Appendix 5 Lossie Sand dune restoration management plan

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Contents

Introduction

Forest stands of Corsican pine and Scots pine were established in 1951 on the sand dunes.

Plantations can be found along the southern inland boundary neighbouring the existing open areas, and the area under restoration. These consist of both planted Corsican and Scots pine and semi-natural birch in varying densities and sizes.

The area under restoration (30 hectares) had the original plantation removed in approximately 2003 to 2006.

A standard specification was used to harvest the trees, in an attempt to restore mobile sand dunes. By any standard, this must be deemed a failure, explained by the fact that the tree stumps and litter layer were not removed. This meant that a scrub of birch and gorse regenerated on the dunes, encouraged by the litter built up during the rotation of trees, and the remnants of the brash left behind after the felling.

Geo-morphological report, 2014.

A Geo-morphological report was prepared in 2014 by Ken Pye. This identified this site as a candidate restoration site (Area 1 on map below). The potential risks associated with further forest clearance and restoration works are:

1. Loss of rare plants and other species associated with the forest,
2. Diffuse sand deposition from suspension may occur over a considerable distance down-wind of the mobile dunes during severe wind storms,
3. The mobile dunes may migrate over infrastructure, economic assets, features of high conservation importance or cause blockage of the River Lossie,
4. A possible increase in water table levels may have an adverse impact on tree growth in adjacent planted blocks.

Risk 1 is judged to be low as there are no recorded rare species in the compartments
identified for restoration; however, there are uncertainties relating to the possible occurrence/ distribution of rare species and the risk could be minimised by further detailed surveys, with implementation of localised protection measures if found to be necessary.

Risk 2 is judged to be very low due to the relatively low wind energy environment.

Risk 3 is judged to be very low as transgressive dunes are unlikely to form, given the relatively low wind energy and the offshore sand transport resultant. This situation is considered unlikely to alter with climate change.
Risk 4 is judged to be low owing to the elongate, relatively narrow nature of the site, and the locations of the compartments suggested for clear-felling; however, there are uncertainties relating to the range of spatial and temporal water table variability in the site which should be investigated in more detail. The risk could be minimised by undertaking the clearance /restoration in phases and carefully monitoring any changes in groundwater levels using dip wells, and if found to be necessary counteractive measures could be taken, including the digging of additional drainage ditches, pumping, or raising the surface level of forest tracks.

Site visits

The site has been visited by Ian McKee and Alan Campbell twice in the last two years, mainly to consider how to consolidate the restoration process on the previously felled areas.

Jeff Waddell, the previous FES Open Habitats Ecologist visited on 18/08/13 to survey the site and classify the field layer according to how it resembles mobile or fixed dune, and modified woodland flora types.

Jeff classified the Area 1 as “type 2, early successional dune forest vegetation. (Fine leaved grasses and/or Sand Sedge and/or Bryophytes and/or Pine Straw dominant).”

This is the least modified category, and consists of vegetation that could be described as made up of 1) Abundant bryophytes and pine straw. 2) Fine leaved grasses and Sand Sedge (SD12). 3) Dwarf shrubs (H11).

Proposed method of Sand dune restoration at Lossie

The restoration process that will be employed at Lossie will consist of:

• Initial habitat monitoring,
• Tailored harvesting operation,
• Treatments to restore conditions required by mobile sand dunes (the precursor of fixed sand dunes),
• Subsequent monitoring,
• Follow up treatments.

The methods employed during the harvesting operation will be non-standard and specifically tailored to achieve the objectives. This will involve whole tree harvesting, including removal of the stumps and all brash. The exact method and sequencing will be favourable to the removal of the litter and humus layers. The aim is to leave the site devoid of any tree, needle, or leaf matter, creating a disturbed ground of bare sand. This will then produce the conditions by which natural succession of mobile dune community may develop, then to a fixed ‘grey’ dune community. Lowland heath type community would also be desirable, although the proportions of this at Lossie is already very impressive, hence the desire to restore dune communities on this particular part (Area 1).

Objectives of the restoration management plan

• Restore important sand dune open habitat that is currently afforested with Corsican pine and some native trees. Appropriate outcomes are the restoration of mobile sand dune, fixed sand dune, and Lowland heath. The proportions of eachwill depend on local conditions and will be governed largely by natural processes, as long as they are not promoted by previous management impacts.
• Monitor progress over the next 10 years.
• Raise awareness amongst visitors and involving local community groups in how FES is managing the dune systems, what the benefits are, and how they contribute to protecting the coastline from rising sea levels.

