

## CASE STUDY 3E - WEST DORSET AND EAST DEVON

**Case study area:** West Dorset and East Devon, UK.

**Main geomorphological types:** Harder and soft clifflines, shingle and sandy beaches

**Main coastal change processes:** Coastal erosion, landsliding, beach change, sea flooding

**Primary resources used:** Art.

**Summary:** The study area coastline comprises high cliffs of Jurassic and Cretaceous age, which include extensive landslides. These cliffs back beaches of pebbles, shingle and sand. Where rivers flow towards the sea through valleys such as at West Bay there have been historical flooding problems.

**Recommendations:** Analysis of artistic depictions has demonstrated areas of the coast where active landslips have taken place, in addition to showing where there has been little change over time. Further review of artistic images in conjunction with archaeological and historic sites would provide more detail of past change to coastal managers.

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 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.

West Dorset and East Devon is one of six UK case study areas for the Arch-Manche project. This section introduces the study area and why it was chosen as part of the project, and then presents 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 presented. For further details about the project and the methodology see [Section 2](#).

Within the study area the available art resource has been researched, ranked and analysed. The extents of the detailed study areas are shown in Figure 3E1 below.

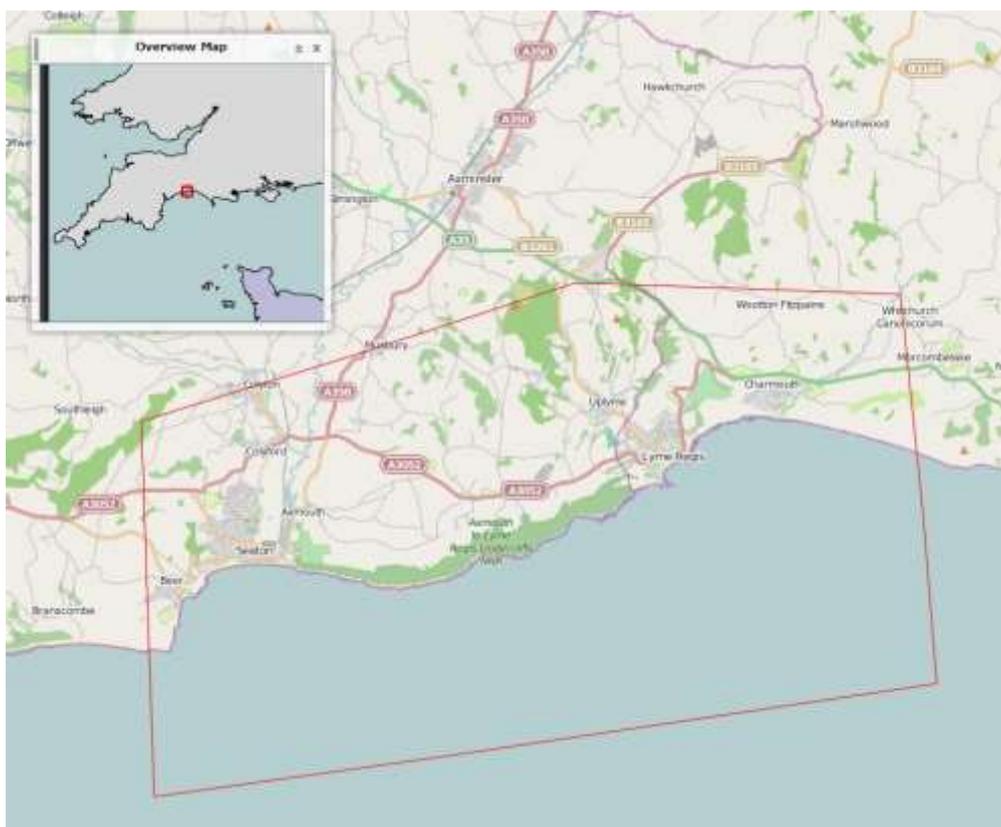


Figure 3E1: Map of the West Dorset and East Devon case study area

### 3E.1 Introduction to the Study Area

The West Dorset and East Devon case study area extends from the coastal resort of West Bay near Bridport in Dorset westwards via Charmouth to the town of Lyme Regis; it then continues westwards as far as the village of Beer in East Devon; in total a coastal frontage length of 16 miles (25km). The site forms part of the Dorset and East Devon Coast World Heritage Site known as the *Jurassic Coast*. This part of the coastline of the west of England has provided inspiration for numerous artists over the last 200 years, and the popularity of these counties for tourism on account of the dramatic coastal scenery has ensured that there is a rich resource of landscape paintings, drawings and prints, as well as illustrated literature accounts, to support this study.

#### 3E.1.1 Geology and Geomorphology

This case study area considers two coastal frontages to the east and west of Lyme Regis. The eastern study site is West Bay near Bridport where a small harbour was constructed in 1722 at the mouth of the River Brit. On either side of the village the cliffs rise up steeply and are composed of vertical cliffs of the Bridport Sands of Jurassic age, which rise in height to over 45m. The river valley runs through an alluvium flood plain and across the beach to the sea. The construction of the two parallel harbour arms allowed access to the sea but has interrupted sediment transport along the coast. This has led to increased erosion on the western cliffs and necessitated artificial beach nourishment in the past. Major improvements to flood and coastal defences were completed in 2009.

