

Interreg
North Sea Region
Building with Nature

European Regional Development Fund



EUROPEAN UNION

Coordination meeting Scotland **DUNDEE, SCOTLAND**

Wednesday 5 - Friday 7 September 2018

Supported by



Scottish Government
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CONTENTS

PROGRAMME

September 5 - 7

GETTING AROUND

Map & travel information

WHAT TO SEE & DO

Ideas for free time in Dundee & Scotland

BRIEFING NOTES

- Building with nature in Scotland
- Eddleston Water
- South Esk River Catchment
- Coastal Protection - A Scottish policy summary
- Dynamic Coast (NCCA)
- Montrose Coast Erosion
- St Andrews Site Visit

ATTENDEES LIST

CONTACT

If you have any questions please contact

Debi Garft, Scottish Government debi.garft@gov.scot / 0044 (0)7387 233605

Ruth Wolstenholme, Sniffer ruth@sniffer.org.uk / 0044 (0)771 289 6934

PROGRAMME

DAY 1 - WEDNESDAY 5 SEPTEMBER

- 0900 - 1700 Work Package 3 (River Room 3) Meetings in Dundee University Tower Building, 9th Floor.
1200 - 1700 Work Package 4 (River Room 2) (Refreshments and lunch provided)
- 1800 - 2000 Informal Meal at the Malmaison Hotel for those who booked
2030 - 2200 Welcome Reception and Whisky tasting at The Vine

DAY 2 - THURSDAY 6 SEPTEMBER

- 0815 - 1700 Site Visits-Meet outside side entrance Malmaison Hotel.
Please come prepared for the Scottish weather with sturdy footwear/boots and waterproofs
(refreshments and lunch provided)
- Montrose (Morning) - Presentation at SWT & site visit
 - St Andrews (Afternoon) - Presentation & beach visit
- 1830 Reception and Tour of RRS Discovery
1945 Formal dinner at Discovery Visitor Centre

DAY 3 - FRIDAY 7 SEPTEMBER

- 0815 - 1330 Project co-ordination committee meeting
in the Malmaison Hotel (Refreshments and lunch provided)

VISITING THE EDDLESTON

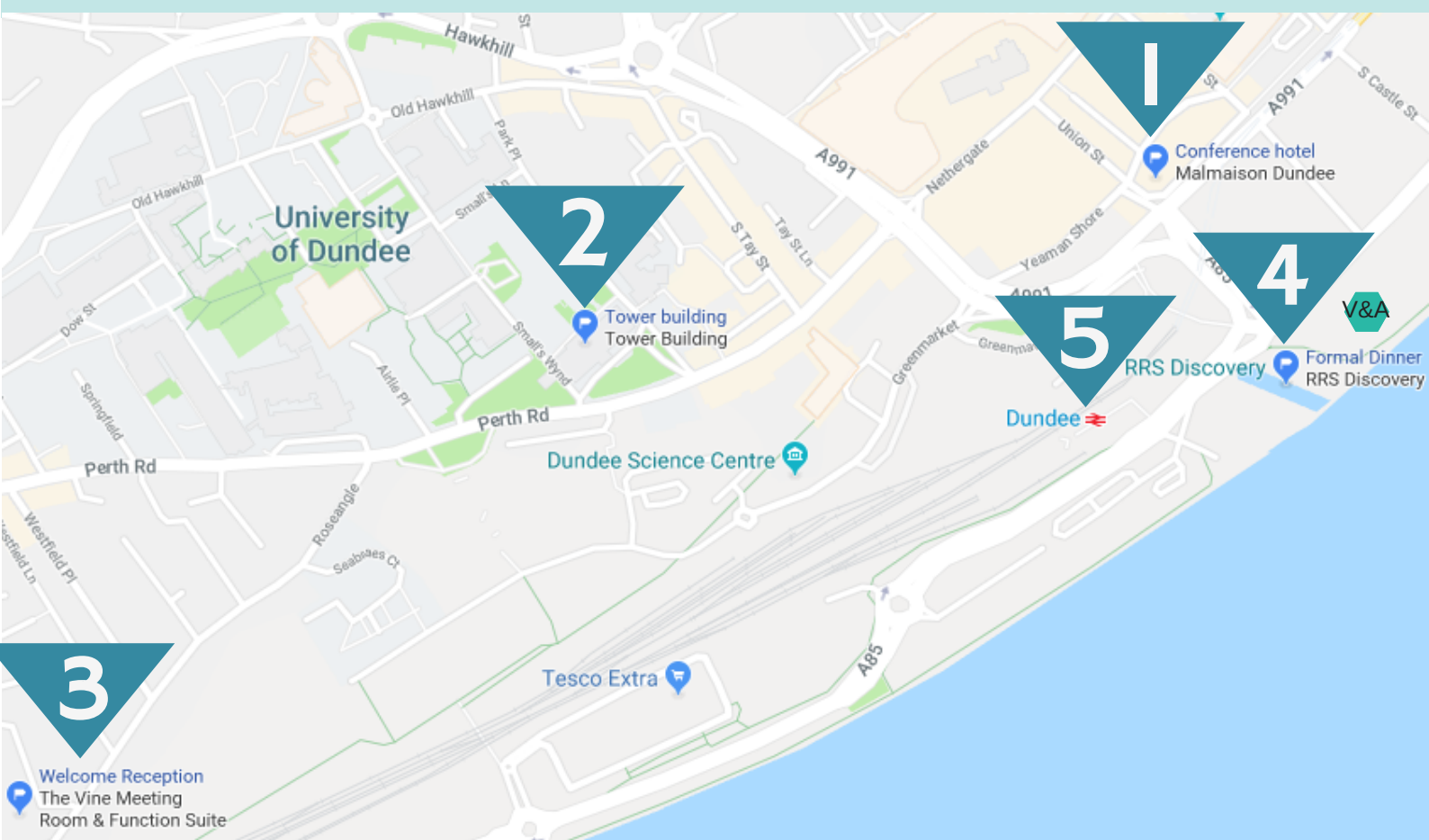
A visit to the Eddleston Water project has been arranged separately by the Tweed Forum for Tuesday 4 September

LOCATIONS



1. Dundee - Meeting venue
2. Montrose - Morning Site Visit
3. Charleton Fruit Farm - Lunch venue
4. St. Andrews - Afternoon site visit