Uncertainties

The proposal has a number of uncertainties:

• The theory of the method to be used,
• The application of the method, due to local circumstances,
• The impact on other features – plant, lichen and moss species.

Trials have been carried out by Natural Resource Wales, and initial results have been favourable in that the amount of non-native and native tree colonisation and regeneration has been lower than experienced elsewhere using sub-optimal methods. However, it is not known if these examples are particularly applicable to circumstances and conditions found at Lossie.

Criteria for success

Criteria for success will be:

• Increasing establishment of positive indicators of sand dune habitats (desirable species as defined by SNH monitoring method),
• Reducing cover of negative indicators of sand dune habitats (tree saplings, heather, gorse, and ruderals),
• Increasing establishment of positive indicators of Lowland Heath habitat (heather),
• Reducing cover of negative indicators of Lowland heath (tree saplings, gorse, and ruderals).

Relationship of this site with areas already undergoing restoration

This adjoins a larger area that was previously felled. As mentioned above, this site has not been restored to a satisfactory standard, because sub-optimal methods were used to harvest the trees, i.e. without removing stumps, litter or humus layer.
Plans are in place to manage these now open areas to restore mobile dunes, in the same manner as proposed for this afforested site. It will be interesting to compare the sites, and the rates of restoration or recovery, and the amount of regeneration of negative indicator species versus positive ones.

Monitoring

• A set of permanent monitoring quadrats need to be set up prior to works in year one. Rare plants need to be searched for to allow completion of the workplan and to finalisation of the methods to be used. Identify any mitigation measures needed to protect rare species within the treatment area.
• Repeat quadrats after trees, stumps and litter are removed.
• Continue monitoring on a five year cycle, unless ecological justification is given to alter the method (e.g. to visual check only).

This method will be adapted from “Monitoring Sand dune plant communities during restoration”, reference 4 in the appendices.

Estimated Costs

Estimates of costs have not yet been gathered, but factors to be considered are listed below.

• Monitoring methods are likely to be approximately £1,500 for initial visit and quadrat survey. However, the area could be included in the contract for monitoring of the existing open areas, or carried out by the District Environment team, assisted by the Open habitat Ecologist.
• Harvesting costs will be higher than usual due to the removal of stumps and all brash. So the harvesting may make a net loss.
• Restoration costs of removing the litter layer are likely to be the most significant cost element of the proposal.

Next steps required to take this proposal forward

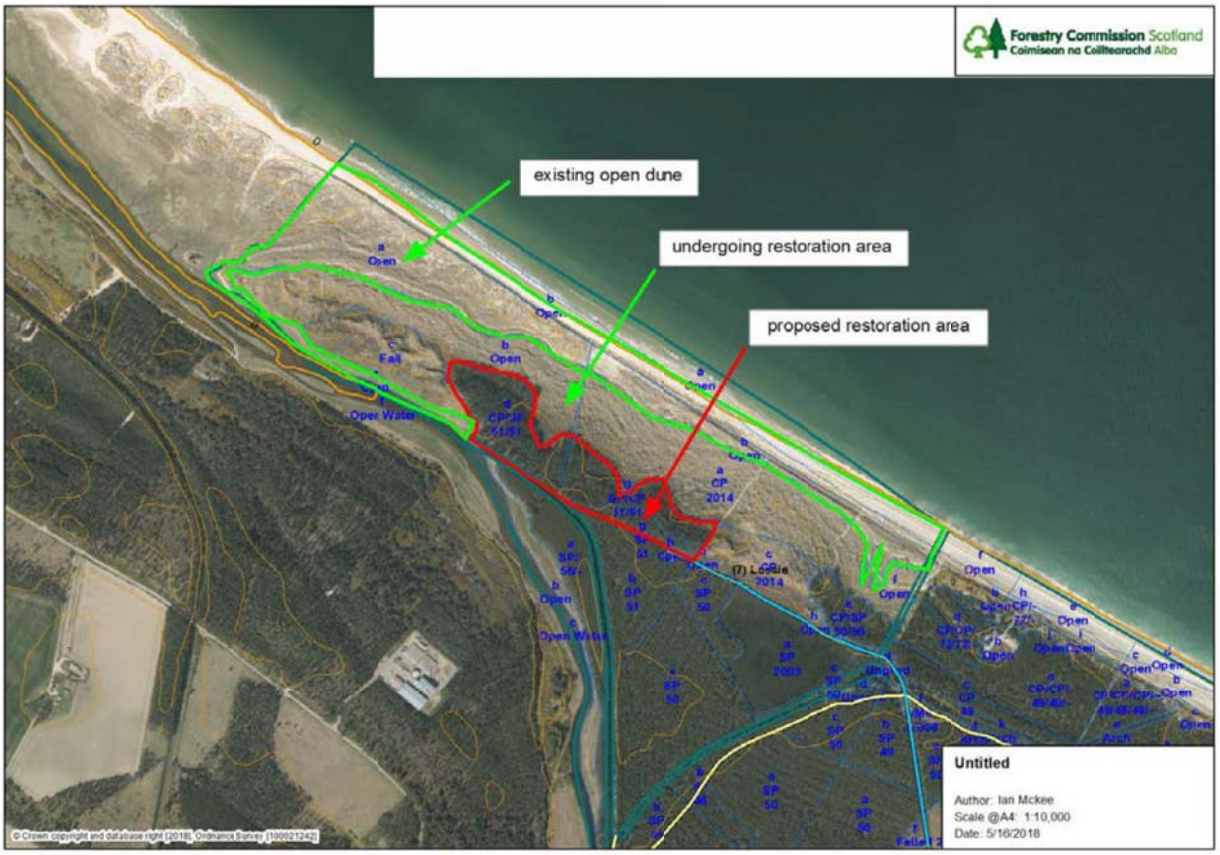
- Harvesting plan will be prepared. This would include:

