliff top. This ensured that thorough comparison could be made between the geomorphological conditions depicted in the artwork and the present day situation.

The fieldwork element has been largely visual in terms of identifying the location of the paintings and making judgements, on site, of the role that art can fulfil as a qualitative or quantitative tool to support coastal risk management. The field inspections allowed a more accurate appraisal to be made of current physical conditions rather than relying upon written accounts and reports particularly as storm events can cause significant alterations over relatively short time periods.

3B.5.3 Art Field Data Gathering Results

The approach adopted for each case study has been the examination of one particular artwork and to make an assessment of what it tells us about changes over time from field observation. However, for some of the study sites it has been found that several artists painted the view from the same or a similar spot. This helps to establish a chronology of coastal change through the nineteenth and twentieth centuries. The results for each case study location are described below.

B1. Reculver Church

Location

The study site is Reculver Church (Towers) situated approximately 5km to the east of the seaside resort of Herne Bay on the North Kent coast.

Why was the study site selected?

The study site illustrates historic problems associated with erosion of the soft cliffs at this point, and is particularly well illustrated through a chronology of landscape paintings, produced since the early nineteenth century. It is believed that these artworks illustrate clearly how historical information can be gained to inform us of the rate and scale of long term coastal change.



Figure 3B7. Reculver Church', North Kent coast by William Daniell, RA engraved in 1824. Some rudimentary coastal defences can be seen, which were helping to preserve this important landmark for navigation. A substantial rock revetment now protects the site.

Geomorphological setting

This coastal site is located on eroding soft clay cliffs composed of London Clay, which are of Tertiary Age. Immediately to the east are the Thanet Beds, which are named after this part of the Kent coast which has historically been known as the Isle of Thanet, whilst, to the south and to the east, are extensive outcrops of chalk for which the county is famous. The rocks exposed are of Cretaceous and Tertiary Age, dating from between 140-50 million years ago. They represent a fixed sequence of sands, clays and chalk (limestone), which has been gently folded into an anticline known as the Wealden Dome.

Cliff erosion takes place along the undefended frontages and where it is uneconomic for defences to be maintained erosion will be allowed to continue looking ahead over the next 100 years, in order to maintain the nature conservation interest of the locality.

Key coastal risk management issues for the frontage

The eroding cliffs at Reculver (except immediately in front of Reculver Towers) are of high conservation and landscape importance. In the shoreline management plan for the frontage, the long-term recommendation is to allow continued erosion of the cliffs, which will maintain the geological exposures and the landscape quality of the frontage. There will, however, be potential for loss of buried unknown heritage as the cliffs erode and retreat. Development along

this frontage is minimal, and in most cases the built assets are set well back from the cliff face. However, in the medium term, some assets may be at risk and the coastal footpath will need to be re-routed.

An element of shoreline protection is provided by cliff fall debris as these events take place, and certainly it is not deemed necessary or visually desirable to defend this section of the coastline. With sea level rise it is anticipated that erosion rates will increase between the next 20 and 50 years, and increased erosion is likely to make a modest contribution to the sediment budget, which is transported along the coast by the process of longshore drift. With sea level rise, the naturally functioning coastline will continue to provide sediment inputs from the cliffs to the foreshore, albeit at a greater rate than those experienced historically.

How can the artwork inform coastal risk management?

The historic church of St Mary at Reculver has been depicted by numerous artists over the last 200 years. In 1798 James Malton painted a watercolour called *'The Two Sisters near Margate'*, the title reflecting the twin towers of the church (Figure 3B10). Later, in 1813, the Reverend J. Skinner recorded the wall of the Roman fort of Reculver in his diary. The wall used to be located seaward of the church, and was long since lost to coastal erosion. The drawing by Reverend Skinner illustrated the drastic undercutting of the cliff as a result of coastal erosion (Figure 3B11). Later Charles Lyell, the celebrated geologist, cited the Roman shore fort of Regulbium (Reculver) as evidence of the scale and pace of coastal erosion (Lyell, 1838). Lyell's own view of 1834 shows the significant retreat of the coastline since an earlier engraving made in 1781 (Figures 3B8 and 3B9).

William Daniell, on his *'Voyage round Great Britain'*, passed along the Kent coast in 1824, and he noted that *"this important landmark is also known by the name of the Sister Churches, assigned to it in reference to the two spires which crown the towers on the west front of the church. The following inscription, copied from a stone tablet over the door of the edifice, will serve to explain their present condition: these towers, the remains of the once venerable church of the Reculvers, were purchased for the Parish by the corporation of the Trinity House of Deptford Strand in the year 1810, and the groynes laid down at their expense to protect the cliff on which the church had stood. When the ancient spires were afterwards blown down, the present structures were erected, to render the towers still sufficiently conspicuous to be useful in navigation"* (Captain Joseph Cotton, Deputy Master in the year 1819). Daniell continued *"the abrupt bank of earth on which the church stands has been much wasted by the sea... to break the impetus of the tide, and prevent further encroachments, the Trinity House have laid down groynes on the beach, which it is hoped will be sufficient for the security of so valuable a land mark as her sister churches"*.

Daniell continued *"at this station, denominated regulbium by the Romans... their ancient lease to the castle, which defended the northern entrance of the Roman haven. The church is dedicated to St Mary, and is supposed to have been built on the foundations of one which belonged to a Benedictine abbey erected here by Bassa, a Saxon priest and noble, in the reign of King Egbert"*.

