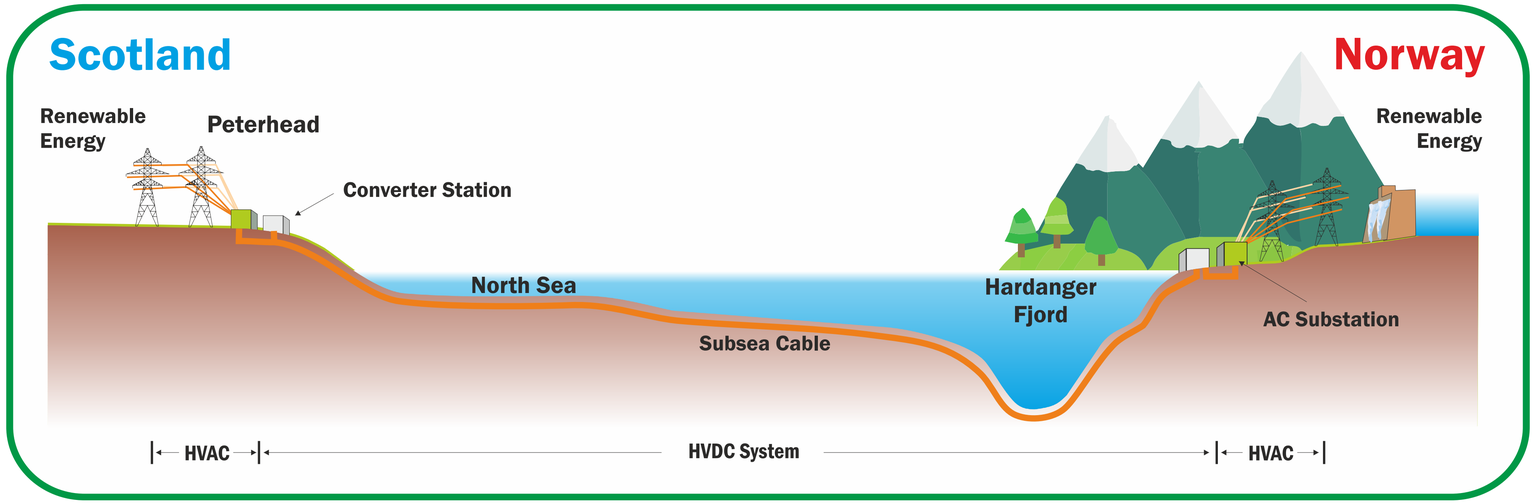
What is NorthConnect?

Welcome to our latest Community Open Days for the NorthConnect project

NorthConnect has been set up to develop, consent, build and operate a High Voltage Direct Current (HVDC) electrical interconnector between Peterhead in Scotland and Simadalen in Norway. The 665km long, 1400MW interconnector will provide an electricity transmission link allowing the two nations to exchange power and increase use of renewable energy. The intention is for the HVDC interconnector to be operational by 2023.

NorthConnect is a Joint Venture (JV) project company owned by four community and state-owned partners from Norway and Sweden: Agder Energi AS, E-CO Energi AS, Lyse Produksjon AS, and Vattenfall AB. The partnership was established on 1st February 2011.



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Project Benefits

Security of Supply

By tapping into the Nordic Region's hydro-power the UK will be able to import power when required, during planned shut-downs of generation plant, in periods of low wind, and in emergencies (un-planned shut-downs). Similarly, in periods of low rain fall and unplanned shutdowns in Norway, the UK will be able to export power to Norway to help secure their supply.

Green Battery

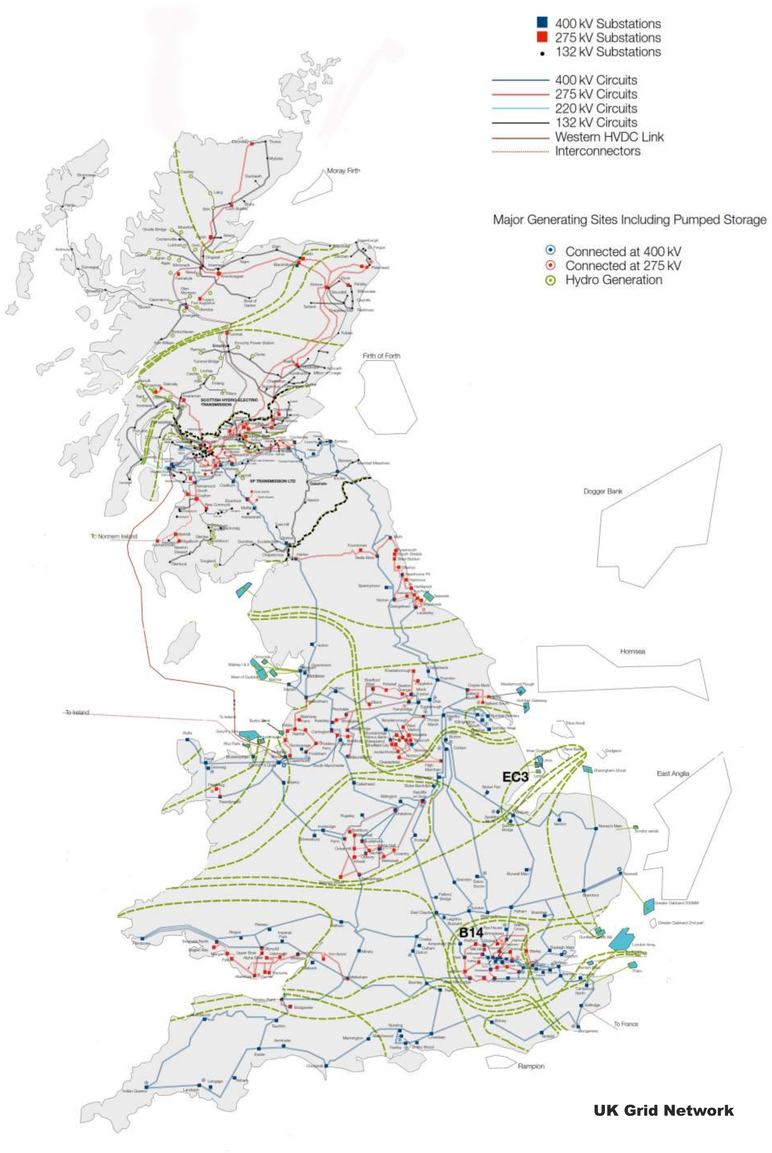
The south-west area of Norway contains 90% of the hydro-power plants in the country and is known as the 'green battery'. Tapping into this storage facility will help us meet our targets of increasing renewable energy production and reducing CO2 emissions.

