

Note / Memo

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Industry & Buildings**

To: Marine Scotland
From: Redacted
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Classification: Project related

Subject: Environmental note for beach protection works at Dunbar East Beach

1 Introduction

This note outlines the potential environmental impacts of a proposed seawall defence project at Dunbar East Beach to support a marine licence application to Marine Scotland. A baseline of the area is outlined in Section 2, and an assessment of potential impacts and proposed mitigation is included in Section 3.

1.1 Project Background

East Lothian Council is proposing construction of a seawall defence project to promote the natural regeneration of Dunbar East Beach. The works are to repair/replace an existing groyne at the south of the site that has fallen into disrepair alongside works to improve the exposure conditions in the bay to encourage any sediment that is in the local system to remain on foreshore. It is hoped by reducing the wave conditions at the beach combined with the refurbished groyne that the bay will retain more sediment and in the long term regain the amenity value that has been lost in recent years. Dunbar East Beach was a sandy beach as recently as 2013, however, following successive storms in 2014 the beach was almost entirely eroded and further storms in the subsequent years has left the frontage devoid of any sediment able to form a beach.

Works to enhance the retention of sediment on the foreshore have been proposed. A previous project with this aim, placing rock armour around an existing Scottish Water sewer outfall pipe, was undertaken in 2017. However, no change in sediment retention was identified. Further works are therefore necessary.

Construction equipment and materials will be delivered to the site by road and the foreshore will be accessed using an existing ramp at the south end of the beach. The groyne structure will be constructed along the line of the existing groyne, the first 4 panels of the old timber groyne will remain as they are, then will be a plant bay gap with fill in planks to allow for movement of plant through the groyne. Following this a new concrete and timber groyne will be constructed. The existing groyne is on the south end of the beach and an approximately 30m long concrete extension along the previous footprint of an old timber groyne is proposed. A small trench will be excavated in the footprint of the groyne extension (approximately 200mm deep) before concrete is cast directly onto the foreshore. It is proposed to then construct a new standalone breakwater toward the southern end of the beach and a new fishtail groyne at the northern end of beach. The breakwater and fishtail groyne will both be constructed from 3-6 tonne of selected rock armour, placed directly onto the foreshore.

Drawings showing the exact positions and dimensions of the new structures and groyne refurbishment works have been attached with this application, as well as an outline method statement. Planning

permission for the works will be applied for in parallel with this marine licence application. Additionally, the Crown Estate will be contacted to discuss landownership.

2 Baseline

2.1 Coastal Processes

Historic investigations show a continuous yet dynamic beach front with the groyne constructed before the 1930s. This was damaged in 1983 and repaired in 1992-1994. Since the late 1990s, evidence shows a general reduction in the level of sand on the beach.

Two studies have been undertaken of erosion at Dunbar East Beach. The first was undertaken by Dr, Pontee (Pontee, 2006) which determined that the beach had decreased since at least 1960 and that this coincides with the deterioration of the groyne and the installation of sewerage pipes. During the same time, there has been a general increase in wind speeds and (since the mid-1980s) an increase in the frequency of wind from north-north-west to north-east directions. It appears that these changes have caused similar changes in the wave climate. This could have produced an increased south-easterly (and possibly offshore) movement of material on East Beach, coupled with a decreased north-westerly movement. This would have produced a net loss of material from East Beach.

The second study undertaken by Pippa van Kuijk and Dr Nick Cooper on behalf of Royal HaskoningDHV (Royal HaskoningDHV, 2016) found that the frontage is exposed to a relatively high energy wave climate from the North Sea and a relatively high tidal range (4.4m on spring tides). Given this exposure, sparse sediment cover over the rocky shore platform is to be expected. Due to the predominant wave direction being parallel to the shore there is expected to be only low-to-modest alongshore transport of sediment in the inter-tidal zone. It is expected that during storm events, material (mostly sand) is drawn down the inter-tidal zone from the upper beach to the nearshore sub-tidal zone (below the low water mark). Once in the nearshore, tidal currents can, if sufficiently strong, transport the material (especially the sand fractions) parallel to the shore, before calmer conditions slowly and progressively bring the material back to the upper beach.

