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Volume 5 Proposed Development (Onshore)

Chapter 7 Geology, Soils and Contaminated Land

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Acronyms and Abbreviations

AMSC	Approval of Matters Specified in Conditions
BGS	British Geological Survey
BS	British Standard
CIA	Cumulative Impact Assessment
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
EIAR	Environmental Impact Assessment Report
FMD	Foot and Mouth Disease
GCR	Geological Conservation Review
HDD	Horizontal Directional Drilling
LCRM	Land Contamination Risk Management
LDP	Local Development Plan
mAOD	Metres Above Ordnance Datum
MLWS	Mean Low Water Springs
MMP	Materials Management Plan
MSA	Mineral Safeguarding Area
NPF4	National Planning Framework 4
OnTI	Onshore Transmission Infrastructure
OS	Ordnance Survey
ONEC	Onshore Export Cable Corridor
OWF	Offshore Wind Farm
PAN	Planning Advice Note

PCB	Polychlorinated Biphenyls
PCS	Potentially Contaminated Sites
PPP	Planning Permission in Principle
PRA	Preliminary Risk Assessment (for contamination)
RAF	Royal Air Force
RLB	Red Line Boundary
RIGS	Regionally Important Geological Sites
SEPA	Scottish Environment Protection Agency
SSSI	Site of Special Scientific Interest
TJB	Transition Joint Bays
UNESCO	United Nations Educational, Scientific and Cultural Organization
UXO	Unexploded Ordnance

Executive summary

This chapter of the Onshore Environmental Impact Assessment Report (EIAR) assesses the potential effects from the Proposed Development (Onshore) on geology, soil and contaminated land. This includes direct, indirect, whole project assessment, cumulative, inter-related effects, inter-relationships and transboundary effects.

This assessment considers the effects to designated geological sites, designated mineral resources, peat and carbon-rich soils and contaminated land. Human health is also considered as a receptor to contaminated land that may be disturbed as a result of the Proposed Development (Onshore).

The following impacts were identified as requiring assessment:

- Loss or damage to designated geological sites during construction;
- Sterilisation of mineral resources during construction;
- Potential for disturbance of contaminated land during construction, operation and decommissioning, with consequential impacts on human health; and
- Loss of peat and carbon-rich soils during construction.

The potential impacts on groundwater and surface water as a result of the disturbance of contaminated land are assessed in Volume 5, Chapter 6: Hydrology and Hydrogeology.

The assessment has taken account of embedded mitigation measures for the assessment of potential effects, including:

- The implementation of a Construction Environment Management Plan (CEMP) which will prevent pollution during construction and ensure the appropriate management of waste;
- The design of the Onshore Export Cable Corridor (ONEC) to avoid all Class 1 and 2 peatland and the selection of the Onshore Substation Site to avoid potential peatland;
- The implementation of a groundwater and surface water quality monitoring plan;
- The design of the ONEC and Onshore Substation Site to avoid private water supplies;
- The identification and management of contaminated land in accordance with current guidance;
- Development of a Materials Management Plan (MMP) if soils are required to be re-used; and
- Implementation of a Peat Management Plan.

No significant effects were identified and overall, no significant residual effects to any of the identified receptors are predicted, either for the Proposed Development (Onshore) alone or cumulatively with other plans or developments.

7 Geology, Soils and Contaminated Land

7.1 Introduction

- 7.1.1.1 This chapter of the Environmental Impact Assessment Report (EIAR) identifies the potential impacts on Geology, Soils and Contaminated Land associated with the construction, operation and decommissioning of the Proposed Development (Onshore). Specifically, this chapter considers potential impacts landward of Mean Low Water Springs (MLWS) during the construction, operation and maintenance and decommissioning phases of the Onshore Transmission Infrastructure (OnTI) and assesses the potential for likely significant effects on designated geological sites, carbon-rich soils and contaminated land.
- 7.1.1.2 This chapter is supported by the following technical appendices:
- Volume 7E, Appendix 7-1: Geo-Environmental Preliminary Risk Assessment;
 - Volume 7E, Appendix 7-2: Peat Survey Reports;
 - Volume 7E, Appendix 7-3: Geology, Soils and Contaminated Land Figures; and
 - Volume 7E, Appendix 7-4: Consultation Summary.
- 7.1.1.3 The following supporting studies relate to and should be read in conjunction with the following chapters:
- Volume 2, Chapter 2: Marine and Coastal Processes, covering the potential coastal erosion impacts;
 - Volume 5, Chapter 2: Land Use, which covers the potential loss of agricultural soils;
 - Volume 5, Chapter 3: Terrestrial Ecology and Biodiversity, covering the potential ecological impacts on peat;
 - Volume 5, Chapter 6: Hydrology and Hydrogeology, which covers the potential effects of contamination on water resources and groundwater dependent terrestrial ecosystems (GWDTE);
 - Volume 6, Chapter 3: Climate Change Resilience, which covers the cumulative impacts associated with climate change; and
 - Volume 6, Chapter 4: Greenhouse Gases, which covers the potential carbon impacts associated with peat loss.

7.2 Legislation, Policy and Guidance

- 7.2.1.1 Volume 1, Chapter 2: Legislation and Policy, of this EIAR sets out the policy and legislation associated with the Proposed Development (Onshore).
- 7.2.1.2 Legislation, Policy and Guidance that relate to the Geology, Soils and Contaminated Land assessment are identified and described in Table 7-1.

Table 7-1: Legislation Policy and Guidance

Relevant Legislation, Policy and Guidance	Description
<p>National Planning Framework 4 (NPF4) (Scottish Government, 2023¹).</p>	<p>Forms a part of the terrestrial planning framework. The NPF4 sets out national planning policy requirements. Specific policies for geology, soils and contaminated land assessment include:</p> <p>Policy 4. The Natural Spaces Policy is intended to protect designated sites, such as Site of Special Scientific Interest (SSSI) from loss or damage as a result of development.</p> <p>Policy 5. The Soils Policy is intended to protect carbon-rich soils, restore peatlands and minimise disturbance to soils from development. This is relevant to Peat and Carbon-rich Soils within this EIAR chapter.</p> <p>Policy 9. The Brownfield Policy is relevant to the safe development of contaminated or unstable land.</p>
<p>Aberdeenshire Local Development Plan (LDP) 2023 (Aberdeenshire Council, 2023²).</p>	<p>The Aberdeenshire Local Development Plan guides future development in Aberdeenshire. Specific policies related to the geology, soils and contaminated land assessment include:</p> <p>Policies R3.9, PR1.1, PR1.9, Appendix 14. Policies are intended to identify and safeguard important mineral resources and identify sites where important mineral resources are present.</p> <p>Policies PR1.1, PR1.10, C3.1. Policies are intended to safeguard peat and carbon-rich soils against damage or loss, where they provide important sinks for carbon or ecological value.</p> <p>Policies E1.7, E1.8. Policies intend to identify areas of geological importance and consider the potential impacts on these as a result of development.</p>

Relevant Legislation, Policy and Guidance	Description
	Policy P4. This policy states that development will be refused if there is a risk that it could cause significant pollution or present an unacceptable risk to the public or the environment.
Scottish Government Planning Advice Note 33 (PAN33): Development of Contaminated Land (Scottish Government, 2017 ³)	This planning advice note provides advice on the implications of the contaminated land regime for the planning system.
Code of Practice for Ground Investigations – British Standards (BS) 5930:2015 (British Standards Institute, 2020 ⁴).	This British Standard provides best practice guidance for gathering information on ground conditions during intrusive ground investigations.
Code of Practice for the investigation of potentially contaminated sites – BS 10175:2011+A2:2017 (British Standards Institute, 2017 ⁵)	This British Standard provides best practice guidance for gathering information on ground conditions and contamination at potentially contaminated sites.
Construction Industry Research and Information Association (CIRIA) C552 Contaminated Land Risk Assessment (CIRIA, 2001 ⁶).	This document is a good practice guide for the assessment of risks from contaminated land.
Land Contamination Risk Management (LCRM) (Environment Agency, 2023 ⁷).	LCRM provides guidance on the risk assessment process that must be followed for the assessment of contaminated land in England and Wales. The process of risk assessment recommended in LCRM is also used in Scotland.
Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Materials, and the Minimisation of Waste. (Scottish Renewables and Scottish Environment Protection Agency (SEPA), 2012 ⁸).	This guidance provides advice on the investigation, management and disposal of peat encountered in development. It does not reflect current legislation, good practice or controls but is acknowledged to provide some relevant advice and is used for reference purposes.