GETTING AROUND



1. Malmaison Hotel - Conference hotel, Dinner Day 1 & Venue for Day 3
2. Tower Building University of Dundee, Nethergate DD1 4HN - Meetings Day 1
3. The Vine, 43 Magdalen Yard Rd, Dundee DD1 4NE - Welcome Reception & Whisky tasting Day 1
4. RRS Discovery - Formal Dinner & Tour Day 2
5. Dundee Train Station

Travelling to the meeting

We encourage you to consider your carbon footprint when attending this meeting. All locations within Dundee can be reached within 10 minutes walk of each other. For those wishing to explore more of the city you can hire a bike directly from the station using Bike & Go:

bikeandgo.co.uk/locations/scotland/dundee

You can take the Tram or Airlink 100 bus from Edinburgh Airport to Haymarket Station and catch the train to Dundee from there. Tram tickets must be bought from machines on the platform using cash or card, bus tickets can be bought on-board. You can book train tickets in advance at

Scotrail.co.uk

To plan your public transport within Scotland you can use travelinescotland.com.

WHAT TO SEE & DO

City of Discovery

Dundee is a historic city, famous for 'Jam, Jute and Journalism'. As the first UNESCO City of Design the modern city of Dundee has lots to offer, with a new V&A museum opening soon. It is home to the Discovery, which Scott and Shackleton and their brave crew took on their Antarctic adventures. It is in Lonely Planet's top 10 places to visit in Europe for 2018. There are lots of ways to extend your stay, listed on the Convention Bureau's website:

conventiondundeeandangus.co.uk

Here we've picked out some highlights of what to do in and near the city if you have extra time around your visit.

Free evening

Dundee Rep - The Dundee Rep is a world class performing arts organisation, and also a member of Scotland's Green Arts Initiative. The varied programme includes comedy and poetry to dance and drama: [Dundee Repertory Theatre](#).

Two Hours

Dundee Botanic Garden - Visit the University of Dundee Botanic Garden and enjoy its wide range of plants, with fine collections of conifers and broad-leaved trees and shrubs, tropical and temperate glasshouses, water garden and herb garden: [Dundee Botanic Garden](#).

Half Day

Tay River Trips and Dolphin Watching - In recent years dolphins have returned to the River Tay from around May to October. Take the opportunity to see them up close on a river trip on the Tay. Further information can be found at [Pirate Boats Ltd](#)

Full Day

Walking/Hiking around Dundee - There are a wide variety of walks in the countryside starting from or easily reached from Dundee. Make sure to bring appropriate footwear and a waterproof as the weather can change! Find routes at walkhighlands.co.uk/angus/dundee-arbroath

Explore Scotland

In 2017 Scotland was ranked as the second best country in the world to visit by Rough Guides. September is a great time to be in Scotland, and often sees the best of Scotland's weather, so an ideal time to extend your trip and visit. visitscotland.com

Building with Nature in Scotland

Author: Heather Forbes, SEPA

Background

In 2009 the Flood Risk Management (Scotland) Act 2009 (the FRM Act) set a direction for more sustainable flood risk management in Scotland, including greater coordination between responsible bodies and targeted, plan led investment in flooding. A key component of this more sustainable approach is the requirement to consider a wider suite of measures than has previously been the case, and in particular to consider where techniques that restore or enhance natural features can contribute to managing flood risk. In Scotland, this approach is commonly referred to as natural flood management or NFM.



Flooded Insh Marshes, Speyside

Responsibilities

NFM up until 2009 was largely being delivered by active non-governmental organisations such as Tweed Forum. The FRM Act required the Scottish Environment Protection Agency (SEPA) to carry out a high level strategic assessment of where NFM may be worthy of consideration nationally. In support of this assessment, SEPA produced maps showing areas of opportunity for NFM, including runoff reduction, floodplain storage, and sediment management. Where there was deemed to be opportunity, local authorities (municipalities) are now tasked with examining this in greater detail and identifying a mechanism for taking forward delivery. There are currently over 100 flood risk management actions identified across Scotland that incorporate NFM, predominantly studies.

Supporting NFM delivery

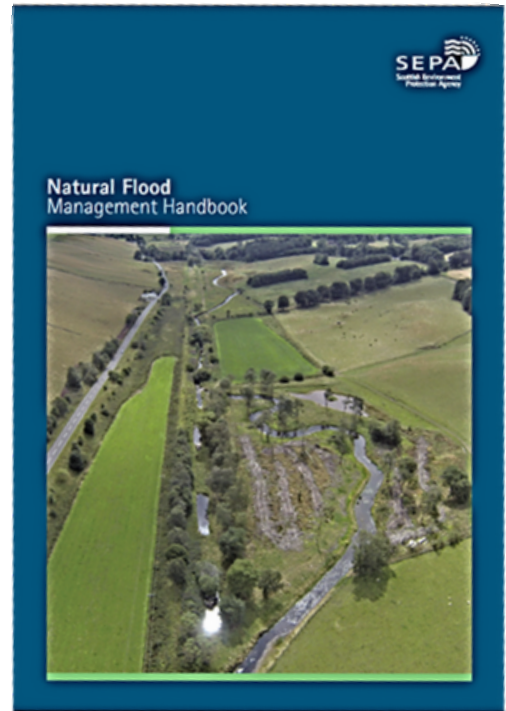
Since 2009, SEPA, Scottish Government and other partners such as the James Hutton Institute, Dundee University and Tweed Forum, have been working to support NFM delivery through a number of activities. These include:

- the production of guidance - e.g. the NFM Handbook;
- amendments to agri-environment schemes to better facilitate NFM delivery by land managers;
- research into the efficacy of NFM – most notably the Eddleston Water Project;
- social research into land manager attitudes and barriers to implementation;
- guidance on mechanisms to compensate land managers for NFM delivery: and
- identification of existing natural features that mitigate flood risk.

Building with Nature in Scotland

Integrating NFM delivery with other drivers

In addition to flood risk mitigation, NFM frequently delivers many other benefits. In recognition of this, opportunities to integrate NFM delivery with other drivers are being examined. This includes opportunities to integrate delivery with Water Framework Directive targets and peatland restoration targets. Analysis of Scotland's National Forest Estate has also been conducted to identify where forestry management may influence flood risk areas.



NFM Network Scotland (www.nfm.scot)

To support NFM delivery, the NFM Network Scotland was established in early 2018. This is a dedicated online resource on NFM that aims to bring together practitioners to share knowledge and best practice. The network provide information on relevant news and events, Scottish case studies, and NFM resources. Although it is focused on delivery in Scotland, anyone is welcome to join.



