

# OUTHEAD, WEST SANDS ST ANDREWS



*Second sand recharge, Out Head, June 2010*

## THIRD SAND RECHARGE

### ECOLOGICAL IMPACT ASSESSMENT

Version 4, 12<sup>th</sup> June 2023

REPORT to: IRONSIDE FARRAR LIMITED/ST ANDREWS LINKS TRUST

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## 1.0 BACKGROUND

### 1.1. Author and scope of reporting

Principal author is David Bell (ECOS Countryside Services LLP). He has specialist knowledge of local coastal ecology. Since establishing ECOS in 1987 he has undertaken professional contracts on the Tay which have included a Tay Estuary biological data collation and review on contract to SNH, National Vegetation Classification surveys of dunes on Barry Buddon, Broughty Ferry and West Sands. He undertook estuary-wide bird surveys to inform the delineation of the original Tay and Eden SPA boundaries and several years of through-the-tide intertidal waterfowl counts on the Inner Tay to inform the Riverside landfill closure. One year's open water waterfowl survey informed dredging proposals on the Inner Tay. In addition, he has completed many smaller EIA contracts targeting specific locations e.g. V&A footprint, Dundee Airport emergency slipway, Port of Dundee extension and writing a management plan for the West Sands dune system as part of the European SUSCOD project. On behalf of the BTO he has been counting waterfowl on the Tay since 1976 across three key WeBS sectors on the Firth of Tay, namely, Inner Tay, Invergowrie and Broughty Ferry – Barry Buddon (Monifieth). Previously he has covered Tay Bridge-Broughty Ferry (Stannergate) sector and Eden Estuary low and core WeBS counts (for six years), including St Andrews Bay, and is still involved in the WeBS low tide counts on the Eden.

The **scope of this EclA report** is restricted to identifying and assessing the biological baseline in relation to the proposed third sand recharge project at Out Head, West Sands, St Andrews. Impacts of the recharge on the physical environment are the subject of a standalone assessment by Professor Alistair Dawson and are therefore excluded.

European protected nature conservation sites, SAC, SPA, RAMSAR, and their respective qualifying interests, have been assessed under the **Habitat Regulations** and are largely excluded from this assessment. Details should be sought in the standalone **ECOS Report to Inform appropriate Assessment (RIAA)**.

- *ECOS (May 2023) St Andrews Links Trust, Third Sand Recharge Project. Report to Inform Appropriate Assessment, Version 4. Report to Ironside Farrar Limited and St Andrews Links Trust*

### 1.2. Project

Six world-famous St Andrews links courses are located on the south shore of the Eden Estuary and West Sands peninsula. In-combination the courses have a linear interface with the Eden estuary and West Sands of approximately 5.3km, **Figure 1**.



Figure 1.1. The St Andrews links courses

Out Head is the northern limit of a naturally accreting cuspidate foreland, that has been extending northwards since the mid-19th C. Accretion is not uniform and mainly confined to the seaward edge and promontory. Open and semi-fixed dunes have been eroding along a short south western section and losses have reached a crucial phase because the main ridge is now very narrow and at risk of being breached, **Image 1.1**. A natural solution, avoiding such measures as gabion mattresses, gabion baskets and rock armour, has been to recharge the erosion zone with sand to forestall the risk to the courses. Sand recharges took place in 2001 and 2008, and a third recharge is being proposed for 2024.



*Image 1.1. Eroding south west aspect of Out Head, April 2023*

A **Nature Restoration Fund** study, by **Ironside Farrar Limited** in 2023, reviewed all options to deal with the current erosion and the final option agreed with the **St Andrews Links Trust (SALT)** and other interested parties was another sand recharge to raise the immediate beach platform and reinstate the eroded dune ridge.

This is a habitat restoration project of local and national importance for its aim of maintaining and enhancing the West Sands dune system. It will, at least in the short term, increase the area of this nationally important nature conservation feature and its associated flora and fauna. **Figure 1.2** shows the location of the proposed dune restoration.



*Figure 1.2. Location of proposed Out Head recharge*

### 1.3 Project design

The recharge design is a straightforward replication of the two previous recharges which have been undertaken successfully and without incident or criticism, the most recent providing dune restoration that lasted for 15 years. The third recharge, hauling sand and shaping, will take place over a pre-selected spring tide series over 10 days, likely to be during the period January-February 2024, with marram planting February-March 2024. Sand will be removed from the same donor site used for the two previous Out Head recharges, 2001 and 2008, location is NGR NO 498202, **Figure 1.2**. This is ideal because that area has been proved to replenish very quickly and is a known area of long-term accretion. Approximately 12,000-15,000m<sup>3</sup> of sand will be transported to the receptor site on the south west interface with the Eden Estuary. Working will take place over both low tides each day. Sand will be extracted to a maximum depth of 0.5m over an area of approximately 200x200m using a single 360-degree backhoe excavator loading three or four “Moxy” type dump trucks following agreed movement corridors, **Figure 1.3**. Three machine movement corridors (A,B and C) will be used for gaining access to the donor site, hauling sand to the receptor site and return to a safe storage over high tide. Working will be limited to a low tide window of a few hours which will “roll” according to the times of low tide. All refuelling and maintenance will be completed at the remote site compound (D).

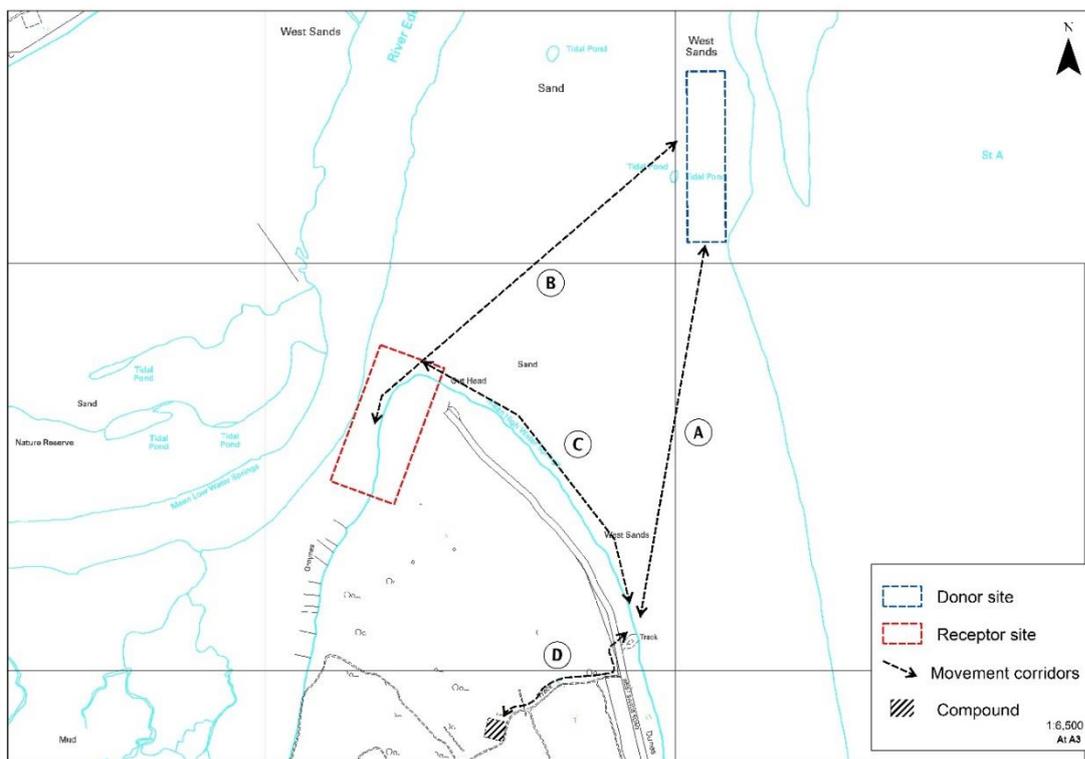


Figure 1.3. Locations of donor and receptor site and vehicle movement corridors

Work at the receptor site will involve tipping and bulldozing sand into place to create a new 200m long sand cliff with a top platform approximately 10m wide. A slope will extend seawards to a depth of 25-30m, previous recharges extended to approximately 40m.