The western section of the East Devon - Dorset World Heritage Site coast provides an outstanding combination of significant geological and geomorphological features. At the western end of the frontage, the Chalk and Upper Greensand strata form the cliffs at the village of Beer, whilst, to the east of the River Axe, which enters the English Channel at Axmouth, the cliffs are composed of mudstones overlain by the Upper Greensand and Chalk, with a capping of recent Plateau Gravels. These sequences continue in the cliffs until,

approaching Lyme Regis, the Blue Lias Clay of the Jurassic period start to appear in the lower part of the cliffline.



*Figure 3E2: A view looking eastwards along the Lyme Regis Dorset frontage. To the east of the town is the landslide complex of Black Ven. Further east is the village of Charmouth whilst the eastern end of the study site is at West Bay (out of photograph). Photograph courtesy of Wightlight Gallery.*

The Blue Lias forms the dramatic cliffs to the west of the town of Lyme Regis, with parts of the exposure being obscured by the extensive landslip systems at Bindon and Downlands, which were dramatically depicted in the nineteenth century lithographs by Dawson, Conybeare and Buckland (Conybeare and Buckland, 1840). To the west of Lyme Regis, which occupies the banks of the River Lyn and the adjacent hillsides, lies Black Ven, which forms one of the largest coastal landslide systems in Great Britain. The cliffs are composed of Jurassic Black Ven Marls and are capped by the Gault Clay and Upper Greensand. At this point the cliffs reach a height of approximately 134m. To the east the River Char, at the village of Charmouth, marks the eastern boundary of this part of the study area.

The rocks on this part of the Devon and Dorset coast were folded and faulted during the earth movements that formed the Alps and the Himalayas some 20 million years ago, known as the Alpine Orogeny. These earth movements led to formation of geological structures, such as the Weymouth and Purbeck Anticlines to the east, and the dramatic series of ridges and valleys to be found in South Dorset. The area was not directly impacted upon by the repeated advances and retreats of the great ice sheets of the Ice Age during the last two million years, however, the Arctic tundra climate, which prevailed during glacial periods, was instrumental in the formation of the chalk downs.

The lower Jurassic Lias cliffs between Lyme Regis and Charmouth are particularly important on account of the well-preserved specimens of marine reptiles that have been found since the eighteenth century. These continued finds, as cliff erosion exposes fresh rock, highlight the historical significance of the area for the study of palaeontology.

The landslides along the coastal cliffs of this part of Dorset are a relatively frequent occurrence and are linked to both the underlying geology, coastal processes and the meteorological conditions. In West Dorset, the lower part of the cliff sections are composed of Jurassic clays and limestones, whilst the top of the cliffs at Black Ven, Stone Barrow and Golden Cap are capped by Upper Greensand of Cretaceous age. Rainwater percolates through the sands of the Upper Greensand until it reaches the clay. Water builds up at this level and seeps out through the cliffline along a spring line. During periods of prolonged rainfall the water levels lubricate the clay surface and increase the mass of the cliff top

sediments, causing the Greensand to slide over the clay, across the undercliff below, and onto the beach.

### 3E.1.2 Environmental Impacts and Coastal Management Approach

The coastline between West Bay and Lyme Regis, and extending on westwards along the South Devon coast, forms one of the most spectacular coastal landslide complexes in Europe and lies within the World Heritage Site, celebrated for its unique geology and natural environment. These clifflines are subject to large-scale potentially catastrophic landslides, which may pose a significant risk to cliff top assets and to public access along the beach and the clifftops themselves. The cliffs form a valuable case study in relation to issues surrounding coastal erosion and landslides, the protection of built assets and safe public access. Development has taken place close to the clifftop and on a landslide complex at Lyme Regis. Although first protected in the nineteenth century, the coast was protected to a higher standard by stabilisation measures above the sea cliffs, comprising slope drainage and piling.

For much of the historical period, the land to the east of the town of Lyme Regis, known as the Spittles, has remained relatively stable. Historical rates of cliff retreat of the unprotected sea cliffs reach up to 0.7 of a metre a year and these rates were exacerbated as a result of the removal of limestone ledges from the foreshore in the past for local cement production. During the mid-1980s a major reactivation of the Spittles landslide complex commenced and has continued to this day, necessitating further studies and investigations, and in 2013/14 further coast protection and drainage measures.

Over time the cliff instability and erosion processes have resulted in the loss of farmland, three coastal roads and a number of properties. The whole frontage has been the subject of detailed study and investigation over many years and the frontage presents serious challenges looking ahead to the future in terms of managing coastal change and striking a balance between the protection of people and the built environment through sympathetic civil engineering schemes, which embrace and celebrate the natural landforms, geology and processes that attracted the World Heritage status.



*Figure 3E3: East Cliff at Lyme Regis. Coast and cliff protection and drainage works are currently in progress in order to reduce risks for cliff top properties and assets. Photograph courtesy Halcrow CH2M HILL.*

Key to the success of the shoreline and coastal strategy for the area has been the significant effort and investment by engineers to understand the geology, geomorphology, cliff behaviour, coastal processes and environment, whilst fully engaging with the local community in determining acceptable and sustainable policies and scheme concepts. Complex ground conditions require complex solutions combining both slope stabilisation and coast protection measures, and these are being developed successfully along this part of the frontage.