NFM
Network
Scotland

The Eddleston Water Project

Author: Luke Comins, Tweed Forum

Who is involved

The project is a partnership initiative led by the Tweed Forum with Scottish Government, Scottish Environment Protection Agency (SEPA) and the University of Dundee. Other key partners include British Geological Survey, Scottish Borders Council, Scottish Natural Heritage, the Forestry Commission, National Farmers Union (Scotland) the Tweed Foundation, Forest carbon and the Woodland Trust. The Forum works closely with landowners and the local community so that everyone can contribute ideas and follow the project's progress.

Project results so far

Working with land managers we have been able to introduce subtle changes to current land management practices in order to slow water flow off the hills, create more storage potential and reconnect the river with its floodplain.

So far we have carried out the following on 12 separate farms:

- **207 hectares of riparian and headwater woodland** created which will help increase infiltration and slow overland flow
- **Over 16,000 metres of fencing erected** and **332,000 trees planted**
- **2.8km of river re-meandered and 2900m of floodbank removed.** This has increased river length, reduced the slope and speed of the water flow and provided more space for flood waters, as well as creating new habitats and improving the landscape.
- **116 'high flow restrictors' installed** that will encourage out of bank flow and hold back water in the headwaters
- **28 leaky ponds created** (8000 square metres). These wetland features have a good deal of 'free board' built in so that they will store water during intense rainfall events.

Monitoring the effects of these measures is a fundamental part of the project and is supported by the Building with Nature project (EU North Sea Region Interreg). A network of rain gauges, groundwater and river level gauges have been installed throughout the valley to collect data on how the changes affect river flows and flood frequencies.

Other monitoring programmes will reveal what changes occur to the river's habitats and wildlife such as fish, aquatic invertebrates and vegetation. Detailed monitoring and modelling of the groundwater has also been undertaken at a site close to Eddleston village.

Whilst the measures have yet to be tested by a big flood, early indications are that some do have an effect in storing water, increasing infiltration and delaying flood peaks; and certainly the ecology of the restored sections has improved significantly.



Eddleston Water – Project Sites

Project aims

The three main aims are to:

- Investigate the possibility of reducing the risk of flooding to the communities of Eddleston and Peebles by restoring some of the original natural features of the catchment.
- Improve the river habitat for wildlife and fisheries.
- Work with landowners and communities in the Eddleston valley to maximise the benefits they would gain from such work, while maintaining the profitability of local farms.

The Eddleston Water is a small tributary of the River Tweed, flowing 20 km north to south before reaching the main river in the town of Peebles. Over time, the course of the river has been extensively altered and long sections were straightened in the early 19th century. Other changes in land management, both in the river valley and on the surrounding hill slopes, have also altered how the land drains.

Together, these changes have resulted in an increased risk of flooding to Eddleston and Peebles, as rainfall and flood waters travel ever more quickly and directly from the hill slopes and along the river channels towards these communities. At the same time, these changes have also damaged the river environment itself, leading to the loss of over a quarter of the river's original length, and habitat loss for plants and animals, including salmon and trout, as well as rare and protected species such as otters and lampreys.



Installing woody debris flow restrictors, mimicking fallen trees, to hold back high flows



Extensive riparian planting on the Shiplaw Burn



Monitoring site - stream stage recorder



Re-meandering completed in 2015 on the Eddleston Water at Cringletie



Flood retention pond at Kidston Mill

Key

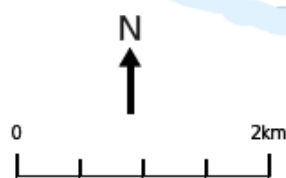
- Eddleston Watershed Boundary
- Existing Forestry

Completed Projects

- Flow Restrictors/Engineered Log Jams
- Leadburn Community Woodland
- Native Tree Planting
- Productive Conifer
- Native Planting - outwith project
- Pond
- Re-Meandering Works
- Transverse Hedges

Monitoring Sites

- ▲ Stream Stage Recorder
- Tipping Bucket Rain Gauge
- SEPA Hydrometric Monitoring Stations
- ◆ Forestry Commission Monitoring Stations
- ◆ Groundwater monitoring stations



South Esk River Catchment

Author: Rebecca Wade, Abertay University

The South Esk catchment includes the River South Esk and its tributaries, lochs, groundwater, wetlands, uplands, fertile farmland and the unique enclosed estuary of Montrose Basin. The area is very important regionally and beyond for a variety of reasons, a source of livelihood (for farming, forestry, fisheries and tourism), for recreation, as a supply of private drinking water and for wildlife. The River South Esk is designated a Special Area of Conservation (SAC) under the European Habitats Directive, for its populations of Atlantic salmon and freshwater pearl mussel.

Catchment management is delivered via the River South Esk Catchment Management Plan (CMP). The first CMP period is complete and has been extremely successful. River South Esk CMP2 is currently under consultation. Experienced participants from neighbouring catchment partnerships, shared experiences and expertise to help develop a comprehensive plan for sustainable catchment management. Throughout the life of the plan, partners, the community and a range of stakeholders have shared good practice, aspirations and when requested - valuable funding. This has resulted in a 90% delivery rate of the initial 65 actions, of which the partnership is very proud. The River South Esk Catchment Partnership is funded by Angus Council. Delivery partners and Stakeholders include Esk Rivers and Fisheries Trust, SNH, Cairngorms NPA. Find out more at: <http://theriversouthesk.org/>

