



## HIGHWAY DEVELOPMENT - VIKING ENERGY FARM, SHETLAND



In an ambitious infrastructure development in Shetland, Viking Energy, which is owned by SSE Renewables, has collaborated with RJ McLeod (Contractors) Limited to develop a new 1.4 mile highway. This infrastructure will support delivery of components to the Viking Wind Farm project, which will consist of

103 wind turbines set around the central Mainland of Shetland. It will also facilitate delivery of components to SSE Networks' Shetland HVDC link project, which will connect Shetland to the wider national electricity grid for the first time.

Following the wind farm's construction, the road is to be handed over to the Local Roads Authority (Shetland Islands Council) to provide a new, more efficient and safer, 2-way single carriageway road for public use.

During the design development stage of VikingWind Farm, it was identified that road upgrade works were required to facilitate component deliveries to the Kergord region of the site. Options were explored to upgrade the existing road (B9075), however following discussion with the Roads Authority, the preferred solution was an offline upgrade which eliminated disruption to the existing road.

## FACTS

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**Amount of material:** 5500m<sup>3</sup> of [LECA® LWA \(10-20mm\)](#)

**Interesting Fact:** This infrastructure will support and help to feed the Viking Wind Farm project which will consist of 103 wind turbines set around the central Mainland of Shetland.

**Delivery Method:** Walking Floor

**Contractor:** SSE plc

### Floating Road Developments

#### Topological and Land Constraints

Based on topographical and land constraints the new road required to be located adjacent to the existing one, and an alignment was drafted on this basis. Ground investigation followed which identified deep deposits of peat through three sections of the proposed alignment with pockets up to 5m deep. It was calculated that a substantial volume of peat would require excavated to fully found a new road in the traditional roads' manual manner. This was not considered a sustainable option in this instance.

Having constructed floating roads on its wind farm sites for many years the SSE design team sought to explore floating the new road (referred to as the Sandwater Road because of its proximity to the picturesque Sandwater SSSI). Two constraints were identified when carrying out this assessment:

- 1) Embankment heights up to 4m were required to provide a compliant road geometry and with a traditional rock fill there would be a risk of the peat below failing under significant loading.
- 2) Long-term settlement was predicted using a traditional rockfill which would have been a potential a maintenance liability for the local authority following adoption of the road.



## Further Research and Investigation

Extensive research was carried out identifying that in Norway, where floating highways on deep peat is common, a solution is to use a lightweight fill to minimise secondary settlement and risk of failure. Three options were considered in developing the final solution, this included the use of Expanded Polystyrene (EPS), tyre bales and Leca® lightweight aggregate (LWA)\*2.

Leca® LWA, having been used extensively within the UK including on the M8 in Glasgow and the Queensferry Crossing, was deemed the best solution due to its installation convenience, as it can be placed traditionally using a truck and excavator, and its inert chemical and porous nature. Its weight is also a fraction of traditional fill material (typically 85% less) and following assessment it was confirmed that its use would enable embankments to be constructed safely as required and it would also limit the long-term road settlement to limits suitable for adoption.

Leca® LWA has been installed successfully now as part of the construction of the Sandwater Road. Its use allowed all three deep peat sections to be floated, which has significantly reduced the environmental impact of the works.

## Overview of Project

5500m<sup>3</sup> of LECA® LWA was specified to form a Lightweight Floating road construction. Thanks to the lightweight and robust nature of the material, this material was deemed suitable to provide the necessary engineering support for the difficult groundwork conditions where the highway was proposed to be constructed.

It was important for Viking Energy to ensure that this new highway development would not give rise to any significant or unacceptable environmental effects, specifically upon the landscape, biodiversity (wildlife and ecology), geology cultural heritage, noise and air quality and traffic and transportation.

The LECA® LWA was shipped directly into Lerwick Harbour and then delivered directly to site. The lightweight nature of the LECA® LWA means that up to 70m<sup>3</sup> of material can be delivered per truck, so the contractors required less trucks to move the material onto site when compared to traditional fill material.

As LECA® LWA had never been specified by Shetland Islands Council previously, many assurances were required to ensure that the material would be suitable to accommodate the new highway scheme. One key question was the long-term performance of LECA® LWA within a highway structure. The developers required the confidence to ensure that that the LECA® LWA would be inert and would not consolidate or creep over time.



LECA® was able to provide the supporting evidence required to ensure that these engineering factors could be accommodated. This included a real-life highway case study where LECA® LWA was specified. For this example of highway development, a series of settlement studs were inserted into a completed pavement and monitored after one year. The studs were installed in the three different sections of the road:

- Pavement overlays
- Reconstructed pavements, and LECA® LWA lightweight fill.

Settlements in the LECA® lightweight fill sections varied from 0.8mm to 5.0mm following the initial year. The settlements outside of the lightweight fill sections varied up to 15mm after one year and no pavement defects had been observed. This provided the factual evidence which highlighted the ability of LECA® LWA to be installed and to not consolidate or creep in a real-life highway situation.

Furthermore, there was substantial evidence provided through many historical case studies throughout Scotland where Transport Scotland had approved departures for the specification of LECA® LWA. This included many iconic geotechnical highway developments such as the Queensferry Crossing (5000m<sup>3</sup> of LECA® LWA), Bertha Park (20,000m<sup>3</sup> of LECA® LWA) and the Dalry Bypass A732 (5600m<sup>3</sup> of LECA®

LWA) and many more. This provided the confidence for the designers to recognise that LECA® LWA as a tried and tested geotechnical fill material, offering a robust lightweight engineering solution for poor ground conditions, whilst offering the positive environmental credentials sought.

The shipment was successfully delivered to Lerwick Port in September 2020 and work continues in the final stages of the highway development.