Relevant Legislation, Policy and Guidance	Description
Part IIA of the Environmental Protection Act. UK Parliament, 1990 ⁹).	Part IIA deals with contaminated land and provides a means for identifying and remediating land that poses a significant risk to human health or the environment. Under Part IIA, local authorities have a legal obligation to identify contaminated land and ensure that any unacceptable risks are removed. Part IIA provides a mechanism for contaminated land to be addressed outside of the planning and development system.
Contaminated Land (Scotland) Regulations 2005 (Scottish Parliament, 2005 ¹⁰).	These regulations provide a regime, regulated by the SEPA, to designate land as contaminated land under Part IIA of the Environmental Protection Act and serve remediation notices on third parties to remediate contaminated land.
Scottish Government. Environmental Protection Act 1990- Part IIA Contaminated Land: Statutory Guidance Edition 2 (Scottish Government, 2006 ¹¹).	This document provides statutory guidance for the operation of the contaminated land regime (Part IIA) following the implementation of the Contaminated Land (Scotland) Regulations 2005 ¹⁰ .
Waste Management Licensing (Scotland) Regulations 2011 (Scottish Parliament, 2011 ¹²).	These regulations provide a system for the licensing and control of waste management in Scotland, to ensure that waste does not cause pollution of the environment, harm to human health or become detrimental to the amenities of the local area.
Developments on Peat and Off-Site Uses of Waste Peat (SEPA, 2017 ¹³).	This guidance provides advice on the types of peat and presents a hierarchy of recommended management options for developments on peat.
Scottish Government, Scottish Natural Heritage, SEPA. Peatland Survey: Guidance on Developments on Peatland (Scottish Government, 2017 ¹⁴)	This guidance provides a sampling methodology for investigations on peatland.

7.3 Stakeholder Engagement

7.3.1 Overview

- 7.3.1.1 The Scoping Report was submitted to Aberdeenshire Council in December 2022, who then circulated the report to relevant consultees. A Scoping Opinion was received from Aberdeenshire Council on 1 February 2023. Relevant comments from the Scoping Opinion specific to Geology, Soils and Contaminated Land are provided in Volume 7E, Appendix 7-4: Consultation Summary.
- 7.3.1.2 Further consultation has been undertaken throughout the pre-application stage. Volume 7E, Appendix 7-4: Consultation Summary outlines the consultation activities carried out relevant to the assessment of Geology, Soils and Contaminated Land.

7.4 Baseline Characterisation

7.4.1 Study Area

- 7.4.1.1 The study area for Geology, Soils and Contaminated Land is defined as the OnTI Red Line Boundary (RLB) plus a buffer zone of 100m. This study area is used to assess potential effects on all elements of this chapter. The study area is shown within Figure 7-1 in Volume 7E, Appendix 7-3: Geology, Soils and Contaminated Land Figures.

7.4.2 Data Sources

- 7.4.2.1 The publications and datasets which have been reviewed to inform the baseline characterisation of Geology, Soils and Contaminated Land within the study area listed in Table 7-2 below.
- 7.4.2.2 Full details of all datasets reviewed are presented in the desk study report in Volume 7E, Appendix 7-1: Geo-Environmental Preliminary Risk Assessment.

Table 7-2: Summary of key datasets and literature for geology, soils and contaminated land baseline characterisation

Resource Title	Author	Year	Reference
1:50,000 geological maps	British Geological Survey	Various	See Table 7-3
Cullen to Stake Ness Coast SSSI Site Management Statement	Scottish Natural Heritage	2011	(Scottish Natural Heritage, 2011 ¹⁵)
Cullen – Troup Head, Banffshire Coast Geological Conservation Review Site, Geosite Details	Scottish Geology Trust	Unknown	(Scottish Geology Trust, unknown date of publication ¹⁶)
Geo-Environmental Preliminary Risk Assessment (PRA)	Ove Arup and Partners Ltd	2024	Volume 7E, Appendix 7-1: Geo-Environmental Preliminary Risk Assessment.
Aberdeenshire Local Development Plan Supplementary Guidance: Areas Safeguarded or Identified as Areas of Search for Minerals Development	Aberdeenshire Council	2017	(Aberdeenshire Council, 2023 ¹⁷)
Carbon and peatland 2016 map	James Hutton Institute	2016	(James Hutton Institute, 2017 ¹⁸)
Interactive mapping of future coastal change	Dynamic Coast	2021	(Centre of Expertise for Waters, 2021 ¹⁹)

Resource Title	Author	Year	Reference
New Deer substation sites: Habitats, peat & GWDTE	Botanaeco Ltd	2024	Volume 7E, Appendix 7-2: Peat Survey Reports
Peat near Turriff: Peat survey	Botanaeco Ltd	2024	Volume 7E, Appendix 7-2: Peat Survey Reports

Site Specific Surveys

- 7.4.2.3 A reconnaissance survey was undertaken between 18 and 20 January 2023 in support of ONEC route optioneering. This survey comprised a general walkover from publicly accessible areas to gain an overview of general conditions present within the study area at the time. This survey involved making and recording visual observations about site characteristics such as slopes, watercourses, ground conditions, potential contamination, and land-use.
- 7.4.2.4 Detailed (intrusive) surveys of peat presence and depth have been carried out where permission could be obtained (areas of mapped Class 1, 3 and 5 soils, see Figure 7-4 in Volume 7E, Appendix 7-3: Geology, Soils and Contaminated Land Figures for locations) as part of this EIAR. Permission was sought to investigate the remaining areas of Class 3 and 5 soils within the RLB, but Caledonia Offshore Wind Farm Limited (the Applicant) was not successful in obtaining the required landowner approvals. However, these represent a very small proportion of the total area of mapped Class 3 and 5 peat within the OnTI RLB.
- 7.4.2.5 Further investigations will be completed in the future as part of the Approval of Matters Specified in Conditions (AMSC) application at detailed design stage.

7.4.3 Baseline Description

Geology

- 7.4.3.1 The geological baseline for the study area has been established from information published by the British Geological Survey (BGS).
- 7.4.3.2 The study area falls within the BGS 1:50,000 scale map sheets listed in Table 7-3.

Table 7-3: BGS 1:50,000 map sheets applicable to the Proposed Development (Onshore)

Proposed Development (Onshore) Area	Map Sheet(s)
Landfall Site	British Geological Survey 1:50,000 scale Sheet 96E Banff (BGS, 2002a ²⁰) British Geological Survey 1:50,000 scale Sheet 96W Portsoy (BGS, 2002b ²¹)
Onshore Substation Site	British Geological Survey 1:50,000 scale Sheet 86E Turriff (BGS, 1995 ²²) British Geological Survey 1:50,000 scale Sheet 87W Ellon (BGS, 1991 ²³)
ONEC	British Geological Survey 1:50,000 scale Sheet 96E Banff (BGS, 2002a ²⁰) British Geological Survey 1:50,000 scale Sheet 96W Portsoy (BGS, 2002b ²¹) British Geological Survey 1:50,000 scale Sheet 86E Turriff (BGS, 1995 ²²) British Geological Survey 1:50,000 scale Sheet 87W Ellon (BGS, 1991 ²³)

Bedrock Geology

- 7.4.3.3 The study area is underlain by a range of metamorphic, sedimentary and igneous bedrock lithologies.
- 7.4.3.4 Bedrock geology at the Landfall Site comprises psammite and pelite of the Whitehills Grit Formation, with localised areas of metacalcareous rock, metamicrogabbro and amphibolite, gritty psammite and semipelite.
- 7.4.3.5 Bedrock geology at the Onshore Substation Site comprises micaceous psammite, semipelite and pelite of the Macduff Formation, with a small area of quartz-microgabbro in the far south of the Onshore Substation Site.
- 7.4.3.6 Bedrock geology within the ONEC is variable. The majority of the ONEC comprises micaceous psammite, psammite, semipelite and pelite of the Macduff Formation and Whitehills Grit Formation. An approximately 10km length of the study area in the south comprises sedimentary rocks (conglomerate, sandstone, siltstone and mudstone) of the Crovie and Inverness Sandstone Groups.
- 7.4.3.7 A map showing the bedrock geology is included shown in Figure 7-3 in Volume 7E, Appendix 7-3: Geology, Soils and Contaminated Land Figures.

Superficial Geology

- 7.4.3.8 The study area comprises a lowland glaciated and periglaciated terrain, with associated landforms and superficial deposits such as till, glaciofluvial and glaciolacustrine deposits.
- 7.4.3.9 Younger post-glacial superficial deposits such as peat, head, alluvium, raised marine and river terrace deposits are also present, associated with watercourses, wetlands and slope processes.
- 7.4.3.10 Areas of potentially shallow bedrock are also present locally, where soil cover is likely to be <1m thick.
- 7.4.3.11 A map of superficial geology is shown within Figure 7-2 in Volume 7E, Appendix 7-3: Geology, Soils and Contaminated Land Figures.

Geological Sites

- 7.4.3.12 The geological baseline described above is considered to have natural features of interest with regards to geodiversity.
- 7.4.3.13 NatureScot data (Scottish Natural Heritage, 2011²⁴, & Scottish Geology Trust, unknown date of publication²⁵) indicates that there are two sites within the study area which are designated for their geodiversity. These are summarised in Table 7-4 and comprise natural exposures of the metamorphic rocks in the coastal cliffs and shoreline. Figure 7-4 in Volume 7E, Appendix 7-3: Geology. Soils and Contaminated Land Figures shows the location of these designated sites.

Table 7-4: Designated Sites relevant to geology within the study area

Site Name	Qualifying Features relating to Geodiversity	Location
Cullen to Stake Ness Coast SSSI	Metamorphic Rocks of the Dalradian Supergroup	Coastal cliffs and shoreline at Landfall Site
Cullen to Troup Head Banffshire Coast Geological Conservation Review (GCR) site	Metamorphic Rocks of the Dalradian Supergroup	Shoreline at Landfall Site

- 7.4.3.14 The boundaries of the SSSI and GCR site overlap, however within the study area the boundaries are not identical. The GCR boundary includes the intertidal zone, whilst the SSSI boundary extends further onshore.
- 7.4.3.15 Away from the Landfall Site, there are no designated sites with features of geological interest within the study area.