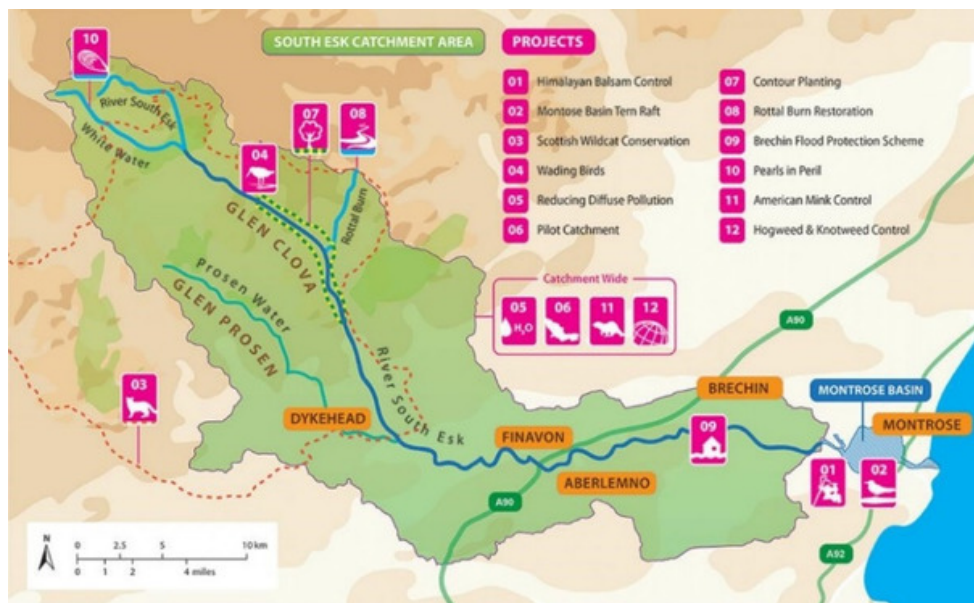


Figure 1 - Overview of catchment management projects

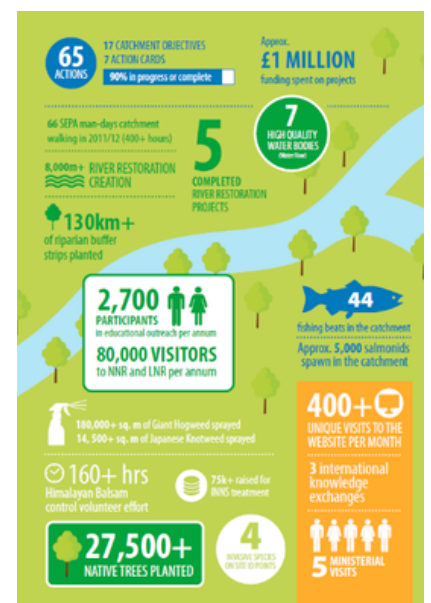


Figure 2 - Delivery and progress on catchment actions

South Esk River Catchment

The Rottal Burn river-restoration project

The Rottal Burn in the South Esk Catchment was re-meandered in 2012. The project aimed to restore the Rottal Burn to a more naturalised state, to enable it to support functional populations of salmon and trout, and to increase its general biodiversity potential. The project promoter was Esk Rivers and Fisheries Trust, with EnviroCentre Ltd providing assessment, design and construction management. Funding came from the SEPA Water Environment Fund and from Dee Ward (Rottal Estates). Since 2012, stakeholders and researchers have worked together to support multiple student projects which collectively provide a broad evidence base for the restoration benefits. The projects have monitored morphological and ecological change over 6 years as the system has matured. This site provides a rare example of an unconstrained restored channel, reconnected to its floodplain. The project has successful stakeholder, landowner and agency collaboration, coupled with research and monitoring impact. Research and student involvement is directly informing the next generation of engineers and environmentalists (via Abertay University and other Scottish universities). Monitoring project partners are Abertay University, Esk Rivers and Fisheries Trust, River South Esk Catchment Partnership and Rottal Estates.



Fig 3. Map and air photomontage (OS/SEPA/CEH)



Fig 4. Student at Rottal (Wade, 2017)

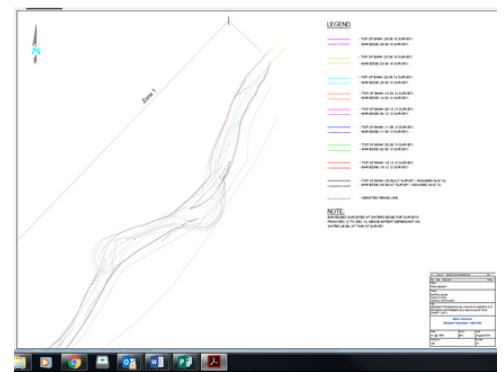


Fig 5. AutoCAD Bank Migration overlay (Hanova 2015)



Coastal Protection

A Scottish Policy Summary

Author: Alistair Rennie, Scottish Natural Heritage

Coast protection in Scotland is at the discretion of the landowner but formal coast protection schemes are controlled by Scottish Ministers and the Coast Protection Authorities (CPAs), under the **Coast Protection Act 1949** (Part I). All coastal local authorities (ie the regional level of government) are CPAs. The CPAs, however, also have discretionary powers to undertake certain coast protection works, but they are not obliged to protect land and may choose to allow land to erode. The CPA will be a regulatory body in schemes brought forward by private landowners, or may be both regulator and developer for their own schemes.

Act empowers CPAs to carry out such coast protection works, whether inside or outside their area, as may appear to them to be necessary or expedient for the protection of land in their area. Expedient is not defined within the Act but this generally means actions that are convenient or practical. This means unlike other legislation, in Scotland, the Coast Protection Act has no requirement for any works undertaken at the coast to be sustainable or proportionate to the erosion risk. This possibility may point contrast the duty placed on all public bodies within Section 44 of the Climate Change (Scotland) Act (2009), to act in the way best calculated to help deliver the climate change adaptation programme.

Certain areas are excluded from the Act, including our major ports on the rivers Clyde, Forth, Dee and Tay.

In England and Wales the Flood and Water Management Act (2010) makes amendments to the Coast Protection Act, making reference to national flood and erosion strategies.

Links to other legislation

Flood risk is covered within the Flood Risk Management (Scotland) Act 2009, which ensures a framework between all organisations involved in flooding; encourages sustainable flood management (working with natural processes); national assessments and maps informing regional strategies within Potentially Vulnerable Areas.

Climate Change (Scotland) Act 2009 is well known for ambitious mitigation efforts, but it also requires the development of an Adaptation Programme, which addresses the Scottish risks identified within the UK Climate Change Risk Assessment. All public bodies have duties to help deliver the Adaptation Programme.

Links to policy context available here: <http://www.dynamiccoast.com/outputs.html>

Dynamic Coast

Authors:

Dr Alistair Rennie, Scottish Natural Heritage

Jim Hansom, University of Glasgow

Prior to 2015 the Scottish Government and its Public Sector bodies had no national overview of the past and present rates and extents of coastal erosion and its associated flooding across Scotland. This restricted their individual and shared ability to effectively plan for climate change at the coast. In 2009 the Climate Change (Scotland) Act required the development of an Adaptation Programme in response to the risks identified for Scotland within the UK Climate Change Risk Assessment. This assessment anticipated increased coastal flooding and erosion, the loss of beaches and coastal features, aspects that required a detailed picture of past, current and future erosion. Severe coastal storms hit parts of the UK in 2014, this raising public and political interest.