The profile will reflect previous recharges, although it may be slightly steeper. An upper bench, raised slightly higher than the existing eroded ridge, will be transplanted with cell grown marram plants of local provenance, or transplants taken from adjacent dunes, at a density of 10 plants per square metre. Prior to marram planting, a series of chestnut pale fences will be installed across the face. After planting these fences will be closed at the toe with another public exclusion fence. Anti-erosion roll bags will be temporarily placed inside the dune fence to limit initial losses for 6-12 months. **Figure 1.4** shows the footprint of the proposed dune restoration works.

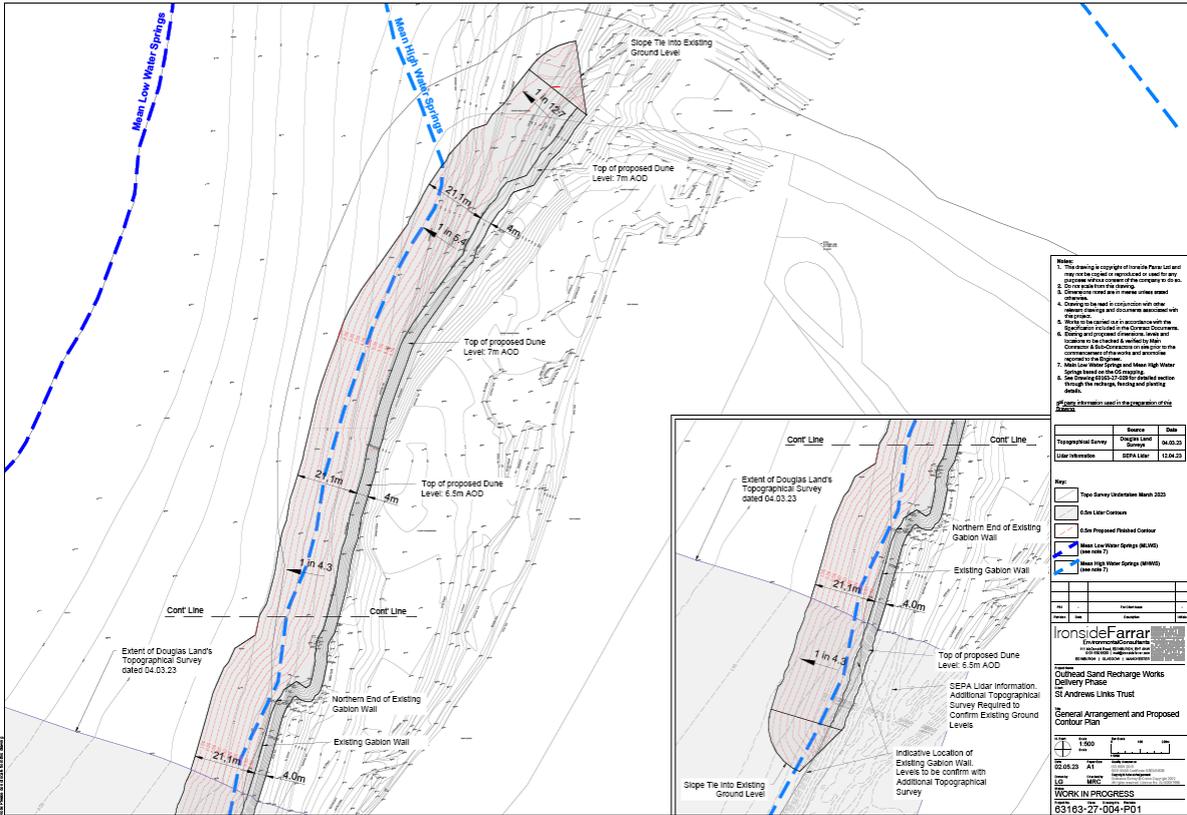


Figure 1.4. Proposed dunes restoration footprint

### 1.4 Project timing and key elements

Table 1.1 outlines the main elements of the projects and the preferred timings for the project.

Table 1.1. Ideal project outline, as known April 2023

<b>Out Head Beach recharge 2024</b>				
<b>Donor site: south bank of the River Eden outfall (NGR NO 498202)</b>				
<b>Receptor site. a 200m south west dune interface with the Eden Estuary inter-tidal sand and mudflats (NGR NO 493196)</b>				
<b>Volume of sand to be moved = 12,000 -15,000m<sup>3</sup></b>				
<b>Depth of excavation = max. 0.5m</b>				
<b>Proposed machinery movement routes (Refer to Figure 1.1)</b>				
Fig. 1.1 Ref.	Location		Approx. Dist.	
	From	To	(metres)	
A	Beach slip road	Donor site	928	Access route used on all previous recharges
B	Donor site	Receptor site	1026	Haul route used on all previous recharges
C	Receptor site	Slip road for compound	817	Flood tide return route used on all previous recharges
D	Machine compound	Beach slip road access	428	Access route to a remote maintenance, fuelling and parking area used for all machinery and vehicles

<b>Indicative Ideal Programme</b>				
	January 2024			Install public exclusion fence
				Complete topographical and any other baseline surveys
	January - February 2024			Complete sand haul and receptor site profiling and shaping. Install temporary erosion protection rolls
	February-March 2024			Install diagonal sand trap fencing
				Receive delivery of tube grown marram transplants and immediately transplant, assuming local transplants are not available
				Plant a berm 200mx10m in length with marram at a density of 10 plants/m <sup>2</sup> . Add in-situ charge of NPK fertiliser with each plant. Top dress marram planting with NPK.
				Install toe fence
	Spring-summer 2024			Repeat top dressing of NPK twice

## 2.0 ECOLOGICAL ASSESSMENT METHODOLOGY

### 2.1. Evaluation and assessment methodology

The aim of the EclA is to assess the impact of the proposed works on **Verified Ecological Receptors (VERs)** i.e. sites, habitats and species. The presentation and content of the assessment follows current NatureScot guidance and advice.

- *CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland. Version 1.1. Updated September 2019.*
- *SNH (2018). A Handbook on Environmental Assessment. 5<sup>th</sup> Edition;*

There are no perceived limitations to the assessment methodology with the desk-top data collation and ECOS surveys providing adequate data for this assessment, which is the third such assessment for a near identical dune restoration project.

### 2.2. Assessment process

#### 1. Valued Ecological Receptors (VERs)

The level of value and sensitivity of **VERs** are identified based on criteria summarised in **Table 2.1**.

Table 2.1. Value and Sensitivity of Receptors

Value level/ sensitivity	Examples
<p><b>International/ High Sensitivity</b></p>	<p><b>Sites:</b> All awarded, proposed or candidate sites for an international designation e.g. Special Protection Areas, Biosphere Reserves, Special Areas of Conservation.</p> <p><b>Habitats:</b> Any significant areas of a priority habitat type listed in Annex 1 of the EC Habitats Directive.</p> <p><b>Species:</b> Sites which are critical for those species listed as internationally important e.g. in European Habitats Directive or European Bird Directive. A regularly occurring nationally important population of any internationally important species.</p>
<p><b>National/ High Sensitivity</b></p>	<p><b>Sites:</b> All notified Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNRs), Marine Nature Reserves (MNRs), any National Conservation Review Grade 1 site.</p> <p><b>Habitats:</b> Any site with viable areas of any key habitat identified in the UK Biodiversity Action Plan or Scottish Biodiversity Strategy or sustaining populations of nationally important species.</p> <p><b>Species:</b> Those given special protection under the Wildlife and Countryside Act 1981 and amendments. All Red Data Book Nationally Notable species. All priority species listed in the UK Biodiversity Action Plan and included in the Scottish Biodiversity 100 list. Also any population of a species of international or national importance and representing more than 1% of the regular UK population.</p>
<p><b>Regional/ Moderate Sensitivity</b></p>	<p><b>Sites:</b> All Listed Wildlife Sites. Any other sites with regionally important habitats not previously identified.</p> <p><b>Habitats:</b> Any sites with viable habitats identified as priority habitat in a Local Biodiversity Action Plan.</p> <p><b>Species:</b> All species listed as priority species in Regional Biodiversity Action Plans. All Red Data Book Nb and N species. Species which have been identified as scarce in local publications e.g. a local flora, bird atlas. Occurrence of an internationally or nationally important population.</p>



Value level/ sensitivity	Examples
<b>Local/ Low Sensitivity</b>	<p><b>Sites:</b> Sites with special importance locally for amenity and education e.g. greenspace, community woods etc.</p> <p><b>Habitats:</b> Any areas of habitat that enrich the biodiversity of the local area e.g. a pond, species-rich verge, flush or hedge.</p> <p><b>Species:</b> Those with special importance in the parish or neighbourhood e.g. a Rookery or mature native trees. Notable areas of alien species that threaten biodiversity.</p>

### 2.3. Potential effects

Identification of potential effects will be based on the **response** of each VER and the **magnitude** of effect based on **Table 2.2**. Consideration will also be given to the **duration** and **reversibility** of any effects.