Reduced Price Fluctuations

The price of electricity changes constantly in the UK depending on a number of factors. Having access to a wider electricity market will help to reduce the fluctuation in wholesale electricity prices which will help reduce the overall price we pay for electricity.

Balancing Mechanism

Additional security of supply benefit comes from being able help 'balance' the grid in Scotland which has a highly fluctuating, wind dominated system. It also helps relieve grid constraints at the border between Scotland and England, as our current grid system was not designed to support Scotland's new and increasing renewable energy production. The fast reacting converter station design coupled with hydro plants in Norway enables the interconnector to be used to support the Scottish system. It could also be used to re-start the grid in Scotland in a very short space of time following a 'Black-Out' scenario.



UK Grid Network

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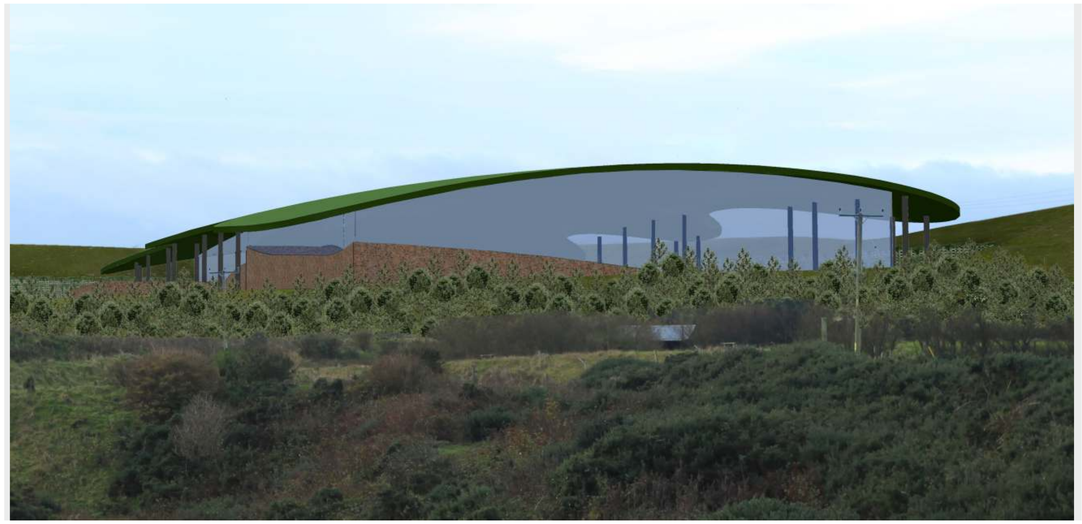
The Story So Far

NorthConnect is a large and complex project with a variety of different elements. Because of this, it has been split into different phases of development.

Early on in the process, NorthConnect completed a detailed site selection and route option assessment, particularly focussing on the alternatives in relation to location of the converter station site, location of the landfall and routing of the onshore cables and subsea cables. A second options assessment was then undertaken covering the specific locations for the converter station, landfall point and onshore cable routing.



Converter Station

Plan of Converter Station

Phase one of the development planning dealt with the Converter Station at Fourfields and the High Voltage Alternating Current (HVAC) cable connecting it with the substation near Peterhead Power Station. Full planning permission for this phase was granted by Aberdeenshire Council on the 27th August 2015. This planning permission is valid for a period of seven years.

A similar process is ongoing in Norway for their converter station.

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HVDC Cable Consenting Process

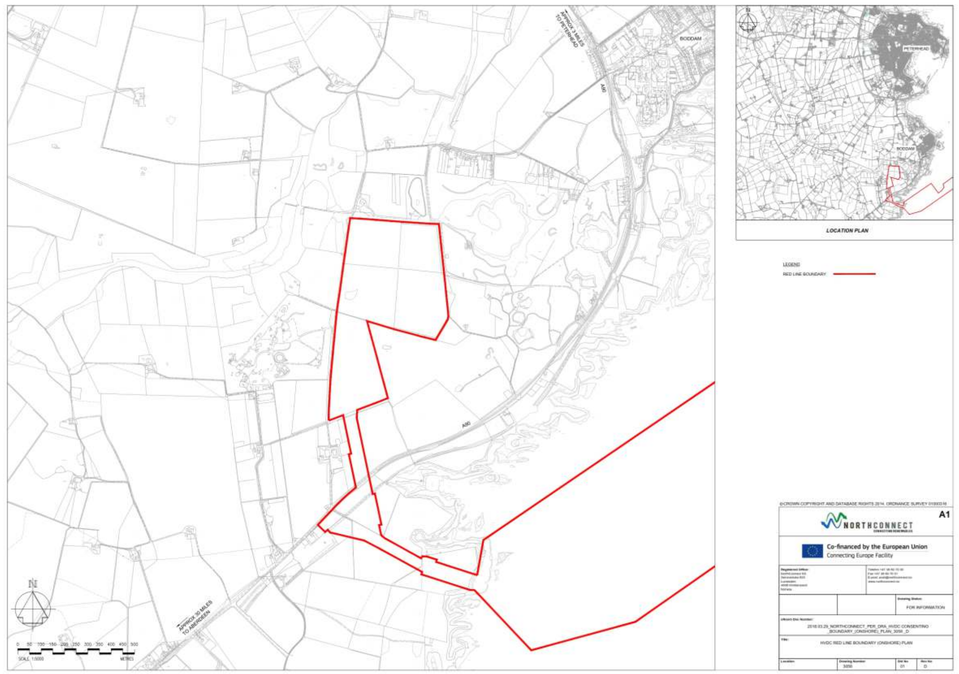
The High Voltage Direct Current (HVDC) cable will run from the Converter Station at Fourfields underground to Long Haven Bay and out into the North Sea on its way to Norway. This means that applications must be made to both Aberdeenshire Council and Marine Scotland, who are the consenting bodies involved in this development. A single Environmental Impact Assessment Report will be submitted to both authorities to support the applications.