Geomorphology

- 7.4.3.16 The study area lies within an area of generally low topography with elevations ranging from sea level at the Landfall Site, to a maximum elevation of 175 metres above Ordnance Datum (mAOD) within the ONEC.
- 7.4.3.17 The Landfall Site comprises a 10m coastal cliff which gently slopes down to the MLWS mark. Above and inland from this coastal cliff, the Landfall Site development area slopes upward to an elevation of 35mAOD.
- 7.4.3.18 The proposed Onshore Substation Site location ranges in elevation from 100mAOD to 110mAOD, gently sloping upward from west to east.
- 7.4.3.19 The highest elevation within the study area is at Deershill (175mAOD), located within the ONEC to the west of the Onshore Substation Site.

Mineral Resources

Active Quarries

- 7.4.3.20 There are no active quarries within the study area.

Historic Quarries

- 7.4.3.21 The BGS database of Recorded Mineral Sites indicates there are eight “Ceased” (inactive / historic) quarries within the study area. Details of these former quarries are summarised in Table 7-5 below.

Table 7-5: BGS Recorded mineral sites

Name	Location	Commodity	Type and Status	Applicability to Proposed Development (Onshore)	Shown on OS 1:25K Maps?
Scatterie	368513 858106	Igneous and Metamorphic Rock	Opencast, Ceased	Within ONEC	No
Upper Dallachy	363262 864975	Igneous and Metamorphic Rock	Opencast, Ceased	Within 100m buffer	No
Scatterie Gravel Pit	370242 857328	Sand and Gravel	Opencast, Ceased	Within 100m buffer	No
Rettie	363567 863285	Igneous and Metamorphic Rock	Opencast, Ceased	Within ONEC	No

Name	Location	Commodity	Type and Status	Applicability to Proposed Development (Onshore)	Shown on OS 1:25K Maps?
Little Blarishinnoch	363692 861403	Igneous and Metamorphic Rock	Opencast, Ceased	Within 100m buffer	Yes
South Itlaw	366825 858240	Igneous and Metamorphic Rock	Opencast, Ceased	Within ONEC	No
Bridge of Swanford	382341 845391	Igneous and Metamorphic Rock	Opencast, Ceased	Within 100m buffer	Yes
Waulkmill Gravel Pit	368513 858103	Sand and Gravel	Opencast, Ceased	Within ONEC	No

7.4.3.22 Historic Land Use datasets provided by Landmark Information Group (refer to the Desk Study in Volume 7E, Appendix 7-1: Geo-Environmental Preliminary Risk Assessment) also identify a series of locations in which pits and quarries appear on historic Ordnance Survey (OS) maps. There are 29 such points within the study area, however the majority of these sites correspond with the Recorded Mineral Sites identified by the BGS, and there are typically multiple points at the same locations where a pit/quarry is shown across multiple historic map series.

7.4.3.23 Overall, there are two additional historic pits or quarries shown on historic OS mapping which are not included in the BGS database. These are listed in Table 7-6.

Table 7-6: Additional quarries from historic land use datasets

Description	Location	Years shown on OS maps ⁱ	Applicability to Proposed Development (Onshore)	Shown on current OS 1:25K Maps?
Quarrying of sand/clay/gravel	378587 846169	1873 to <1970	Within 100m buffer	No
General quarrying	365098 860481	1874 to <1977	Within ONEC	No

7.4.3.24 The Potentially Contaminated Sites (PCS) database provided by Aberdeenshire Council identifies ten pits or quarries within the study area. The pits or quarries identified in the PCS database within the study area are all shown to be small (plan footprint less than 1,000m²) and the majority are not shown on current maps.

7.4.3.25 Of the ten pits or quarries identified in the PCS database, seven are included in the BGS Recorded Mineral Sites and/or Historic Land Use databases described above, however there are three additional pits or quarries shown in the PCS database which are not recorded elsewhere. These are summarised in Table 7-7 below.

Table 7-7: Additional pits / quarries from Aberdeenshire Council database

Description	Location	Site ID	Applicability to Proposed Development (Onshore)	Shown on current OS 1:25K Maps?
Todholes Quarry	365089 860480	BB001193	Within ONEC	No
Mill of Ryland Quarry	366901 858512	BB001403	Within 100m buffer	No
Greenlaw Quarry	367594 858294	B001402	Within 100m buffer	No

ⁱ The “to” date corresponds to the first map publication in which the pit/quarry is no longer shown and is therefore considered to be ceased and potentially infilled.

- 7.4.3.26 All former pit and quarry features identified are shown in Figure 7-5 within Volume 7E, Appendix 7-3: Geology, Soils and Contaminated Land Figures.
- 7.4.3.27 The majority of these former pits and quarries are not shown on current 1:25k OS mapping, indicating that they are small and inactive. They are not considered to be significant with regards to potential mineral resources.
- 7.4.3.28 Former pits and quarries can be a potential source of contamination, as discussed in the Desk study in Volume 7E, Appendix 7-1: Geo-Environmental Preliminary Risk Assessment and in the section on contaminated land (Section 7.4.3.44) below.

Mineral Resources

- 7.4.3.29 The Mineral Planning Authority for the study area is Aberdeenshire Council.
- 7.4.3.30 There are no Mineral Safeguarding Areas (MSA) or Mineral Safeguarded Sites within the study area.
- 7.4.3.31 There are two mineral areas of search (areas where mineral reserves should not be sterilised by inappropriate development) for sand and gravel within the study area, at Idoch (Cuminestown) and Banff West, as shown on Figure 7-4 within Volume 7E, Appendix 7-3: Geology, Soils and Contaminated Land Figures. Both areas of search encroach into the OnTI RLB, but the area within the OnTI RLB is only a small part of the total area of search in each case.

Peat and Carbon-rich Soils

- 7.4.3.32 NatureScot's Carbon and Peatland map¹⁸ has been used to identify potential peat and carbon-rich soils within the study area. The map classifies soils into five carbon classes. Figure 7-4 within Volume 7E, Appendix 7-3: Geology, Soils and Contaminated Land Figures shows the mapped peat deposits within the study area.
- 7.4.3.33 During the development of the preferred ONEC, areas of NatureScot Class 1 and 2 peat (which describe nationally important carbon-rich soils, deep peat and priority peatland habitat) were avoided where possible, in line with current guidance and advice provided during stakeholder engagement (described in Volume 7E, Appendix 7-4: Consultation Summary). The OnTI RLB was also designed to avoid Class 5 soils at Redbriggs.
- 7.4.3.34 The majority of soils within the study area are mineral (Class 0 and Class 4) and are not carbon-rich. Peat soils are only mapped in the southern part of the study area, which include small areas of Class 1, 3 and 5 soil, as shown in Figure 7-4 within Volume 7E, Appendix 7-3: Geology, Soils and Contaminated Land Figures.
- 7.4.3.35 Two areas of Class 1 and 5 soils are mapped within the southern part of the study area (which comprises the OnTI RLB plus 100m buffer). A small area of Class 1 soils is mapped to the south-east of Idoch, which is within the study area buffer but outwith the OnTI RLB. The other area is associated with the Burn of Swanford near the proposed Onshore Substation Site location.

- 7.4.3.36 A National Vegetation Classification (NVC) and peat survey has been carried out within the mapped area of Class 1 peat associated with the Burn of Swanford (Volume 7E, Appendix 7-2: Peat Survey Reports) which confirmed that the area has been impacted by agriculture and forestry, and as a result does not meet the definition of a priority peatland habitat. The survey location is shown in Figure 7-4 within Volume 7E, Appendix 7-3: Geology, Soils and Contaminated Land Figures. A probing survey of this area confirmed that deep peat (greater than 1m thickness in some places) is present, therefore this area may be considered Class 3 or 5 soil i.e. not supporting peatland habitat, but deep peat is present.
- 7.4.3.37 An area of Class 3 soil is mapped as associated with the Burn of Banquholly near Redbriggs. The mapped area spans the entire width of the study area. A peat survey (Volume 7E, Appendix 7-2: Peat Survey Reports) has been carried out within part of the Class 3 area where permission to access the land could be secured. This survey concluded that no peat is present. The survey location is shown in Figure 7-4 within Volume 7E, Appendix 7-3: Geology, Soils and Contaminated Land Figures.
- 7.4.3.38 An area of Class 4 soil is associated with an un-named watercourse north-west of Deershill. This mapped deposit spans the width of the study area in two places. Class 4 does not describe soils which are likely to be associated with peatland habitats and are unlikely to include carbon-rich soils.
- 7.4.3.39 Table 7-8 below shows the peatland classes and the percentage of the study area covered by each class.