Commencing in 2015, the overarching aim of the two year Dynamic Coast research project was to provide both the Scottish Government and its agencies (and the public) with a robust evidence base coastal erosion to satisfy statutory responsibilities, improve planning, resilience and adaptation on rapidly changing and increasingly mobile shorelines. Since its launch in 2017 the Dynamic Coast website has received over 6,500 unique users from half the countries in the world. Its maps and reports have fostered enhanced joint working and collaboration within Scotland, with data collection, analysis and sharing now more commonplace.

Dynamic Coast reviewed Scotland's 21,300km of shoreline and identified that 19% was potentially erodible or 'soft' (3,802km), 78% is hard and mixed (unlikely to erode at meaningful rates) and 3% is artificial. By comparing the position of soft shorelines in three series of maps since the 1890s, the mobility, past trend and future implications has been assessed.

Since the 1970s, 865 km of the soft coastline has moved position: 11% (423 km) has advanced seawards (accreted); 12% (442 km) has retreated landward (eroded); and the remaining 77% (2,936 km) has remained approximately stable. However, compared with the historic period (1890 to 1970), the proportion of advancing coast has fallen by 22% and the proportion of retreating coast has increased by 39%. Nationally, average erosion rates since the 1970s have doubled from their historic rates to 1.0 m/yr. Significant spatial variations exist within these national averages, with a marked bias of increased erosion on the more open east coast shores, which have both a higher natural susceptibility to erosion and a higher density of assets and infrastructure, compared with the west and north coasts.

Dynamic Coast

If the rates of recent erosion continue to 2050 at least 50 residential and non-residential buildings, 1.6 km of railway, 5.2 km of road and 2.4 km of clean water network as well as significant areas of runways, cultural and natural heritage sites are expected to be affected by coastal erosion. Using 2017 direct replacement costs alone, these total £340m, though this likely underestimates the number and value at risk and does not include indirect cost of collateral impacts. £340m compares with £5bn of assets currently protected by built defences and £13bn protected by natural defences (beaches and marshes etc). It is clear that Scotland's natural capital adds considerable natural capital and highlights the benefits that Building with Nature offers.

Dynamic Coast is GIS-based so results can be presented at national, regional, coastal cell, site levels or by theme (flooding or golf sector for example) to inform key decision makers. Interactive maps and summary reports are available via DynamicCoast.com.

Dynamic Coast 2 commenced in 2018 aiming to explore the resilience / susceptibility of our natural coastal defences, estimate any acceleration due to climate change, improve monitoring (satellite/drone/ground survey), development of Resilience & Adaptation plans at selected Super Sites and to explore whether vulnerability to coastal erosion has a socioeconomic bias.



Montrose - A short summary

Authors: Jim Hansom, University of Glasgow and Alistair Rennie, Scottish Natural Heritage

Montrose port and town has a population of 11,000 residents and sits on Scotland's east coast, between the mouths of the Rivers South and North Esk. It sits on a low-lying peninsula of glacial sands and gravels deposited over the last 10ka and reworked more recently as sea levels fell from about 6ka before commencing their rise over more recent decades. The peninsula encloses a tidal basin that is the largest saltwater lagoon in the UK. Extensive tsunami deposits on the basin's southern shore infer a wider entrance of the South Esk than existed some 7,000 years ago. The local economy includes agriculture, port, oil & gas servicing, engineering, pharmaceuticals, golf and tourism.

Historic map analysis shows a northerly extension of defences from the port since the 1900s, over which time the beach has continued to erode. Retreat of the low-tide line since 1902 has generally been more rapid than the high-tide line and there are areas where this trend is accelerating. Figures are provided (below) for a northerly transect at the southern end of the golf course, and a southerly transect at the Annat Bank (which is adjacent to the dredged tidal channel of the South Esk).

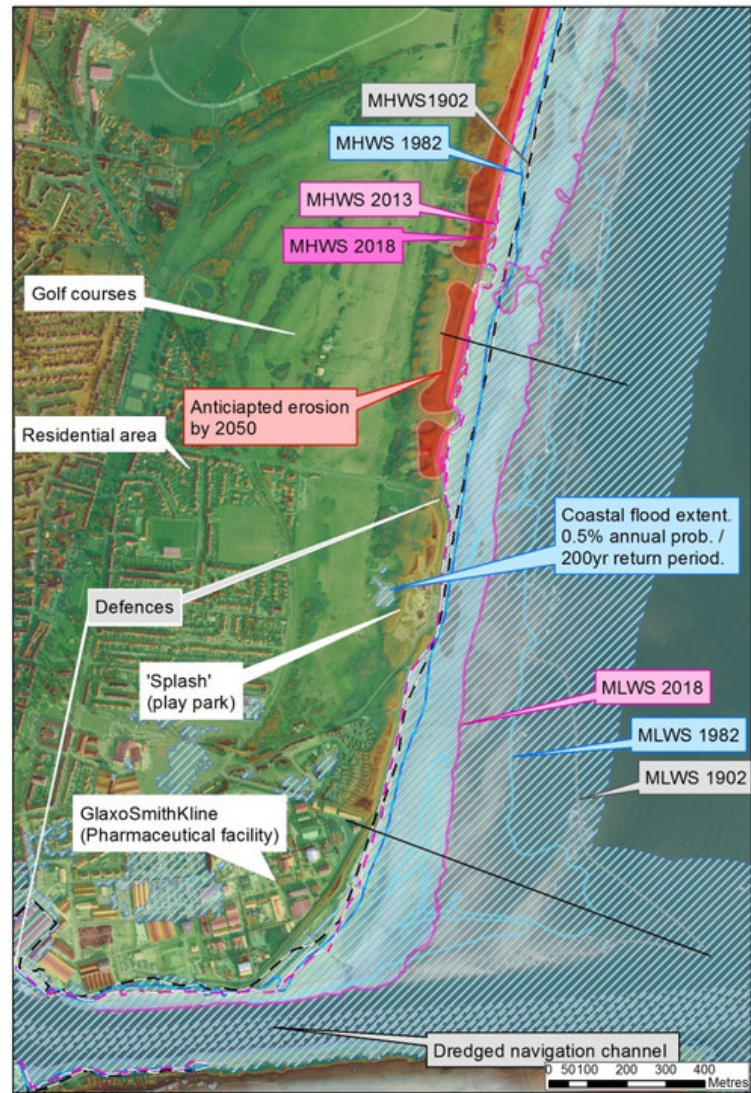
Based on recent erosion rates (1982-2013), ca 60m of erosion is anticipated over the next 30 years within the beach and dunes fronting the golf course. This is expected to exacerbate existing concerns for the residents and golfers, who see the dunes as their natural defences. The Angus Shoreline Management Plans (17 January 2017) states that the management policy is (from north to south): Beyond the golf course: No Active Intervention, at the Golf Course: Managed Realignment, at the Splash & Holiday Park: Hold the Line then Managed Realignment; and GlaxoSmithKline: Hold the Line.