Coastal risk management issues along this part of the Devon-Dorset coast are overseen by the South Devon and Dorset Coastal Advisory Group, which was established in 2006 to oversee coastal risk management and the preparation of the Durlston Head to Rame Head Shoreline Management Plan, which amalgamates two earlier plans for frontages to the east and the west. This Coastal Advisory Group brings together ten local authorities covering a 308km length of coastline, with the aim of ensuring the development of a strategic approach for coastal risk management across the frontage.

### **3E.1.3 Description of the Coastal Art of the Study Area**

The coastlines of South Devon and West Dorset, with their dramatic and varied physical environments, attracted numerous artists from the eighteenth to early twentieth centuries. The varied geological formations exposed in the coastal cliffs and unique landforms provided them with inspiration and many were drawn back to these shores time and time again.

During the early years of the eighteenth century, J. M. W. Turner painted numerous views in the west of England. For example, in c.1811 he painted *'Lyme Regis'*, which was taken from Charmouth to the east, looking along the coastline towards the town of Lyme. Between 1811 and 1814 Turner also produced several views along the Devon coastline.

In 1825 William Daniell completed several aquatint engravings of coastal scenes in Dorset and South Devon for inclusion in the latter part of his *'Voyage Round Great Britain'* (Daniell & Ayton, 1814); for example *'Bridport Harbour'* (now called West Bay), and *'Lyme Regis from Charmouth'*. At Bridport Daniell wrote *"it appeared in a deplorable state with the entrance being choked with sand"* (Daniell & Ayton, 1814). Later, the Finden Brothers' publication *'Ports, Harbours, Watering Places and Picturesque Scenery of Great Britain'* (Finden and Finden, 1838) also portrayed this dramatic coastline.

On the Dorset coast, in particular, the fascinating coastal scenery drew artists and gentry who were studying the emerging science of geology. They produced illustrations for fine publications as well as individual prints of the major landslide events that took place at Bindon and Downlands to the west of Lyme Regis (Conybeare & Buckland, 1840), as well as watercolour drawings and fine oil paintings. The prolific coastal artists Samuel Phillips Jackson and William Borrow also painted views of Lyme Regis.

Edward Francis Drew Pritchard (1809-1905) painted along the Dorset coastline, for example, *'East Cliff, with Portland, Dorset in the Distance'* and *'View towards Portland, Dorset'*, whilst Henry Joseph Moule (1825-1904) was a prolific local artist who *"constantly painted the landscape"* and his collection of works provides us with a *"unique record of the Victorian countryside"* (Dorset County Museum). A fellow Victorian artist, Frederick Whitehead (1853-1938), was a naturalist painter who captured the Dorset landscape and coastline with remarkable detail. Other artists who accurately depicted the coastal scenery in this area included William Callow (1812-1908), William Collins (1788-1847), Myles Birket Foster (1825-1899) and Thomas Girtin (1775-1802), who painted a watercolour of Lyme Regis.

The geologically rich coastline of Devon and Dorset also drew many followers of the Pre-Raphaelite Brotherhood in the mid-to-late nineteenth century. Artists such as John Brett

(1831-1902), John William Inchbold (1830-1888) and the topographical and marine artist Edward William Cooke (1811-1880) produced fine paintings and drawings of the coastline.

Cooke was drawn to paint the coastline of the south west of England in part due to a keen interest in geology. Cooke began his “*series of highly-finished pictures in oil to illustrate the chief geological features of the British coast*” (Munday, 1996) such as ‘*Beer Beach Number 4. Fishing Cove of Beer*’ in the 1860s. Cooke was fascinated with the geology of the coastline and he sought to depict the rocks, shingle and cliffs in the most accurate way possible, a technique advanced by the famous Victorian art critic and writer, John Ruskin (1819-1900).

John Brett explored the Dorset coast during the summer of 1870, painting a large number of watercolours of locations including Swanage, Lulworth Cove, Lyme Bay, Charmouth and Lyme Regis. One of Great Britain’s leading sea painters, Charles Napier Hemy (1841-1917), also painted the harbour of Lyme Regis, while the Pre-Raphaelite painter, Sir John E. Millais, painted ‘*The Boyhood of Raleigh*’ (1870) in the nearby small resort of Budleigh Salterton.

The turn of the twentieth century and the increasing number of tourists visiting coastal locations in the south west led to a greater demand for illustrated books and colour picture postcards depicting local scenes. Two artists, Henry Wimbush (1858-1943) and Alfred Robert Quinton (1853-1934), were particularly prolific in their production of pretty watercolours for postcard publishers A. & C. Black, who produced colour plate regional guide books. Popular subjects by A. R. Quinton included Babbacombe, Beer, Budleigh Salterton, Sidmouth, Lyme Regis, Weston-super-Mare and St Michael’s Mount.

The coast of the study area does, therefore, have a rich art heritage that can be interrogated to support the analysis of change over time.

#### **3E.1.4 Art Resources Consulted for the Case Study Sites**

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 West Dorset and East Devon coastal frontage. To achieve this objective, online reviews were carried out of the collections held at the 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 it was necessary to establish if there were relevant artworks contained in museums and art galleries in Devon and Dorset including the Russell Cotes Museum in Bournemouth and the Dorchester and Lyme Regis Museums. 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, 2004a & 2004b) and the BBC *Your Paintings* website (See [Section 2.1.2.1](#) for further information on this resource). Research also made use of important publications and exhibition catalogues (also see [Section 2.1.2.1](#) for more detail).