• Details of access and egress routes for the removal of timber, stumps, brash, and litter by machine.
• The location of timber stacking areas.
• The destination of litter and humus layers, perhaps composting.
• Soil disturbance during the harvesting, which is to be encouraged, only if this does not compromise the removal of the litter layer.
• Consideration of sequencing, as it may be more efficient and effective to remove the litter layer before extraction, or perhaps even felling.

- Finalise estimated costs. The harvesting and removal is likely to be a net cost.
- Consult with Richard Thompson to scope whether there are any rare lichen species in the existing CP and birch stands.
- Make budget submission as per FES protocols.

Map

Project area –CP/SP stand with red outline.



Appendices

References and further reading

1. Coastal Geomorphology Report to Inform Possible Dune & Shingle Restoration in Forest Enterprise Scotland Managed Forests, A Report to Forestry Commission Scotland, KPAL Report No: 160724, 30 March 2014

2. FES Open Habitats Ecologist Advisory Report, Lossie Forest, NJ265685, 15th of August 2013

3. SNH monitoring method: SUPRALITTORAL SEDIMENT - 7.2.3. Sand dunes

4. Monitoring Sand dune plant communities during restoration, FES, Ian McKee, March 2018

5. SNH Priority habitat description for Coastal Sand Dunes

Appendix 6 Schedule of operations

Operation	Phase 1 (2018 – 2022)	Phase 2 (2023 – 2027)
Habitat		
Sand dune restoration (page 41)	2020	
Clear gorse from SSSI (page 41)	2018/19	As required
Fen clearance (page 41)	2019	
Heritage		
Monitoring of Scheduled Monument	Annually (full structural survey in 2018)	Annually (full structural survey in 2023)
Remove heras fencing from around unsafe buildings and replace with deer fence and sign-age	2019	
Clear gorse and vegeta-tion from buildings and vantage lines	2020	2023 & 2026
Recreation		
Maintain current infra-structure (page 47)	Ongoing	Ongoing

Appendix 7 Lossie Forest WWII Coastal Defences leaflet.

Defending the coast

In the late summer of 1940, under threat from German invasion, sections of the British coast where the enemy could easily land were fortified with a series of defences built along them forming a *'crust'*. The Moray coastal defences ran between Cullen Bay and Findhorn Bay, through today's Lossie and Roseisle Forests. Within Lossie Forest, you can still discover evidence of the variety of defences constructed: an unbroken line of anti-tank cubes interspersed with pillboxes and road blocks; and a coastal gun battery at Innes Links, complete with Battery Observation Post, generator houses, searchlights and the concrete foundations of the barrack blocks.

A Polish Army Engineer Corps constructed some of these defences. Wieslaw Szczygiel, a Polish soldier in that unit, recalls briefly working on them before moving to a unit at Tentsmuir in Fife. The defences were completed on the 28th of May 1941 and were manned by the 227th battery of the 501 Coastal Regiment.