Reculver once occupied a strategic location of the north western end of the Wantsum Channel between the Isle of Thanet and the Kent mainland. This led the Romans to build a small fort there at the time of their conquest in Britain in 43 AD. After the Romans left Britain in the early fifth century, Reculver became a land estate of the Anglo-Saxon kings of Kent. The site of the Roman fort was given over to the establishment of a monastery dedicated to St Mary in 669 AD, and King Eadbert the Second of Kent was buried there in the 1760s. The twin spires of the church became a landmark for mariners known as 'The Twin Sisters' supposedly after

daughters of Geoffrey St Clare. The population of Reculver declined as the Wantsum Channel silted up, and coastal erosion claimed many buildings constructed on the soft sandy cliffs. The village was largely abandoned in the late eighteenth century, and most of the church was demolished in the early nineteenth century. Protecting the ruins and the rest of Reculver from erosion has been an on-going challenge for the coast protection authority.

After Daniell's view of Reculver the next artwork in chronological succession was a painting by James Ward of 1818 entitled '*Reculver Church*' (Figure 3B12), which shows a view of the building dramatically located on the cliff edge taken from the west looking eastwards, whilst a further view by Stuart Westmacott (Figure 3B13), painted in 1851, shows the building from the east side looking west.

This sequence of images of Reculver church frontage tells the story of coastal change over the last 1,000 years, and without these images it would be less easy to appreciate the dramatic rate of coastal change that has taken place. Along most coastal frontages erosion is episodic rather than uniform, in other words significant retreat takes place after particular storm events or wet periods when the cliffs become saturated and liable to instability problems. There may be long periods when the cliffs appear relatively stable but, over a time span of 100 years, the overall rate of retreat can be very significant. Images of this kind can be useful when explaining to stakeholders about long-term coastal change and how their particular frontage may be affected if natural processes continue in the event of an increase in the rate of erosion as a result of climate change.

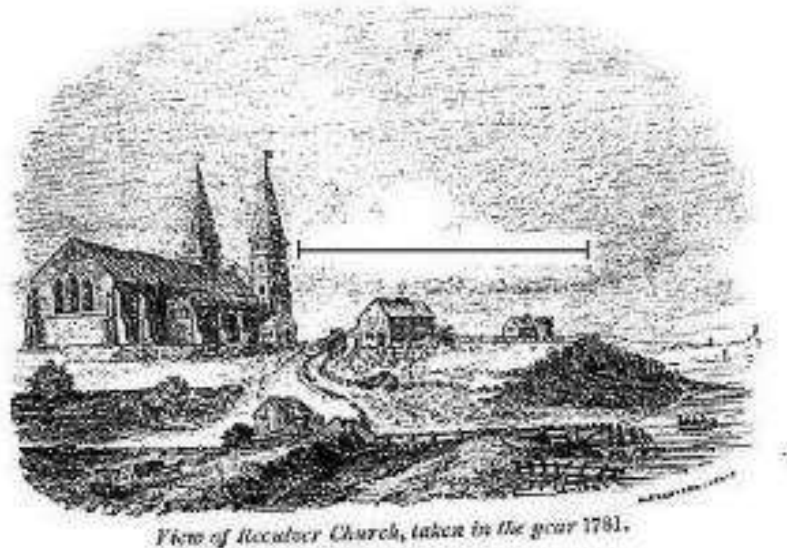


Figure 3B8. Charles Lyell cited the Roman shore fort of Regulbium (i.e. Reculver) as evidence of the scale and rate of marine erosion. In this view of 1781 Lyell observed that there had been a notable distance between the church and cliff line.



Figure 3B9. Lyell's view of 1834 shows the significant retreat of the shoreline since the previous engraving (above) was made in 1781.



Figure 3B40. 'The Reculver', commonly called 'The Two Sisters' by James Malton, 1798. Malton's watercolour drawing shows a building existing between the seaward side of the church and the cliff edge. Image: Courtesy Bonham's. Private collection.

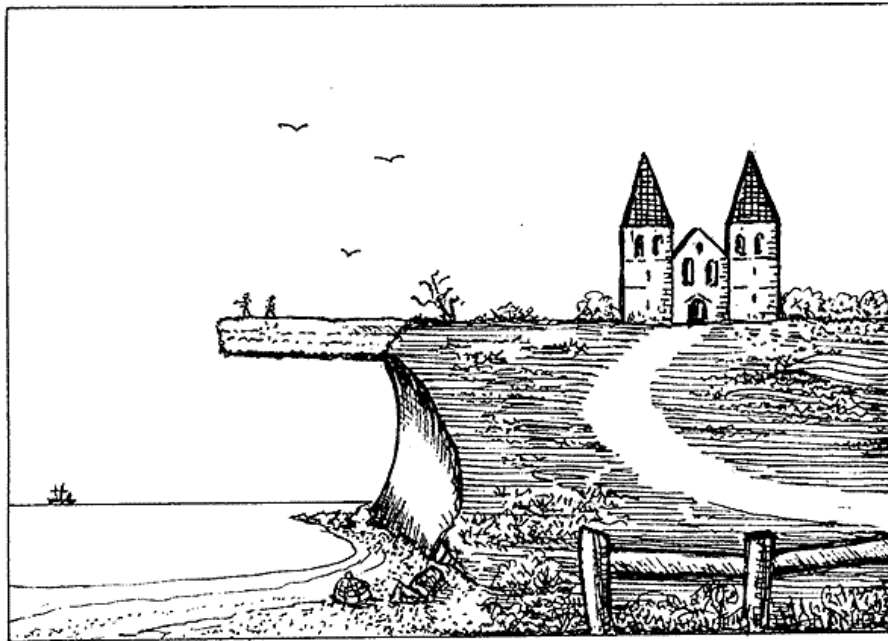


Figure 3B11. The Rev. J. Skinner recorded the wall of the Roman fort at Reculver in his diary around 1813 after the cliff had been drastically undercut by erosion. This diagrammatic drawing provides a simplistic summary of the erosion issue as he perceived it.



Figure 3B52. In this view of Reculver by James Ward painted in 1818 a range of coastal defences can be seen at the foot of the soft cliff line. Image courtesy of Canterbury City Museum & Art Galleries.