This consultation process is specific to the scope of the planning and marine licence applications for the HVDC cables to connect to the interconnector converter station in Scotland.

The project consists of two High Voltage Direct Current (HVDC) cables and a fibre optic control cable to be laid along the bed of the North Sea between Simadalen in Norway and Long Haven Bay, south of Peterhead in Scotland. The fibre optic cable will be bundled with one of the HVDC cables resulting in 2 cable trenches.

At each end of the cables, a Converter Station will transform the energy from HVDC to HVAC (alternating current) in order for it to pass into the National Grid Network. In Scotland this is via the substation near Peterhead Power Station.

The Converter Station in Scotland is situated south of Peterhead at Stirling Hill, in an area called 'Fourfields'. Core paths are routed around three sides of the Fourfield site and the cables will pass under the southern section of the path. To minimise inconvenience to walkers, the proposal is to lay ducts under the path during enabling works, while access to the Stirling Hill Path which bisects the Fourfields site is open. The path will then be reinstated for use from then on. Cables will be pulled through the ducts at the appropriate point in the installation works.



HVDC corridor from converter station to sea

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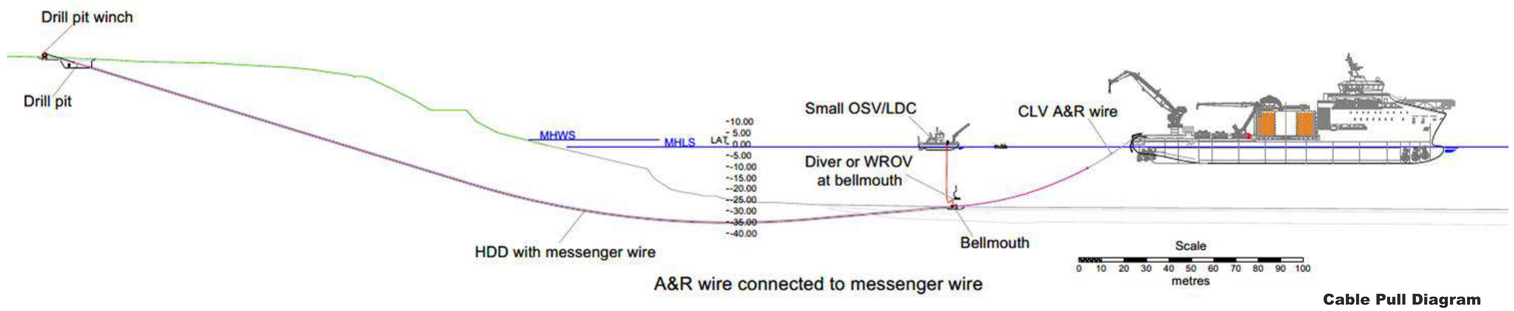
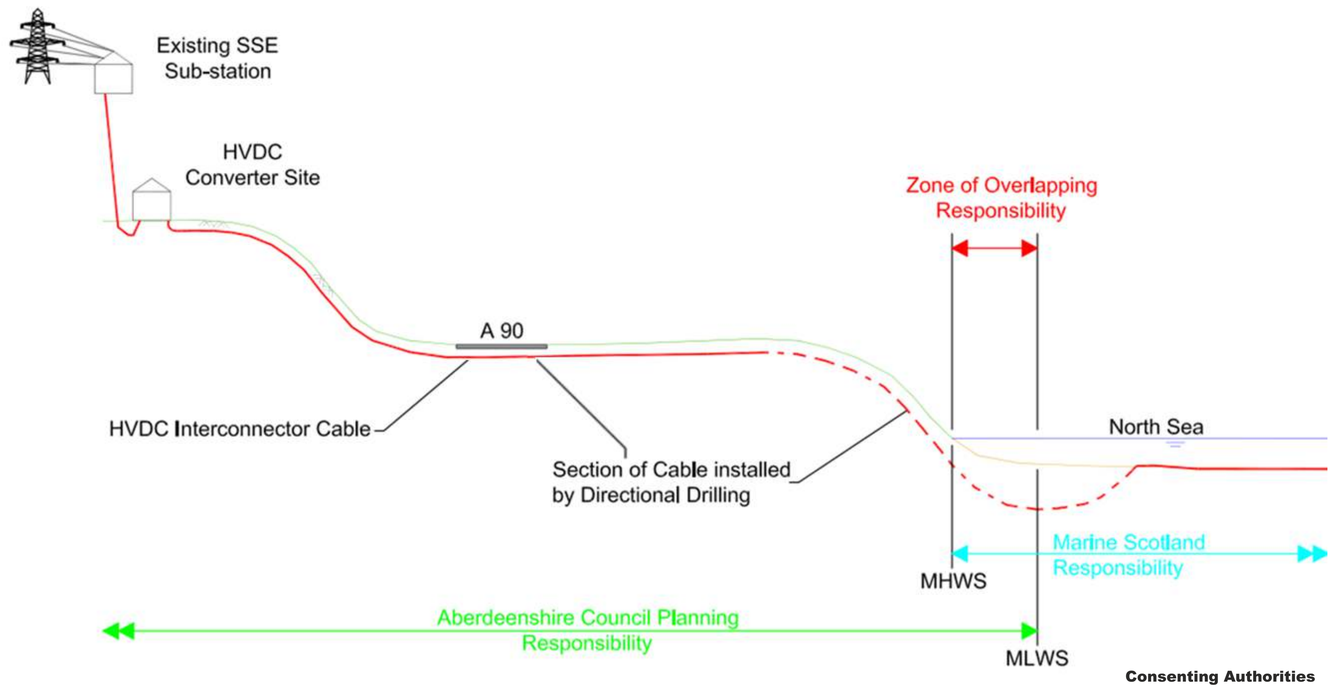
Project Description

The HVDC cables' landfall works will involve horizontal directional drilling (HDD) at Long Haven Bay of three cable ducts in order that the cables can be pulled from offshore to onshore. There will be a buried joint bay between the landfall and the A90 to change to land cables, which have a slightly different design.



