
ELC_28: Tyne Estuary & Belhaven Bay

Site information

Location and summary description:

The Tyne Estuary & Belhaven Bay site is notable for a varied assemblage of dynamic coastal landforms located west of Dunbar. The main features are sand spits, intertidal sand flats, sand dunes, salt marshes, shore platforms, raised shorelines and a tsunami deposit.

National Grid reference:

Mid-point: [NT 64408 79790]

North-west end: [NT 63636 81113]

South-east end: [NT 66149 78563]

Site type: Natural landform; Natural view

Site ownership: Not known

Current use: Open country

Field surveyors: John Gordon

Current geological designations: Part of the site lies in the Dunbar GCR site

Date visited: 2 December 2014

Other designations: Firth of Forth SSSI, SPA and Ramsar site; John Muir Country Park.

Site map

(Figure 33) Tyne Estuary Map. The site boundary includes the landform assemblage of the modern estuary and bay as an integral coastal geomorphology unit. The adjacent bedrock and Quaternary site at Dunbar ([ELC_4](#)) is shown for reference (transparent grey area).

Site description

Background

The site comprises a varied assemblage of coastal landforms, including sand spits, sand dunes, salt marshes, intertidal sand flats, raised shorelines and a tsunami deposit all developed in a highly dynamic environment (ELC_28_P1). Aspects of the coastal evolution, including its wider setting in the context of the deglaciation of the area, are described by Jackes (1973), Rose (1980), Davies et al. (1986), Firth et al. (1997) and Babbie Group ABP Research & Consultancy Ltd (2002). Jackes (1973), Davies et al. (1986) and Firth et al. (1997) provide geomorphological maps of varying detail.

Quaternary deposits and landforms

Shore platforms and raised beaches

The east side of Belhaven Bay displays an assemblage of former shorelines represented by shore platforms and raised beach deposits. A shore platform in the present intertidal zone is cut across gently dipping Carboniferous strata and continues more extensively to the east (see [\(ELC_4\)](#) Dunbar Shore). At the back of the present beach, there is a low cliff and a step up to a second (raised) shore platform overlain by a Holocene raised beach that is utilised by the Winterfield Golf Course (ELC_28_P2), (ELC_28_P3). Inland to the east, the backing cliff of this platform rises to a higher glaciated shore platform. Good sections in the raised beach deposits reveal shelly sand and gravel deposits (ELC_28_P3). However, some of the exposures have been covered by coastal defence works (concrete blocks and gabion baskets that are partly collapsing). Hall (2012) notes that the coastal edge has retreated by some 45 m in this area since AD 1854, indicating significant coastal erosion of the soft bedrock cliff. On the Tynninghame shore, an extensive intertidal shore platform also fringes the bay north-east of Sandy Hirst towards St Baldred's Cradle. The platform here is extensively littered with glacial erratics (ELC_28_P4).

Sections in raised beach deposits and blown sand exposed by recent coastal erosion also occur along the south side of the Tyne Estuary near Hedderwick and along the lower part of the incised Hedderwick Burn (Davies et al., 1986). The presence here of gravel layers with rip-up clasts of mud and broken shells may also represent deposits of the tsunami associated with the Holocene Storegga Slide (Hall, 2012; Smith et al., 2012); see also [\(ELC_23\)](#) (Lochhouses).

Beach-dune-saltmarsh complexes

The site forms a large sediment sink with significant accumulations of sand in the extensive intertidal sandflats within the Tyne Estuary and the adjacent sand dune systems and sandy beaches (ELC_28_P1). The site is of particular interest for the two sand spits of Sandy Hirst and Spike Island (ELC_28_P1). Sandy Hirst extends south from the north shore of the estuary. It appears to have been a relatively stable feature since first recorded on Ordnance Survey maps in 1853 (Jackes, 1973). On its west side, an extensive area of saltmarsh fringes the bay (ELC_28_P5). Saltmarsh is also present along the south-west margin of the site in front of Buist's Embankment.

Spike Island is a relatively recent recurved spit formed by coastal progradation through the growth and attachment of an offshore sandbank sometime after the 1940s (Jackes, 1973). A line of sand dunes has built up along the spit and an area of saltmarsh is developing on the former sandflats on its landward side (ELC_28_P1), (ELC_28_P6). Inland of these saltings, a line of older dunes marks the former coastal edge. The southern part of the present coastal edge of Spike island is relatively low and appears relatively stable, whereas the seaward edge of the higher dunes towards the north end is cliffed and eroding (ELC_29_P7).