Table 7-8: NatureScot peatland classifications within the study area

NatureScot Peat Class	Description	% of study area (total area 17.3km ²)
Class 0	Mineral soil. Peatland habitats are not typically found on such soils	96
Class 1	Nationally important carbon-rich soils, deep peat and priority peatland habitat	0.7*
Class 2	Nationally important carbon-rich soils, deep peat and priority peatland habitat	0
Class 3	Not priority peatland habitat. Most soils are carbon-rich, with some areas of deep peat	0.1

NatureScot Peat Class	Description	% of study area (total area 17.3km ²)
Class 4	Unlikely to be associated with peatland habitats. Area unlikely to include carbon-rich soils	2.6
Class 5	No peatland habitat recorded. Soils are carbon-rich and deep peat.	0.5
*The mapping shows an area of approximately 0.12km ² Class 1 peat within the study area, but 0.11km ² of this has been proven through habitat assessment to not be supporting priority habitat and is more similar to Class 5 soil.		

- 7.4.3.40 Table 7-8 shows that the majority (96%) of mapped soils within the study area are mineral and a further 2.6% are Class 4, which are unlikely to be carbon-rich or supporting peatland habitat.
- 7.4.3.41 Approximately 0.7% of the study area was mapped as Class 1 peatland, although as described above, a peat survey (Volume 7E, Appendix 7-2: Peat Survey Reports) has confirmed that the largest area of mapped Class 1 peatland within the study area is not supporting priority peatland habitat and is considered to be Class 5 within the study area. Therefore, there is no Class 1 peat within the OnTI RLB and only 0.006km² within the study area.
- 7.4.3.42 Figure 7-4 within Volume 7E, Appendix 7-3: Geology, Soils and Contaminated Land Figures illustrates these small areas of mapped Class 1 and 5 soils within the 100m buffer zone but not within the OnTI RLB, and are therefore outside the area that would be directly disturbed as a result of construction.
- 7.4.3.43 A very small area (0.1% of the study area) of Class 3 carbon-rich soils is mapped within the OnTI RLB. As described above, a peat survey (Volume 7E, Appendix 7-2: Peat Survey Reports) has confirmed that some of the Class 3 soils within the study area are, in fact, mineral and are not peat or carbon-rich. Therefore, the area of Class 3 soils within the study area is smaller than the mapped extent.

Contaminated Land

- 7.4.3.44 A summary of potentially contaminative historic land uses within the study area is provided within the desk study report in Volume 7E, Appendix 7-1: Geo-Environmental Preliminary Risk Assessment and in Figure 7-5 within Volume 7E, Appendix 7-3: Geology, Soils and Contaminated Land Figures.
- 7.4.3.45 Suspected areas of contaminated land were identified at scoping stage and where possible, avoided by the Proposed Development (Onshore). For example, the former Royal Air Force (RAF) Banff airfield is located to the west of the site

within the study area, but is not within the OnTI RLB and as a result will not be disturbed as a result of the Proposed Development (Onshore).

7.4.3.46 Potentially contaminated land that remains within the study area is associated with:

- Historical quarries and pits, which may have been infilled with waste derived from nearby industry or farming;
- Farms, which can be a potential source of contamination, where features such as slurry pits, fuel or herbicide/pesticide storage or sheep dips are present or have been present historically. There is also a potential to encounter animal burials on farmland, which could be associated with disease outbreaks such as foot and mouth disease (FMD);
- Railway land, which can be a potential source of contamination with hydrocarbons as a result of leaks and spills;
- Vehicle maintenance, which can be associated with the storage of fuels, oils and other hydrocarbons;
- Electrical substations (e.g., New Deer) which can be a source of polychlorinated biphenyls (PCB), depending on the age and maintenance of the equipment;
- Ground gases such as methane and carbon dioxide may be present, associated with infilled ground or natural deposits of peat or alluvium. Radon is also naturally present within the study area; and
- Unexploded ordnance (UXO) may be present associated with the former RAF Banff airfield.

7.4.3.47 The contamination associated with these types of features is usually localised to the source area. The exception to this is UXO, which may have been dropped during bombing raids outside the boundary of the airfield. No active or historic landfills have been identified within the proposed ONEC, or within 100m of it.

7.4.3.48 The Preliminary Risk Assessment presented in the Desk study in Volume 7E, Appendix 7-1: Geo-Environmental Preliminary Risk Assessment assesses the risks posed by contamination to human health, surface water and groundwater at the Landfall Site, ONEC and Onshore Substation Site. This assessment concluded that the risk posed to offsite neighbours and land users during construction is low. It is recommended that a UXO Desk Study is carried out for the part of the ONEC that passes close to RAF Banff, to ensure that any risks from UXO are controlled during construction.

7.4.3.49 During operation, the risk to site end users is generally very low, with the exception of ground gas risks, which are moderate where confined spaces may be present.

7.4.4 Future Baseline

7.4.4.1 Volume 7A, Appendix 7-1: Cumulative Impact Assessment Methodology provides details of the reasonably foreseeable project or development that are assumed to be fully built and in use by the time the Proposed Development (Onshore) construction starts from Q3 2027. The following reasonably foreseeable developments are assumed to make up the future baseline of relevance to Geology, Soils and Contaminated Land during construction and operation are set out in Table 7-9.

Table 7-9: Developments assumed to make up the future baseline

Planning Reference	Description	Part of construction future baseline?	Part of operation future baseline?
APP/2023/2040	Denhead Solar Farm. Formation of 25MW Solar Farm, Siting of Substation, CCTV, Erection of Security Fencing, Formation of Access and Associated Infrastructure	Yes	Yes
APP/2023/1454	Green Volt Offshore Wind Farm, laying of underground cables and erection of substation	No	Yes

7.4.4.2 Application APP/2023/2040 is located on the edge of the OnTI RLB and is not expected to result in disturbance of the area within the proposed ONEC. Therefore, it is predicted that the future baseline for Geology, Soils and Contaminated Land will not change as a result of this proposed scheme, and it has not been considered within this topic assessment.

7.4.4.3 Application APP/2023/1454 is considered within the Cumulative Assessment within Section 7.8.

7.4.4.4 None of the identified schemes are considered to change the future baseline significantly during operation, as the operation of the developments should not involve ground disturbance and therefore the potential operational effects on Geology, Soils or Contaminated Land are unlikely to be significant.

7.4.4.5 In addition these developments, climate change may cause changes to the existing baseline, as described in Volume 6, Chapter 3: Climate Change Resilience. Given the potential for changes in rainfall patterns, seasonality,

temperature, sea level and extreme weather events, there may be a variety of impacts on the geology, soils and contaminated land within the area including:

- Sea level: Current climate change predictions show that mean sea level, storm frequency and intensity are expected to rise in the future. These factors can result in an increase in coastal erosion, which could impact the designated coastal geological sites. However, current estimates of future coastal erosion under the high emission 2100 scenario¹⁸ suggest a low rate of erosion at the landfall site;
- Changes in rainfall: Increases in rainfall intensity may result in increased mobility of contamination that is already in the ground, by increasing infiltration. Conversely, an increase in drier spells could result in the drying out of peat bogs and damage to peatland habitats; and
- Increased temperatures: increases in air and ground temperature could alter the behaviour of contamination in the ground, for example by increasing the volatilisation of contaminants. However, this is unlikely with the projected temperatures at the location of the Proposed Scheme (Onshore).

7.4.4.6 The scale of change to the future baseline resulting from climate change cannot easily be quantified, but these potential effects have been considered within this topic assessment where possible.

7.4.5 Data Gaps and Limitations

7.4.5.1 No intrusive ground investigations (apart from the peat survey described in Section 7.4.3) have been completed as part of this EIAR and the assessments presented are based on information available at the time of writing. Intrusive investigations will be undertaken at later stages of the Proposed Development (Onshore) to inform detailed design details of which will be submitted as part of the relevant AMSC applications.

7.4.5.2 Whilst a site reconnaissance visit was carried out during the ONEC route optioneering phase, it was limited to publicly accessible areas only and was a visual survey which did not target specific areas such as mapped peat deposits or potentially contaminated land.

7.4.5.3 Permission was sought to investigate two areas of Class 3 and 5 soils within the RLB, but the Applicant was not successful in obtaining all of the required landowner approvals. Peat probing has been carried out in two areas within the southern OnTI RLB (Volume 7E, Appendix 7-2: Peat Survey Reports, see also Figure 7-4 in Volume 7E, Appendix 7-3: Geology, Soils and Contaminated Land Figures). Any additional peat probing or surveys will be undertaken at later stages to inform detailed design and the detailed Peat Management Plan.

7.4.5.4 The assessment presented in this chapter of the EIAR is qualitative in nature, taking into account the findings of the Preliminary Contamination Risk Assessment (PRA) in Volume 7E, Appendix 7-1: Geo-Environmental Preliminary

Risk Assessment, which is based on conjectured areas of contamination from historical mapping and other sources.

7.5 EIA Approach and Methodology

7.5.1 Overview

7.5.1.1 This section outlines the methodology for assessing the likely significant effects on Geology, Soils and Contaminated Land from the construction, operation and decommissioning of the Proposed Development (Onshore). Full details of the methodology for the assessment of impacts on human health as a result of Contaminated Land, including relevant assumptions and limitations, can be found in Volume 7E, Appendix 7-1: Geo-Environmental Preliminary Risk Assessment.