### **3E.2 Results of the Art Scoring**

The development of the ranking system is described in [Section 2](#). In order to rank the artworks a database was established into which data was entered for both archaeological/maritime heritage sites and for artworks. By entering the data on artwork type, medium, subject matter, time period and other parameters the database was then able to calculate the ranking scores for eighteen works of art from the West Dorset and East Devon case study site. The highest scoring artwork, a watercolour by Arthur W Perry of ‘*Beer Beach*’ gained 70 points whilst two coastal lithographs of ‘*Axmouth Landslip*’ and of ‘*Lyme*

*Regis'* each scored 66 points. The information imparted by these artworks and others is described in the study examples below. Further details on the ranked artworks are provided in Table 3E.1.

Artists tended to paint attractive or dramatic coastal locations as well as meeting specific demands of their patrons. On the Devon and Dorset coasts they were drawn to the expanding and fashionable coastal resort of Lyme Regis, the imposing sea cliffs and the activities of fishermen working along the shoreline at Beer and elsewhere.

The result has been that many of the sites of key geomorphological and coastal risk management interest have been painted by artists particularly during the nineteenth century. As the aspiration of this study is to illustrate how art can inform on long-term coastal change it is fortunate that within the higher scoring artworks there are examples, which include locations affected by coastal and beach change.



Figure 3E4. Location of artworks in the West Dorset and East Devon study area

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 two study locations along the beach frontage and, for each, several works are analysed as follows:

Study Ref	Location	Artist	Date	Score type	Score period	Score style	Score enviro	Total Score
E.1	Bridport Harbour (West Bay)	William Daniell	1825	Aqua-tint	Early	Topog.	Detailed View	55
E.2	Lyme Regis from Charmouth	William Daniell	1825	Aqua-tint	Early	Topog.	Detailed view	48
E.2	Lyme Regis	David Dunster	c.1840	Lithograph	Mid.	Topog.	Very Detailed View	51
E.2	Landslip at Bindon near Axemouth	W. Dawson	1840	Lithograph	Mid.	Topog.	Very Detailed View	66
E.2	Ruins at Lanslip	J. Dawson	1840	Lithograph	mid.	Topog.	Very Detailed	66

	Axemouth						View	
E.2	The Landslip, Lyme Regis	Alfred Robert Quinton	1920	Water-colour	Late	Topog.	Detailed View	70
E.3	Beer Beach	Arthur W. Perry	c.1890	Water-colour	Late	Topog.	Detailed View	70
E.3	Beer Beach	Alfred Robert Quinton	1900	Water-colour	Late	Topog.	Detailed View	70
E.3	Fishing Cove of Beer	Edward William Cooke RA	1858	Oil	Mid.	Topog.	Very detailed view	62
E.3	Distant view of Beer Head	Edward William Cooke RA	1858	Oil	Mid.	Topog.	Very detailed view	62

*Table 3E1 Art ranking results for West Dorset and East Devon*

A more detailed interpretation of the individual artworks is provided in the study descriptions below. The assigning of scores to each artwork suggests names of those artists who have depicted different aspects of the West Dorset-East Devon Study Site coast most accurately across the timeline 1770-1920. These artists include William Daniell, William Dawson, Edward William Cooke, Arthur W. Perry and Alfred Robert Quinton. They can be relied upon in terms of the accuracy of their depictions of this coastline.

### 3E.3 Discussion of the Art Scoring Results

The West Dorset and East Devon coastlines have seen pockets of development established in the bays and coves over the last two centuries; these have usually been based on fishing communities such as at Beer. Some of these communities, such as Lyme Regis, expanded rapidly during the Victorian and Edwardian seaside development periods. Over the last twenty years considerable efforts have been made to encourage improved coastal management in the west of England 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 South West Coastal Group (covering the extensive coastline from Portland Bill in Dorset to Hartland Point in North Devon) 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.

The case study has assessed the value of various artworks in terms of informing us about beach change and cliff conditions through a combined approach of desk-based research, museum and gallery searches and field visits. These 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 geologically fascinating East Devon and West Dorset coasts testify to their considerable artistic skills in capturing accurately the coastal topography.

The artworks examined illustrate the evolution of this coastline over time and help to explain the nature and rate of the geomorphological processes occurring there. This study focused on the use of historic paintings, however several historic maps, charts and photographs were also consulted to review 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.

### **3E.4 Art Field and Research Studies**

Fieldwork within this case study area was undertaken in support of the art study. It was possible to establish, 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. Fieldwork aimed to help answer the research questions through examination of the artworks at the case study sites. The key questions were:

- 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?

In order to identify the most suitable artworks that could be studied in more detail at the field study sites a national search was undertaken involving an extensive review of landscape paintings, watercolours and prints held in public and some private collections. Following ranking of nineteen artworks twelve examples were the subject of more detailed analysis involving site visits.

Along this frontage there are a range of physical conditions to be found that are of concern for coastal managers including eroding cliffs and cliff instability problems to the east of the town, and issues surrounding the interruption of sedimentary transport processes at West Bay near Bridport. In order to reflect these varying conditions art images have been selected which examine these issues and which allow helpful comparison with the present day.

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 was 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.