Additional Information

The wider geomorphological setting of the site comprises Lateglacial and Holocene raised beach deposits and a range of glacialfluvial landforms and deposits that extend inland from the estuary into adjacent areas of predominantly agricultural land (Jackes, 1973; Davies et al., 1986; Firth et al., 1997). These adjacent features have not been included here, but could be evaluated as part of a revised site assessment in the future.

Stratigraphy and rock types

Age: Carboniferous

Formation: Ballagan Formation

Rock type: Sandstone, siltstone and dolomitic limestone

Assessment of site: access and safety

Road access and parking Access to the southern part of the site is from the A1 via the A1087 to Dunbar. There are public car parks and toilets at the John Muir Country Park access points at Belhaven and Linkfield. Access to the northern part of the site is from the A1 via the A199, A198 and the unclassified road (Limetree Walk) to the Tynninghame

Links car park.

Safety of access No additional precautions beyond those normally associated with visiting a beach and dunes. Visitors should be aware of incoming tides if accessing the beach and intertidal flats and should note that the Belhaven bridge is not accessible at high tide.

Safety of exposure No special precautions are required. Access There is good access on footpaths.

Current condition The condition is good.

Current conflicting activities None known.

Restricting conditions The active sand spit and intertidal areas are covered at high tide.

Seasonal access restrictions may apply over parts of the site during the bird breeding season.

Nature of exposure Coastal

Assessment of site: culture, heritage & economic value

Historic, archaeological & literary associations No known associations

Aesthetic landscape Coastal landscape

History of earth sciences The John Muir Way passes the site.

Economic geology No known associations

Assessment of site: geoscientific merit

| | Rarity | Quality | Literature/collections | Primary interest |
|-------------------------------------|----------|-----------|------------------------|------------------|
| Lithostratigraphy | | | | |
| Sedimentology | | | | |
| Igneous/mineral/metamorphic geology | | | | |
| Structural geology | | | | |
| Palaeontology | | | | |
| Geomorphology | Regional | Excellent | | X |

Site geoscientific value

The Tyne Estuary & Belhaven Bay site displays an excellent suite of coastal landforms and sedimentary environments that demonstrate coastal evolution during the Quaternary, particularly during the latter part of the Holocene, and support a diversity of coastal habitats. There is significant potential for research on past and present processes of coastal evolution, as well as for education and public interpretation on coastal evolution and the links between geodiversity and biodiversity.

The Tyne Estuary & Belhaven Bay is an excellent regional example of an assemblage of dynamic coastal landforms and sedimentary environments.

Assessment of site: current site usage

Community The area is heavily used for recreation, including walking and birdwatching.

Education There is significant potential for education and public interpretation on coastal dynamics and evolution.

Assessment of site: fragility and potential use of the site

Fragility The site would be vulnerable to heavy trampling, off-road vehicle use, tree planting, tipping and coastal protection works.

Potential use School education and public interpretation addressing coastal dynamics and living with a dynamic landscape in the context of climate change and sea-level rise; research on modern coastal dynamics and sedimentary processes; monitoring coastal changes.

Geodiversity summary

The site is an excellent example of a range of active coastal landforms and there is significant potential for research on coastal dynamics and developing its educational value and public interpretation through greater promotion of existing information.

Site Photos

(ELC_28_P1) Satellite image showing the diversity of geomorphological features present.

(ELC_28_P2) East side of Belhaven Bay, showing the intertidal shore platform, low backing cliff and raised shore platform with raised beach deposits on top now occupied by Winterfield Golf Course. The section in raised beach deposits in the foreground is shown in Photo 3. © John Gordon.

(ELC_28_P3) Section in raised beach deposits resting on a raised shore platform planed across dipping mudstone and cementstone at Belhaven. © John Gordon.