Cable Pull Diagram

The HVDC onshore cables will be laid from there through further HDD works beneath the A90 trunk road, and then in a buried cable trench into the Fourfields Converter Station.



Consenting Authorities

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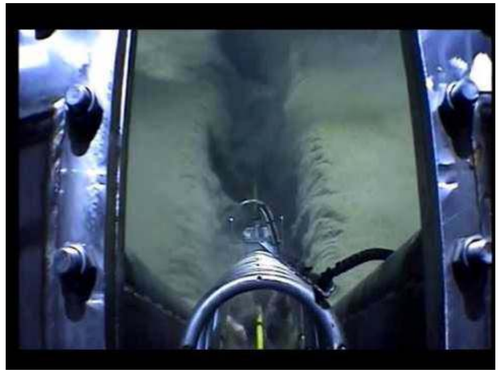
Marine Cable Installation

To protect the cable from damage, it will be installed below the seabed wherever practicable. This will be achieved by post-lay jet trenching, mechanical trenching or pre-trenching. This shall be attempted along all the specified sections of the cable routes except at:

- **Crossings of pipelines and cables where protection shall be carried out according to individual crossing agreements;**
- **On seabed with bedrock or exceptionally hard soils; or**
- **Where special features obstruct trenching.**



Cable Trenching

Cable Trenching

Cable Protection by Rock Placement

Rock placement will be the primary protection method used where the detailed engineering has demonstrated that trenching is not feasible, or if trenching has been unsuccessful or does not provide adequate protection. This is typically on hard seabed, boulder fields and at crossings. The total route across the North Sea has 105 cable and pipeline crossings to be managed.

Rock Placement

Rock Placement

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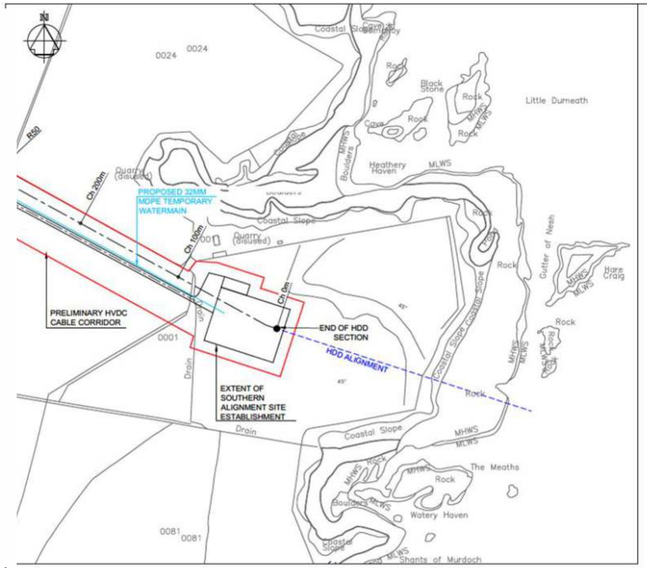
Onshore Development

Ground Investigation

Ground Investigations (GI) to understand the local geology and hydrogeology have taken place at both the Fourfields site and at landfall on the cliffs above Long Haven Bay as well as along the HVDC cable corridor route. This was to inform the onshore cable route and the location of where ducts can be drilled under the cliffs, to link the on and offshore cables. Further GI is being undertaken along the HVAC cable route, to be completed shortly, and from the Scottish Water reservoir to the Fourfields site.

GI investigations at Long Haven Bay



HDD Location Plan

Horizontal Directional Drilling (HDD)

Horizontal Directional Drilling will be used to drill the ducts under the cliffs at Long Haven Bay where the HVDC cables will come ashore. The site set up has been specifically designed with seabirds in mind to maximise distances from the loudest noise sources to the cliffs.

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Ecology

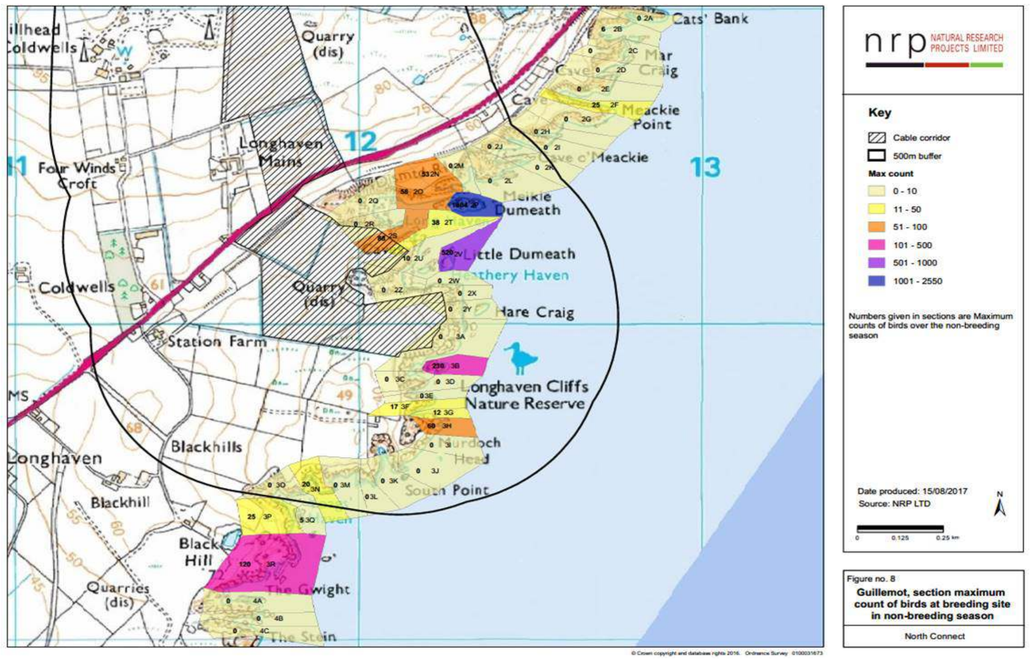
Northern Fulmar

Extensive ecological assessments have taken place, looking at a variety of species identified in the initial habitat surveys. These include surveys relating to vegetation, birds, otters, badgers and water voles. The vegetation survey focused on the coastline around the HVDC landfall, in the vicinity of Long Haven Bay; an area designated for vegetated sea cliffs as part of the Buchan Ness to Collieston Special Area of Conservation (SAC).