*Table 2.2. Magnitude of Effect*

<p><b>Very high magnitude:</b> loss of most of the site (i.e. at least 50% of its area). Loss or severe depletion of a population of an internationally important, rare or protected species (i.e. &gt;50% of the population) caused by loss of habitat, severance or disturbance.</p> <p><b>High magnitude:</b> loss affecting more than 30%, but less than 50% of the site area, or indirect adverse impacts (e.g. disturbance, pollution) affecting &gt;50% of the site. Loss or depletion of a nationally important, protected or nationally rare species through habitat loss, severance or disturbance.</p> <p><b>Medium magnitude:</b> loss affecting less than 30% but more than 10% of the site area, or indirect adverse impacts (e.g. disturbance, pollution) affecting &gt;30%, but less than 50% of the site. Significant reduction of a regionally important, nationally rare or protected species, but not sufficient to significantly affect viability, or severe reduction of a regionally uncommon species through habitat loss, severance or disturbance. Loss of regionally important habitat.</p> <p><b>Low magnitude:</b> loss affecting 10% or less of the site area, or indirect adverse impacts (e.g. disturbance, pollution) affecting less than 30% of the site. Potential for slight reduction of a population of a locally important habitat, nationally rare or regionally uncommon species, of minimal significance to viability.</p> <p><b>Negligible magnitude:</b> site and/or rare and uncommon species not significantly affected.</p>
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## 2.4. Significance of Effects

Definition of the **significance** of residual effect, after mitigation, will be based on the matrix in **Table 2.3**.

Table 2.3. Significance Matrix

IMPACT SIGNIFICANCE				
Impact magnitude	Value of feature			
	International	National	Regional	Local
<b>Very high</b>	Very major significance	Very major significance	Major significance	Moderate significance
<b>High</b>	Very major significance	Major significance	Moderate-major significance	Moderate significance
<b>Medium</b>	Major significance	Moderate-major significance	Moderate significance	Slight-moderate significance
<b>Low</b>	Moderate-major significance	Moderate significance	Slight-moderate significance	Negligible-slight significance
<b>Negligible</b>	Slight significance	Slight significance	Negligible	Negligible

## 3.0 BASELINE ECOLOGICAL DATA

### 3.1. European Statutory designated Nature Conservation Sites

- Firth of Tay and Eden Estuary Special Area of Conservation (SAC)
- Moray Firth Special Area of Conservation SAC
- Firth of Tay and Eden Estuary Special Protection Area (SPA)
- Firth of Tay and Eden Estuary Ramsar Site (Ramsar)
- Outer Firth of Forth and St Andrews Bay Complex Special Protection Area (SPA)<sup>2</sup>

Details of these sites, the potential impact of proposed Out Head works, proposed mitigation and overall conclusion of residual integrity can be accessed in the standalone RIAA report, which should be read in conjunction with this EclA. Conclusion of the RIAA was that there would be **no likely adverse effect and the Conservation Objectives for all five named European sites** would be met during and after the third recharge.

### 3.2. UK Statutory designated nature conservation sites

Proposed works lie within the boundaries of two UK designated sites.

- *Eden Estuary SSSI, EU Code 135289, declared in 1971 and last notified 16 February 1990*<sup>1</sup>
- *Eden Estuary LNR, declared in 1978*<sup>2</sup>

<sup>1</sup> *Wildlife & Countryside Act 1981, as amended*

<sup>2</sup> *National Parks and Access to the Countryside Act 1949*

### 3.2.1 Eden Estuary SSSI

Location and extent of the SSSI is shown on **Figure 3.1**, site details in **Appendix 1**. This SSSI was notified in 1971 for 17 biological features. Primary habitats being coastland and woodland, primary species being botanical and ornithological. Included in the 1160ha SSSI are the contiguous Out Head and West Sands dune systems. The 12 notified bird species are wintering or passage waterfowl that were later given further protection under internationally agreed Ramsar and SPA designations. Botanical features include upstream alder-willow swamp, woodland and scrub, complex freshwater and brackish transitions with diverse green algal seagrass beds (*Zostera*) and representative lagoonal saltmarsh types. Three species of eelgrass are present on the Eden, namely, narrow-leaved eelgrass (*Zostera angustifolia*), dwarf eelgrass (*Zostera nana*) and common eelgrass (*Zostera marina*). Relevant to this EclA are the habitats and species associated with the sand dunes.



**Figure 3.1.** Location and extent of south eastern sector Eden Estuary SSSI, from SNHi accessed 14<sup>th</sup> May 2023

### 3.2.2 Eden Estuary Local Nature Reserve

North East Fife Council, with the support of the Nature Conservancy Council for Scotland, local nature conservation organisations and the wildfowling community declared the **Eden Estuary Local Nature Reserve (LNR)** in 1978, **Figure 3.2**. An LNR Management Plan was subsequently agreed and published in 1987 with the aim of protecting the nature conservation interest of the already notified SSSI of 1971, whilst ensuring continued public access for recreation and education. LNR byelaws included provision for the establishment of three sanctuary zones that had the main effect of excluding human activities from the vicinity of key high tide roosts and preventing disturbance to feeding birds on the Guardbridge mudflats. The latter is an important feeding location for the Eden wintering and passage Icelandic breeding race of the black-tailed godwit (*Limosa limosa islandica*) population.

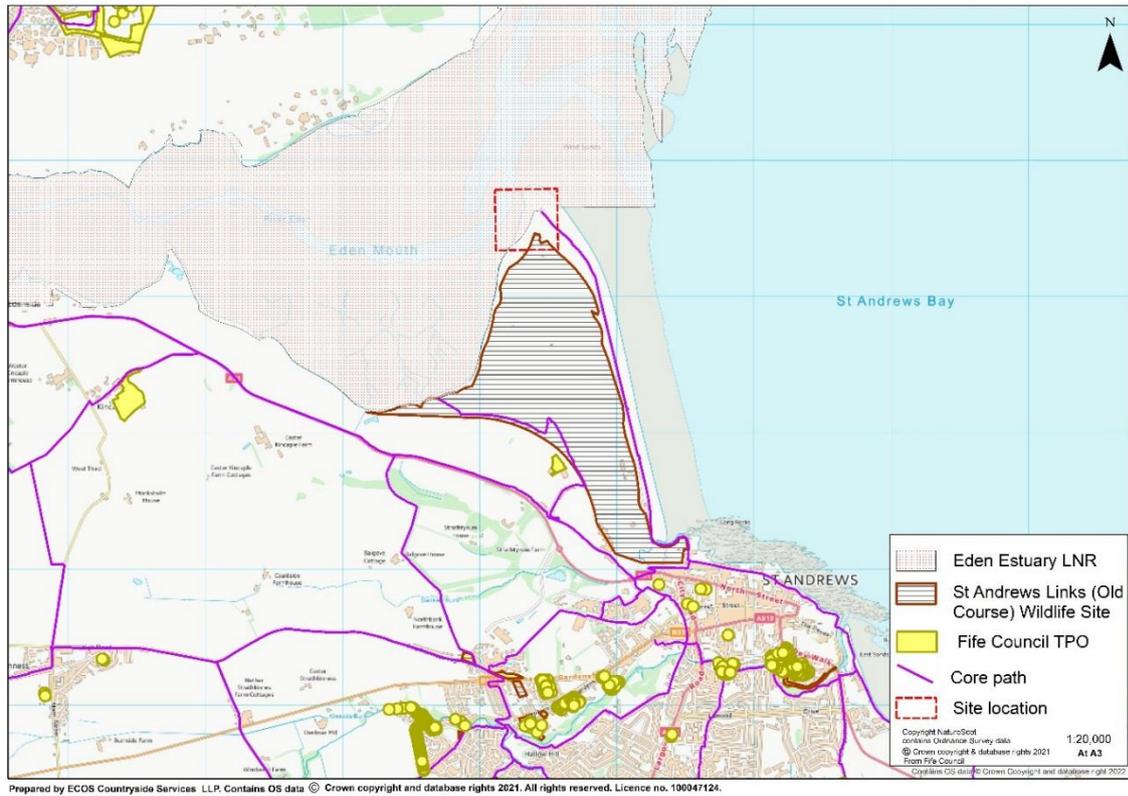


Figure 3.2. Local designations, including LNR

### 3.3. Terrestrial habitats at Out Head

Phase 1 habitat<sup>4</sup> and National Vegetation Classification (NVC)<sup>5</sup> surveys are relatively recent<sup>6+7+8</sup> confirming the dominance of open dune and fixed dunes and fixed dune grassland across Out Head. The pattern of mapped NVC communities is a typical, if very narrow, succession on accreting dunes with transition from accumulating bare sand through seasonal strandline, pioneering foredune, yellow dune to fixed dune. All clearly visible in Figures 3.3-3.6.