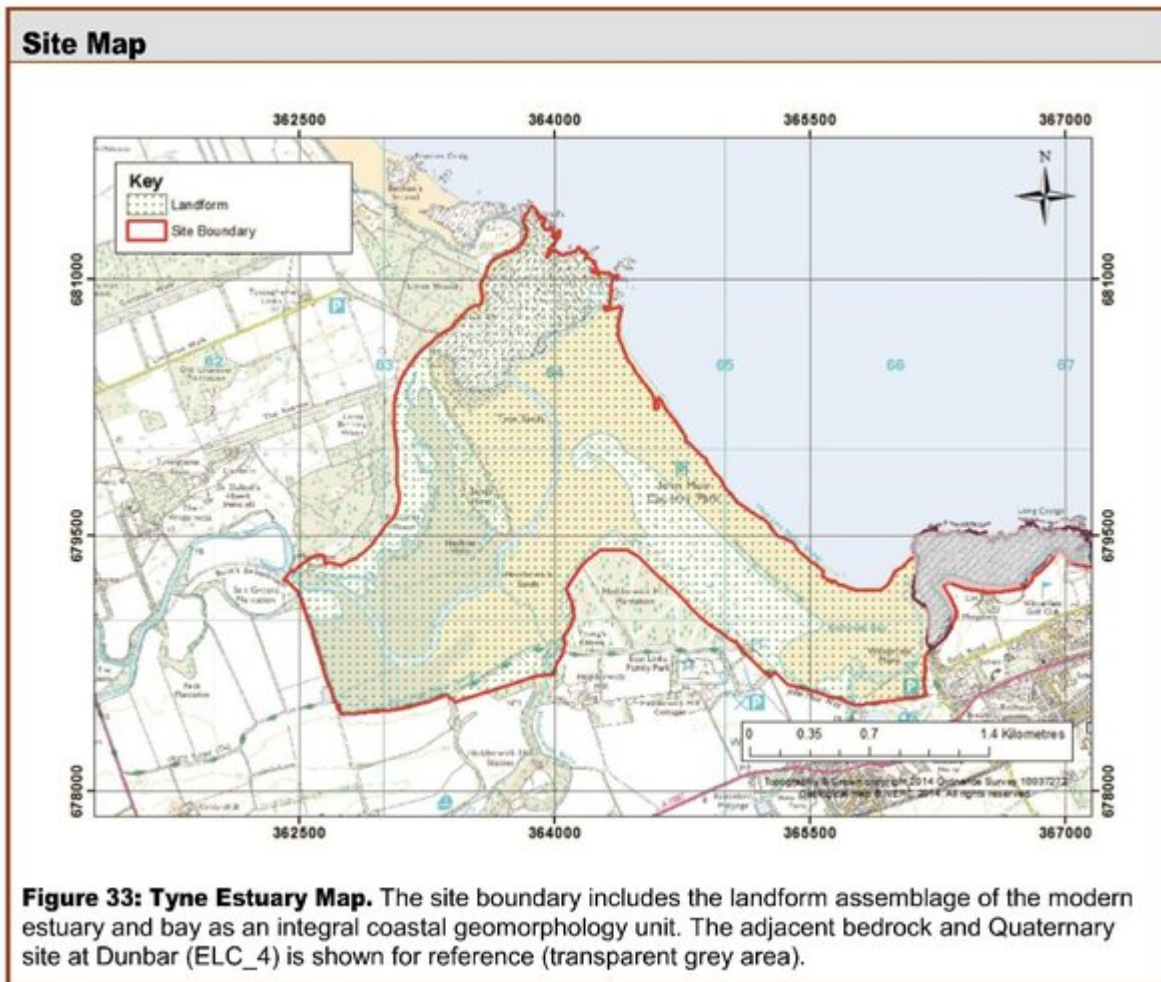
(ELC_28_P4) Intertidal shore platform littered with glacial erratics, north of Sandy Hirst. © John Gordon.

(ELC_28_P5) Saltmarsh on the west side of Sandy Hirst. © John Gordon.