The bird surveys have focussed on the Buchan Ness to Collieston Special Protected Area (SPA) and the Bullers of Buchan Site of Special Scientific Interest (SSSI) around Long Haven Bay. These sites are important breeding area for seabirds such as common guillemot, kittiwake and herring gull.

This survey work has led to the decision to carry out the major onshore work at Long Haven Bay outwith the main bird breeding seasons.

Pre-construction surveys will be carried out to ensure that the information is up to date for the protected mammal species, such as otters and badgers, and if need be the cable routing will be moved within the planning red line boundary to avoid damage and minimise disturbance. Additional precautions to minimise disturbance will be implemented such as directional lighting and restrictions on construction access.



Example Bird Survey Results

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Archaeology

Archaeological walkovers along with desk top surveys have taken place to inform the route of the HVDC cables.

Key points of interest include the remains of a farm steading settlement in a corner of the Fourfields site. This area will be avoided during construction.

More recent archaeology includes a former railway line which is a section of the former Boddam Branch of the Great North of Scotland Railway; a 24 km single track branch line running from the Formatine & Buchan Railway at Ellon to Boddam. Opened in August 1897 the branch carried freight (predominantly from local quarries) and passenger traffic. Longhaven Station formed part of the disused branch line as did the goods siding to the southeast of the station. The HVDC cable will be routed underneath the route of the former line using HDD.

Former Railway Line near Long Haven Bay

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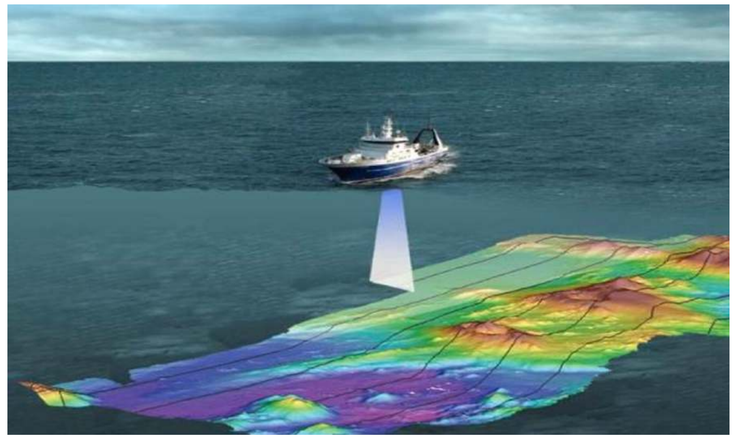
Offshore Corridor Development

Marine Survey

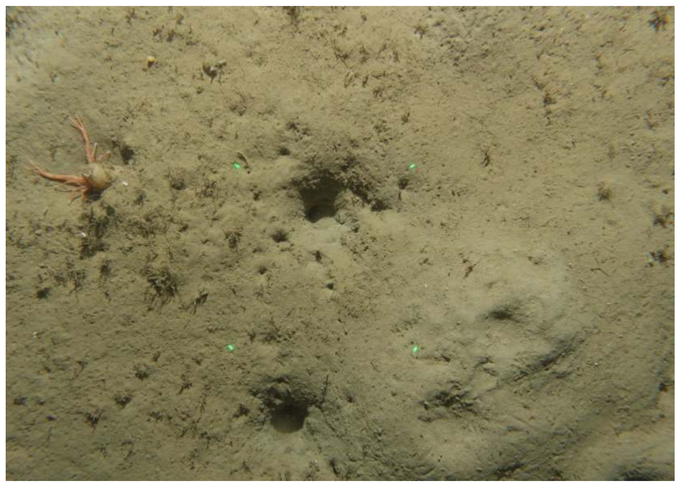
Marine projects require detailed survey work to help develop the best possible design, while minimising any potential impacts. The proposed marine cable route is around 665km long; that's equivalent to the distance between Peterhead and London. The marine survey corridor was approximately 500m wide.

Survey work began in the winter of 2016 and took around a year to conclude. The UK Nearshore Survey off the Boddam coast was undertaken in the winter months to avoid the bird breeding season. In the summer of 2017, the North Sea geophysical surveys, geotechnical surveys, and Remotely Operated Vehicle (ROV) inspections were conducted, to understand the bathymetry, geology, and other submarine features along the corridor.

The survey results will be used to inform the best possible route and installation techniques for the subsea cables. This involves ensuring that the cable burial and installation works will not interfere with other seabed infrastructure; will minimise environmental impact, and will have a minimal effect on fishing activities.



Example Survey Vessel



Benthic Ecology

Benthic Ecology

The geophysical survey data were used to predict the types of seabed habitat that might be present within the survey corridor in order to gain an understanding of what creatures might be living in the area, known as 'benthic ecology'. Video surveys of the benthic habitats were also undertaken, together with grab samples of the sea bed, which provided a more detailed understanding.

Some areas featuring sensitive benthic habitats were identified close to the UK coast. These were small pockets of biogenic reef, formed by a species of tube building worm called the 'Ross worm'. These areas are designated as Annex 1 habitats, and are protected by UK legislation. A 50m buffer has been added around the sensitive benthic habitat types, in order to ensure they are not damaged or disturbed during the cable installation and burial works.