Figure 3B63. A further view of Reculver Church from the east side by Stewart Westmacott painted in 1851. Image courtesy of Canterbury City Museum & Art Galleries.

Where can the original artwork be viewed?

The view of 'Reculver' by William Daniell can be viewed on the Internet. The oil paintings can be viewed at www.bbc.co.uk/yourpaintings.

Ranking score achieved by the William Daniell image: 55

B2 Margate, North Kent Coast

Location

Margate is a popular seaside resort located on the north coast of Kent between the resorts of Westgate-on-Sea to the west and Foreness Point and North Foreland to the east.

Why was the study site selected?

This site was selected to illustrate the role that historical artworks can play not just in informing us of long-term coastal change but also physical and structural change to the coastline, as a result of human intervention.

Geomorphological setting

Margate is located on the Isle of Thanet in the north eastern corner of the county of Kent, and has been developed along the chalk cliffline, which dominates the frontage, and is recognised as being of international importance on account of the geology, environment and landscape character. To the west of the town, the wave cut chalk shore platforms at the base of the cliff are of particular geological significance, whilst, in the town itself, the frontage has been heavily developed and defended with coast protection and harbour structures. Because of the extent of

the development, the beach at Margate is dependent on management including the use of groynes and nourishment where appropriate. The coast protection structures, including groynes and the harbour arm, restrict sediment movement along the frontage.

Key coastal risk management issues for the frontage

The town of Margate is of particular significance in terms of its residential, commercial and strategic activities, particular tourism. As a result, coastal defences will continue to be maintained and upgraded to protect these valuable assets. Figure 3B14 shows a view of Margate harbour by William Daniell, painted in 1824, it forms part of his 'Voyage round Great Britain' and illustrates the growing resort taken from a vantage point just to the west of the harbour arm. An advantage of Daniell's work was his topographical accuracy including the form of the small beach in the foreground, the shape of the harbour arm, and its proximity to the seawall and seafront properties, and the view looking along the coastline in an easterly direction beyond.

Works of art, which depict seawalls and harbours can be particularly useful to designers who are having to replace or improve these structures. Often the original harbour structure may have been covered by reinforced concrete or, other later, additions and alterations. It is, therefore, useful to understand how the nature of the original construction, which could help reduce costly investigations and studies that might otherwise be deemed necessary.

Observations on the artwork

This view is typical of the meticulous observation and eye for detail in William Daniell's aquatint engravings. It provides a wealth of information on the state of the coast in the emerging resort of Margate in the early part of the nineteenth century.



Figure 3B74. 'Margate' by William Daniell engraved in 1824. His view illustrates how artworks can depict not just physical change but also the history of coastal development and sometimes the modes of construction used.



Figure 3B85. The present day view of Margate

How can the artwork inform coastal risk management?

This view by Daniell was selected to illustrate the role that art can fulfil in terms of understanding not just physical changes on the coast but also the history of coastal development and construction. Not only are features such as harbour arms influential in terms of interruption of sediment transport but an understanding of their form can be particularly helpful to designers and coastal engineers who may wish to repair or replace these structures. It can be seen from Daniell's view (Figure 3B14) and from the present day view (Figure 3B15) that the harbour wall has stood the test of time and remains unaltered. Part of the former beach is now occupied by a dinghy park and the new Turner Contemporary Art Gallery can be seen on the left.

It can be seen that artwork such as this can inform not just coastal risk management but integrated coastal zone management more widely as the view encompasses a range of features and issues relating to the coastal zone.

Where can the original artwork be viewed?

The William Daniell view of Margate can be viewed easily on the Internet.

Ranking score achieved by the William Daniell image: 40

B3 Pegwell Bay, Kent

Location

Pegwell Bay is located on the east Kent coast just to the south and west of the seaside town of Ramsgate. The town faces south looking along the Kent coast, past Sandwich and Deal, in the direction of Dover and out across the Straits of Dover.

Why was the study site selected?

Pegwell Bay is famous in terms of art history for the painting by William Dyce RA (1806-1864) entitled '*Pegwell Bay – Recollections of the 5th October 1858*' (Figure 3B16). Dyce was an artist of the Pre-Raphaelite Brotherhood who wished to capture nature in every detail and as precisely as possible. The painting is remarkable for its almost 'photographic' quality, and proved fascinating to Victorians at the time on account of the emerging science of geology but also the conflicts it posed in relation to the biblical account of '*The Creation*'. The study site shows a chalk cliff frontage affected by coastal erosion and weathering, together with a detailed portrayal of the foreshore, which bears comparison with the present day situation.

Geomorphological setting

Pegwell Bay is located at the southern end of the chalk cliff-line to the west of the town of Ramsgate, and north of the Minster Marshes and Ash Level, which form the floodplain of the River Stour, which flows northward from Sandwich, to emerge into Pegwell Bay. The Bay is backed by a rugged well-jointed chalk cliff with a wave-cut platform and a rocky foreshore, whereas, to the south, there are extensive sand dunes and a shingle foreshore forming part of the Sandwich Bay Nature Reserve. Within the floodplain of the Stour there are extensive saltmarshes with a hinterland of dunes.

Key coastal risk management issues for the frontage

Pegwell Bay lies to the west of the main developed area of Ramsgate but an important strategic road links Ramsgate with the community of Cliffs End to the west. Existing coastal defences will be maintained and may require upgrading in the future, but the cliff top is susceptible to weathering and cliff falls. To the west of the Bay at Cliffs End, the steep chalk cliffs give way to relict, undefended sandstone cliffs, before the transition between the Isle of Thanet and the predominantly low-lying east Kent coast to the south.