7.5.2 Impacts Scoped in to the Assessment

7.5.2.1 The Onshore Scoping Report was submitted to Aberdeenshire Council in December 2022. The Scoping Report set out the overall approach to assessment and allowed for the refinement of the Proposed Development (Onshore) over the course of the assessment. The proposed scope of the assessment is set out in Table 7-10.

Table 7-10: Geology, soils and contaminated land scope of assessment

Potential Impact	Phase	Nature of Impact
Effects on statutory (SSSI) and non-statutory (GCR) sites designated for their geological interest through partial/full removal, defacement or obscuring or rock outcrops/landforms	Construction	Direct and/or In-Direct
Impacts on human health of site users and adjacent site occupiers as a result of works in potentially contaminated land	Construction, Operation	Direct
Pollution/contamination of soils from activities associated with the Proposed Development (Onshore)	Construction, Operation	Direct
Sterilisation of mineral resource through developments at surface, or prevention of extraction through removal of access to mineral resource	Construction	Direct and/or In-Direct

Potential Impact	Phase	Nature of Impact
Physical damage to peat or carbon rich soils, resulting in loss of carbon storage	Construction	Direct

7.5.3 Impacts Scoped out of the Assessment

- 7.5.3.1 The impacts scoped out of the assessment during EIA scoping, and the justification for this, are listed in Table 7-11.
- 7.5.3.2 In the absence of detailed information regarding decommissioning works, and unless otherwise stated, the impacts during the decommissioning of the OnTI are considered comparable with, or less likely than, those of construction stage.

Table 7-11: Impacts Scoped Out

Potential Impact	Justification
Impacts on geological sites during operation or decommissioning	Any potential impacts would occur during construction. No additional impacts as a result of post-construction activities.
Impacts on mineral resources during operation or decommissioning	Any potential impacts would occur during construction. No additional impacts as a result of post-construction activities.
Impacts on peat and carbon-rich soils during operation or decommissioning	Any potential impacts would occur during construction. No additional impacts as a result of post-construction activities.
Contamination of the Water Environment during construction, operation or decommissioning	Impacts on the Water Environment are assessed in Volume 5, Chapter 6: Hydrology and Hydrogeology
Impacts on agricultural soils	Impacts on Land Capability for Agriculture are assessed in Volume 5, Chapter 2: Land Use
Waste	Waste was scoped out of EIA, therefore this chapter only discusses waste in the context of sources of potential contamination and

Potential Impact	Justification
	the management of excavated peat or contaminated soils.

7.5.4 Assessment Methodology

- 7.5.4.1 The project-wide generic approach to assessment is set out in Volume 1, Chapter 7: EIA Methodology. The assessment methodology for geology, soils and contaminated land for the EIAR is consistent with that provided in the Scoping Report.
- 7.5.4.2 The methodology for the assessment of geology, soils and contaminated land is based on the principle that the environmental effects will be determined by identifying potential receptors, assigning receptor value, assessing the magnitude of change on the receptor and then identifying the significance of the effect. The assessment of contaminated land impacts is set out in full in Volume 7E, Appendix 7-1: Geo-Environmental Preliminary Risk Assessment and an overview is provided in the following sections.
- 7.5.4.3 The scope of the assessment comprises:
- Impact on geology, in particular associated with designated geological sites and mineral resources;
 - Impacts on peat and carbon-rich soils; and
 - Impacts on human health arising from the project’s interaction with contaminationⁱⁱ.
- 7.5.4.4 A desk study has been undertaken (presented in Volume 7E, Appendix 7-1: Geo-Environmental Preliminary Risk Assessment) which identifies the potential geological, soil and contaminated land receptors within the study area.
- 7.5.4.5 Each of the identified receptors has been assigned a value and sensitivity, using the parameters in Table 7-12 below.

ⁱⁱ Note that the assessment of risks to construction workers is not a requirement of the EIA. In the UK, such risks are controlled by legislation such as the Construction (Design and Management) Regulations 2015 and the Health and Safety at Work Act 1974. The potential risks to construction workers have been assessed in Volume 7E, Appendix 7-1 in line with standard good practice for Preliminary Risk Assessment.

Table 7-12: Receptor value and sensitivity

Receptor value and sensitivity	Geological receptors	Soil receptors	Human receptors
Very high (e.g. international)	UNESCO Global Geoparks GCR sites (international) Sites of international importance	None	Residential developments Allotment gardens Schools, nurseries
High (e.g. national)	Geological SSSI GCR sites (national)	Nationally important carbon-rich soils, deep peat and priority peatland habitat (NatureScot Class 1 and 2)	Public open space areas e.g. parks, playing fields
Medium (e.g. regional/county)	Regionally Important Geological Sites (RIGS) Mineral Areas of Search	Non-priority peatland habitat, most soils are carbon-rich with some areas of deep peat (NatureScot Class 3)	Commercial or industrial land uses
Low (e.g. local)	Locally important geological sites e.g. exposed former quarries or mines Mineral Safeguarding Areas (MSA)	Carbon-rich soils unlikely to be associated with peatland habitat (NatureScot Class 5)	Highways, railway land
Negligible	No geological exposures	Mineral soils and soils unlikely to contain peat (NatureScot Classes 4 and 0)	Undeveloped land, agricultural land Land with no sensitive land uses proposed

7.5.4.6 The magnitude of impact on receptors is described in Table 7-13.

Table 7-13: Magnitude of impact on receptors

Magnitude of impact	Criteria	Example impact on attribute	
High	Results in complete loss of feature of international importance, or significant harm to health	Geology	Loss of geological feature/designation of international importance
		Soils	Irreversible damage to, or loss of, carbon-rich soils supporting peatland habitat
		Contamination	Contamination is present with potential for significant harm to human health
Medium	Results in partial loss of feature of national importance, or remediation of contamination is required	Geology	Partial loss of nationally important feature/designation, damage to key characteristics, features or elements
		Soils	Partial loss of carbon-rich soils supporting peatland habitat
		Contamination	Contaminant concentrations exceed background levels and land requires remediation in order to make it suitable for development
Low	Results in minor change to a feature or resource, or low risk to health	Geology	Minor, measurable change in geological feature or resource of local importance, or minor loss of key characteristics, features or elements

Magnitude of impact	Criteria	Example impact on attribute
		Soils Minor loss of carbon-rich soils supporting non-priority peatland habitat.
		Contamination Significant contamination is unlikely to be present, no pathways are present and there is a low risk to health.
Negligible	Results in insignificant change or risk to health	Geology Very minor loss or detrimental impact on geological feature of local importance
		Soils Loss or detrimental impact on carbon-rich soils not supporting peatland habitat
		Contamination Contamination is unlikely to be present, the site does not have a history of potentially contaminative use. There is no requirement for remediation to make the site suitable for development.

7.5.4.8 By combining the sensitivity of the receptor and magnitude of impact, an assessment has been made of the significance of effect. The possibility and extent of successful mitigation is then considered, and the residual effect reported. The resultant effects may be either negative (adverse), positive (beneficial) or neutral, depending on the nature of the impact.

7.5.4.9 For the purpose of this assessment, significance of moderate and above will be defined as a likely significant effect. Significant effects are presented in grey in Table 7-14.

Table 7-14: Significance Matrix

Magnitude of Impact	Receptor Value/Sensitivity				
	Very high	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

7.5.4.10 All assessments follow a source-pathway-receptor approach, under which, for there to be a risk of impact to geology, soil or human health as a result of contaminated land, all three elements must be present to create a pollutant linkage. In the context of this chapter, contamination sources are those associated with known historical activities on the land which may be disturbed through the construction, operation or decommissioning of the OnTI. Receptors are designated geological sites, designated mineral resource, peat and carbon-rich soils or human health.

7.5.5 Approach to Cumulative Effects

7.5.5.1 The Cumulative Impact Assessment (CIA) assesses the impact associated with the Proposed Development (Onshore) together with other relevant plans, projects and activities. Cumulative effects are therefore the combined effect of the Proposed Development (Onshore) in combination with the effects from a number of different projects, on the same receptor or resource.

7.5.5.2 The approach to the CIA for Geology, Soils and Contaminated Land follows the process outlined in Chapter 7: EIA Methodology.

7.5.5.3 The list of relevant developments for inclusion within the CIA is outlined in Volume 7A, Appendix 7-1: Cumulative Impact Assessment Methodology.

7.5.5.4 Developments which are located within the study area have the potential to result in a cumulative effect. Developments which are either operational or in the

decommissioning stage are considered to be part of the baseline and are not considered within the assessment.

7.5.6 Embedded Mitigation

- 7.5.6.1 Where possible, mitigation measures have been embedded into the design of the Proposed Development (Onshore).
- 7.5.6.2 Where embedded mitigation measures have been developed into the design of the Proposed Development (Onshore) with specific regard to Geology, Soils and Contaminated Land these are described in Table 7-15. The impact assessment presented in Section 7.7 takes into account this embedded mitigation.

