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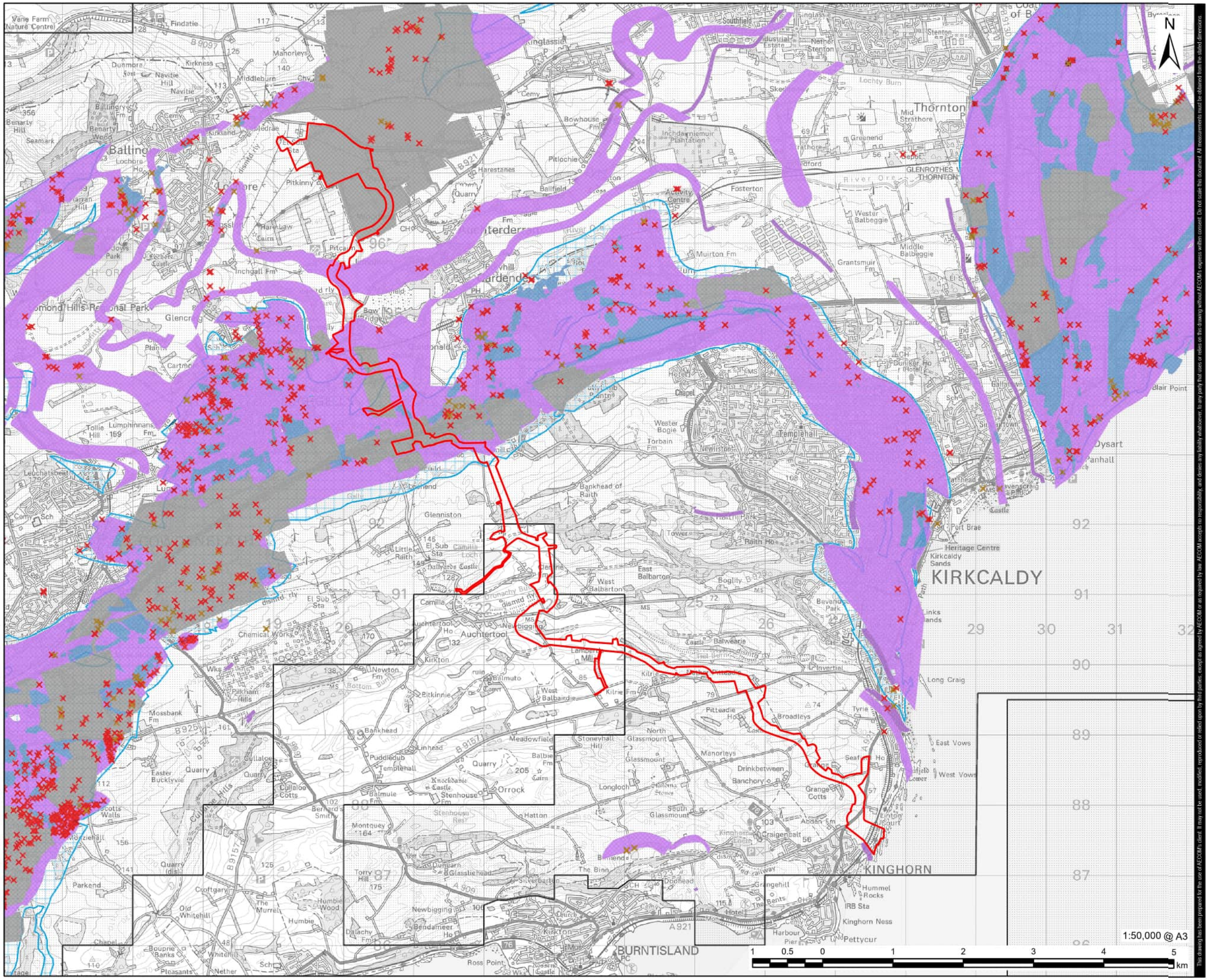

AECOM

PROJECT

Eastern Green Link 4

CLIENT

SP Energy Networks

CONSULTANT

AECOM Limited
One Trinity Gardens
Newcastle
NE1 2HF
www.aecom.com

LEGEND

- Planning Application Boundary
- Adit
- Gutter Pit — Mine Entry
- Shaft
- Mine Entry Potential Zone of Influence
- Fissures and Breaklines
- Surface Mining (Past and Current)
- Past Shallow Coal Mine Workings
- Probable Shallow Coal Mine Workings
- Coal Outcrops
- Coal Mining Reporting Area
- Development High Risk Area
- Surface Coal Resource Areas

NOTES

ISSUE PURPOSE

EIA REPORT

PROJECT NUMBER

60707131

FIGURE TITLE

Historic Mining Activity

FIGURE NUMBER

Figure 12.3

Revision: 1 Drawn: LC Checked: MLS Approved: VD Date: 2025-11-27

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LEGEND

- Scoping Boundary
- Scoping Boundary 1km Study Area
- Site of Special Scientific Interest
- Geological Conservation Review Site