Observations on the artwork

The painting by William Dyce is of particular interest on account of the extraordinary detail that has been achieved in this oil painting. In terms of the cliff-line the structure of the cliffs, including the jointing, is particularly well defined, as are the details of the caves running along the foot of the cliff. Along the foreshore one can see the wave-cut platform, which extends into the intertidal zone, and, in the foreground, details of a groyne forming a rudimentary coast protection structure. At the time the view was painted by Dyce it coincided with the emerging art of photography and many people thought this painting had been copied from a photograph, which was incorrect. However, it demonstrates the almost photographic detail that could be achieved through art by the followers of the Pre-Raphaelite ethos of capturing nature in its precise detail.



Figure 3B96. 'Pegwell Bay – Recollections of 5th October 1858' by William Dyce, RA demonstrates the precise detail that could be achieved by the Pre-Raphaelite artists. Dyce has achieved a depiction that has the appearance of a photograph. Courtesy of Tate Images 2014.



Figure 3B107. The chalk cliff frontage at Pegwell Bay today

How can the artwork inform coastal risk management?

Paintings of this kind can inform coastal risk management by providing a reliable comparison with the conditions to be found in later works of art, in photographs and when viewed at the present day. From the same spot estimates could be made of cliff retreat because it is possible to identify sections of cliff that may have fallen away as a result of undercutting of the toe of the cliff by the sea, and weathering over the last 160 years. It can, therefore, advise coastal engineers of the rate and scale of coastal change over a very long time span.

Where can the original artwork be viewed?

At the Tate Britain or on the BBC 'Your Paintings' website (www.bbc.co.uk/yourpaintings).

Ranking score achieved by the William Dyce oil painting: 62.

B4 Deal Castle, East Kent Coast

Location

Deal Castle is located on the east Kent coast along the Deal town frontage, and is situated immediately behind the beach.

Why was the study site selected?

Deal Castle was chosen as a study site because it is located adjacent to the low-lying coast and an aquatint engraving is available, which provides precise details of the structure in the year 1824. The heritage importance of this structure adds further value for the Arch Manche project.



Figure 3B118. Deal Castle' by William Daniell, RA engraved in 1824. His fine draughtsmanship shows us the relationship between the structure and the shore at that time. A substantial beach now provides flood protection for this low-lying coastline. Private Collection.

Geomorphological setting

The town of Deal lies on the open coast, with a mixed shingle and sand beach to the north and shingle beaches along the frontage, which is defended. The area to the north of Deal is low-lying, whereas to the south of the town the land begins to rise to meet the cliffs at St Margaret's Bay and South Foreland.

Key coastal risk management issues for the frontage

To the north, the frontage consists of shingle beaches backed by an embankment of shale and a narrow dune system. The beach and dunes are of international environmental importance. Along the coastline of the Deal frontage assets are protected by a shingle beach with timber groynes and a concrete seawall. Flood defences also provide protection for a large area of the town from flooding. The coastal risk management policy is to seek an improvement to reduce erosion and flood risk, through beach management, by increasing the volume of the shingle beach. There is also the possibility of improving the seawall along the Deal frontage to reduce the risk of overtopping. South of Deal Castle there are no formal defences and the intention is to carry out minimal work and maintain the beach; it is unlikely that any properties will be at risk if this approach is adopted.

Observations on the artwork

This view of Deal Castle from the south was produced in 1824. It shows the fortification constructed directly on the beach. The castle had been built by King Henry VIII in 1540, in the shape of a Tudor Rose, and aimed to provide a powerful deterrent from attacks by the French.

How can the artwork inform coastal risk management?

This view of Deal Castle by William Daniell provides a very precise depiction of the location of this important heritage structure on the beach at Deal. Beach levels can be compared with later images and photographs over time to assist the understanding of coastal change along this part of the open east Kent coast. The coastline has since been defended with a concrete seawall approximately 20m seaward of the foremost element of the castle defences.

Where can the original artwork be viewed?

The image can be viewed easily on the Internet.

Ranking score achieved by the William Daniell aquatint engraving: 55.

B5 Walmer Castle, Kent

Location

Walmer Castle is located on the east Kent coast at the southern end of the Deal town frontage, and is situated immediately behind the beach.

Why was the study site selected?

Walmer Castle was chosen as a study site because it is contiguous with Deal Castle and is located adjacent to the low-lying coast. An aquatint engraving also by Daniell was available, which provides details of the castle structure and its relationship to the beach in the year 1824. The heritage importance of this structure adds further value for the Arch Manche project.

Geomorphological setting

The town of Deal lies on the open coast, with a mixed shingle and sand beach to the north and shingle beaches along the frontage, which is defended. The area to the north of Deal is low-lying, whereas to the south of the town the land begins to rise to meet the cliffs at St Margaret's Bay and South Foreland.

Key coastal risk management issues for the frontage

To the north, the frontage consists of shingle beaches backed by an embankment of shale and a narrow dune system. The beach and dunes are of international environmental importance. Along the coastline of the Deal frontage assets are protected by a shingle beach with timber groynes and a concrete seawall. Flood defences also provide protection for a large area of the town from flooding. The coastal risk management policy is to seek an improvement to reduce erosion and flood risk, through beach management, by increasing the volume of the shingle beach. There is also the possibility of improving the seawall along the Deal frontage to reduce the risk of overtopping. South of Deal Castle there are no formal defences and the intention is to carry out minimal work and maintain the beach; it is unlikely that any properties will be at risk if this approach is adopted.

Observations on the artwork

This view within Figure 3B19 shows the southern-most of three castles (the others are at Deal and Sandown) built in the 1530s by King Henry VIII. In the view by William Daniell (c.1824) the castle appears situated immediately above the beach. The beach appears to have taken on a barrel form with a crest, along which people can be seen walking, whereas, behind, shallow lagoons of water indicate where the sea has flooded through the barrier beach. A low wall appears to protect the foot of the slope below the castle from coastal erosion. The view describes, in a very precise way, the morphology of this part of the coastline, in particular the form of the cliffline and the extensive beach, looking northwards towards Deal.