### **3E.5 Art Field Data Gathering Results**

The West Dorset and East Devon case study was chosen to illustrate two geomorphological processes, namely beach conditions at a site where coastal development has interrupted natural coastal processes (Bridport), and eroding, unstable coastal cliff and slopes between Charmouth and Axmouth and at Beer. Site inspections have confirmed that the locations selected do provide a good representation of these coastal geomorphology types against which the value of historical artworks can be tested.

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 us to establish a chronology of coastal change through the nineteenth and twentieth centuries. The results for each case study location are described below.

## E.1 West Bay, Dorset

### Location

Bridport is located at the eastern end of Lyme Bay, 15 miles (24km) to the west of Dorchester, and seven miles (10km) to the east of Lyme Regis. The town is located within the East Devon-Dorset Jurassic Coast World Heritage Site.

### Why was the study site selected?

This site was selected to examine issues surrounding beach change on the open coast at West Bay (referred to as Bridport Harbour in early artworks). The harbour arms at West Bay extend across the wide beach and, as a result, have an impact on sediment transport along this part of the coastline. The processes are compared between the view portrayed by William Daniell in 1825 and the present day situation.

### Geomorphological setting

The frontage lies within the internationally renowned Jurassic Coast World Heritage Site. At this location the River Brit runs out to the sea through a valley it has cut through the Bridport Sands, which are of Jurassic age. These sandstones form dramatic clifflines on either side of the small seaside resort of West Bay, which is located in the river valley.



Figure 3E5: 'Bridport Harbour' (West Bay) by William Daniell RA (1825).

Figure 3E5a (inset top) shows the present day view with the much more extensive beach on the east side of the twin harbour arms compared with the western beach. Image courtesy of Halcrow.

### Key coastal risk management issues for the frontage

West Bay is situated at the western end of the shingle spit of Chesil Beach. The east beach at West Bay is designated as a Site of Special Scientific Interest, whilst West Dorset Jurassic

coast is England's first national World Heritage Site. Once a flourishing port, West Bay's fortunes declined after devastating floods occurred in 1824. The parallel historic piers and sea defences at West Bay have suffered major and sustained damage over the last 50 years, and were deemed to be in urgent need of repair to prevent flooding and protect properties from the sea. A major refurbishment of flood and coastal defences was completed in 2009.

### **Observations on the artwork**

The aquatint engraving by William Daniell (1825) shows a view of '*Bridport Harbour*', now known as West Bay, viewed from the hillside on the eastern side of the valley of the River Brit.

Since Daniell's view, the harbour has developed considerably for commercial, tourism and residential reasons. The engraving shows a ship passing through the two parallel harbour arms, which provide access through the beach to the harbour. The extent of the beach is well displayed in the early engraving and bears interesting comparison with the present day view.

### **How can the artworks inform coastal risk management?**

A key consideration for coastal engineers is achieving an understanding of natural coastal processes such as longshore drift. Wherever possible it is highly desirable for the natural coastal systems to be maintained without interruption by structures such as harbour arms or other forms of coastal defences. However, at West Bay, the harbour arms were a necessity if access was to be achieved to the town and quayside, across the wide beach. Here there is a complex sediment transport mechanism (see Figure 3E.6 below). There is a dominant transport in Lyme Bay from west to east; however, at West Bay there is also significant transport just offshore in a westerly direction. This has led to a large accumulation on the eastern side of the harbour and a much reduced beach volume and erosion and cliff set-back by about 100m on the western side (Bray *et al.*, 2004).

In the view by William Daniell (1825) the differences in cliffline and beach volume either side of the harbour arms appear much less marked. This probably relates to the repair, infilling and upgrading of the harbour, which only took place at about the time of Daniell's visit in the mid-1820s. Improvements to the harbour may have led to increased wave reflection and scour and it has been estimated that this could have reduced beach volumes by 0.5million M<sup>3</sup> since the mid-nineteenth century (Brunsden and Moore, 1999). The situation at West Bay has necessitated beach nourishment to reduce erosion and more recently the implementation of a Beach Management Plan. Certainly, his view seems to indicate a more extensive beach on the up drift side rather than the down drift, which is what might be expected.