Polish troops constructing the defences at Lossie in 1940

On the 27th of May 1940, General 'Tiny' Ironside took charge of the anti-invasion defence plan for Britain. At this time, nearly the entire army, known as the British Expeditionary Force, was fighting against the Germans in Europe. As Commander in Chief of Britain's Home Forces, Ironside had only one badly equipped armoured division and fifteen under-manned infantry divisions to protect all of Britain. Before May 1940, defence measures were minimal and mainly located in the South of England. There was, however, over 400 miles of British coastline thought suitable for landing enemy troops and tanks – and on the 10th of May 1940, the Admiralty warned of a "concentration of flat bottomed ships in Norway." With so few men at his disposal, Ironside concentrated on building a large scheme of coastal and inland anti-invasion. The purpose of these defences was to slow down an enemy invasion, giving time for his overstretched army to position and counter-attack. Another key threat to the defence of Britain was attack from the air. Anti-aircraft defences were established, including specialised artillery and radar for tracking enemy planes. The Home Guard took the role of defending their local area and often manned anti invasion defences.

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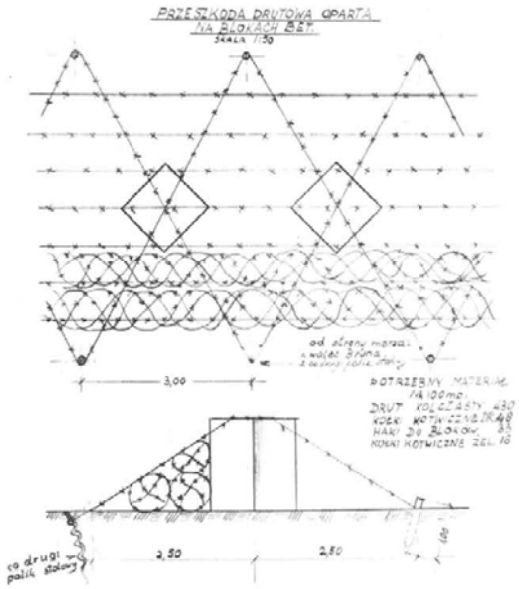
The focus of General Ironside's defence plan for Britain was the construction of land defences during 1940 and 1941. The main aim was to combat the movement of tanks by using a combination of natural and man-made obstacles. Natural defences included rivers, with bridges were marked for destruction if an invasion occurred.

Sections of coastline, where the enemy could easily land, had a series of defences built along them forming a *'crust'*. Coastal crust defences are evident all along the Moray coast. Man-made obstacles include lines of concrete anti-tank blocks forming a barrier between regularly placed pillboxes. Some blocks had pebbles set into the concrete while they were still wet to provide camouflage on a pebble beach. Many cubes had steel rings in the centre of their tops, to anchor the complex pattern of barbed wire that covered them. Ditches, minefields, walls of scaffolding and barbed wire fences also supported these defences. Ports and coastal airfields were major enemy targets and so coastal gun batteries were placed nearby to protect them. If the enemy moved past the coastal defences, the inland stop-lines formed a second line of defence.



The coastal crust at Lossie Forest – and a Polish Army diagram of the barbed wire

In the summer of 1940, General Alan Brookes took over from General Ironside. Although defence construction continued, plans changed. Fewer defences inland were built, as they would be an obstacle to British troops as well as to the enemy. Brookes focused on developing a mobile military force in Britain to respond to any attack.