Figure 3B19. In his view of 'Walmer Castle' (1824) Daniell provides us with an extensive and detailed depiction of the shoreline and cliffs. The form of the beach at low water can be seen clearly. Some defences have been put in place around the frontage of the castle, which forms a hard point along this relatively soft coastline. Private Collection.



Figure 3B120. An oil painting by Henry Pether (c.1852) shows how the castle frontage has been extended seawards to create a lawns and a coastal path. Image courtesy of Woolley & Wallis, Salisbury.

How can the artwork inform coastal risk management?

The coloured aquatint engraving illustrates coastal conditions in the early nineteenth century and contrasts significantly with the present day situation where the beach appears much more stable, with the upper beach being vegetated. Whereas, in the view by Daniell, the Castle appears vulnerable to erosion and demanded the provision of a seawall, the present structure appears much more secure. The frontage could become increasingly vulnerable in the future as a result of coastal erosion promoted by rising sea levels, and so it is likely that the defences will be maintained for the foreseeable future, but may require replacement in the long term.

Where can the original artwork be viewed?

The image can be viewed easily on the Internet

Ranking score achieved by the William Daniell aquatint engraving: 55.

B6 Leas Cliff Hall Beach, Folkestone

Location

Folkestone is located on the south east coast of Kent, eight miles (12km) to the west of the port of Dover. It faces directly out across the Straits of Dover.

Why was the study site selected?

The site was selected to illustrate how art can demonstrate historical beach levels.

Geomorphological setting

The geology of Folkestone comprises rocks of the Cretaceous period, including the Wealden Clay, which is overlain by the Lower Greensand, the Gault Clay and Upper Greensand and, above that, the Chalk. Each of these strata are exposed in turn along the coastal frontage between Folkestone and Dover. The site in question, known as 'The Leas', comprises an unstable coastal slope, which has been developed on the relic sandstone cliffs, with a sand and

shingle beach at the toe. Along the top of the coastal slope there is substantial tourism and residential development, whilst the slopes have been cultivated into extensive public gardens.

Key coastal risk management issues for the frontage

There are substantial assets in terms of property and infrastructure along this frontage, which will continue to be maintained and improved as required. The policy along the Folkestone frontage is to hold the coastal defence line by maintaining the existing seawall and the arms of the harbour, as well as the groyne, which help manage the shingle beach along the western and central sections of the frontage and provide toe support for the slope behind, which is prone to instability.

It may be necessary to upgrade the coastal defences in the future as a result of sea level rise and possible coastal squeeze, with rising sea levels causing scour in front of the existing seawall structures. Maintaining a beach for tourism purposes along the frontage may be increasingly difficult in the future, and may require artificial recharge.

Observations on the artwork

This view of the Leas Cliff Hall frontage at Folkestone was painted in the 1920s by the prolific artist Alfred Robert Quinton (1853-1934) (Figure 3B21). Although painted as an illustration for a colour picture postcard, the work is surprisingly accurate in terms of the detail of the coast protection structures and in terms of showing the beach levels. It is interesting to compare it with the photographic postcard from the early 1900s (Figure 3B22). Because of the considerable number of views produced by Quinton around the English coast during the Edwardian period and later, they are particularly useful when making comparisons of beach levels against the seawalls and groyne.

How can the artwork inform coastal risk management?

The artwork can be used to demonstrate changes in the form and volume of the beach over time. Bearing in mind that along much of the coastline of England, no formal monitoring systems existed until some 20 years ago, it is possible to use images such as this to gain a longer term perspective on beach change and to gain insight of past conditions which may assist the selection of coast protection options for frontages in the future.

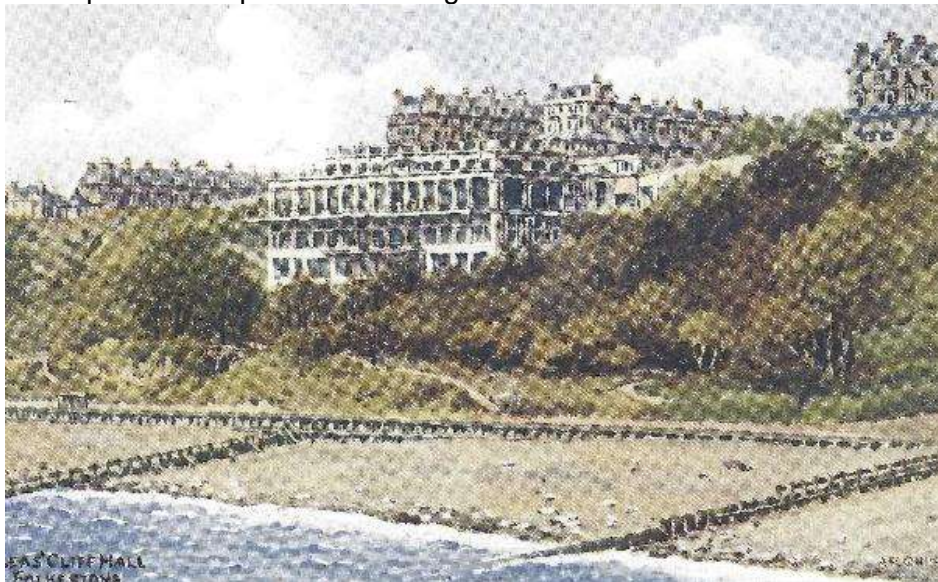


Figure 3B131. The Leas Cliff Hall in about 1900. The view was painted by the prolific coastal watercolourist, Alfred Robert Quinton. His view shows the wooded coastal slope and the beach levels against the coastal revetment and groyne (Image courtesy of J. Salmon of Sevenoaks).