Increased erosion was observed after the construction of a Scottish Water sewer pipe along the beach and parallel to the shoreline and a project to place rock armour around the existing outfall pipe, with the aim of enhancing retention of sediment on the foreshore, was undertaken. Placement of the rock armour was undertaken in 2017, however, no change in sediment retention was identified.

2.2 Marine Environment

2.2.1 Conservation Designations

There are no sites designated for their nature conservation importance within the footprint of the proposed works. No Special Areas of Conservation or Marine Protected Areas have been identified within the vicinity of the works.

Firth of Forth Special Protection Area

The Firth of Forth Special Protection Area (SPA) is 0.5km further north past Dunbar Harbour. The Firth of Forth SPA is a complex of estuarine and coastal habitats in south east Scotland stretching from Alloa to the coasts of Fife and East Lothian. The site includes extensive invertebrate-rich intertidal flats and rocky shores, areas of saltmarsh, lagoons and sand dune.

The Firth of Forth SPA qualifies under Article 4.1 by regularly supporting populations of European importance of the Annex 1 species detailed in Table 1.

Table 1: Qualifying species of the Firth of Forth SPA (Article 4.1)

Species	Count (1993/94 to 1997/98 winter peak means)	% of the GB population
Red-throated diver <i>Gavia stellata</i>	90 individuals	2
Slavonian grebe <i>Podiceps auritus</i>	84 individuals	21
Golden plover <i>Pluvialis apricaria</i>	2,949 individuals	1
Bar-tailed godwit <i>Limosa lapponica</i>	1,974 individuals	4

The Firth of Forth SPA qualifies under Article 4.1 by regularly supporting a population of European importance of the Annex 1 species: sandwich tern *Sterna sandvicensis* during the passage period (a winter peak mean during the five year period 1993/94 to 1997/98 of 1,617 individuals, 6% of the GB population).

The Firth of Forth SPA further qualifies under Article 4.2 by regularly supporting populations of European importance of the migratory species detailed in Table 2.

Table 2: Qualifying species of the Firth of Forth SPA (Article 4.2)

Species	Count (1993/94 to 1997/98 winter peak means)	% of population
Pink-footed goose <i>Anser brachyrhynchus</i>	10,852 individuals	6 (Eastern Greenland/Iceland/UK biogeographic population)
Shelduck <i>Tadorna tadorna</i>	4,509 individuals	2 (North-western Europe biogeographic population)
Knot <i>Calidris canutus</i>	9,258 individuals	3 (North-eastern Canada/Greenland/Iceland/North-western Europe biogeographic population)
Redshank <i>Tringa totanus</i>	4,341 individuals	3 (Eastern Atlantic biogeographic population)
Turnstone <i>Arenaria interpres</i>	860 individuals	1 (Western Palearctic biogeographic population)

The Firth of Forth SPA also qualifies under Article 4.2 by regularly supporting in excess of 20,000 individual waterfowl. In the five year period 1992/93 to 1996/97 a winter peak mean of 95,000 individual waterfowl was recorded, comprising 45,000 wildfowl and 50,000 waders.

Firth of Forth Ramsar

The Firth of Forth Ramsar site is 0.5km further north past Dunbar Harbour. The site qualifies under Ramsar criterion 5 (Assemblages of international importance: Species with peak counts in winter: 72281 waterfowl (5 year peak mean 1998/99-2002/2003)) and criterion 6 (species/populations occurring at levels of international importance). These species are shown in Table 3.

Table 3: Qualifying species/population of the Firth of Forth Ramsar as identified at designation.

Species	Count (5 year peak mean 1998/9-2002/3)	% of population
Species with peak counts in spring/autumn		
Pink-footed goose, <i>Anser brachyrhynchus</i>	7863 individuals	3.2 (flyway population)
Common redshank, <i>Tringa totanus totanus</i>	5151 individuals	2 (flyway population)
Species with peak counts in winter		
Slavonian grebe, <i>Podiceps auritus</i>	68 individuals	2
Red knot, <i>Calidris canutus islandica</i>	7295	1.6
Bar-tailed godwit, <i>Limosa lapponica lapponica</i>	1737	1.4

Firth of Forth Site of Special Scientific Interest

The Firth of Forth Site of Special Scientific Interest (SSSI) is 0.5km further north past Dunbar harbour. The site is an extensive coastal area located on the east coast of Scotland. It stretches from Alloa to Crail on the north shore and to Dunbar on the south shore. It includes the estuary upriver from the Forth bridges and the firth east of the bridges. It is of importance for a variety of geological and geomorphological features, coastal and terrestrial habitats, vascular plants, invertebrates, breeding, passage and wintering birds.