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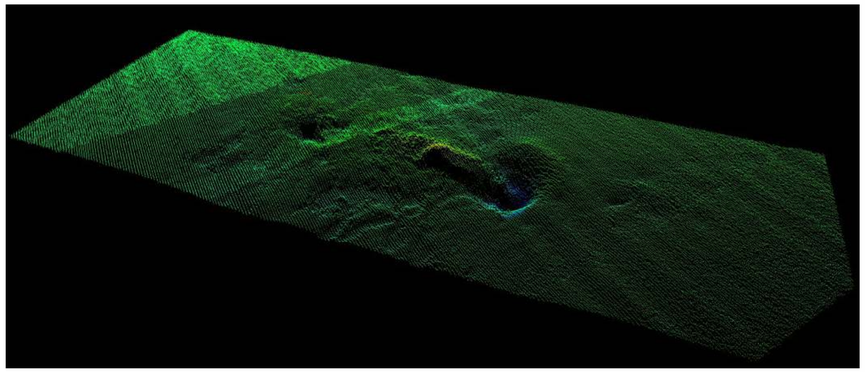
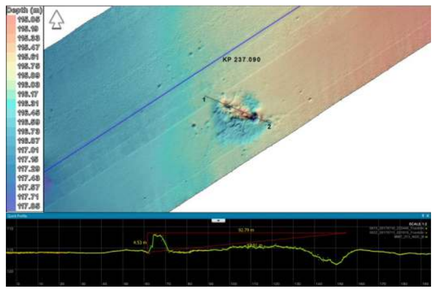
Offshore Corridor Development



Multi beam echo sounder profiles of a confirmed wreck identified within the NorthConnect marine survey corridor

Offshore Archaeology

One of the objectives of the North Sea geophysical survey was to identify features of potential archaeological interest within the survey corridor. A total of 6 sites were identified as being of possible archaeological interests, and these were later visually inspected using an ROV. The ROV inspections confirmed that 4 of the 6 possible sites were wrecks. The other 2 features were man made, but were not wrecks and did not have any archaeological value.



The wrecks included 2 known wrecks; the Egenaes, a fishing boat sunk by a German U-Boat in 1917, and M/V Margareta Nyborg, a Danish fishing vessel. The positions of the other two wrecks did not correlate with any known or reported vessel loss sites, and no name plates were found, so these remain unidentified. A 50m wide buffer zone has been placed around all the wreck sites, to ensure that these features are not damaged or disturbed during the cable installation a burial works.

The Consenting Corridor

The survey work has informed the identification of a corridor which we will now seeking consent for. The corridor encompasses the survey corridor minus benthic and archaeological features and associated buffer zones. The cable contractor will select the final cable routes, based on the information provided by NorthConnect and additional surveys they may wish to complete. The cables in the first 12 nautical miles will be laid within a 60m wide corridor within the consenting corridor. A lease from Crown Estates Scotland will be obtained for the cables laid in this area.

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Assessing the Impacts

The Environmental Impact Assessment Report is currently being produced to fully understand all the effects of the HVDC installation and operations. This will allow appropriate mitigation to be incorporated into the design and installation stages of the project and inform the planning and marine licence decisions. Aspects being assessed include:

- Sea users including: Fishing, oil and gas, and recreational users;
- Noise effects on local resident, birds and marine mammals;
- Traffic and Navigation;
- Ecology;
- Archaeology;
- Socio-economic;
- Water Quality;
- Geology and Hydrogeology;
- Archaeology and Cultural Heritage;
- Materials and Waste; and
- Air Quality and Climate Change.

Next Steps

Once we have gathered feedback from this open day and other consultation activities, such as the fishermen's drop in sessions and meetings with the various statutory stakeholders, we will finalise the Environmental Impact Assessment Report which will support both the planning application to Aberdeenshire Council and the Marine Licence applications to Marine Scotland.

Proposed Timeline

Submission – Summer 2018

Consultation period – Late Summer 2018

Expected decision – By end of 2018

Expected Construction Start – Spring/Summer 2019

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Legacy Fund

NorthConnect is working with Foundation Scotland, one of Scotland's leading organisations in the distribution and management of community funding, to provide the local area with a Legacy Fund to help create a strong, sustainable and resilient community in the years ahead.

The area of support encompasses a 10 mile radius around the NorthConnect project; the aims of the fund include:

- **To provide sustainable support to the communities living, working and playing in the vicinity of the NorthConnect infrastructure , including: the converter station, HVAC and HVDC cabling both on and offshore;**
- **To support sustainable energy use and production;**
- **To support sustainability, energy, environment, health and wellbeing education;**
- **To increase participation in and access to contemporary culture, events and recreational activities in an environmentally sensitive manner;**
- **To preserve and enhance the natural environment for residents and visitors to the area.**

The first round of funding through the NorthConnect Legacy Fund was awarded in December 2017. Twenty applications to the fund were received in total, and thirteen of those were successful, including Aberdeenshire Sailing Trust, Peterhead Sea Cadets and Boddam & District Community Council. A second round of funding will be open to applications later this year, so if you have a project that matches the aims above, please get in touch.

www.foundationscotland.org.uk/programmes/northconnect

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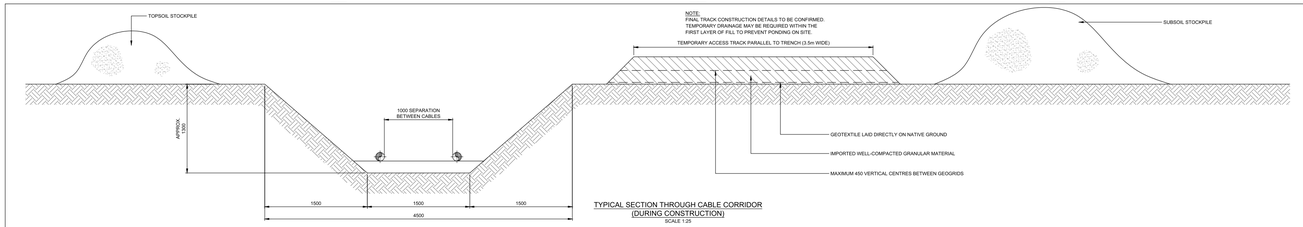
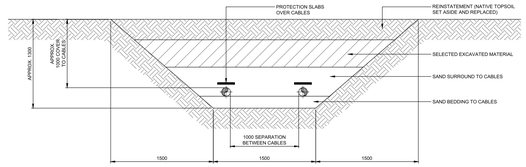
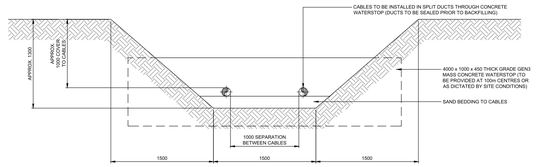