Table 7-15: Embedded Mitigation

Code	Mitigation Measure	Securing Mechanism
M-39	<p>An Outline CEMP has been produced and included alongside the EIAR to support the Planning Permission in Principle (PPP) (Volume 7, Appendix 10: Outline Construction Environment Management Plan). The Outline CEMP includes measures on pollution prevention, noise control, biosecurity, and waste management. The Outline CEMP will then be developed further through the final design process and this will result in a detailed CEMP being submitted for discharge. The CEMP will be implemented to avoid, minimise or mitigate effects on the environment during the construction and decommissioning phases of the Proposed Development (Onshore).</p>	<p>Detailed CEMP secured through a condition attached to the PPP.</p>
M-46	<p>A surface water and groundwater monitoring plan will be developed for any works that could affect quality or quantity of surface waters, groundwater aquifers or groundwater dependent waterbodies or habitats. This will be agreed with SEPA and be implemented pre, during, and post construction</p>	<p>Outlined within the Outline CEMP and secured by condition attached to the PPP for a detailed CEMP.</p>
M-54	<p>The ONEC has been designed to avoid areas of Class 1 and 2 peatland (as mapped by Scotland’s Soils) where possible. Where areas of mapped Class 1 and 2 peatland are within the ONEC, they have been ground truthed by survey and proven to not constitute priority peatland.</p>	<p>Route design / Design Principles Outlined within the Outline Peat Management Plan (Application Document 7) produced for the PPP and secured through a condition attached to the PPP for a Peat Management Plan.</p>
M-55	<p>The selection of the Onshore Substation Site was influenced by prioritising avoidance of potential peatland, wells, watercourses and potential GWDTE.</p>	<p>The OnTI RLB within the PPP and accordance with mitigation measures identified within the EIAR submitted with the PPP.</p>

Code	Mitigation Measure	Securing Mechanism
M-60	The ONEC and Onshore Substation Site will aim to avoid known/confirmed positions of Private Water Supply source points and infrastructure by 250m, and where this is not achievable a protection plan will be implemented.	Outlined within the Outline CEMP and secured by condition attached to the PPP for a detailed CEMP.
M-62	The presence and nature of contaminated land and the potential risks to human health, surface and groundwater will be assessed and managed in accordance with Scottish Government regulations such as Part IIA and associated statutory guidance, to ensure that land does not meet the statutory definition of contaminated land and guidance for the assessment of risks from contaminated land for new developments, such as Land Contamination: Risk Management. Geoenvironmental Quantitative Risk Assessments will be undertaken to inform remedial and mitigation measures.	Outlined within the Outline CEMP and secured by condition attached to the PPP for a detailed CEMP.
M-63	A MMP will be required to be prepared where soils are required for re-use within the Proposed Development (Onshore)	Outlined within the Outline CEMP and secured by condition attached to the PPP for a detailed CEMP.
M-86	Horizontal Directional Drilling (HDD) will be utilised for the Landfall Site at the coastline to ensure avoidance of coastal cliffs and all habitats associated with the Cullen to Stake Ness Coast SSSI.	Condition attached to the PPP.
M-94	Where peat or carbon-rich soils cannot be avoided, the Onshore Export Cable Route will be designed such that the effect on the peat hydrology and carbon losses are minimised, for example through the implementation of a Peat Management Plan.	Outlined within the Outline Peat Management Plan (Application Document 7) produced for the PPP and secured through a condition attached to the PPP for a Peat Management Plan.

Code	Mitigation Measure	Securing Mechanism
M-95	An UXO Desk Study will be carried out prior to construction of the Onshore Export Cable Route, covering the area close to RAF Banff airfield, to ensure that the risks posed by UXO are adequately controlled during construction.	Outlined within the Outline CEMP and secured by condition attached to the PPP for a detailed CEMP.

7.6 Key Parameters for Assessment

7.6.1.1 Volume 1, Chapter 4: Proposed Development Description (Onshore) details the parameters of the Proposed Development (Onshore) using the Rochdale Envelope approach. This section identifies those parameters during construction, operation and decommissioning relevant to potential impacts on geology, soils and contaminated land.

7.6.1.2 The worst-case assumptions with regard to geology, soils and contaminated land are summarised in Table 7-16.

7.6.2 Proposed Development (Onshore) Phasing

7.6.2.1 As described in Volume 1, Chapter 5: Proposed Development Phasing, three possible construction programme scenarios have been identified for the Proposed Development (Onshore).

7.6.2.2 The assessment of impacts presented in this chapter considers the sequential construction scenario. While overall construction durations are very similar for sequential and enabling scenarios, the sequential scenario would require all construction processes to be carried out again in the second phase of works. For example, trenchless activities at the landfall within the Whitehills to Melrose Coast SSSI, which is designated for geological interest, would occur during Phase 1 and then again in Phase 2. Under the enabling scenario however, the first phase of works would look to undertake some works required for Phase 2 (such as Horizontal Directional Drilling (HDD) at the Landfall Site), reducing the need for construction processes to be undertaken again at the same sites in the second phase.

7.6.2.3 As the effects of the Proposed Development (Onshore) are largely associated with construction and not operation, the sequential scenario has the potential to cumulatively increase the magnitude of potential impacts as the ground will be disturbed over a longer period, increasing the duration of exposure to any potentially contaminated land.

7.6.2.4 An increased construction period also has the potential to cause the sterilisation of mineral resources over a longer timeframe.

7.6.2.5 Two construction periods also increase the risk of accidental pollution incidents, as there will be a longer combined length of construction.

7.6.2.6 The worst case assumptions with regard to the consideration of construction scenarios are also summarised in Table 7-16.

Table 7-16: Worst Case Assessment Scenario considered for each impact as part of the assessment of likely significant effects

Potential Impact	Assessment Parameter	Explanation
Construction		
<p>Disturbance of potentially contaminated land, accidental pollution incidents, temporary mineral resource sterilisation and temporary reduction in access to geological designated sites (SSSI, GCR).</p>	<p>Landfall Site and ONEC</p> <p>4 x HDD works within an area of the following indicative dimensions of 464m (L) x 17.2m (D) (as a maximum) at the Landfall Site for the Onshore Export Cable Circuits. HDD works carried out over two construction periods (i.e., 2 x HDD ducts installed in phase 1 followed by a subsequent 2 x HDD ducts installed in phase 2).</p> <p>1 x temporary Landfall Site construction compound approximately 20,000m² required for either construction phases.</p> <p>4 x Transition Joint Bays (TJBs) installed two at a time over two construction phases.</p> <p>4 x Onshore Export Cable Circuits installed predominantly using Open Cut Trench (OCT) apart from at sensitive crossings where HDD will be used. Installed two at a time over two construction phases. Total ONEC of approximately 37km and an Onshore Export</p>	<p>Aligns with the sequential construction scenario. The worst case scenario for is the largest footprint and extent of excavation required over two distinct construction phases where all activities completed in the first phase are undertaken again in the second phase.</p> <p>Sequential construction may cause contaminated land to be disturbed/exposed over a longer or extended time period, and would also result in twice the construction works, with land being disturbed in the same place. This has the potential to cause chronic effects to health as a result of the release of dust from excavations, haul roads and construction compounds</p>

Potential Impact	Assessment Parameter	Explanation
	<p>Cable Route (i.e., the working corridor) of up to 100m wide.</p> <p>2 X Onshore Grid Connection Cable Circuits to connect the Onshore Substations to the Grid Connection Point at the existing New Deer Substation (for Phase 1), located within an Onshore Grid Connection Cable Route (i.e., the working corridor) of up to 100m wide. 4 x construction compounds (maximum 3750m² per primary compound) and 1 x haul road for each construction phase.</p> <p>Onshore Substations</p> <p>2 x construction and electrical commissioning of Onshore Substations over two construction periods.</p> <p>2 x construction compounds over two construction periods (One for each phase).</p>	
Operation		
Disturbance of potentially contaminated land during routine	<p>Landfall Site and ONEC</p> <p>There will be routine maintenance activities at the Onshore Export Cable Circuits including</p>	Contaminated land may be disturbed/exposed during operation of the Proposed Development

Potential Impact	Assessment Parameter	Explanation
<p>maintenance operations or emergency repairs</p>	<p>periodic visual inspection of the link boxes, TJBs and Cable Joint Bays (typically bi-annually) including checking for faults, water penetration, corrosion of joints and cables and structural conditions.</p> <p>Onshore Substations</p> <p>It is anticipated that there would be weekly operational maintenance vehicles movements to the Onshore Substation Site under normal operation, with more frequent movements during planned maintenance or repair works.</p>	<p>(Onshore), causing acute effects to health as a result of the release of dust from excavations</p>
<p>Decommissioning</p>		
<p>In the absence of detailed information regarding decommissioning works, it is assumed that below ground infrastructure will remain in situ and all above ground infrastructure will be removed and the land reinstated. Therefore, the impacts during the decommissioning of the OnTI are considered likely less than those of the construction stage and comparable with the operation stage.</p>		

7.7 Potential Effects

7.7.1 Construction

Geology – Designated Sites

- 7.7.1.1 There are two designated geological sites within the study area, the Cullen to Stake Ness Coast SSSI and the Cullen to Troup Head GCR site, which overlap at the Landfall Site location. These are both sites of national importance and therefore of High sensitivity.
- 7.7.1.2 HDD will be used at the Landfall Site to bring the cable onshore as outlined in mitigation measure M-86, which will minimise the disturbance of the geological exposures in the cliffs, which the designations refer to. The construction of the cable route is therefore not likely to cause damage to, or loss of, the exposures in the cliff face.
- 7.7.1.3 Consideration of the potential changes to coastal erosion and subsequent impacts on the SSSI and GCR as a result of the Proposed Development (Onshore) is outside the scope of this topic assessment, but is considered in Volume 2, Chapter 2: Marine and Coastal Processes.
- 7.7.1.4 The SSSI boundary extends further onshore than the GCR. The Landfall Site will require the construction of a HDD launch pit within a construction compound and four Transition Joint Bays (TJB) on land behind the cliffs, which will lie outwith the SSSI area. It should be noted that consent would be required from NatureScot for works within the SSSI, as the activities would fall under site specific Operations Requiring Consent.
- 7.7.1.5 The designated areas stretch along the coastline for many kilometres and the area of geological exposure where public access may be restricted due to construction activities is small in comparison. The magnitude of impact during construction without mitigation is considered to be negligible. The overall effect on geological designations is minor, which is not significant in EIA terms.