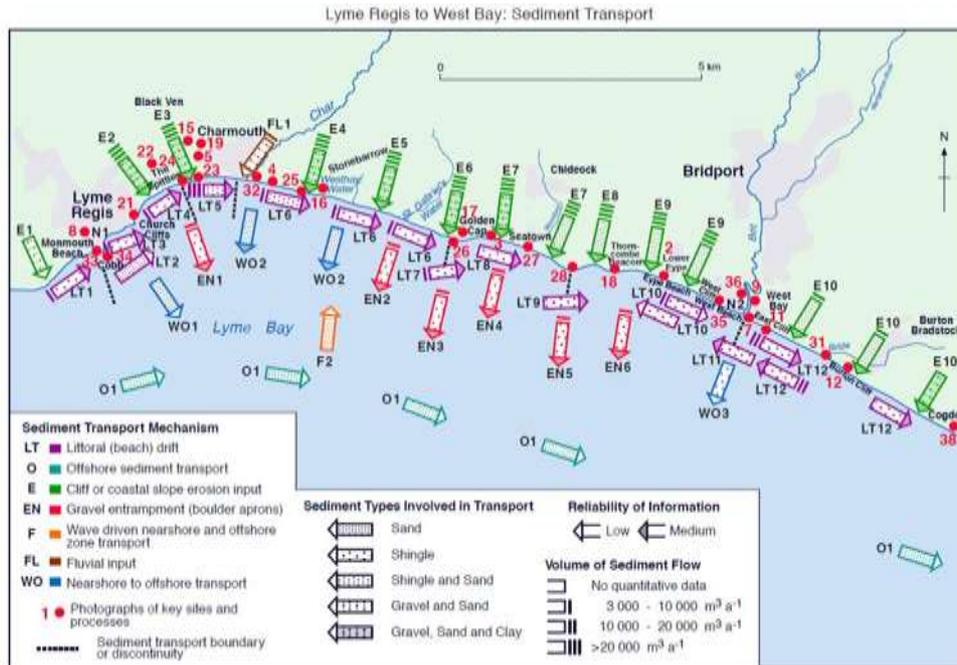


Figure 3E6: Sediment transport in Lyme Bay Dorset (SCOPAC: Bray et al., 2004).

A particular concern and interest to coastal engineers is the volume of beach material that may be available, looking ahead over the next century, from eroding cliffs which will help maintain beaches as a natural form of coastal defence. Rising sea levels may result in increased scour and loss of beach material, but equally, if rates of erosion increase, further material may be added to the coastal sediment budget as a result of cliff falls and coastal landslides. For these reasons, long-term coastal monitoring is essential, and this is being undertaken very effectively around the English coast under the auspices of the Channel Coast Observatory at the National Oceanography Centre, Southampton. However, for many parts of the coastline, monitoring is a relatively recent innovation (less than 20 years) so, if historical information can contribute to our understanding of coastal processes, it is to be welcomed and Daniell's views can support our understanding of the chronology of beach change in this area.

#### Where can the original artwork be viewed?

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

- **Ranking score achieved:** The Daniell view scored 55 points (see Table 3E.1).

## E.2. Charmouth to Axmouth

### Location

The study site includes the coastline from Charmouth to the east of the seaside resort of Lyme Regis extending westwards to the village of Axmouth.

### Why was the study site selected?

The coastline is composed of rocks of the Jurassic period, which are subject to massive coastal land sliding. The study site was chosen to illustrate large-scale geomorphological change along the frontage over the last 200 years.

### Geomorphological setting

The coastal topography is dominated by four flat-topped ridges rising to 200m, which have been truncated by coastal erosion. These ridges are cut by southern flowing rivers including the Lym at Lyme Regis, the Char at Charmouth and the Brit at West Bay. The coastline of

West Dorset and East Devon includes steeply terraced clifflines formed by coastal erosion and landsliding over the centuries. The natural coastal processes in operation maintain, a unique, diverse and distinctive landscape. Where development has taken place comprehensive coastal risk management measures have been implemented but along some frontages, such as at Black Ven, to the east of Lyme Regis, the scale of the processes are so great that intervention would be both impractical and undesirable.

Coastal erosion, the nature of the geology and ground water movements through the coastal cliffs and slopes has led to the formation of landslide complexes, in which the backscar is separated from the beach by zones of degradation and material transport that can extend to several hundred metres in length; these have been the subject of detailed research (Brunsden & Chandler, 1996). The eroding and sliding cliffs contribute to the west to east moving sediment budget.

### **Key coastal risk management issues for the frontage**

Coastal defences have been constructed in the past at both Charmouth and Axmouth and at Lyme Regis with further works at the eastern end of the town currently in progress. Elsewhere the frontage between the two locations is undefended on account of the limited assets that require protection and for environmental reasons. As a result, coastal erosion and landsliding have been allowed to continue uninterrupted. Apart from the coastal risk management at Lyme Regis the main coastal risk management issue is for users of the coastline along the cliff top and the cliff base in terms of public safety.

### **Observations on the artworks**

Daniell's view (Figure 3E.7) is taken from the western side of the beach at Charmouth at high water, looking along the coastline, past the Black Ven landslide complex towards Lyme Regis. In his view, the cliffline in the middle distance appears exposed (rather than vegetated), although there is no obvious evidence of cliff failure. He does, however, depict the lower part of the cliff in the middle distance in a darker colour, perhaps indicating the Blue Lias strata. The hillside beyond shows scattered development with the town of Lyme Regis round the headland. The image shows no obvious signs of instability and although Daniell refers to the fact that '*the cliffs in the neighbourhood contain peculiar attractions for the geologist*' (Daniell and Ayton, 1814) he does not mention cliff or slope instability. This suggests that perhaps the landslides were activated or reactivated during the nineteenth century as a result of changing climatic conditions, sea level rise and human activity.