Barns Ness Coast SSSI

The Barns Ness Coast SSSI is 1.5km further south along the coast. The site contains a variety of coastal habitats including shingle and sandy shores, sand dunes and rocky stacks.

The succession of Lower Carboniferous Limestone, rich in fossils, allows correlation between the Scottish Lower Carboniferous and the Lower Carboniferous of Northumbria, hence is of considerable importance. At Barns Ness an almost complete, though heavily faulted, section through the whole lower limestone group is exposed. The dissected raised beach platform on the foreshore at Broxmouth is of geomorphological interest.

The mineral enriched dune grassland, beach-head saltmarshes and shingle are of particular interest as examples of very uncommon habitats in the Lothian area. The grassland contains an exceptionally diverse range of wild flowers, with species such as purple milk-vetch *Astragalus danicus*, restharrow *Ononis repens* and red and white campion (*Silene dioica* and *S. latifolia*). The site as a whole supports a number of locally rare plant species, including sea milkwort *Glaux maritima*, saltmarsh rush *Juncus gerardii*, crested hair-grass *Koeleria macrantha*, yellow horned-poppo *Glaucium flavum*, sea arrow-grass *Triglochin maritimum*, sea meadow-grass *Puccinellia maritima* and various sedges such as sand sedge *Carex arenaria*, distant sedge *Carex distans* and long-bracted sedge *Carex extensa*.

A good diversity of birds, butterflies, day flying moths and invertebrates also add to the interest of the site.

2.2.2 Habitats and Species

The footprint of the proposed works is solely within the intertidal area, an area of intertidal rock. No species or habitats of conservation importance have been identified within the footprint of the works using Marine Scotland's Maps interactive tool (National Marine Plan interactive).

Given the recent removal of sand from the area, it is anticipated that any benthic communities within the intertidal will be opportunistic or pioneer marine species of low conservation value.

2.2.3 Water Quality

Water Framework Directive

The proposed works are taking place within the North Berwick to Barns Ness Coastal Waterbody (ID: 200467) which was classified as Good in 2016.

Bathing Waters

The works are taking place within the Dunbar (East) Bathing Water site (EC bathing water ID number: UKS7616018). The site has been classified as 'Good' for both 2016/17 and 2017/18 bathing waters seasons.

3 Impact Assessment

3.1 Changes to Coastal Processes

Potential impact

There is potential for the works to change coastal processes at a local scale. The aim of the project is to promote deposition of sediment on the foreshore and naturally regenerate the beach.

Mitigation identified

No adverse impacts have been identified and therefore no mitigation measures are required.

3.2 Direct Impact to Intertidal Ecology

Potential impact

Potential direct impacts to intertidal ecology through habitat loss, disturbance and pollution have been identified. Habitat will be lost due to the placement of rock armour on the foreshore. Total habitat loss anticipated to be 0.13ha.

Intertidal areas could be disturbed by movement of heavy machinery during construction works and the refurbishment of the groyne. There is the potential for pollution from spills or leaks of fuel and oil.

However, due to the recent loss of sediment on the foreshore it is anticipated that any species present are of low conservation value. As noted in the baseline, no designated sites or protected species or habitats have been identified within the footprint of the works.

Mitigation identified

- Works will adhere to best practice guidance and pollution prevention measures, such as using spill kits and bunding, and those specifically provided in the CIRIA Coastal and Marine Environment Site Guide (Second edition) (C744) and SEPA's Pollution Prevention Guidance will be followed;

- Work will only be taken at low tide and no equipment will be left within the intertidal environment outside of working hours.