Whilst much of the sand dunes are owned by Angus Council, residents argue that eventually defences will be needed, therefore it's better to build them sooner and save the golf course. The type of defences identified largely focus on structural interventions.

A synoptic overview identifies that sea levels have been rising here over the last few decades and is expected to quicken in coming decades. Wave and tidal nearshore hydrodynamics carry sediments largely northwards from the Splash area although a southward component also exists. The northward sediments can be seen to accumulate at the northern end of Montrose Bay. Any southern movement of sediment towards the mouth of the South Esk has resulted in the navigation channel of the port requiring to be dredged annually (ca 1.3million m³ over last 20yrs) and lost to the local system. The Annat Bank flanks the north side of the channel and accepts much of the southern sediment feed. Its extent and volume has reduced markedly since 1902. Irrespective of current activities and future plans to deepen the dredging channel, erosion rates are set to accelerate into the future given the anticipated increases in sea level rise, alongside associated increased wave energy and flood frequency.

A foreshore sediment dispersal experiment by Angus Council confirms that beach feeding is a possible management option. Results are promising with much of the sediment moving west and north from the Splash area. Beach feeding is one of a range of options being considered by the Angus Council's Flood Study which is running in parallel with the Dynamic Coast Super Site investigation. Montrose Port have yet to commit to beach feed as a viable option.

Montrose - A short summary



S. golf course

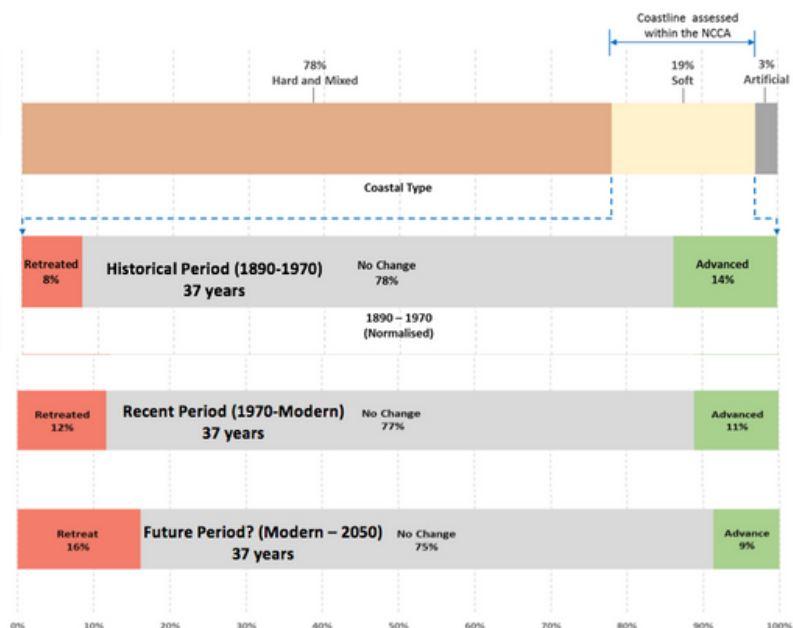
Year	change (m)	rate (m/yr)
1902 - 1982	-12.4	-0.2
1982 - 2013	-48.2	-1.6
2013 - 2018	-11.6	-2.3

Year	change (m)	rate (m/yr)
1902 - 1982	-103.2	-1.5
1982 - 2018	-57.8	-1.2

Annet Bank

Year	change (m)	rate (m/yr)
1902 - 1982	35.5	0.4
1982 - 2018	-26.9	-0.7

Year	change (m)	rate (m/yr)
1902 - 1982	-261.8	-3.9
1982 - 2018	-435.2	-9.3



Climate change is a likely driver (sea level increasing)

Montrose Bay

Authors:

Walter Scott, Angus Council

Mark Davidson, Angus Council

Montrose Bay is located on the North Sea coastline of Angus, 47km north-east of Dundee and 65km south of Aberdeen. Rivers North Esk and South Esk flow into the bay, with the Montrose Port Authority operating from the navigation channel of the South Esk.

In recent years there has been increased erosion and accretion along the shoreline, which is already directly affecting key assets and infrastructure in Montrose, including the fifth oldest golf course in the world. This risk had been identified in the Angus Shoreline Management Plan, which sets the policy for managing risks from erosion and flooding to the coast.

The effects of climate change are predicted to increase the rate of erosion and flooding. The Montrose Flood Protection Study, which is a requirement of the Tay Estuary and Montrose Basin Local Flood Risk Management Plan, is ongoing and will assess whether flood defences and natural flood management can be used to reduce flood risk in order that sustainable approach is taken and to consider the interactions between actions and effects on coastal processes along the shoreline. This study will be supported by ongoing work by consultant Partrac, who are specialists in sediment management, and who delivered the Sediment Tracer Study that confirmed the existence of onshore sediment transport pathways from nearshore deposition to the beach.

Montrose Bay has also been identified as one of seven 'super-sites' under the second phase of the Scottish Government's Dynamic Coast: Scotland's National Coastal Change Assessment, which aims to create a shared evidence base to support more sustainable coastal and terrestrial planning decisions in the light of a changing climate. The assessment will forecast future change in the shoreline, anticipated damage and develop mitigation and adaptation plans with stakeholders.

The outputs of all of these studies are planned by the end of 2019, which will allow any actions including mitigation and protection works to be considered within the prioritisation for the 2022-28 flood risk management cycle.