NOTES

ISSUE PURPOSE

EIA REPORT

PROJECT NUMBER

60707131

FIGURE TITLE

Geology Designations

FIGURE NUMBER

Figure 12.4

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0.5 0.25 0 0.5 1 1.5 2 2.5 km

12.6 Embedded Mitigation

In developing the Scottish Onshore Scheme, measures have been embedded into its design and construction in order to avoid or reduce likely significant effects on the environment including geology and ground conditions. These measures, referred to as 'embedded measures', form part of the design of the Scottish Onshore Scheme or are standard control and management measures incorporated into its construction. As these measures are secured through the design and construction of the Scottish Onshore Scheme they are taken into account in the preliminary assessment of effects in **Section 12.7 Assessment of Effects**.

Design Mitigation

Embedded design measures typically relate to seeking to avoid sensitive geological receptors through the design of the underground cable routes or the selection of the installation method, for example the use of trenchless methods. Key design measures include:

- The Scottish Onshore Scheme has been designed to avoid areas of sensitive geology or ground-related risk as much as possible.
- Where areas of sensitive geology or ground-related risk cannot be avoided the proposed underground DC cable has been designed to cross them as directly as possible to reduce impacts or minimise exposure to risks.
- The trenchless crossing at the proposed landfall has been designed to cross the designated geological sites (Firth of Forth SSSI, Kinghorn Coast GCR, Burntisland to Kinghorn Coast GCR and Abden GCR) to avoid crossing the exposed faces/geological outcrops. It will cross below ground level at a maximum depth of up 42 m below ground level before emerging in the Firth of Forth below Mean Low Water Springs.
- The underground cables will be installed within ducts which provides a level of protection to the cables in event of ground instability issues arising.
- During installation of the underground cables including trenchless crossings there is the potential need for dewatering of groundwater from excavations. Where groundwater is encountered during trenching and other excavations, it will be pumped, stored and treated through pollution control measures before being discharged into the nearest watercourse.
- Where possible excavated materials arising from trench excavation for the proposed underground cables and/or earthworks for the proposed converter station, will be reused on site in reinstatement. This includes reinstatement of underground cable trenches, establishing a cut/fill balance for the converter station platform and as part of landscaping at the proposed converter station.
- The siting of the proposed converter station platform optimised the extent of ground engineering required to establish a level platform on which the converter station will be located by moving material for the south and east of the platform to the north and west (i.e. cut/fill balance). Siting the converter station platform in this location also avoids areas to the south of the site which are underlain by greater depths of made ground associated with past mining activity.

- Converter station buildings will be designed to include gas protection measures. The design will be informed by further pre-construction ground investigation and ground gas monitoring.

Control and Management Measures

Construction works will be undertaken in accordance with a Construction Environmental Management Plan (CEMP) that will describe the management arrangements for the Scottish Onshore Scheme and the principles of mitigation that will be adopted. Embedded control and management measures comprise the following.

General Environmental Management

Inductions and Training: All construction personnel to receive site-specific induction including environmental information. All personnel will be suitably trained on emergency procedures, including the use of spill kits.

Environmental Monitoring: Regular monitoring, auditing and reporting to ensure effective implementation of mitigation measures and environmental performance. A designated Site Environmental Manager will conduct regular checks of works areas, record environmental incidents and corrective measures, and monthly audits recording compliance with the CEMP and relevant environmental legislation.

Spill Response: Spill kits will be available, and personnel will be trained in their use. In the event of a spill/leak the flow of pollution will be stopped (if safe to do so) using spill kits or other means to prevent the spill reaching watercourses. Spill kit contents will be checked weekly, and their contents replaced if used. Contaminated materials from spill kits will be disposed according to the Site Waste Management Plan (SWMP). The cause of any spill/ leak/ incident will be investigated and reported to prevent recurrence.

Fuel Storage and Refuelling: All fuel will be stored within double-skinned bowsers, kept in a secure building. Refuelling areas will be on hardstanding to prevent infiltration to ground. Each refuelling area will have a designated spill kit. Refuelling lines will be fitted with automatic shutoffs. Only vehicles which do not regularly use public roads will be refuelled on site. Refuelling will only be undertaken by suitably trained personnel within designated areas. Plant nappies will be kept beneath stationary mechanical plant. Regular inspections will be undertaken, and plant removed offsite where maintenance is required.

Non-fuel items, e.g., hydraulic oil, will be stored in appropriate labelled containers/bunded areas. Where possible, biodegradable oils will be used when working over watercourses.

Storage of fuel and chemicals will be in accordance with GPP 2: Above ground oil storage.