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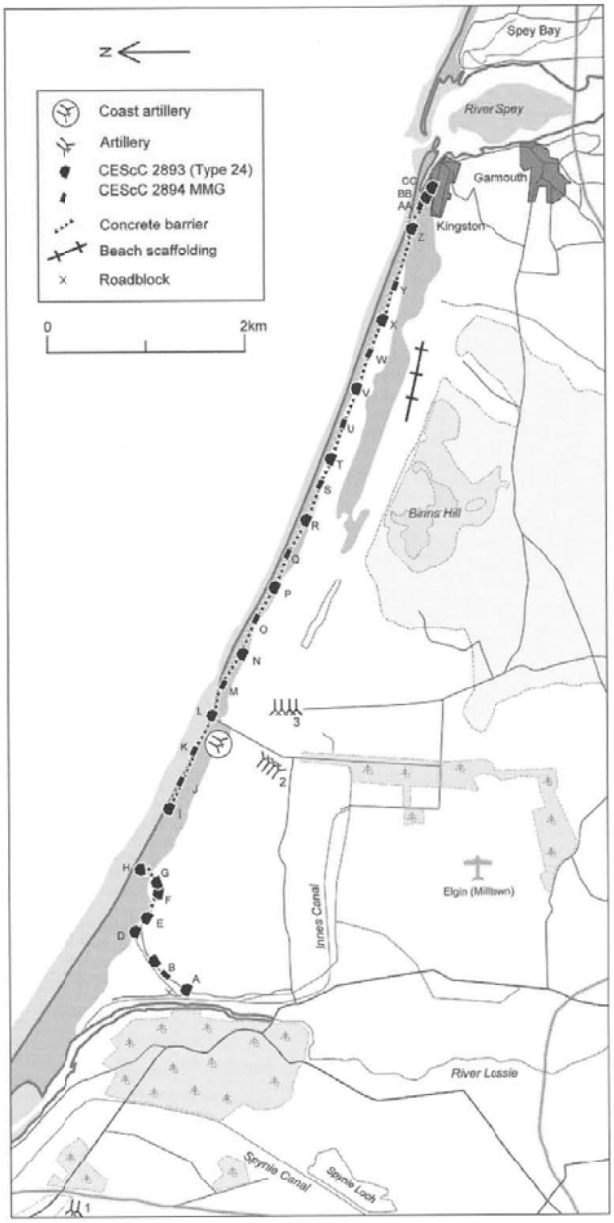
At over 8km in length, the coastal defences in Lossie Forest comprise the longest and best-preserved length of anti-invasion cubes and pillboxes in Scotland.



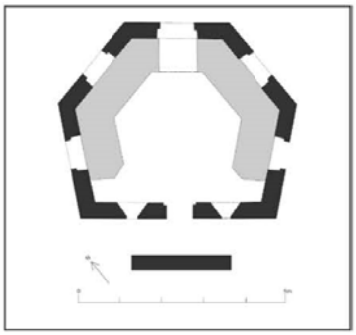
The construction of the defences along the vulnerable coasts of Scotland was a major task. Personal accounts from Polish soldiers provide some detail about the troops tasked with building them. Dr Kazimierz Piotr Durkacz was a medical student in Poland when Germany invaded in 1939. He joined the Polish Forces and was stationed in Scotland. Durkacz worked north of Tentsmuir on the coastal defences from Broughty Ferry to Arbroath. He describes building the anti-tank blocks. "*At first we used wood to make the mould for the large concrete blocks and then a combination of corrugated iron and wood. I can remember mixing the concrete with a shovel.*" Once the concrete set, they removed the wooden mould. The soldiers worked in squads of ten men and each squad had a target of blocks to complete in a week.

Krzystof Madejski describes working at Lossie Forest: "*On Friday the 16th August 1940 we arrived in the small seaside town of Lossiemouth. They loaded us onto trucks and – to our great indignation – took us out of the town and into the forest to the camp. We went to sleep listening to the whisper of the forest and the roar of the low-flying British planes… On Sunday, some of us went for 'reconnaisance' to the nearest town (Elgin) – others went to the forest to pick mushrooms… [Later] a big tent was put up and a club with canteen was created. This proved very popular, specifically because of the cigarettes, beer, biscuits and chocolate.*" He describes constructing the anti-tank cubes: "*[Building the concrete blocks] is very* ***zmudne*** *(tedious) and unpleasant because of the continuously blowing wind, which covers the workers with sand and cement… They return to camp white with dust and complain about the concrete mixers that regularly break down.*"

4 Lossie Forest WWII Coastal Defences

Pillboxes

Several World War II pillboxes survive on the beach at Lossie Forest. These small gun stations formed an important part of the coastal and inland defences and protected important military targets such as airfields. Pillboxes are small concrete structures in which soldiers could stand and open fire on the enemy at close range. From 1940, over 28,000 were constructed all over Britain. In June 1940, branch FW3 of the War Office Directorate of Fortifications and Works issued twelve *'Standard Design Drawings'* for building pillboxes. In practice, designs were often adapted to suit local tactical needs and availability of materials. The Lossie pillboxes are mainly **Type 24**, an irregular hexagonal shape. A small concrete wall often protected the back entrance of the pillbox while small rectangular windows (called firing loops) face outwards. The size and shape of these openings allowed the guns inside to cover the area between this pillbox and the next. At the same time, they limited how much enemy gun fire could get in, protecting the soldiers. Some pillboxes were cleverly camouflaged as buildings; others were painted and covered in netting. The pillboxes would have slowed down an enemy invasion. During battle, this could have proven vital in allowing the Home Forces time to organise a counter-attack.