Vegetation changes have taken place since these surveys. Principally the northward extension of foredune on the east side of Out Head creating new SD2 and SD4, whilst severe erosion on the south west has resulted in a severe loss of open dune (H6.8/SD5b).

<sup>4</sup> JNCC (2010) Handbook for Phase1 habitat survey.

<sup>5</sup> Rodwell, J.S. (ed.) (1991). *British Plant Communities. Volumes 1-5* Cambridge University Press.

<sup>6</sup> DARGIE (2001) Sand Dune Survey of Scotland. Report to SNH.

<sup>7</sup> CES (2003). NVC survey of the Eden Estuary SSSI. Report to SNH.

<sup>8</sup> ECOS 2011. NVC survey of the West Sands Dunes. Report to SUSCOD.

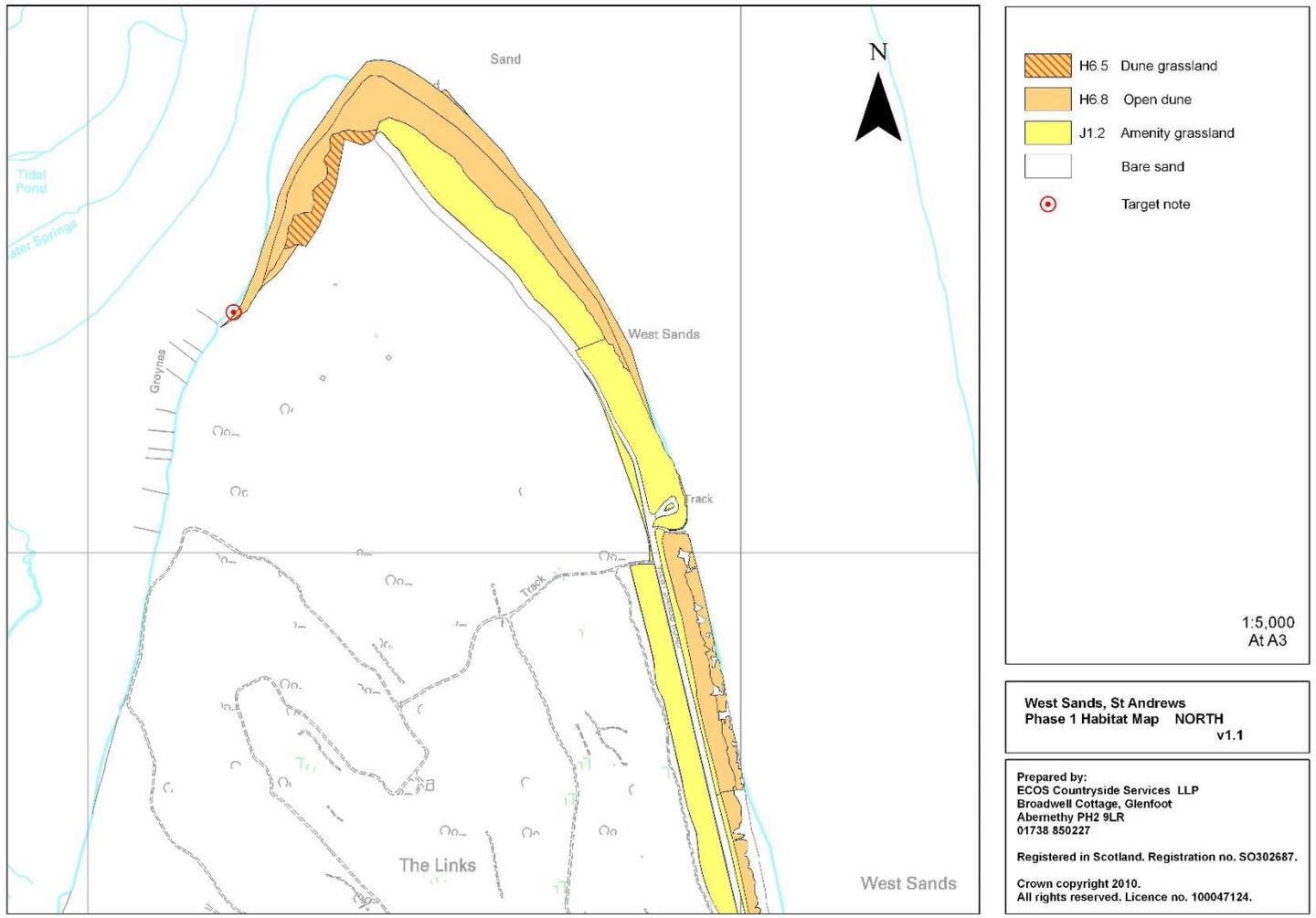
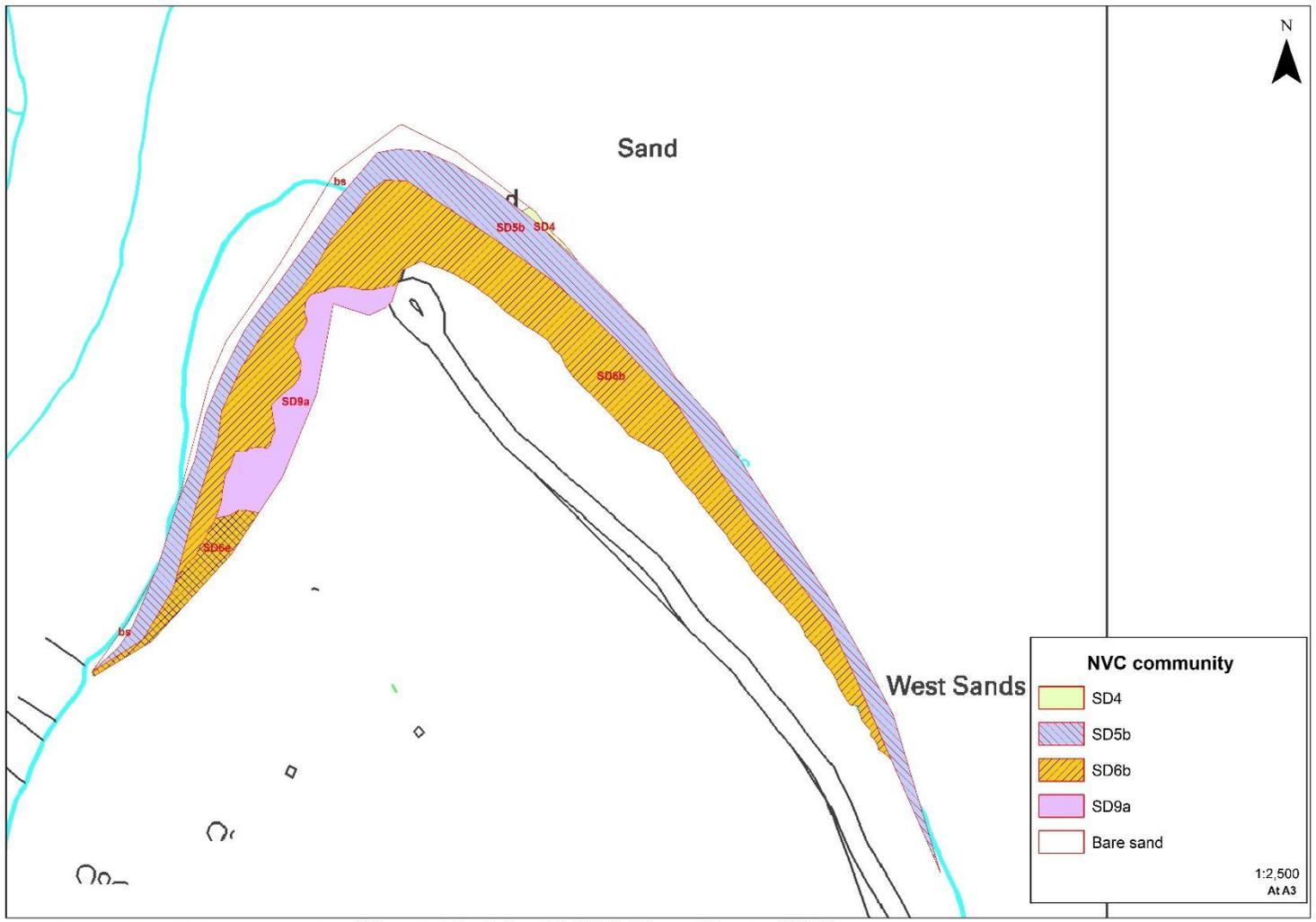