In the meantime, the Montrose Bay Stakeholder Group (a group convened and chaired by officers of Angus Council, and attended by local councillors and representatives of Scottish Environment Protection Agency, Scottish Natural Heritage, Montrose Port Authority, Marine Scotland and Montrose Golf Links Limited will continue to work collaboratively to seek to advance coastal management practice, ongoing studies and monitoring, as well as mitigation and protection works.

Angus Council are delighted to welcome Interreg to visit Montrose Bay. During your visit we will show you the beach and some of the affected infrastructure and explain the coastal processes first hand. We hope that you will gain an appreciation of the scale and effects of coastal erosion and perhaps you can offer some ideas on how we can best seek to manage it."

St Andrews Site Visit

Introduction

Dune management at St Andrews provides an alternative perspective to the morning session at Montrose. Whilst there are similarities with Montrose, the driving mechanisms are different and so it is essential to appreciate the physical processes alongside the social, policy and governance relationships. At St Andrews, genuine partnership working has successfully enhanced the natural resilience of this globally renowned tourism resource. Relationships have grown and fostered over decades on several projects that have Building with Nature at its core. The Dynamic Coast supersite work attempts to build on past collaboration, consider future risks and opportunities to develop Resilience and Adaptation Plans here and elsewhere.

Briefing note for St Andrew's field trip

St Andrews is an historic town with a population of 17,000 and hosts Scotland's oldest University, the 3rd oldest in the English-speaking world. Globally recognised as the 'home of golf', its links (sand dunes) extend from the town to the sea so that nature is never far away. Golf has been played here for over 600 years and is a key economic driver. During the 2015 Open Golf Championship 90,000 visitors contributed more than £88m to the economy and a further £52m in global marketing benefits from 500m TV viewers.

The St Andrews peninsula is composed of Holocene sands sitting atop of Old Red Sandstone and backed by cliffs which underlie the town. The sands are mostly sourced from the adjacent River Tay (which has the greatest sediment flux of Scotland's rivers) and have been deposited and reshaped over millennia. Over the last hundred years the links have grown seawards, to such an extent that at least 9 golf holes are now located in an area that was sea in 1893. More recently the accretion has slowed and replaced by erosion in some places. The earliest golf course designers always worked with nature and, since 2000, that sentiment has been evident in the management of the links and beach.

The links are owned by the St Andrews Links Trust, which takes a partnership approach to coastal management via West Sands Partnership, which include the Links Trust, Fife Council, Fife Coast and Countryside Trust, University of St Andrews and SNH. The links and estuary have international (SAC) designations for estuarine habitats, seals and National (SSSI) designations for dunes, mudflats and a variety of bird interests.

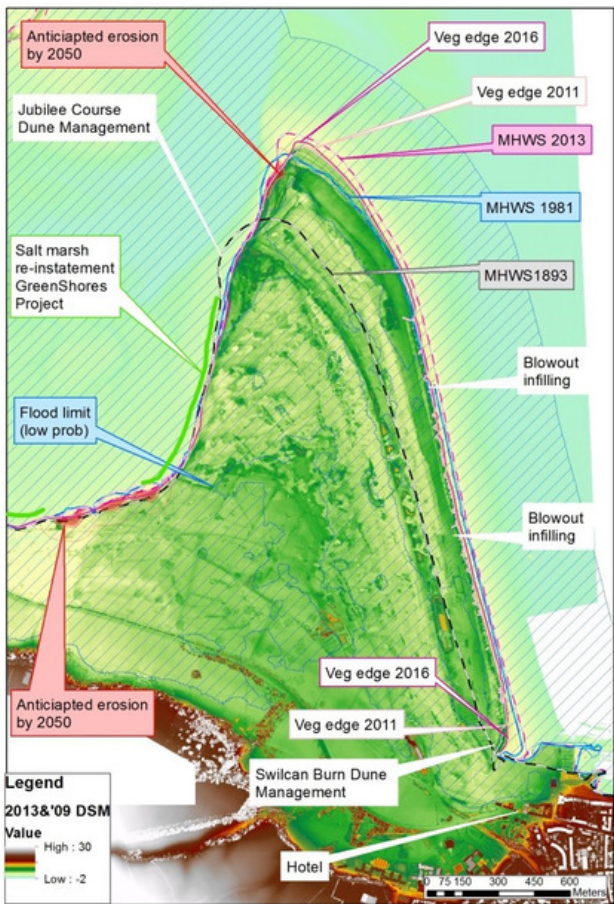
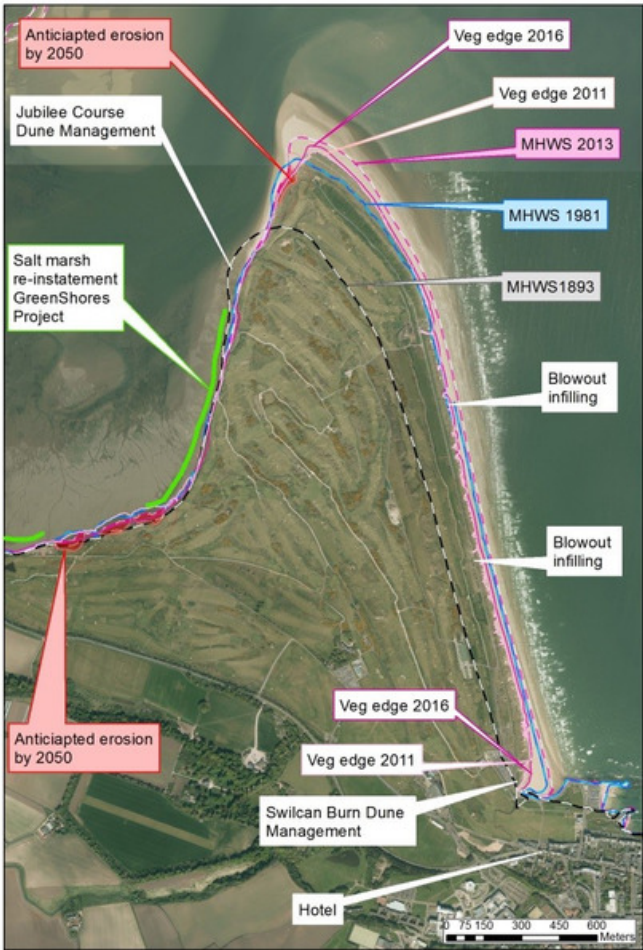
Swilcan Burn Dune Management – in March 2010 a storm surge exacerbated existing erosion along the dune edge at the mouth of the Swilcan Burn. The SUSCOD project (Interreg 4B) alongside the West Sands Partnership undertook dune re-profiling in June 2010 with 7,500 m³ of sand sourced from the intertidal area north of the dunes together with thousands of transplanted marram plants. The reinstatement works cost £100k (SALT, Fife Council & Fife/ Scottish Enterprise) and provided essential flood and erosion defence but also improved access to the beach (key tourism resource) whilst safeguarding one of the most important views in world golf. Further info via the ScotGolf Summary.