Inside a pillbox

5 Lossie Forest WWII Coastal Defences

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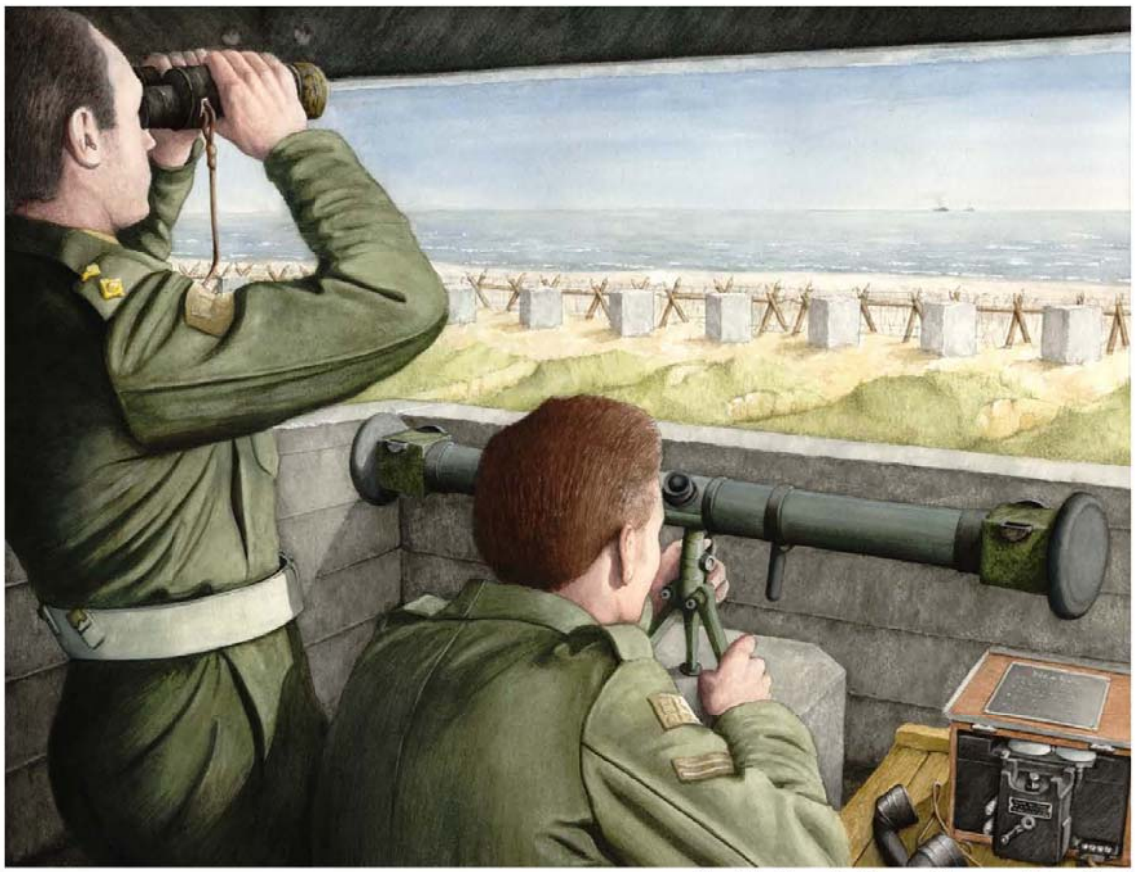

Inside the Battery Observation Post

The Coastal Battery

At the front of the battery were two gun emplacements, armed with large 6" Mark II guns. These were old World War I guns removed from naval ships and recycled. However, they were powerful and could fire long distances – and were excellent for keeping enemy ships at bay. There is a series of other buildings behind the gun emplacements. A large magazine housed the shells, which were brought forward and prepared in the forward magazine. A vital building was the Battery Observation Post (BOP), hidden on a knoll overlooking the beach. As command control, this was where the calculations for aiming and firing the big guns were made. Two searchlight stations provided light to see an enemy attack at night. Machine gun emplacements would provide firepower to defend the beach if enemy troops landed. To prevent detection from enemy planes the buildings were painted and hidden with web netting – and have irregular roofs to disguise their shape. Keep an eye out for corrugated edges – and several of the buildings still boast painted camouflage designs. The battery went out of operation in April 1945, followed by the removal of the guns two months later (although you can still see the circular iron fixtures).