Geology – Mineral Reserves

- 7.7.1.6 The historical quarries and pits identified in Section 7.4.3 are small and inactive and are not considered to be significant mineral reserves.
- 7.7.1.7 Two mineral areas of search are present within the study area, at Idoch, Cuminestown and Banff West. These areas of search have been defined at county (Aberdeenshire) level for sand and gravel supply and have therefore been assigned a medium receptor value. The majority of the defined area of search at Banff West lies outside the study area and is unlikely to be significantly impacted by the construction of the proposed cable route. The area of search at Idoch falls partially within the proposed ONEC and is more likely to be disturbed or temporarily sterilised by construction of the Proposed Development (Onshore).

7.7.1.8 The construction of the ONEC will cause temporary sterilisation of the mineral resource within the construction area, as the area of the cable trenching plus any haul roads/temporary works areas would not be accessible during construction. The area that would potentially be sterilised at Idoch (the area within the OnTI RLB) is less than 20% of the defined area of search and therefore the magnitude of impact is assessed to be low, as the majority of the area of search is still available for exploitation during construction. The overall effect on mineral resource is assessed to be minor and not significant in EIA terms.

Carbon-Rich Soil/Peat

- 7.7.1.9 As outlined in embedded mitigation measures M-54 and M-55, the ONEC route and Onshore Substation Site have been designed to avoid Class 1 and 2 peatland where possible. Two areas of Class 1 (comprising 0.7% of total study area) are mapped within the study area, however, a peat survey has confirmed that the area of Class 1 within the ONEC is not priority peatland habitat and is therefore not Class 1 peatland. The remaining area of mapped Class 1 within the study area is 0.006km², which is within the 100m buffer but lies outside the ONEC and is unlikely to be directly disturbed as a result of the Proposed Development. The value of Class 1 peat is assessed to be High, but the impact is negligible as no loss of Class 1 peat is anticipated as a result of construction, therefore the overall effect on Class 1 peatland is minor and not significant in EIA terms.
- 7.7.1.10 There are small areas of Class 3 soils within the proposed ONEC which comprise 0.1% of the total study area. Peat survey has confirmed that some of the mapped Class 3 soils are not peat or carbon-rich, although an area of Class 3 soils has been identified through peat survey elsewhere within the study area. These soils are of medium value and may be disturbed or lost as a result of construction where they are required to be excavated. The loss of small areas of these carbon-rich soils is assessed to have a low magnitude of impact. The overall effect on Class 3 soils is therefore minor and not significant in EIA terms.
- 7.7.1.11 Mapped Class 4 soils comprise approximately 2.6% of the study area. These soils are unlikely to be associated with peatland habitats, and are unlikely to include carbon-rich soils, therefore they are assigned a negligible value. The loss of small areas of these soils is assessed to have a negligible magnitude of impact. The overall effect on Class 4 soils is negligible and not significant in EIA terms.
- 7.7.1.12 Mapped Class 5 soils comprise approximately 0.5% of the study area. An area of Class 5 soils has been identified through peat survey elsewhere within the study area. Although these soils can include areas of deep peat, they are assigned a low value as they do not support peatland habitat, and the magnitude of impact is low due to the small potential area of disturbance as a result of the Proposed Development. The overall effect on Class 5 peatland is minor and not significant in EIA terms.
- 7.7.1.13 It should be noted, the location of a mapped peat deposit does not mean that it will definitely be adversely affected by the Proposed Development (Onshore) and a detailed assessment is required to identify the actual effects of the proposal on

peat and carbon-rich soils, which will include intrusive ground investigations to confirm the extent, depth and nature of peat within the area of proposed works.

- 7.7.1.14 The information from ground investigation will then be used in the detailed design of the Proposed Development (Onshore) to avoid and minimise the impact on peat and carbon-rich soils where possible.
- 7.7.1.15 Where the disturbance of peat or carbon-rich soils cannot be avoided, the Onshore Export Cable Route will be designed such that the effect on the peat hydrology and carbon losses are minimised, through the implementation of the measures in the Outline Peat Management Plan (Application Document 7).
- 7.7.1.16 With the implementation of these embedded mitigation measures, the overall effect on peat and carbon-rich soils is assessed to be minor and not significant in EIA terms.

Contaminated Land

- 7.7.1.17 A small number of potentially contaminated land sources have been identified within the study area, which could be disturbed as a result of excavations or HDD during construction. Pollution prevention measures will be put in place to mitigate the effects of contamination on soil and water quality, as outlined in mitigation measure M-39 in Table 7-15.
- 7.7.1.18 The receptors to any such contamination disturbance may be humans living close to the site, who may be exposed to contamination via dust inhalation or direct contact with mud/soil dropped on roads and as such would be of very high sensitivity. The magnitude of impact is considered to be negligible, as the proposed construction works are located over 400m from the closest residential properties, therefore, it is considered unlikely that off-site neighbours will come into direct contact with material from the site that has originated from made ground sources of contamination.
- 7.7.1.19 The spread of any contamination would be limited in extent through the measures outlined in the Outline CEMP embedded mitigation measure M-39 and by the completion of a ground investigation, risk assessments and remediation (if required), as outlined in embedded mitigation measure M-62. The overall effect is considered to be minor and not significant in EIA terms.
- 7.7.1.20 The risk of UXO being disturbed during construction in the area close to the former RAF Banff airfield will be controlled through the completion of a UXO Desk Study. This mitigation measure will be included in the Outline CEMP embedded mitigation measure M-95. Although the accidental detonation of UXO would have a high magnitude of impact, the significance of impact with the implementation of the embedded mitigation measure is assessed to be negligible. The overall effect is considered to be minor and not significant in EIA terms.
- 7.7.1.21 Spillages of fuel and/or construction materials during construction, or the mobilisation of ground contamination could have an adverse effect on soil and groundwater quality. Pollution prevention measures will be put in place to

mitigate any such effects on soil and groundwater quality. These are outlined in the Outline CEMP M-39 and embedded mitigation measure M-46.

- 7.7.1.22 The receptor to any such contamination may be humans living close to the site, using groundwater for drinking water supply and as such would be of very high sensitivity. With the application of protection measures in embedded mitigation measure M-60 to avoid private water supplies during construction, or to implement a protection plan, the magnitude of impact is considered to be negligible, as any contamination would be expected to be limited in extent through the measures outlined in the Outline CEMP. The overall effect is considered to be minor and not significant in EIA terms.

7.7.2 Operation

Geology

- 7.7.2.1 As discussed in Section 7.5.2, impacts on geological receptors during operation have been scoped out. This is because disturbance of the ground within the GCR and SSSI will be limited to construction. All infrastructure within the SSSI and GCR such as the onshore cables and TJBs will be below ground and the land will be reinstated.
- 7.7.2.2 Impacts on mineral resources have also been scoped out during operation. Once the OnTI has been installed, mineral reserves will be sterilised within the zone of influence of the buried infrastructure but the identified reserves could still be worked outside of that area.

Carbon-Rich Soil/Peat

- 7.7.2.3 Impacts on carbon-rich soils and peat have been scoped out during operation. This is because disturbance of the ground and loss of carbon-rich soil or peat deposits will be limited to construction only.

Contaminated Land

- 7.7.2.4 Impacts on human health have been scoped into the operation assessment. Human receptors during operation include site users and adjacent site occupiers as a result of works in potentially contaminated land.
- 7.7.2.5 During operation of the Proposed Development (Onshore), exposure to contamination is only likely to occur when repairs are required which involve disturbance or excavation of contaminated ground, which will be temporary and not sustained throughout operation of the Proposed Development (Onshore). Embedded mitigation measure M-62 will ensure that any significant contamination that was encountered during construction will be dealt with at the time of construction and will not remain in operation. In addition, embedded mitigation measure M-63 requires a Materials Management Plan to be in place to ensure that any soils that are re-used during construction (for example, in

agricultural land) will be suitable for use and not pose a risk to health. Exposure to residual contamination during operation is therefore very unlikely. The sensitivity of potential human receptors (site users and nearby occupiers) is very high, but the magnitude of impact is assessed to be negligible, for the reasons outlined here. The overall effect to human health during operation is considered to be minor and not significant in EIA terms.