St Andrews Site Visit

Jubilee Course defences & multiple dune feed – Sand dunes which protect the north-western edge of the Jubilee Course from waves in the Eden Estuary were first defended in 2001 with sloped gabion baskets fronted and topped with 10,000 m³ of sand to the dune and planted. Subsequently the Eden Estuary was designated as a European SAC and this part successfully recharged again in 2008 (ca 12,000 m³). It will likely require a recharge in the coming years. Costs for each feed were approximately tens of thousand pounds. Some of the feed sediment has been trapped within the frontal dune where undercutting has then trickle-fed the beach. Monitoring suggests the dune is resilient and the approach taken has been viewed as successful.

Salt marsh restoration – Between 2000-2018 sections of the salt marsh in the Eden Estuary have been reinstated. Initially as part of a PhD, this has developed into a pan-Scotland project using Building with Nature techniques funding support from SNH, Uni of St Andrews, Scottish Environment Protection Authority, Ministry of Defence, European Agricultural Fund, Royal Dornoch Golf Club and Fife Council approaching. These techniques are also being used protect Royal Dornoch's Struie Course. Design enhancements are being incorporated improve the success rate (use of bio-rolls, species mixes and greenhouses for propagation etc).

St Andrews Site Visit



Jubilee feed & marram planting



West sands blowouts



GreenShore salt marsh work



Swilcan burn dune management 2010 & 2011

St Andrews Site Visit - 6 September 2018

Site visit schedule, 6 September 2018

0830	Travel from Dundee	Coaches organised
0950	Montrose Basin Scottish Wildlife visitor centre https://scottishwildlifetrust.org.uk/reserve/montrose-basin/	Two x 10 min presentations • Dynamic coast (Ali 10min) • Montrose & St Andrews (Jim 10min) • Montrose (Walter 10min) Followed by 20 mins to view the basin
1050	Travel to Montrose coastal site	
1100	Walk and Talk Montrose beach	NB high tide is at 1220
1220	Travel to Charleton Fruit Farm	
1230	Lunch Charleton Fruit Farm	http://www.charleton-farm.co.uk/
2:30	Arrive St Andrews Rusack's hotel	Tea/coffee/toilets 5 mins briefing from Heather (NFM in Scotland) & Rebecca Wade (S. Esk) 2 min Ali to remind where we're going & intro Euan / Gordon / Randal. 2 min into from Ewan Loudon CEO of St Andrews Links Trust
3:15	start site visit at St Andrews	3:15-3:25 walk to road bridge over Swilcan Burn, via Grannie Clarks Wynd 3:25-3:45 discuss Swilcan Burn feed (20mins) 3:45-3:55 drive to Out Head 3:55-4:05 walk SW to Jubilee Feed (500m) 4:05-4:25 talk at Jubilee Feed (20mins) 4:25-4:35 walk N to Outhead 4:35-4:40 thanks to Gordon, Ewan & Randal.
4:45	leave St Andrews for Dundee	Coach trip
5:15	Arrive Dundee	– freshen up for exhibition & meal
1730	Arrive Dundee ahead of evening meal	Return Dundee (timing negotiable) - ready for evening meal Discovery / Malmaison (tbc)

Attendees	Tuesday 4 Eddlestone Visit	Wednesday WP Meeting	Wednesday Evening Meal	Thursday Sit Visits	Thursday Reception & Dinner	Friday Coordination Meeting
Alison Baker				X	X	
Alistair Rennie				X	X	
Andrew Black					X	
Angus Tree	X	WP 4				
Anni Lassen	X	WP 3	X	X	X	X
Antje Branding				X	X	
Arfst Hinrichsen		WP 3	X	X	X	
Birgit Matelski			X	X	X	X
Charlotte Carlsson		WP 3		X	X	
Chris Spray	X	WP 4	X	X	X	X
Chris Zevenbergen				X	X	X
Craig MacIntyre				X	X	
Daphné Thoon		WP 3	X	X	X	X
Debi Garft		WP 4	X	X	X	X
Dirk Jan Douglas				X	X	X
Egon Baldal					X	X
Elisabeth Sijbrandij		WP 4	X	X	X	X
Erik Schenstrom				X	X	X
Floris Groenendijk			X	X	X	X
Heather Forbes		WP 4		X	X	X
Henrik Djerv		WP 4		X	X	
Holger Blum	X	WP 3	X	X	X	X
Inger Staubo		WP 4		X	X	X
James Fitton		WP 3	X	X	X	
Jasper Fiselier	X	WP 3 / 4	X	X	X	
Jens Hansen		WP 3	X	X	X	X
Jim Hansom				X	X	
Julia Busch	X	WP 3		X	X	X
Kees de Jong				X	X	X
Luke Comins	X	WP 4	X	X	X	X
Mark Davidson				X	X	
Mark Wilkinson		WP 4		X	X	X
Mike Strachan				X		
Ofelia Yocasta Rivero	X	WP 3	X	X	X	
Par Persson		WP 4		X	X	X
Per Sørensen	X	WP 3	X	X	X	X
Priscilla Kramer			X	X	X	X
Quirijn Lodder		WP 3	X	X	X	X
Rebecca Wade				X	X	
Rinse Wilmink	X	WP 3	X	X	X	
Ruth Wolstenholme			X	X	X	
Simon Hillmann	X	WP 3	X	X	X	X
Sofie Kamille Astrup	X	WP 3	X	X	X	
Stephanie IJff			X	X	X	X
Stevie Swenne					X	X
Susanne Quartel		WP 4		X	X	X
Thorbjorn Nilsson		WP 3		X	X	
Tommer Vermass		WP 3	X	X	X	
Walter Scott				X	X	

Interreg

North Sea Region

Building with Nature

European Regional Development Fund



EUROPEAN UNION

northsearegion.eu/building-with-nature



Scottish Government
Riaghaltas na h-Alba
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