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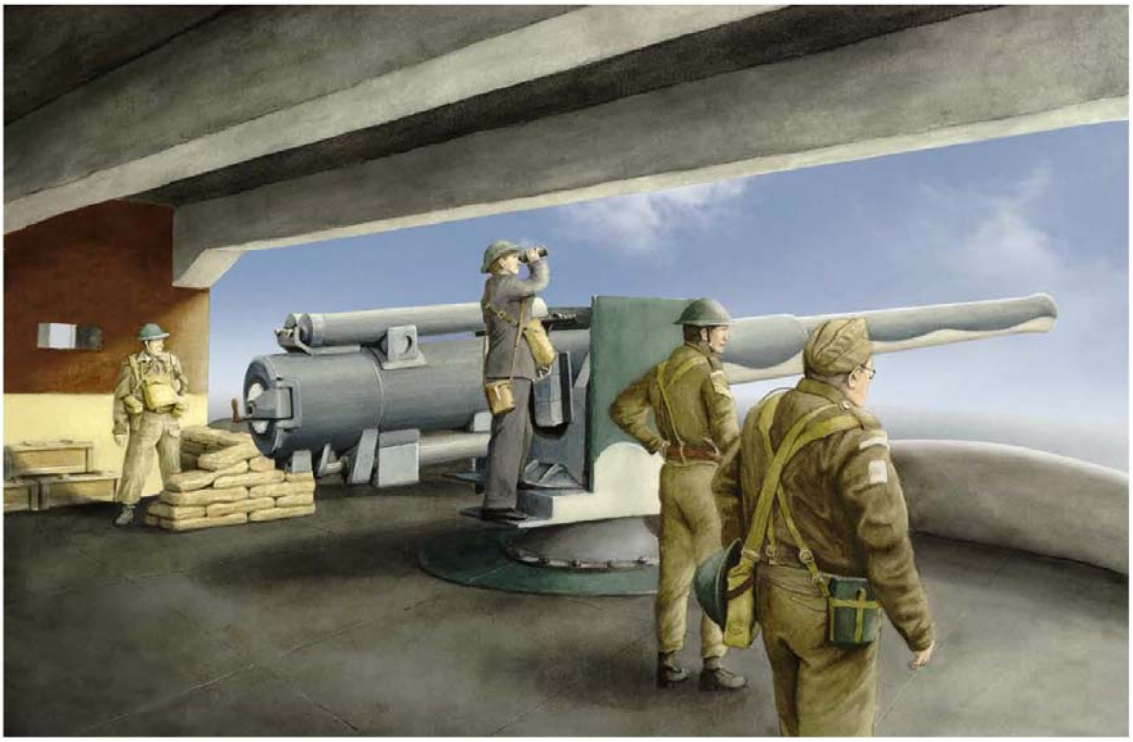
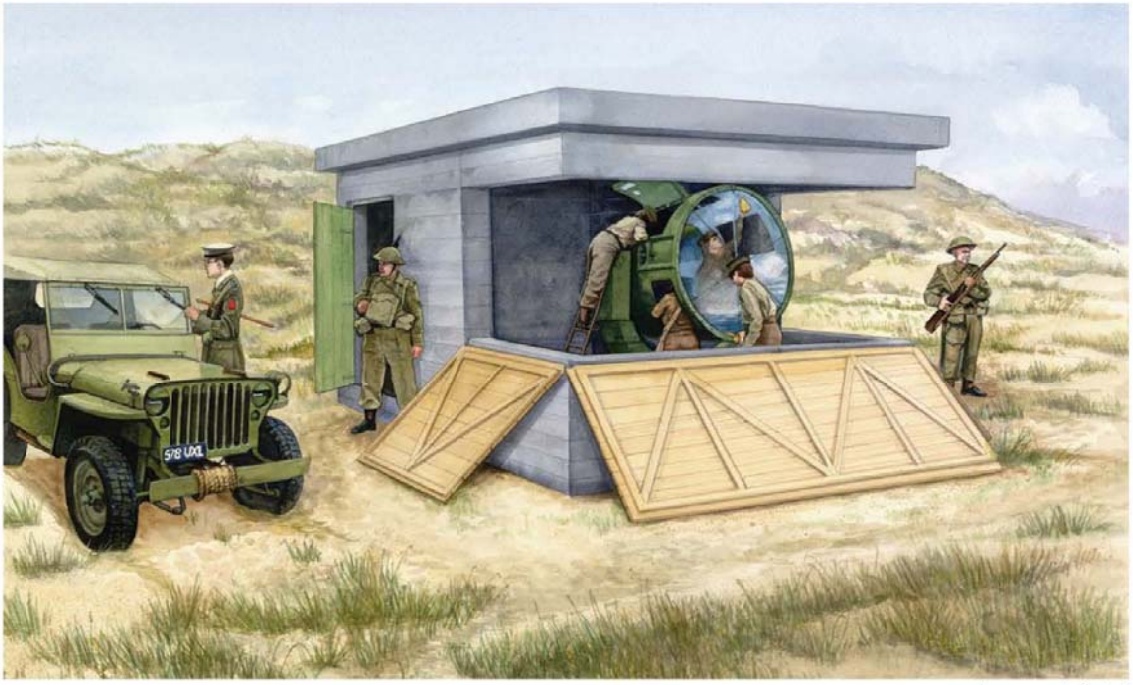
Lossie Forest