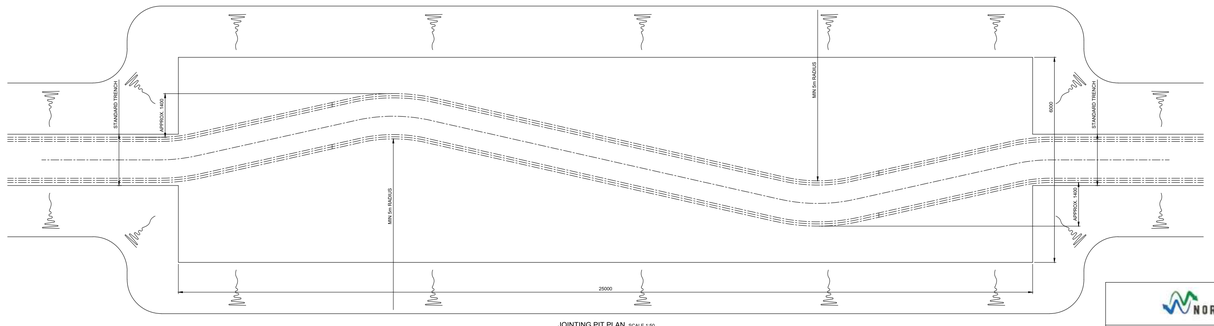
TYPICAL SECTION THROUGH CABLE CORRIDOR
(DURING CONSTRUCTION)
SCALE 1:25



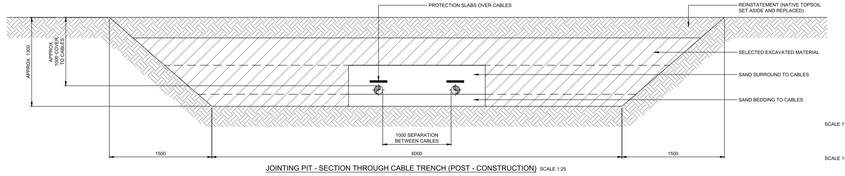
TYPICAL SECTION THROUGH CABLE TRENCH
(POST - CONSTRUCTION) SCALE 1:25



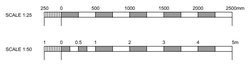
SUGGESTED WATERSTOP DETAIL
SCALE 1:25



JOINTING PIT PLAN SCALE 1:50



JOINTING PIT - SECTION THROUGH CABLE TRENCH (POST - CONSTRUCTION) SCALE 1:25



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NORTHCONNECT
CONNECTING RENEWABLES

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Drawing Status: FOR INFORMATION

eRoom Doc Number: 2018.02.13_Northconnect_TEC_DRA_HVDC_Onshore_Cable_Route_Details_3065_B

Title: HVDC ONSHORE CABLE ROUTE DETAILS

Location	Drawing Number	Sht No	Rev No
BODDAM	3065	C1	B

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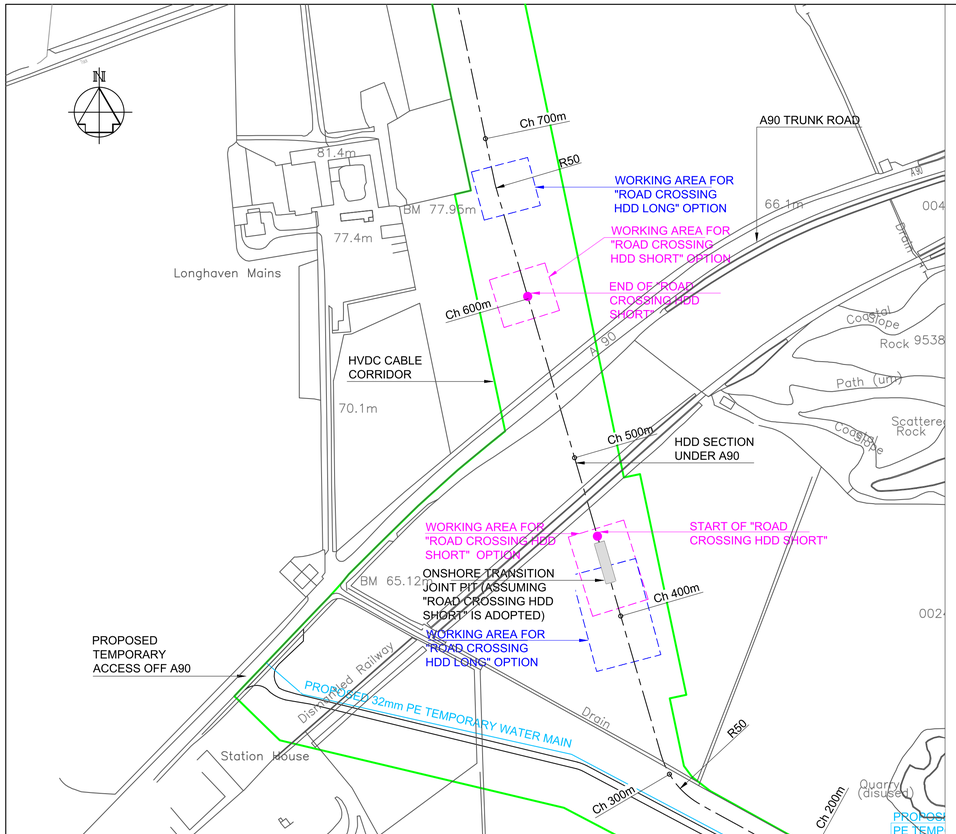