Figure 3.3. Phase 1 habitat survey, ECOS 2011





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Figure 3.6. ECOS NVC 2011

### 3.4. European protected species – otter

On the Eden Estuary, breeding otter are resident upstream of [REDACTED] and [REDACTED], where signs are frequent. There are no regular observations to the east of [REDACTED], where any otter use must be infrequent or unobserved.

### 3.5. European protected species – common seal

Formal seal counts were started in 1991 and undertaken by the Eden Estuary Reserve Managers (Les Hatton and Ranald Strachan) until they ended counting in 2017. Counts now rely on annual monitoring by the Sea Mammal Research Unit (SMRU), St Andrews University and *ad hoc* counting by the Fife Seal Group. Numbers have declined dramatically on the Eden, from a peak of 325 in 2002 and a peak average monthly count of 174 in 2003. Seal numbers are now very low, averaging 3.41 seals in 2017. The latest two winter surveys by the Fife Seal Group reported a peak of four common seals during the period of proposed dune restoration at Out Head, January-March.

Common seal are a qualifying feature of the Firth of Tay SAC and potential impact of the proposals were fully assessed in the standalone RIAA. The RIAA conclusion was that there would not be any likely adverse impact on common seals for the following reasons.

1. The minor haulout on the south bank of the outer Eden Channel is irregularly used by a very small number of seals
2. The alternative main seal haulout close to the mid-channel in Balgove Bay will not be disturbed
3. Common seals are particularly vulnerable to disturbance during their pupping and moulting season May-September. This period lies out with the proposed recharge working window of January to March.
4. There will be no adverse impact on any habitat supporting the seals prey species, nor the supporting processes creating those habitats.

### 3.6. Birds

#### (i) Breeding birds

No work will take place during the normal bird breeding season.

#### (ii) Non-breeding passage and wintering birds, high tide

All ornithological features of the SPAs and Ramsar were screened for adverse effect in the RIAA, only oystercatcher were not screened out, for locally important feeding interest only. There is no regular high tide waterfowl roost in proximity to works and key roosts protected by sanctuary areas established under Bye-laws will therefore not be disturbed.

WeBS data and low tides surveys on the West Sands by Ranald Strachan (SALT) were used to assess the potential impact on feeding oystercatcher, the RIAA concluding no adverse effect, mainly due to the huge alternative foraging available to the relatively small number of birds likely to be displaced.

### 3.7. Biodiversity - scarce plants

Distribution of three scarce Fife dune plants, blue fleabane (*Erigeron acer*), purple milk-vetch (*Astragalus danicus*) and the sand cats-tail (*Phleum arenarium*) were mapped by ECOS in 2010-11, **Figure 3.7 and Table 3.1**. Populations are low and this increases vulnerability. Fortunately, well established stations lie outwith the receptor site and should not be directly or indirectly impacted by the dune restoration. However, their status should be updated in the summer season prior to the proposed works i.e. 2023. Populations of blue fleabane and sand cats-tail are likely to increase slightly as a result of dune restoration.



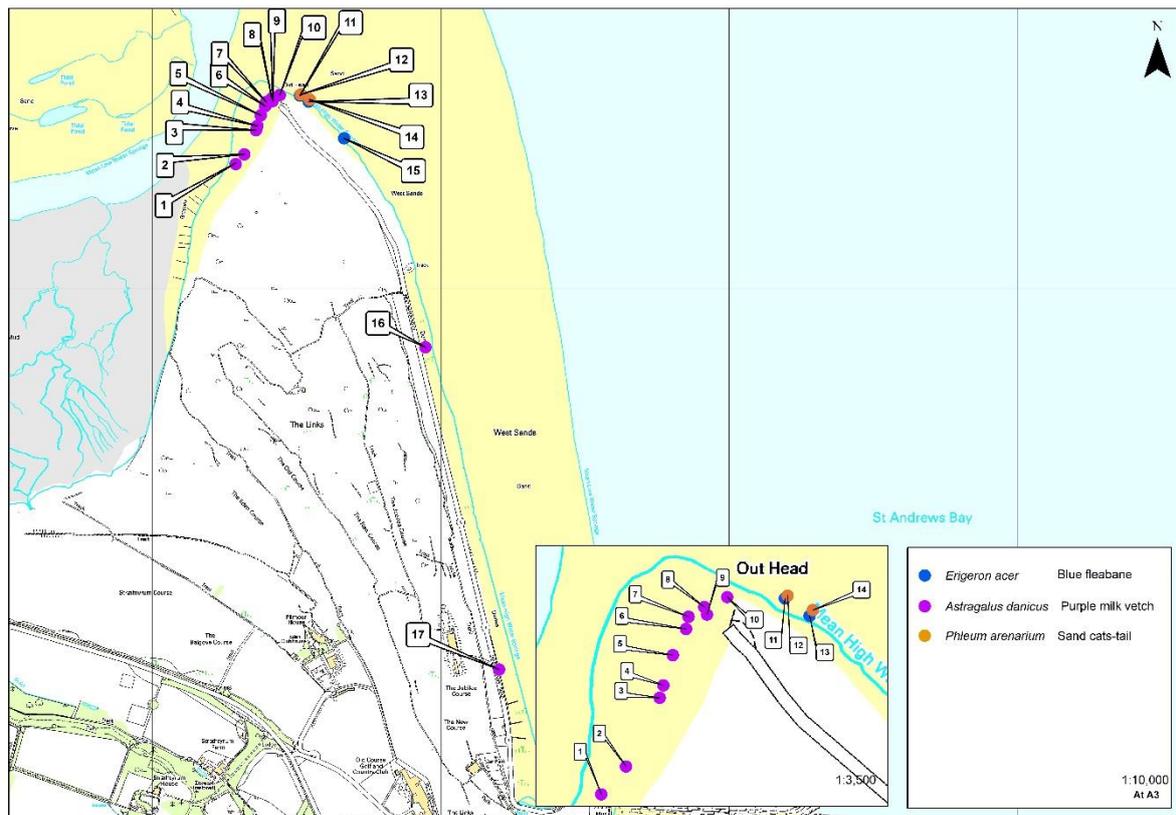


Figure 3.7. Distribution of scarce plants at Out Head, ECOS 2010-2011 surveys

Table 3.1. Scarce plant species summary, from ECOS 2010-2011 surveys

Ref Fig 3.	Species	x-co-ord	y-co-ord	Note
1	Purple milk vetch	349288	719435	Small patch & along path
2	Purple milk vetch	349318	719469	Along path
3	Purple milk vetch	349359	719553	Along path
4	Purple milk vetch	349358	719569	Dense local population
5	Purple milk vetch	349375	719605	A few scattered
6	Purple milk vetch	349391	719637	A few scattered
7	Purple milk vetch	349394	719652	A few scattered
8	Purple milk vetch	349413	719664	Small patch 1m diameter
9	Purple milk vetch	349417	719655	Scattered over 5m
10	Purple milk vetch	349441	719676	Sparse over 2m <sup>2</sup>
11	Blue fleabane	349512	719675	With Sand cats-tail
12	Sand cats-tail	349512	719675	With Fleabane
13	Blue fleabane	349541	719653	Six plants with Sand
14	Sand cats-tail	349541	719563	With Fleabane
15	Blue fleabane	349664	719525	Four plants
16	Purple milk vetch	349946	718795	Beside small patch with
17	Purple milk vetch	350202	717670	Patch six metres in diameter



Image 3.1. Blue fleabane (*Erigeron acer*), Out Head 2011

### 3.8. Invasive non-native species (INNS)

INNS were mapped by ECOS 2010-2011, **Figure 3.8**. The most common invasive non-native species on the West Sands dune system is the tree lupin (*Lupinus arborea*), a native of California, see **Figure 3.8**. This species is currently part of a control programme by SALT who also routinely remove invasive scrub, mainly willow (*Salix sp.*) and white poplar (*Populus alba*). These scrub species invade dunes shading out native plant species, decreasing diversity and loss of marram in particular can result in an increased risk of a blowout. Sea buckthorn (*Hippophae rhamnoides*) and Japanese knotweed (*Fallopia japonica*) were absent at the time of last survey.