Inside the coastal gun emplacement



A searchlight

7 Lossie Forest WWII Coastal Defences

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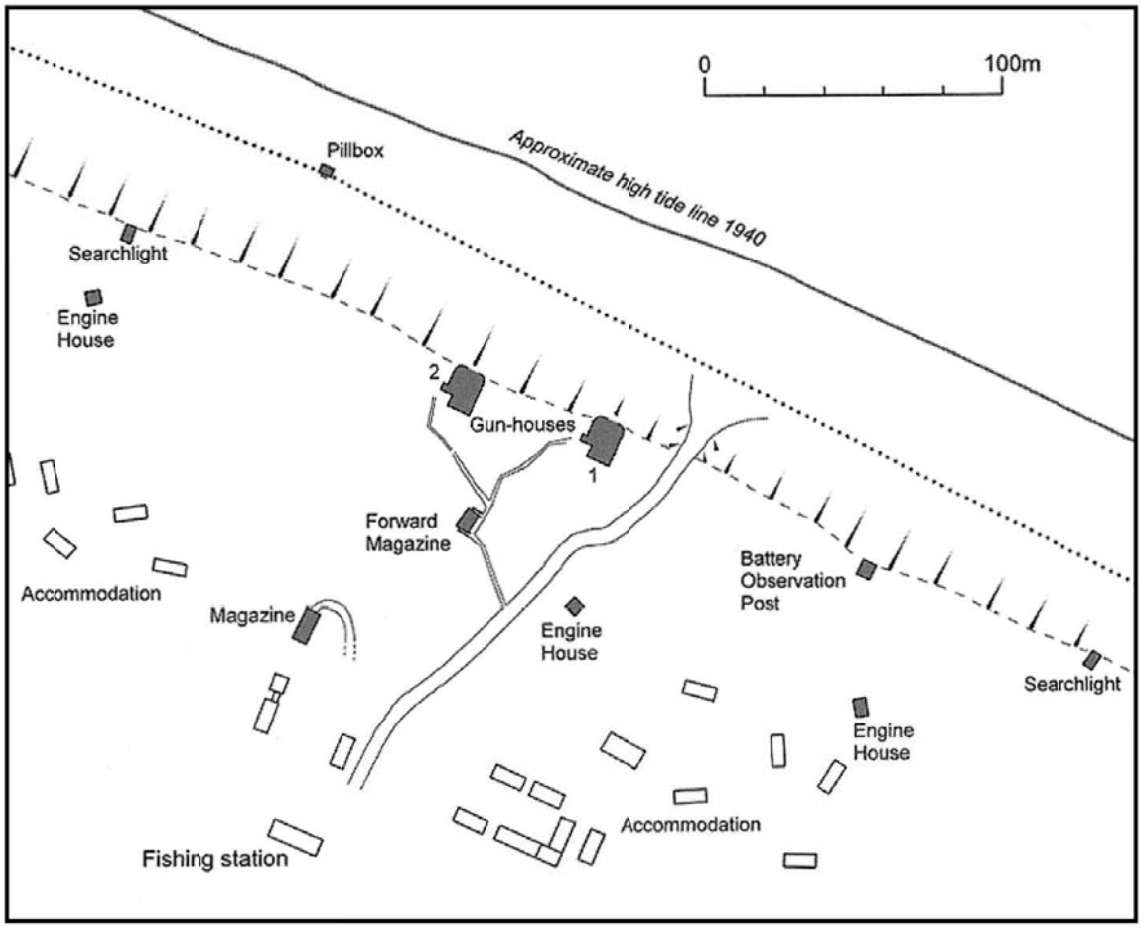

The Innes Links Emergency Coastal Gun Battery (above); and the initial point cloud resulting from the terrestrial laser scanning of a rectangular pillbox and stretch of anti-tank cubes, with real colour captured at the time of survey.

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