Residual impact

Habitat will be lost within the footprint of the new fishtail groyne and standalone breakwater, however given the lack of protected species and habitats within the area, no significant residual impact to wider intertidal communities are expected. The aim of the works is to reinstate lost intertidal sandy habitat from this area and return the area to the natural baseline which would constitute a beneficial impact to natural habitats.

Construction works from plant movement and the refurbishment of the groyne may have a negative impact, however these are anticipated to be minor and temporary. Any risks to intertidal ecology in terms of accidental spills or leaks will be reduced as far as possible through the identified mitigation.

3.3 Indirect Impact to Intertidal Ecology

Potential impact

Given the scale and nature of the works, no impacts to intertidal ecology outside of the footprint of the works have been identified. As noted in Section 3.1 the works would only impact coastal processes on a local scale and likely beneficially and impacts to water quality are assessed in Section 3.4 below. No other pathways between the works and intertidal ecology outside of the works area has been identified.

Mitigation identified

No adverse impacts have been identified and therefore no mitigation measures are required.

3.4 Changes to water quality

Potential impact

There is a risk that imported materials will decrease water quality locally. Sources of impact could be from:

- Spillages of oils and fuels;
- Spillage of unset concrete; or
- Material (fines) from construction materials.

However, the construction materials of the new structures are to be large rocks with a relatively low percentage of fines. Additionally, disturbance to the substrate may increase suspended sediments in the area. However, works will only be undertaken at on an ebbing tide which limits the interaction between disturbance and the marine environment. Also, the area is predominantly intertidal rock and so limited options for suspended sediments is identified.

Mitigation identified

- Imported rock will be washed of dust before being placed on the beach.
- Works will adhere to best practice guidance and pollution prevention measures, such as using spill kits and bunding, and those specifically provided in the CIRIA Coastal and Marine Environment Site Guide (Second edition) (C744) and SEPA's Pollution Prevention Guidance will be followed;
- Work will only be taken at low tide and no equipment will be left within the intertidal environment outside of working hours.
- The concrete used will be underwater concrete suitable for use in the marine environment.

- The north and south face of the groyne will incorporate formliner finish to encourage colonisation of benthic communities.

Residual impact

The works may have a temporary and minor impact however no residual impacts are anticipated.

3.5 Noise and vibration disturbance

Potential impact

There is potential for heavy machinery and construction works to be a disturbance to local bird populations. However, there are no designations for protected bird populations within the footprint of the works and there are no 'noisy' activities (i.e. activities such as piling or the use of explosives). The designated sites and the footprint of the works are separated by Dunbar Harbour, an operational harbour. It is not anticipated that noise generated by the activities is considerably above the background noise levels of the area. Additionally, works are proposed will be undertaken between March and June, predominantly outside of the sensitive overwintering period.

Noise and vibration may also impact local residents. There are residential properties adjacent to the works area. Increased traffic associated with the works and movement of plant is expected to create disturbance effects. However, the majority of works will be undertaken on the foreshore and a lowered elevation from residential properties. This increased distance and change in elevation is expected to reduce the impact of noise for local residents.

Mitigation identified

- Works will be constrained between 8am and 5pm, Monday to Saturday, and also restricted to where access is possible due to tides.

Residual impact

Although noise will be generated, the duration of this impact will be temporary in nature and predominantly outside of sensitive periods for bird species.

4 Conclusion

This assessment finds that the short term and temporary negative impacts during construction can be mitigated to within an acceptable level through following standard guidance and best practice measures. In relation to local residents, the works are for the purpose of increasing the amenity value of the beach and increased protection to the existing sea defences and so any negative impact will be considered in relation to the overall benefit of the scheme to local residents.

5 References

Pontee, N. (2006). *Causes of beach lowering at Dunbar, Eastern Scotland, UK*. Proceedings of the Institution of Civil Engineers - Maritime Engineering, 159(4), pp.157-166.

Royal HaskoningDHV. (2016). *Dunbar East Beach Coastal Management and Groyne Reinstatement Engineering Advice*. Report to Dunbar Shore and Harbour Neighbourhood Group.

CIRIA (2010), *The use of concrete in maritime engineering - a guide to good practice (C674)*. [Online] Available at: <http://www.ciria.org/ItemDetail?iProductcode=C674&Category=BOOK>