Image 3.2. Tree lupin (*Lupinus arborea*) on the West Sands 2010

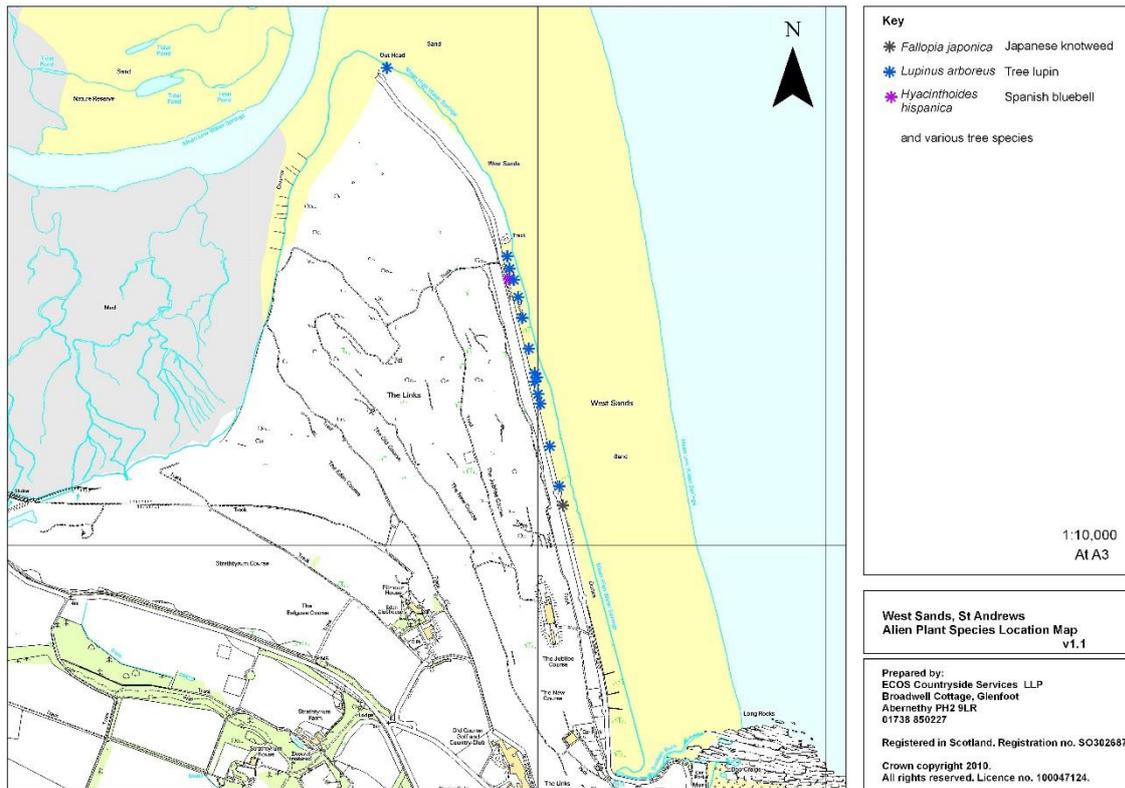


Figure 3.8. Alien plant species summary, ECOS 2010-2011

### 3.9. Terrestrial invertebrates

Terrestrial invertebrates have not been closely studied on the West Sands, however, typical species are known to be present e.g. dune chafer and the open dune spider *Arctosa perita* (DB pers obs). Invertebrate conservation management to date has been to maintain a range of habitats and micro-habitats to maintain invertebrate diversity.

Key butterfly species are the common blue (*Polyommatus icarus*) and the locally scarce grayling (*Hipparchia semele*). The latter has been recently added to the Red List of British Butterflies, endangered category. Larvae are dependent upon a narrow range of grass food plants including marram grass and red fescue, both very common at Out Head, West Sands and across the Links courses.

### 3.10. Marine invertebrates

Marine interest adjacent to the project has been well documented, most recently by the University of St Andrews. The sands adjacent to the receptor site and present on the donor site are faunally impoverished unstable sands supporting low populations of common mobile in-fauna, **Table 3.2**.

Table 3.2. Broad habitat summary

Higher Code*	Biotope code*	Bates Colour code	Biotope Description	Biotope characteristics	Typical infauna	UK status
LGS.S	AEur	Yellow	Burrowing amphipods and isopod <i>Eurydice pulchra</i> in well drained clean sand shores	High sand mobility. Species diversity is low, associates only occurring in low densities. Rarely	<i>Bathyporeia pelagica</i> ; <i>B. Pilosa</i> ; <i>Pontocrates arenarius</i> ,	Common

Higher Code*	Biotope code*	Bates Colour code	Biotope Description	Biotope characteristics	Typical infauna	UK status
				polychaetes and no bivalves.	<i>Haustorius arenarius</i>	
LGS.S	AP	Orange	Burrowing amphipods and polychaetes in clean sand shores	Mid-lower shore due to higher stability supports greater range of species.  Bivalves may be present.	Similar species composition to above with occasional <i>Nephtys</i> , <i>Scolelepis</i> and <i>Arenicola</i> and <i>Angulus tenuis</i> .	Common
LGS.S	Lan	Light green hatch	Dense <i>Lanice</i> in tide-swept lower shore sand		<i>Lanice conchilega</i>	Common
<b>Added biotopes 2023</b>						
LGS.S	BarSnd	N/A	Barren coarse sand shores	-	-	Very common
LGS.S	Tal	N/A	<i>Taltrid</i> amphipods in decomposing seaweed on the strandline	Temporary community, replaced annually. Can be quite diverse.	<i>Taltris saltator</i>	Very common

\*From: Connor, D.W., Brazier, D.P., Hill, T.O., & Northen, K.O. 1997. Marine Nature Conservation Review: marine biotope classification for Britain and Ireland. Volume 1. Littoral biotopes. Version 97.06. JNCC Report, No. 229.

## 4.0 VERIFIED RECEPTOR SUMMARY

**Table 4.1** summarises the known VERs on and immediately adjacent to the donor and receptor sites.

Table 4.1. VERs summary

VER	Level of Importance			
	Inter-national	National	Regional	Local
<b>European sites</b>				
Firth of Tay and Eden Estuary SAC	√	√	√	√
Firth of Tay and Eden Estuary SPA	√	√	√	√
Outer Firth of Forth and St Andrews Bay Complex SPA	√	√	√	√
Firth of Tay and Eden Estuary Ramsar	√	√	√	√
<b>UK sites</b>				
Eden Estuary SSSI	-	√	√	√
Eden Estuary LNR	-	-	-	√
<b>Biodiversity Priority habitats</b>				
Coastal sand dunes	-	√	√	√
Coastal saltmarsh	-	√	√	√
Intertidal mudflat	-	√	√	√

VER	Level of Importance			
	Inter-national	National	Regional	Local
Seagrass beds ( <i>Zostera species</i> )	-	√	√	√
<b>Priority species</b>				
Wintering and passage waterfowl	√	√	√	√
Otter	√	√	√	√
Grayling	-	-	-	√
Blue fleabane	-	-	-	√
Purple milk vetch	-	-	-	√
Sand cats-tail	-	-	-	√
Tree lupin	-	-	-	√