*Figure 3E7: 'Lyme Regis from Charmouth' by William Daniell RA; 1825. The view looks westwards along the study site frontage towards the harbour arm (The Cobb) at Lyme Regis. The Regency resort of Lyme Regis was starting to expand at this time.*



*Figure 3E8 'Lyme Regis' from the Charmouth road at the top of the cliff looking westwards across the town (by Daniel Dunster). The view is taken from above Black Ven, a very large coastal landslide. The town of Lyme Regis developed on an adjacent landslide complex. Image courtesy R.McInnes.*

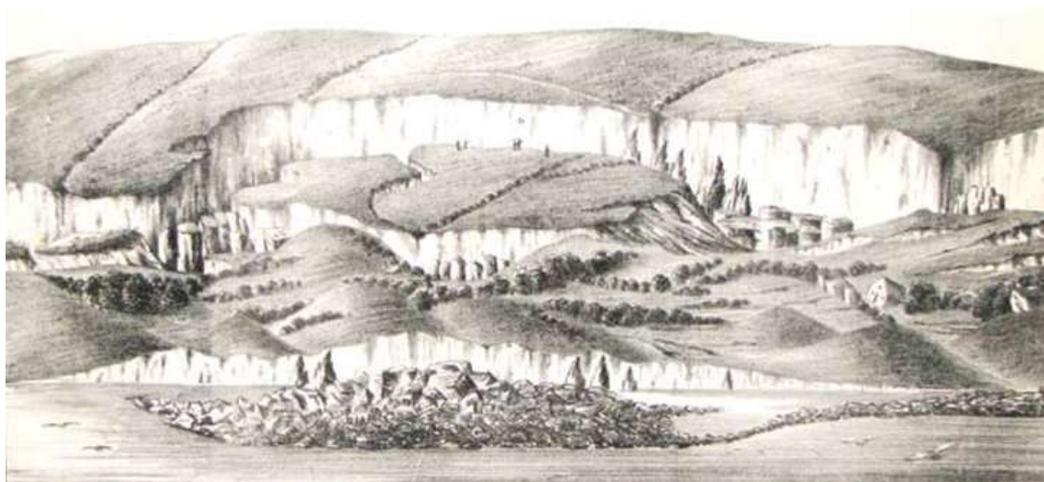


Figure 3E9 A view of the great landslide that took place at Bindon and Dowlands to the west of Lyme Regis on Christmas Day 1839. Image courtesy R.McInnes.

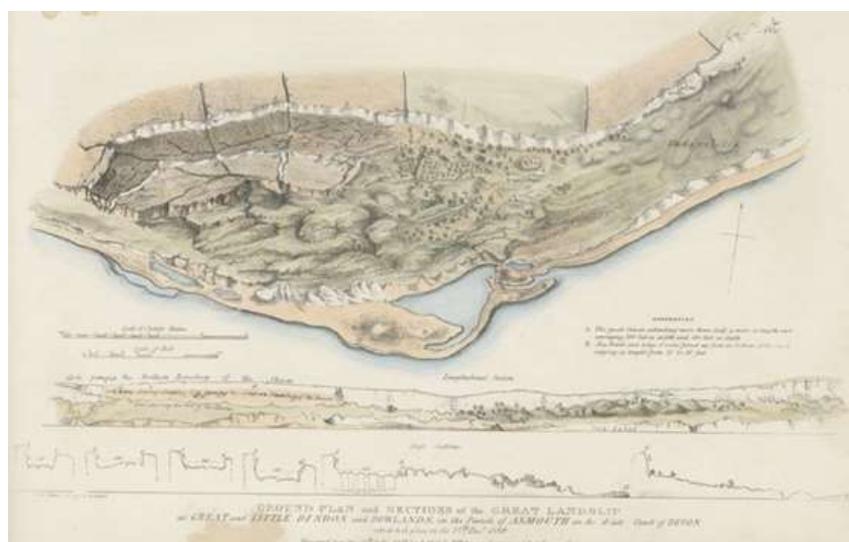


Figure 3E10: The area of the Bindon and Dowlands landslide was studied in detail and the geomorphology was mapped. Private Collection.



Figure 3E11: A further view of the landslide at Bindon and Dowlands is shown in this lithograph. Image courtesy R.McInnes.



Figure 3E12: A view of the Bindon landslide by the prolific watercolourist Alfred Robert Quinton, c.1900. Image courtesy J. Salmon Ltd.



Figure 3E13: This view of the coast west of Lyme Regis shows how the geomorphology is now largely obscured by vegetation. The nineteenth century lithographers, therefore, allow the processes to be viewed more clearly and be better understood. Photograph courtesy: Ian West.

The fine, lithographed view of 'Lyme Regis from the Charmouth road' (Figure 3E.8) by Daniel Dunster provides a detailed depiction of this part of the Dorset coast in 1840 and demonstrates the level of detail that could be achieved using this technique. The landsliding to the west of Lyme Regis towards Axmouth has been described and illustrated through the famous illustrated publication 'Memoirs and Views of the Landslips on the Coast of Devonshire &c.' (Conybeare & Buckland, 1840), which provides several detailed lithographic plates, maps and geological cliff sections as well as informative descriptions. These images and others (see Figures 3E.9 – 3E.12) and works by other artists have helped to understand

the geomorphological processes that have taken place along this coast and were helpful when hazard and risk investigation and management strategies were being developed for this coast in the 1980s and 1990s.

### **How can the artwork inform coastal risk management?**

It has been explained that this section of coast is largely undeveloped, although some properties exist along the clifftops, particularly on the eastern approach to Lyme Regis at The Spittles (see Figure 3E.8). The images do show the progressive development of the town of Lyme Regis across the coastal landslide complex, which forms the coastal slope and cliffs at Lyme Bay. The large number of views of Lyme Regis' produced partly as a result of the town's popularity during the Regency, Victorian and Edwardian eras, but also on account of the geological interest of the locality, collectively form a unique archive of coastal evolution along this frontage.