LEGEND

- PROPOSED WATER MAIN
- PROPOSED CABLE
- CABLE CORRIDOR
- WORKING AREA "ROAD CROSSING HDD LONG"
- WORKING AREA "ROAD CROSSING HDD SHORT"

NOTES

1. EARTHING REQUIREMENTS ALONG CABLE ROUTE TO BE CONFIRMED

TO BE READ IN CONJUNCTION WITH DRAWING NOs. 3060, 3061, 3063 & 3064

A3

NORTHCONNECT
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Drawing Status: FOR INFORMATION

eRoom Doc Number: 2018.02.01_NORTHCONNECT_TEC_DRA_HVDC_ONSHORE_CABLE_ROUTE_GENERAL_ARRANGEMENT_3062_E

Title: HVDC ONSHORE CABLE GENERAL ARRANGEMENT SHEET 2 OF 4

Location	Drawing Number	Sht No.	Rev No
BODDAM	3062	01	E

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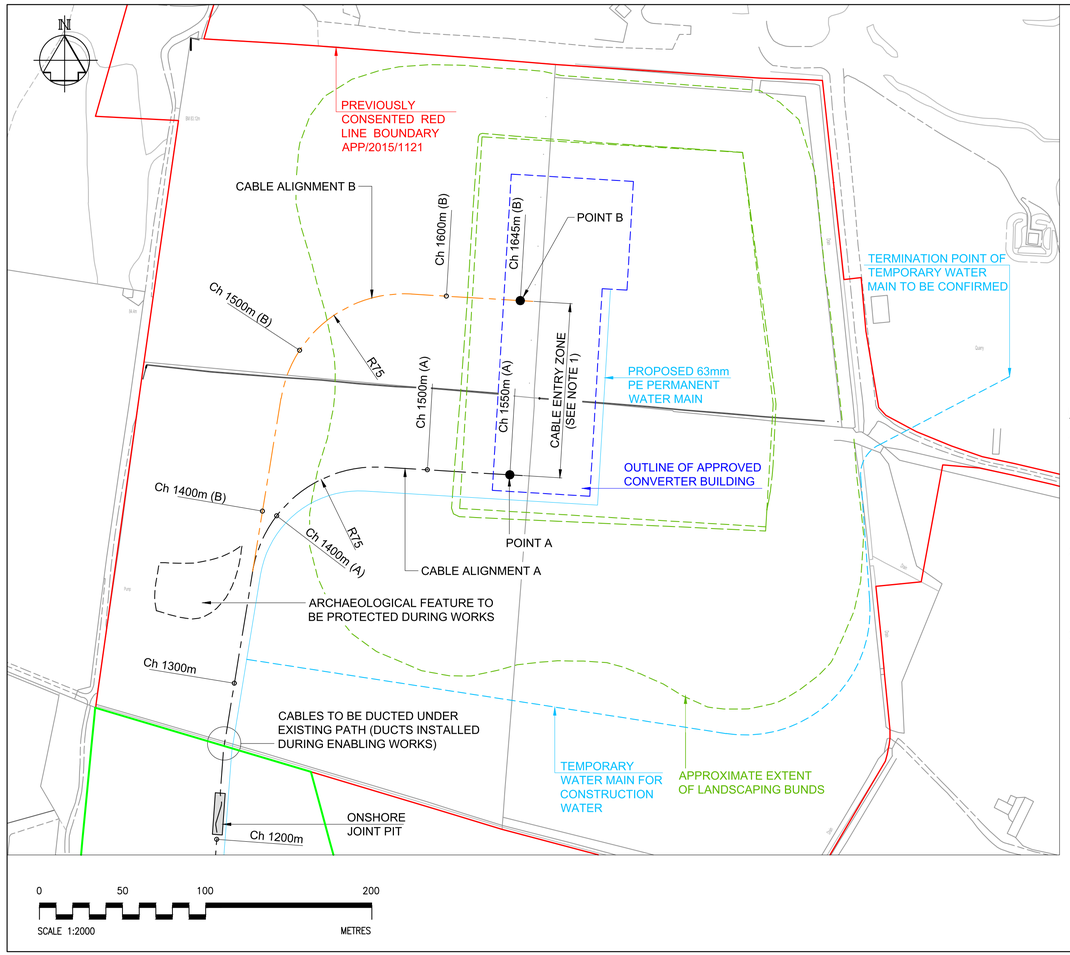

LEGEND

- PROPOSED PERMANENT WATER MAIN
- PROPOSED TEMPORARY WATER MAIN
- PROPOSED CABLE ALIGNMENT A
- PROPOSED CABLE ALIGNMENT B
- CABLE CORRIDOR
- OUTLINE OF PROPOSED CONVERTER BUILDING
- PREVIOUSLY CONSENTED RED LINE BOUNDARY (REF: APP/2015/1121)
- EXTENT OF LANDSCAPING BUNDS

NOTES

1. CABLE ENTRY ZONE - HVDC CABLES TO ENTER BUILDING WITHIN ZONE SHOWN BETWEEN POINTS A AND B (ENTRY ZONE 105m WIDE).
   CABLE ALIGNMENTS A AND B DEFINE THE MAXIMUM AND MINIMUM EXTENTS OF THE CABLE ENTRY ZONE.
2. SEE DRG NO.2018.2.21_NorthConnect_TEC_DRA_HVDC_Cable_Entry_To Convertor_Building_3066 FOR DETAILS OF CABLE DUCTS UNDER LANDSCAPING BUNDS.
3. EARTHING REQUIREMENTS ALONG CABLE ROUTE TO BE CONFIRMED.

TO BE READ IN CONJUNCTION WITH DRAWING NOs. 3060, 3061, 3062 & 3063

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Drawing Status: FOR INFORMATION

eRoom Doc Number: 2018.02.01_NORTHCONNECT_TEC_DRA_HVDC_ONSHORE_CABLE_ROUTE_GENERAL_ARRANGEMENT_3064_E

Title: HVDC ONSHORE CABLE GENERAL ARRANGEMENT SHEET 4 OF 4

Location	Drawing Number	Shl No	Rev No
BODDAM	3064	01	E