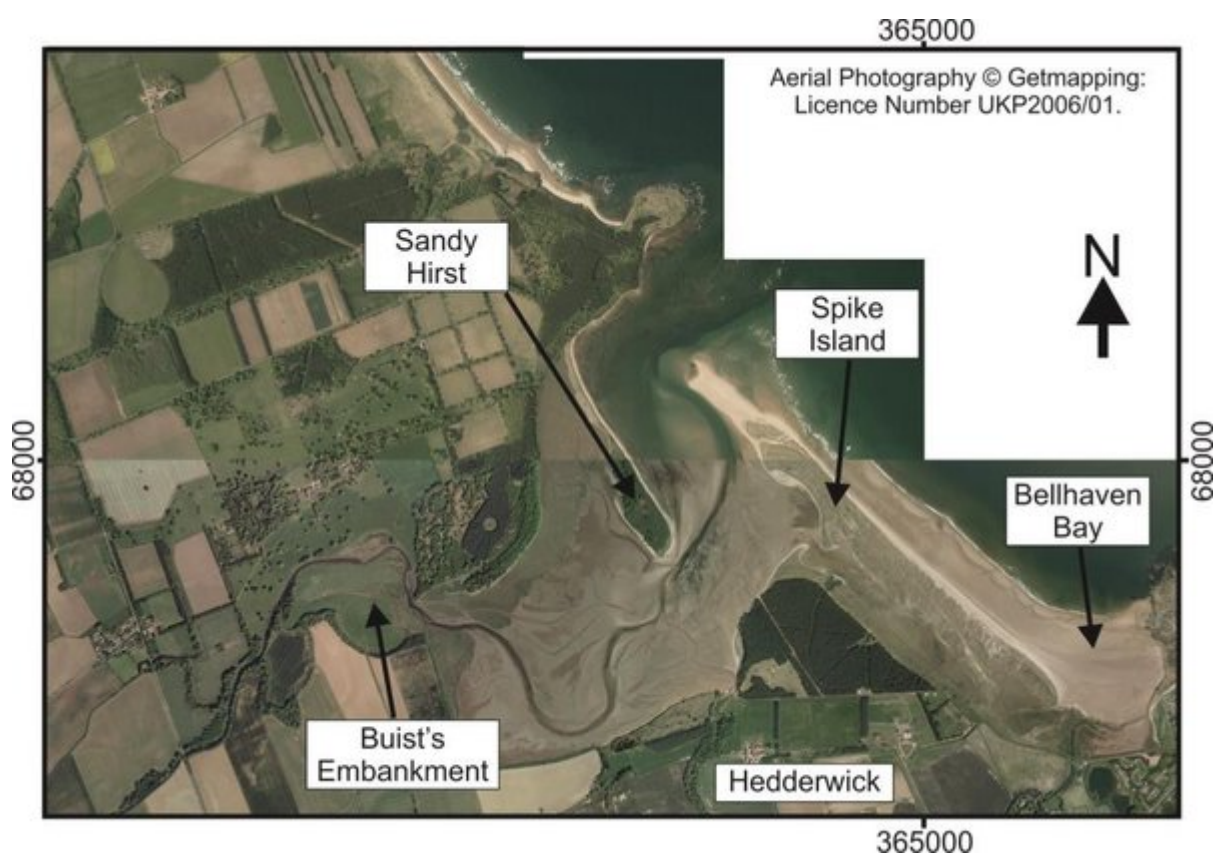
(ELC_28_P6) Saltmarsh development between Spike Island spit (left) and the former coastal edge marked by the line of sand dunes (right). © John Gordon.

(ELC_28_P7) Present coastal edge of Spike Island. © John Gordon.

References



(Figure 33) Tyne Estuary Map. The site boundary includes the landform assemblage of the modern estuary and bay as an integral coastal geomorphology unit. The adjacent bedrock and Quaternary site at Dunbar (ELC_4) is shown for reference (transparent grey area).



(ELC_28_P1) Satellite image showing the diversity of geomorphological features present.



(ELC_28_P2) East side of Belhaven Bay, showing the intertidal shore platform, low backing cliff and raised shore platform with raised beach deposits on top now occupied by Winterfield Golf Course. The section in raised beach deposits in the foreground is shown in Photo 3. © John Gordon.



(ELC_28_P3) Section in raised beach deposits resting on a raised shore platform planed across dipping mudstone and cementstone at Belhaven. © John Gordon.



(ELC_28_P4) Intertidal shore platform littered with glacial erratics, north of Sandy Hirst. © John Gordon.



(ELC_28_P5) Saltmarsh on the west side of Sandy Hirst. © John Gordon.



(ELC_28_P6) Saltmarsh development between Spike Island spit (left) and the former coastal edge marked by the line of sand dunes (right). © John Gordon.



(ELC_28_P7) Present coastal edge of Spike Island. © John Gordon.