### **Where can the original artwork be viewed?**

The views by William Daniell can be found easily on the Internet. The plates from Conybeare and Buckland's book can be view on the website of Lyme Regis Museum at [www.lymeregismuseum.co.uk/bindon](http://www.lymeregismuseum.co.uk/bindon).

- **Ranking scores achieved:** The two views by Daniell scored 48 and 55 points, whilst the lithographed views of the landsliding scored 66 points (see Table 3E.1).

## **E3. Beer, East Devon**

### **Location**

The village of Beer is located in the County of Devon, immediately to the south west of the resort of Seaton. It is situated towards the western end of Lyme Bay overlooking the English Channel.

### **Why was the study site selected?**

This site was selected in order to provide comparison between a selection of coastal landscape paintings showing the location depicted from almost exactly the same spot over a period of seventy years. It provides the opportunity to compare the approaches of the artists and to consider the detailed information that these artworks provide.

### **Geomorphological setting**

Beer is located in a valley within Cretaceous strata of the Upper Greensand overlain by the Chalk. The top of the cliffline is capped with more recent Plateau Gravels. The chalk cliffs are well jointed and include horizontal bands of flint, indicating the deposits are within the Upper Chalk. The beach is comprised of mainly shingle with some sand.

### **Key coastal risk management issues for the frontage**

The coastline at Beer is undefended and so the key issues are public safety, in terms of access to the beach and along the foot of the high chalk cliffline.



Figure 3E14: 'Fishing Cove of Beer' by Edward William Cooke RA; 1858. Cooke was very interested in geology and stated that he would have become a geologist were he not an artist. His oil paintings are remarkable for their clarity as well as the attention to geological detail. This view looks eastwards towards Dorset. Image courtesy of the late John Munday/Private Collection.



Figure 3E15: A detailed watercolour of Beer beach and cliffs by Arthur W. Perry (c. 1900). Image courtesy: Private collection. This is a similar view to that shown in Figure 3E.16 below.



Figure 3E16: Watercolour by Alfred Robert Quinton also painted c.1900 (Image courtesy of J. Salmon Limited). And Inset Figure 3E.16a: the present day scene (courtesy of Ian Woolcock).

### Observations on the artwork

Three views of Beer are provided, each looking at the chalk headland from the west. The artworks are very similar in terms of subject matter. The very detailed oil painting by the 'Pre-Raphaelite follower' and geological artist, Edward William Cooke RA, provides the most extensive view looking eastwards. Cooke also painted a view from the opposite side showing Beer Head in the distance (1858). The watercolour by Arthur W Perry, painted c.1900, depicts a closer view of the headland. As in the work by Cooke the geological formations are painted in careful detail. The third and most recent view, a watercolour by Alfred Robert Quinton, was painted in the early twentieth century.

What these artworks show is a remarkable similarity in terms of the shape of the cliffline, the jointing in the cliff face, and the form, profile and nature of the beach. These paintings were all produced by artists who were known for their topographical accuracy, and visual comparisons of this kind help to provide confidence in artworks amongst professionals interested in coastal management in support of their understanding of geomorphological change along their particular frontage.

### How can the artwork inform coastal risk management?

These artworks indicate, first, that the cliffline at Beer is subjected to extremely slow change as a result of coastal erosion and cliff weathering. Second, the beach has remained relatively static over a period of some 70 years, even though there may have been fluctuations over the intervening period. Finally, the vegetation patterns also seem very similar over time. Images, which confirm that the coastal frontage has changed very little over time, are equally important to those which show more dramatic changes, and help to build up a long-term perspective of coastal change along any particular frontage.

### Where can the original artwork be viewed?

The views are all in private ownership.

- **Ranking score achieved:** The view by E. W. Cooke scored 62 points and the watercolours by Perry and by Quinton scored 70 points.

### 3E.6 Conclusions and Recommendations

The West Dorset and East Devon case study area has a rich art history comprising landscape paintings, watercolour drawings and prints as well as finely illustrated books spanning the period particularly from 1825 to 1900. The dramatic coastal scenery including the landslip topography, and the fossiliferous strata led to a demand for accurate artworks and descriptions of the coast, which now form an important resource available for scientific study.

The works by William Daniell provide a generally accurate overview of the coastal scenery in the mid-1820s whilst the great coastal artists such as E. W. Cooke RA offer precise detail in their works; this quest for topographical accuracy is echoed by later artists including A. Perry and A. R. Quinton. This case study has enabled the formulation of a number of conclusions and recommendations for future work.

#### 3E.6.1 Conclusions

1. The West Dorset and East Devon case study area illustrates the processes of coastal change along the frontage including the impacts of landsliding. Elsewhere only modest changes are observed to cliffs and beaches.
2. This part of the English coast was painted by numerous artists and their output provides a chronological succession of works available for study, such as those views of the village of Beer, East Devon.
3. The artworks included in these case study examples demonstrate the level of artistic detail that could be achieved by some of the leading British nineteenth century artists.

#### 3E.6.2 Recommendations

1. Artworks of the West Dorset and East Devon coast can be used to support understanding of the dramatic physical changes that have taken place since the early nineteenth century.
2. These views allow an improved understanding of the changes to the coastal zone as they depict the scenery before extensive tree growth along the coastline.
3. The names of artists that depicted this coastline most accurately (contained in Table 3E.1) can be interrogated by those wishing to learn more about historical coastal conditions in this location.

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