## 5.0 ASSESSMENT OF POTENTIALLY ADVERSE EFFECTS

Based on the foregoing, **Table 5.1** presents the potential impact summary

VERIFIED ECOLOGICAL RECEPTOR	VALUE	POTENTIAL IMPACT		LIKELY TO BE RESIDUAL AND REQUIRING MITIGATION	CONFIDENCE
		<b>Construction</b>	<b>Operation</b>		
<b>STATUTORY AND NON - STATUTORY DESIGNATED SITES</b>					
<b>Firth of Tay and Eden Estuary SAC</b>	International	Impact assessed for RIAA, concluding no likely significant adverse impact.	No likely adverse impacts	Yes Mitigation as per RIAA	Certain
<b>Moray Firth SAC</b>	International	Impact assessed for RIAA, concluding no likely significant adverse impact.	No likely adverse impacts	No	Certain
<b>Firth of Tay and Eden Estuary SPA</b>	International	Impact assessed for RIAA, concluding no likely significant adverse impact.	No likely adverse impacts	Yes Mitigation as per RIAA	Certain
<b>Outer Firth of Forth and St Andrews Bay Complex SPA</b>	International	Impact assessed for RIAA, concluding no likely significant adverse impact.	No likely adverse impacts	No	Certain
<b>Firth of Tay and Eden Estuary Ramsar</b>	International	Impact assessed for RIAA, concluding no likely significant adverse impact.	No likely adverse impacts	Yes Mitigation as per RIAA	Certain
<b>Eden Estuary SSSI</b>	National	Temporary short-term changes to a total of 0.08ha on a <i>de-minimis</i> scale. This footprint represents 0.000069% of the SSSI.	Positive short-medium term impact	Yes	Certain

VERIFIED ECOLOGICAL RECEPTOR	VALUE	POTENTIAL IMPACT		LIKELY TO BE RESIDUAL AND REQUIRING MITIGATION	CONFIDENCE
		<b>Construction</b>	<b>Operation</b>		
<b>Eden Estuary LNR</b>	Local	As per SSSI	No likely adverse impacts	Yes	Certain
<b>HABITATS</b>					
<b>Inter-tidal sand flat</b>	National	Temporary short term changes to or temporary loss of 0.04ha to the new dune footprint at the receptor site	No likely adverse impact	Yes	Certain
		Very short term disturbance to 0.04ha of inter-tidal habitat at the donor site	No likely adverse impact	Yes	Certain
<b>Coastal sand dunes</b>	National	Minor disturbance to the existing man-made Out Head dunes	No likely adverse impact	No	Certain
		Restoration south west ward open dune to increase its area by approximately 0.04ha	No likely adverse impact	No	Certain
<b>Coastal saltmarsh</b>	National	Saltmarshes on the Eden are remote from works, there will be no direct or indirect impact	No likely adverse impact	No	Certain
<b>Seagrass beds</b>	National	Eelgrass beds are distributed across the mudflats of Balgove Bay and Guardbridge. Their association with these mudflats, and to a lesser extent tidal channels, isolates them from any direct or indirect recharge impact	No likely adverse impact	No	Certain
<b>SPECIES</b>					
<b>Otter</b>	International	No likely impact due to the absence of evidence of use of Out Head at the time of survey	No likely adverse impacts	No	Certain

VERIFIED ECOLOGICAL RECEPTOR	VALUE	POTENTIAL IMPACT		LIKELY TO BE RESIDUAL AND REQUIRING MITIGATION	CONFIDENCE
		<b>Construction</b>	<b>Operation</b>		
<b>Common seal</b>	National	Common seal are a qualifying feature of the Firth of Tay and Eden Estuary SAC. Potential impacts were assessed for the RIAA, concluding no likely significant adverse impact	No likely adverse impacts	Yes Mitigation as per RIAA	Certain
<b>BIODIVERSITY</b>					
		Negligible short-medium term decline in biodiversity to restored dune footprint	No likely adverse impacts	Yes No mitigation available	Certain
		Positive short-medium term net biodiversity gain from creating 0.04ha of new open dune habitat	Positive impact	No	Certain
		Populations of scarce plants will not be directly impacted. Population size is likely to increase following dunes restorations	Positive impact	No	Certain



## 6.0 MITIGATION

The following **mitigation measures** are recommended to avoid or reduce the severity of residual impact of direct and indirect adverse impact on designated sites, habitats, species and overall biodiversity. They will also reduce the severity of potential impacts during restoration and maintenance of the restored dune.

Table 4.1. Mitigation measures to address potentially significant residual impacts

Site	Qualifying Feature	Likely Significant Adverse Effect	Mitigation Measure
Firth of Tay and Eden Estuary Special Area of Conservation (SAC)	<ul style="list-style-type: none"> <li>Habitats - <i>Estuaries.</i></li> </ul>	<ul style="list-style-type: none"> <li>Temporary loss of approximately 0.04ha of substrate due to smothering at Out Head</li> </ul>	<p><b>SACHE1-2</b></p> <ul style="list-style-type: none"> <li>The third recharge will have a smaller restored dune footprint than previous recharges, the reduction is approximately 25%.</li> <li>Loss is short term and will be naturally restored and repopulated by in-fauna as the erosion process advances.</li> </ul>
		<ul style="list-style-type: none"> <li>Temporary loss of infauna over an area of 0.04ha at the donor site. (LGS.S AP biotope only)</li> </ul>	<p><b>SACHE3-4</b></p> <ul style="list-style-type: none"> <li>Working footprint at the donor site will be minimised by on-going review of the volume of sand required at the receptor site.</li> <li>Minimum volumes will be deployed to reduce habitat impact.</li> </ul>
	<ul style="list-style-type: none"> <li>Habitats - <i>Mudflats and sandflats not covered by seawater at low tide.</i></li> </ul>	<ul style="list-style-type: none"> <li>Temporary loss of 0.04ha of substrate at Out Head. (LPG.S.Aeur)</li> </ul>	<p><b>SACHM1-2</b></p> <ul style="list-style-type: none"> <li>The third recharge will have a smaller restored dune footprint, a reduction of approximately 25%.</li> <li>Loss is short term and will be naturally restored and repopulated by in-fauna as the erosion process advances.</li> </ul>
		<ul style="list-style-type: none"> <li>Temporary loss of infauna over an area of 0.04ha at the donor site, LPG.S AP</li> </ul>	<p><b>SACHM3-4</b></p> <ul style="list-style-type: none"> <li>The donor site targets an area of high sediment deposition supporting an impoverished in-fauna to minimise adverse effect.</li> <li>Working footprint at the donor site will be minimised by on-going review of the volume of sand required at the receptor site.</li> <li>Minimum volumes will be used to reduce donor site impact.</li> </ul>
	<ul style="list-style-type: none"> <li>Species - <i>common seal</i></li> </ul>	<ul style="list-style-type: none"> <li>Potential disturbance of a haulout intermittently used by a very small number of seals in winter</li> </ul>	<p><b>SACCSS1-2</b></p> <ul style="list-style-type: none"> <li>The third recharge will be programmed outwith the pupping and moulting season, May-September inclusive.</li> </ul>

Site	Qualifying Feature	Likely Significant Adverse Effect	Mitigation Measure
			<ul style="list-style-type: none"> <li>To maintain welfare a visual inspection of the haulout will be completed prior to daily start up and maintained during truck haul movements. Haul routes will be amended, if necessary.</li> </ul>
<b>Firth of Tay and Eden Estuary Special Protection Area (SPA)</b>	<b><i>Oystercatcher</i></b>	<ul style="list-style-type: none"> <li>Denigration of feeding habitat through pollution event whilst working or whilst refuelling or maintaining machines</li> </ul>	<b>SPAOC1-4</b> <ul style="list-style-type: none"> <li>Remote compound for fuelling and maintaining machines.</li> <li>Construction Management Statement (CMS) must include an agreed Pollution Plan with which all construction staff are familiar.</li> <li>All machines must carry a spill kit for use in the event of a spill e.g. hydraulic failure or fuel leak. All leaks must be reported.</li> <li>Contractor's CMS must be agreed in advance with Marine Scotland/NatureScot.</li> </ul>
		<ul style="list-style-type: none"> <li>Disturbance of feeding and resting birds during cold weather</li> </ul>	<b>SPAOC5</b> Working will be suspended during any severe cold periods likely to limit feeding opportunity, through frozen substrates, or likely tax daily energy budgets. NatureScot will be consulted on the need for this action, if required.
<b>Biodiversity</b>	<b><i>Overall biodiversity</i></b>	<ul style="list-style-type: none"> <li>Restoration of the dune will be a biodiversity enhancement</li> </ul>	<b>BIOD01</b> To ensure maximum biodiversity gain the new dune should be the subject of monitoring and maintenance. This is best delivered as a concise five-year Biodiversity Action and Enhancement Plan (BAEP).