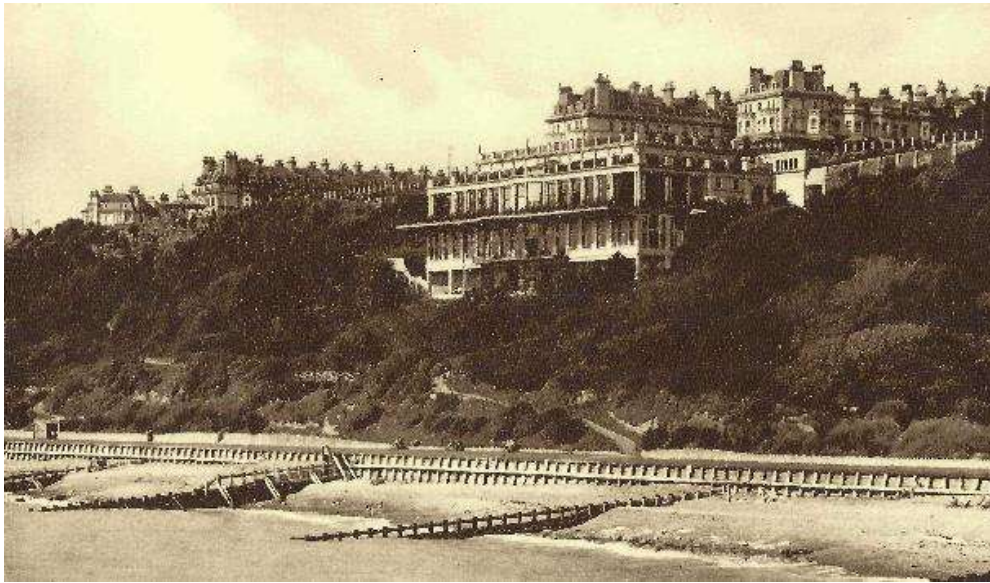


Figure 3B142. Photograph taken in 1900 and compares closely with Quinton's watercolour (above); the beach appears lower and steeper in this view. Private Collection.



Figure 3B153. The present day view, shows the coastal slope, which has faced some instability problems and the upgraded coastal defences including rock groyne.

Where can the original artwork be viewed?

Colour picture postcards by Quinton can be viewed easily on the internet.

Ranking score achieved: 70.

3B.6 Analysis

The Kent study area has combined the use of archaeological and palaeoenvironmental data with historic artworks in order to demonstrate how these tools can be used to improve understanding of coastal change in the long and short term. A particular focus has been on the use of coastal heritage features, namely the coastal defences built during the reign of Henry VIII and Dover Castle built in the 12th Century. Such heritage features have a long history of use and

are also regularly depicted in historic paintings and easily identifiable on historic maps. This section presents the most informative and reliable data gathered from this study area for contributing to understanding of the scale and pace of coastal change.

3B.6.1 Archaeology and Heritage Features

As described in Section 3B.3 the archaeological assessment runs along the eastern coast of the county, from Margate in the north, to Dover in the south. This stretch of coastline contains evidence of human activity from all periods of history; from prehistoric settlements, possible Bronze Age wrecks and Iron Age hillforts, through to Medieval and Post Medieval fortifications and up to the Second World War. However, many of the highest scoring sites, in particular the prehistoric sites, require more in depth study in order to understand the full extent of the sites and what they can tell us about sea level and environmental change.

More recent sites particularly the Medieval and Post Medieval defences provide key information on coastal change. The Tudor 'Device' forts, constructed during the reign of King Henry VIII, are considered the first purpose built coastal structures to defend against military attack in the country. The forts were built in two phases. The first, in response to a perceived threat of French invasion, were constructed between 1539 and 1540. The later forts were constructed between 1543 and 1545 and their different designs reflect the changing nature of siege warfare and firearms. Although they were quickly rendered obsolete by technological advances, many of them were remodelled and reinforced through history, up to and after the Second World War.

These sites are often depicted in historic artworks and are clearly identifiable on historic maps, the analysis has therefore focussed on the use of combined resources to inform past coastal change. This is discussed below in Section 3B.6.3.

3B.6.2 Artistic Depictions

The Kent art study sites have provided six good examples which demonstrate how historical artworks can inform us of changing coastal conditions over the last two hundred years. Four of the images that have been studied are aquatint engravings by William Daniell RA, which were engraved in 1824; one view is an oil painting and the final view is a watercolour drawing. The works by Daniell, in particular, provide, in effect, an illustrated *State of the Coast* report for the 1820s because his views are numerous.

The establishment of a list of key artists that painted the Kent coastline through the ranking system directed research to the higher scoring case study locations. However, where a particular site offered interesting potential for study of coastal change the highest ranking image available was selected for study even if the score was not as high as at other sites. Initial assessment sought to undertake a qualitative assessment of the artworks in terms of their usefulness in informing coastal risk management. Analysis of works by some artists also allowed quantitative assessments, particularly where structures such as harbour walls, groynes or historic buildings exist and where beach levels are clearly indicated or where actual cliff retreat can be measured against a structure. For example, at Deal and Walmer Castles or against the timber groynes at Folkestone.

In terms of the case study examples for soft cliffs the story of erosion at Reculver is particularly interesting to observe through the eyes of the numerous artists drawn to this location. Natural change has now been halted through the provision of a substantial rock revetment, which now protects the church ruins. As described above the church at Reculver has been painted by several artists over the last 200 years, and the rate of erosion can clearly be seen. At Folkestone the coastal cliffs and slope are partially masked by vegetation, which together with coastal defences help to reduce instability problems. Here artistic evidence can be compared to

photography of the period and they show a close similarity. Again substantial defences provided added risk reduction measures for the frontage.