- 7.7.2.6 During operation, it is possible that pollution of soils or water may occur as a result of activities associated with the Proposed Development (Onshore), for example leaks and spills of any chemicals required for operation or during repairs or maintenance. Any such leaks and spills will be dealt with at the time that they occur, as it is an offence to cause pollution of the environment and a pollution incident response plan should be in place where chemicals are being used or stored. Although the sensitivity of site users or neighbours is very high, the magnitude of impact from such incidents is anticipated to be negligible, the overall effect is considered to be minor and not significant in EIA terms.

7.7.3 Decommissioning

- 7.7.3.1 In the absence of detailed information regarding decommissioning works, it is assumed that all in ground infrastructure will be left in place at the end of its design life to avoid unnecessary disturbance of habitats. Therefore, the impacts during the decommissioning of the OnTI are likely less than those of the construction stage and comparable with the operation stage. The assessment of effects presented in Section 7.7.2 is assumed to be applicable to the effects caused by decommissioning activities.
- 7.7.3.2 At the Onshore Substation Site, it is assumed that above ground infrastructure will be removed and the land reinstated, therefore it is considered that decommissioning effects would be less than at construction stage, as any existing ground contamination would have been identified and remediated at construction. Effects associated with the operational phase are considered to be applicable to the decommissioning phase.
- 7.7.3.3 The most appropriate method of decommissioning and the handling and disposal of materials will be undertaken in agreement with the relevant authorities at the time. Any applicable new legislation or guidance published prior to decommissioning will be taken into account in relation to any design of mitigation prior to decommissioning occurring.

7.8 Cumulative Effects

7.8.1 Overview

- 7.8.1.1 The list of developments identified for assessing cumulative effects is presented in Volume 7A, Appendix 7-1: Cumulative Impact Assessment Methodology. In Table 7-17 the potential for cumulative effects with each of these developments

is examined, and an assessment of the cumulative effects pertaining to Geology, Soils and Contaminated Land presented where appropriate.

Table 7-17: Geology, soils and contaminated land cumulative effects

Development	Potential for significant cumulative effects	Comments
<p>Green Volt Offshore Wind Farm, laying of underground cables and erection of substation APP/2023/1454 (the Green Volt Application)</p>	<p>Yes</p>	<p>The proposed landfall and export cable corridor of the Green Volt Application is not within the OnTI RLB but the proposed substation is adjacent to the Onshore Substation Site.</p> <p>There are mapped deposits of peat and carbon rich soils in the area of the substation which will be disturbed/lost as a result of the Proposed Development (Onshore), which have been assessed as not significant in EIA terms due to the low value of the soils as peatland habitat and the small area of potential loss. However, there is the potential for cumulative impacts on Class 3 peatlands when considering the with the Green Volt Application.</p>
<p>Stromar Offshore Wind Farm Onshore Infrastructure Stromar Offshore Wind Farm Limited Pre-application stage (the Stromar Application)</p>	<p>Yes</p>	<p>The proposed scheme scoping area is immediately adjacent to or within the OnTI RLB – a confirmed boundary has yet to be identified for the scheme as it is at scoping stage.</p> <p>As the proposed scheme is at scoping stage and the confirmed boundaries for the development have not been identified it is not possible to undertake a cumulative impact assessment. This scheme has therefore not been considered further.</p>
<p>Beauly to Blackhillock to New Deer to Peterhead 400kv Connection Pre-application stage (herein after referred to as the Beauly Application)</p>	<p>Yes</p>	<p>The proposed scheme is within the OnTI RLB.</p> <p>There are mapped deposits of peat and carbon rich soils in the area where the scheme overlaps with the OnTI RLB, which will be disturbed/lost as a result of the Proposed Development (Onshore). The impact of this has been assessed as not significant in EIA terms due to the low value of the soils as peatland habitat and the small area of potential loss. As the proposed scheme is at scoping stage and the boundaries for the development and potential areas to be disturbed have not been identified it is not possible to undertake a cumulative impact</p>

Development	Potential for significant cumulative effects	Comments
		assessment. This scheme has therefore not been considered further.

7.8.2 Construction

Carbon-Rich Soil/Peat

- 7.8.2.1 There is a potential cumulative impact with the Green Volt Application at the south of the study area. The Onshore Substation Site has been designed to avoid all Class 1 and 2 peatland, but areas of Class 3 and 5 peatland remain in the southern part of the study area within the OnTI RLB. These soils range in value from medium to low and may be disturbed or lost as a result of construction where they are required to be excavated.
- 7.8.2.2 The impact of construction of the Proposed Development (Onshore) was assessed to be minor to negligible, as the areas of peat loss caused by the construction of the OnTI are of medium to negligible sensitivity and are small in relation to the total study area.
- 7.8.2.3 The Green Volt Application also has the potential to impact on Class 3 to 5 peatland and as part of the condition of consent for this development there is a requirement to produce a detailed Peat Management Plan.
- 7.8.2.4 With the implementation of the Peat Management Plan it is considered that there will be no significant impacts on peat and carbon rich soils as a result of the Green Volt Application.
- 7.8.2.5 The overall cumulative construction effect is therefore considered to be minor and not significant in EIA terms.

7.8.3 Operation

Carbon-Rich Soil/Peat

- 7.8.3.1 No cumulative operational effects have been identified in relation to carbon-rich soil or peat, as the loss/damage would be expected to occur at construction stage.

7.8.4 Decommissioning

Carbon-Rich Soil/Peat

- 7.8.4.1 No cumulative operational effects have been identified in relation to carbon-rich soil or peat, as the loss/damage would be expected to occur at construction stage, and it is assumed that all in ground infrastructure will be left in place at the end of its design life to avoid unnecessary disturbance of habitats. Above-

ground infrastructure is assumed to be removed, but any peat or carbon-rich soils would already have been impacted within the footprint of above-ground infrastructure during construction.

7.9 In-combination Effects

- 7.9.1.1 In-combination impacts may occur through the inter-relationship with another EIAR topic that may lead to different or greater environmental effects than in isolation.
- 7.9.1.2 There is also the potential for in-combination impacts resulting from onshore and offshore works. These are identified within Volume 6, Chapter 5: Intertidal Assessment and are therefore not repeated here.
- 7.9.1.3 The potential in-combination effects identified for geology, soils and contaminated land receptors relate to the release of contamination during construction and the consequential impact on the quality of surface watercourses and groundwater, which may include water supplies that are used for drinking. Contamination may be released as a result of the disturbance of contaminated soil, or the accidental spillage of fuel or chemicals being used in construction. The risk posed by these effects has been assessed in Volume 5, Chapter 6: Hydrology and Hydrogeology, and the effect is not significant with the proposed embedded mitigation.

7.10 Mitigation Measures and Monitoring

- 7.10.1.1 No additional mitigation above the embedded mitigation outlined in Table 7-15 is proposed.

7.11 Residual Effects

- 7.11.1.1 Where effects were assessed as significant taking into account secondary mitigation to reduce the magnitude of impacts, the residual effects have been assessed below.

7.11.2 Construction Effects

- 7.11.2.1 No significant residual construction effects are identified.

7.11.3 Operation Effects

- 7.11.3.1 No significant residual operation effects are identified.

7.11.4 Decommissioning Effects

- 7.11.4.1 No residual decommissioning effects are identified.

7.12 Summary of Effects

- 7.12.1.1 Table 7-18 presents a summary of the significant effects assessed within this EIAR, any mitigation required, and the residual effects are provided.

Table 7-18: Summary of Effects

Impact	Magnitude	Sensitivity of Receptor	Significance	Mitigation Measures	Residual Effect
Construction					
Damage to, or loss of access to, designated geological sites	Negligible	High	Minor - Not significant	No additional mitigation is required above embedded mitigation.	Minor (not significant)
Temporary sterilisation of mineral resources	Low	Medium	Minor - Not significant	No additional mitigation is required above embedded mitigation.	Minor (not significant)
Disturbance or loss of Class 1 or 2 peatland	Minor	High	Minor to negligible - Not significant	No additional mitigation is required above embedded mitigation.	Minor (not significant)
Disturbance or loss of carbon-rich soils not supporting priority peatland habitat	Low to medium	Low to medium	Minor - Not significant	No additional mitigation is required above embedded mitigation.	Minor (not significant)

Impact	Magnitude	Sensitivity of Receptor	Significance	Mitigation Measures	Residual Effect
Disturbance of contaminated land during construction	Negligible	Very high	Minor - Not significant	No additional mitigation is required above embedded mitigation.	Minor (not significant)
Disturbance of UXO during construction	High	Negligible	Minor – not significant	No additional mitigation is required above embedded mitigation.	Minor (not significant)
Spillages of fuel/construction materials causing pollution	Negligible	Very high	Minor - Not significant	No additional mitigation is required above embedded mitigation.	Minor (not significant)
Operation					
Disturbance of contaminated land during maintenance/repair	Negligible	Very high	Minor - Not significant	No additional mitigation is required above embedded mitigation.	Minor (not significant)
Spillages of fuel/construction	Negligible	Very high	Minor - Not significant	No additional mitigation is required	None

Impact	Magnitude	Sensitivity of Receptor	Significance	Mitigation Measures	Residual Effect
materials causing pollution					
Decommissioning					
Spillages of fuel/construction materials causing pollution	Negligible	Very high	Minor - Not significant	No additional mitigation is required above embedded mitigation.	None

7.13 References

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