## 7.0 CONCLUSION OF ECOLOGICAL ASSESSMENT

Residual impact matrix below summarises final assessment of potential impact on VERs. It assumes successful delivery of recommended mitigation, including those measures identified in the RIAA.

Residual impact magnitudes are all either negligible or positive in the short-medium term and all are reversible.

VER	Value	Potential Impacts	Mitigation/ Enhancement/ Compensation	Residual Impact Magnitude	Residual Level of Impact/ Duration/ Reversibility
<b>SITES</b>					
<b>Firth of Tay and Eden Estuary SAC</b>	International	<ul style="list-style-type: none"> <li>• Temporary loss of approximately 0.04ha of substrate due to smothering at Out Head</li> <li>• Temporary loss of infauna over an area of 0.04ha at the donor site. (LGS.S AP biotope only)</li> <li>• Temporary loss of 0.04ha of substrate at Out Head. (LPG.S.Aeur biotope only)</li> <li>• Temporary loss of infauna over an area of 0.04ha at the donor site, LPG.S AP</li> <li>• Potential disturbance of a haulout intermittently used by a very small number of seals in winter</li> </ul>	SACH1-2 SACH3-4 SACHM1-2 SACHM3-4 SACCSS1-2	Negligible	Slight/short-medium  Reversible
<b>Firth of Tay and Eden Estuary SPA</b>	International	<ul style="list-style-type: none"> <li>• Denigration of oystercatcher feeding habitat through pollution event whilst working or whilst refuelling or maintaining machines</li> <li>• Disturbance of feeding and resting birds during cold weather</li> </ul>	SPAOC1-4 SPAOC5	Negligible	Slight/short-medium  Reversible
<b>Eden Estuary SSSI</b>	National	Temporary short-term changes to a total of 0.08ha on a <i>de-minimis</i> scale. This footprint represents 0.000069% of the SSSI	As for SAC and SPA	Negligible	Slight/short-medium  Reversible
<b>Eden Estuary LNR</b>	National	As for SSSI above	As for SSSI above	Negligible	Slight/short-medium

VER	Value	Potential Impacts	Mitigation/ Enhancement/ Compensation	Residual Impact Magnitude	Residual Level of Impact/ Duration/ Reversibility
					Reversible
<b>HABITATS</b>					
<b>Inter-tidal sandflats</b>	National	Very short term disturbance to 0.04ha of inter-tidal habitat at the donor site  Short-medium term smothering of 0.04ha at the receptor site	As for SAC above	Negligible	Negligible/short  Reversible
<b>Sand dunes</b>	National	Positive impact due increased an increase of 0.04ha of open dune	As for SAC above	Positive	Positive/short- medium term Reversible
		Restoration of the dune will be a biodiversity enhancement	BIOD1	Positive	Positive/short- medium term Reversible
<b>SPECIES</b>					
<b>Oystercatcher</b>	National	As per SAC above	As for SAC above	Negligible	Slight/short-medium  Reversible
<b>OVERALL BIODIVERSITY</b>					

<b>VER</b>	<b>Value</b>	<b>Potential Impacts</b>	<b>Mitigation/ Enhancement/ Compensation</b>	<b>Residual Impact Magnitude</b>	<b>Residual Level of Impact/ Duration/ Reversibility</b>
<b>BIODIVERSITY</b>	Local- International	Enhancement through delivery of a concise five year Biodiversity Action and Enhancement Plan.	BIOD01	Positive	Positive /short- medium term  Reversible

## Appendix 1. Eden Estuary SSSI Citation

### EDEN ESTUARY SITE OF SPECIAL SCIENTIFIC INTEREST

#### North East Fife District

Midas Reference: 596

PLANNING AUTHORITY: Fife Council  
DATE NOTIFIED UNDER 1981 ACT: 16 February 1990  
NATIONAL GRID REFERENCE: NO 475195  
OS 1:50,000 SHEET NO: 59  
1:25,000 SHEET NO: NO 41/51; NO 42/52  
AREA: 1160 ha.

#### DESCRIPTION:

Biological: Habitat: Coastland: Woodland  
Biological: Species: Botanical: Ornithological

The Eden Estuary SSSI lies between St Andrews and the Firth of Tay and contains extensive intertidal flats of mud and sand with a rich invertebrate fauna. Nationally or internationally important populations of 12 species of waders and wildfowl occur in winter or on passage. A wide diversity of estuarine and coastal vegetation types is represented including the largest extent of saltmarsh in Fife. At least 15 plant species which are scarce either nationally or locally are found here.

More than 10,000 waders use the estuary in winter for feeding and roosting. Oystercatcher, Black-tailed and Bar-tailed Godwits and Grey Plover occur regularly in nationally important numbers whilst Redshank and Knot often do so. Many waders visit the site on passage in spring or autumn, including nationally important numbers of Ringed Plover. The estuary is of international importance for Shelduck in winter and for Red-breasted Merganser in autumn. Nationally important wintering flocks of Common and Velvet Scoter, Scaup and Eider also occur, principally in St Andrews Bay and near Eden Mouth where the main flocks of Merganser are found. Variable numbers of Greylag and Pinkfooted Geese use the estuary as a nocturnal roost with internationally important numbers of Greylag in harder winters. The estuary is of regional significance for several other species of wildfowl and waders in winter including Wigeon, Teal, Dunlin and Curlew. A small but diverse population of breeding birds occurs within the site, which is also of importance in Fife as a feeding area for young Shelduck.

The mudflats are very varied with beds of mussels, brown algae and eelgrass. The three British species of Eelgrass *Zostera augustifolia*, *Z.noltii*, and *Z.marina* are present and all are nationally scarce. There is good representation of saltmarsh types, from pioneer communities with Glasswort *Salicornia europaea* to upper marsh communities with Saltmarsh Rush *Juncus gerardi* and, locally, Saltmarsh Flat-sedge *Blysmus rufus* or Slender Spike-rush *Eleocharis unigulumis*. Brackish swamp with Sea Club-rush *Scirpus maritimus* and other reedswamp types are locally extensive, and in places are transitional to freshwater swamp or fen with characteristic species such as Hemlock Water-dropwort *Oenanthe crocata* and Gipsywort *Lycopus europaeus*.

The outer part of the estuary and the West Sands are largely fringed by sand dunes. Several dune and drift line plant communities are well represented, with several species of plants and insects which are scarce in Fife, such as Blue Fleabane *Erigeron acer*, Oak-leaved Goosefoot *Chenopodium glaucum* which is also scarce in Britain, and the Grayling butterfly *Hipparchia semele*. The uppermost section of the estuary is riverine in character with associated woodland and scrub. The river terrace supports Alder-willow swamp woodland with a characteristic

ground flora including Common Nettle *Urtica dioica* and Ramsons *Allium ursinum*. This woodland type is scarce and declining in the District. Mixed scrub is abundant on the south side of the valley with an abundance of Wood Stitchwort *Stellaria nemorum* which is rare in the District. Areas of Ash-Alder flush woodland and freshwater marsh add to the habitat diversity of the site.

#### **4.0 REMARKS**

A Nature Conservation Review Site in part.

Part declared under Section 21 of the National Parks and Access to the Countryside Act 1949 as a Local Nature Reserve on 28 September 1978 and managed by North East Fife District Council.

This site has been identified as part of the larger Eden Estuary, Tentsmuir Point and Abertay Sands Site which meets the criteria for designation as a wetland site of international importance under the Ramsar Convention and as a Special Protection Area under the terms of the European Community Directive 79/409/EEC on the Conservation of Wild Birds.

Adjoins Earlshall Muir SSSI.

Boundary amended with a net increase.