Perhaps the most striking image from the east Kent coast is the detailed oil painting by William Dyce RA of Pegwell Bay. The painting demonstrates the extraordinary skill of some of the Victorian artists and the detailed information that their works can impart. The two views by Daniell of the Deal frontage showing Deal and Walmer Castles are interesting because they provide detailed information on the form of the beach, which constitutes a key element of the flood defences for low-lying parts of the town.

3B.6.3 Combined Resources

Heritage sites are well represented in historical surveys, artworks, plans and maps, which provides an excellent opportunity to assess them using a mixture of sources. This is particularly true of sites like castles and forts that receive surveys for military purposes and often inspire painting and engravings.

The three forts built along the Kent coast at Sandown, Deal and Walmer were built to protect the Downs Roadstead, an offshore anchorage protected from the worst of the weather by the Goodwin Sands. They were part of the first phase of construction that took place in 1539 and 1540. Sandown and Walmer Castles, the northern and southern forts, were both constructed to a similar design, the whole castle was surrounded by a dry moat, itself enclosed by a counterscarp (outer) stone wall. Deal Castle, the central fort, was significantly larger with six small 'lunette' platforms around the central tower and six outer bastions. It too was surrounded by a dry moat. All three forts were linked by a series of earthen entrenchments and bulwarks that ran along the shoreline between them (Saunders, 1989, 38-39).

A major survey of all the Crown fortifications was conducted in 1623. The three 'Forts on the Downs' were all found to suffer from leaks within the towers themselves, and many cannon were unserviceable. However, the most costly repair for all three forts was the outer wall of the moats, which had been battered by the sea. A great breach was thought to be imminent at Walmer and at Deal the wall's impending failure left the fort "in a perpetual imminent danger to be ruined". Some 80 metres of the 5 metre high wall needed repairing at Sandown; at Walmer a new 85m wall with a sluice was recommended (Kenyon, 2013: 131-137).



Figure 3B164. William Stukeley's 'bird's eye view' of the southern forts, showing Deal Castle (foreground) and Walmer Castle. 1725.

The three forts were sketched by William Stukeley in 1725 (Figure 3B17). Stukeley produced two views of the northern flank of the defences, and a bird's eye view of the southern side. The sketches are revealing in that they show the water running right up to all three forts and against the earthen defences. The beach would appear to be right against the outer moat wall and may have even breached Walmer's moat (Saunders, 1989: 39). This is supported by a 1725 War Department plan of Walmer Castle that shows the moat wall as incomplete on the coastal side of the fort and that the mean high water mark is only 10 to 11 metres from the two eastern bastions. An annotation suggests that the loopholes on this side have been walled up to prevent the sea from flooding through them.

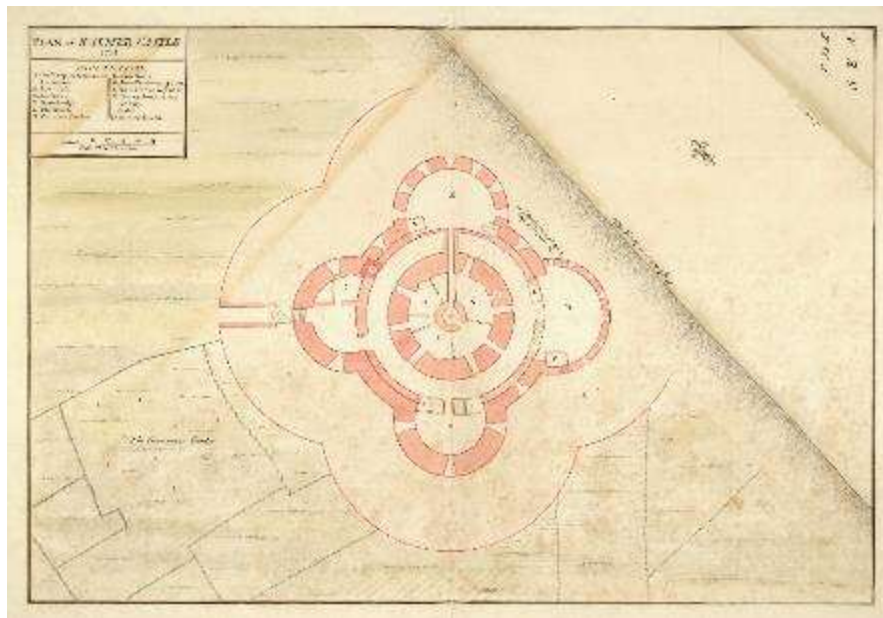


Figure 3B175. War Department plan of Walmer Castle (1725)

This state of the coast is reflected in Daniell's painting 'Walmer Castle' (1824), which clearly shows the proximity of the shoreline to the fort (Figure 3B). In fact the high water mark seems to have moved even closer to the fort and defences installed to prevent the water from flooding the moat. Since then a slow process of land reclamation appears to have been undertaken. By 1872, the date of the first OS County Series map, the dry moat has been fully enclosed and the mean high water mark is a full 120m away from the eastern bastions. By 1906 it is 140m and by 1938 it is 170m away and a fully surfaced road runs between the fort and the shore.

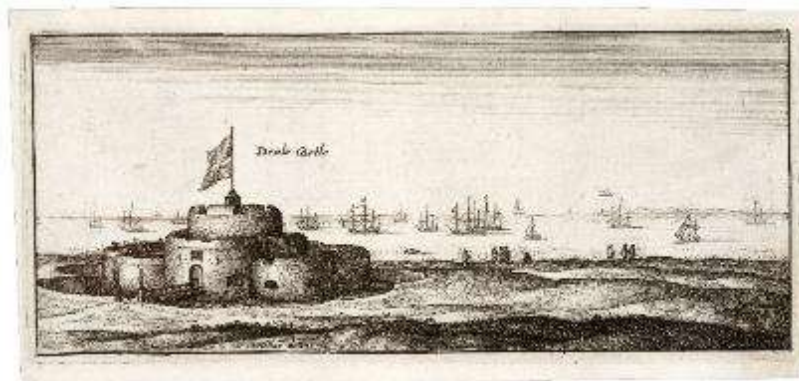


Figure 3B186. Wenceslaus Hollar's engraving of Deal Castle, 1824.

At Deal the fort was built to a similar standard at Walmer, but had six bastions instead of four. A 17th century engraving by Wenceslaus Hollar shows the moat as dry, but the proximity to the coast is notable. Daniell's Deal Castle engraving of 1824 appears to show the shoreline creeping closer to the fort and even beginning to undermine the moat's external wall. Again, the OS County Series maps chart a slow reclamation of the shore and the mean high water mark moves from 20m away from the moat in 1872 to 45m in 1938.



Figure 3B197. Ordnance Survey maps of Deal Castle. From left to right, top to bottom: 1st edition (1872), 2nd edition (1898), 3rd edition (1906), 4th edition (1938), modern aerial imagery (2014) and merge of the 1st edition map with modern aerial imagery, showing the full extent of coastal change since 1872

Sandown, the northernmost of the three forts, has suffered the most from coastal erosion. Although evidently in use up until the 19th century, the moat was apparently breached at the end of the 18th century and a Victorian plan from 1860-1865 shows the fort itself half sat on the beach; the dry moat has been totally lost on the east side and the two eastern bastions face directly onto the beach. An attempt has been made to close the remaining moat off from the sea and there are a number of groynes on the beach, presumably to try and stabilise the shoreline. This condition is reflected in an 1853 print from the Illustrated London News that shows the sea lapping against the eastern bastions (Figure 3B28).

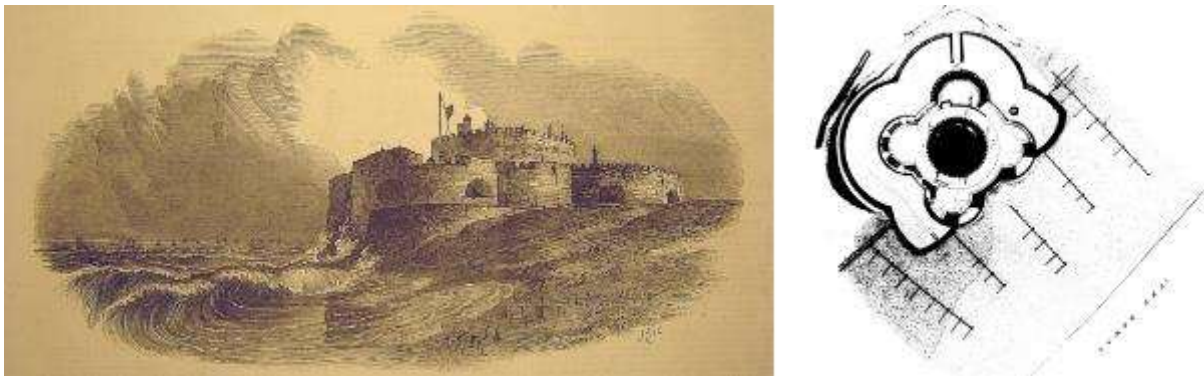


Figure 3B208. Two views of Sandown Castle; a plate from the *London Illustrated News*, 1853 and; a *Royal Engineer Map* from 1860-1865.

By 1872 the condition is much worse; the OS County Series first edition map shows the castle to be largely destroyed by the sea. Artwork from the *Illustrated London News* on 18th November 1882 shows the fort at the time of its demolition (the War department having decided that nothing could be done to sustain it); the fort's central keep and bastions are largely ruined. All trace of the fort bar the foundations of the two westernmost bastions has been removed by the second edition map of 1898.



Figure 3B29. Sandown castle seen from the beach in the early 1900's.

3B.7 Conclusions and Recommendations

The Shoreline Management Plan Review for the Isle of Grain to South Foreland does recognise the historical perspective, noting that erosion and flooding is nothing new. Such historical evidence can be used to help with future planning and management, however, much of the Kent coast has had coastal defences built and witnessed land reclamation meaning that very little of the coast is now natural. Human intervention here has had a dramatic effect on natural change, with large concrete defences reducing erosion and therefore preventing any sediment being recycled resulting in the loss of beaches.

The Kent coastline was painted by numerous artists, allowing a chronological succession of works to be viewed, which describe coastal change in detail, a good example is the site of Reculver on the north coast. William Daniell created numerous views of the Kent coastline

providing a *State of the Coast* visual report for the county in the 1820's. These can demonstrate social and development changes as well as physical and environmental conditions at that time.

Such artworks should be used to support investigations of long-term coastal change, in particular where buildings and other structures are visible it is possible to make judgements on the rate and scale of cliff and beach change. The ranking system has provided a list of artists that depict this coastline most accurately and can be used by those wishing to learn more about coastal change at specific locations.

Data from prehistoric sites is limited, with little known about specific dating or environmental analysis. Further work would be required to investigate these sites in detail in order to reconstruct the ancient landscape and create an evolution model of change over time. The Medieval and Post-Medieval record is more detailed, particularly the coastal defences built in the 12th Century and later by Henry VIII. Even in the 17th Century these sites were recorded as being at risk from erosion by the sea. Later human intervention along this coast has meant that two of the three main forts are now further from the sea than they were when built, but one has now been destroyed by the sea.

Combining artworks, archaeological data, coastal heritage, maps, charts and photographs demonstrates coastal change over at least the last 1,000 years on the Kent coast, providing additional material for ongoing coastal monitoring which only started in the last 10-20 years.

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