Any containers/tanks of contaminating substances (e.g. fuel) onsite will be leak-proof and kept in a safe and secure building or compound from which they cannot leak, spill or be open to vandalism. The containers will be protected by temporary impermeable bunds (or drip trays for small containers) with a capacity of 110% of the maximum stored volume. Areas for transfer of contaminating substances (including refuelling areas) will be similarly protected.

Any permanent oil storage tanks and temporary storage of 201 litres or more of oil in drums and mobile bowsers, and ancillary pipe work, valve, filters, sight gauges and equipment will have secondary containment (e.g. bunding or drip trays).

No oil/chemical tanks will be stored within 50 m of a water feature and potentially further if ground is angled towards a water feature except for fixed/large plant associated with works that must occur close to water features or hand tools that must be placed in that location. Such chemical storage will be on flat, impermeable hard standing, and with an isolated drainage system.

Soil management

In order to avoid or reduce adverse effects on soil a range of good site practice and management measures will be followed:

- Topsoil and subsoil movements will only be undertaken in suitable conditions, for example, avoiding extreme wet weather.
- Soil stripping will be undertaken with care and will be restricted to as small a working area as practicable.
- Soil will be stripped using appropriate machinery (to prevent compaction) and stored in bunds adjacent to the area stripped/excavated to ensure the soil is returned to approximately the same area during reinstatement.
- Excavated material will be stored separately to prevent mixing of topsoil and subsoil during construction.
- During reinstatement subsoil ripping will be undertaken to reduce potential compaction prior to topsoil replacement.

Contaminated land

Further ground investigation will be undertaken prior to construction to inform detailed design of the Scottish Onshore Scheme. This will also inform an assessment of the nature and extent of contaminated land present, the risks it poses to the environment and human health and design of appropriate mitigation and/or remediation. A mitigation/remediation strategy will be agreed with Fife Council and SEPA prior to the commencement of construction.

A protocol will be developed setting out the steps for managing contamination encountered during the course of construction. A watching brief will be maintained in the absence of potential sources of contamination such as Made Ground, visual or olfactory evidence of hydrocarbons or other potential contaminants. Where areas of potentially contaminated ground and/ or water are encountered these will be sampled and undergo appropriate sampling and laboratory analysis.

Subsequently a risk assessment will be undertaken to identify if these areas of potential contaminants pose a risk to construction workers and/or groundwater. Where appropriate a remediation strategy will be devised and agreed with Fife Council prior to any remedial works.

Measures to prevent the creation of contaminant linkages include:

- Risk assessments in accordance with the Health and Safety at Work Act to restrict exposure to potentially harmful substances to a safe level for construction workers. Personal Protective Equipment will be used as appropriate. Construction Design and Management (CDM) practices will be applied;

- Dust suppression measures to reduce the generation of dust from excavated contaminated soils, for example impermeable covers spread over mounds of bare contaminated soil. Implementation of these measures can reduce the risk of effects to construction workers and adjacent site users from potentially contaminated dusts;
- Should contaminated material be identified that requires removal it will be disposed of appropriately. Material to be disposed offsite will be analysed to determine the appropriate waste classification and disposal location;
- In the event contaminated water (for example from dewatering) is encountered it may not be suitable for direct discharge to the water environment. Water may need to be treated prior to discharge or taken off-site for disposal;
- In the event contaminated soils are identified and material requires to be exported from site, vehicles carrying contaminated soils off-site will only be loaded to appropriate levels and be covered to prevent contaminated materials dropping onto roads; and
- Any material imported to site, such as stone for access roads will be natural quarried stone or, if recycled, the material will undergo chemical testing. The suite of contaminants and site use criteria will be agreed with Fife Council, in order to demonstrate that the material is suitable for use on site and does not pose a risk to construction workers or the environment.

12.7 Assessments of Effects

Construction

Potential impacts on geology and ground conditions will largely occur during the construction of the Scottish Onshore Scheme. This will comprise the installation of temporary construction facilities such as haul roads and compounds, the excavation of a trench in which to install ducts and underground cables, the installation of underground cables using trenchless methods as well as construction of the proposed converter station which will include cut-fill earthworks to establish a platform.

Pathways by which the identified geology and ground conditions receptors have the potential to be impacted by the Scottish Onshore Scheme during the construction phase include:

- Release of substances to ground (e.g. fuel spills) resulting in contamination of currently uncontaminated underlying receptors such as soils or affecting workers;
- Reduction in soil quality by heavy trafficking or handling/storage of excavated soils;
- Disturbance of potentially contaminated soils and perched groundwater (if present) and creation of new pathways allowing migration of such contaminants to reach sensitive receptors;
- Creation of new pathways to groundwater as a result of groundworks (e.g. foundations/piling at the proposed converter station);
- Release of ground gas associated with made ground or historic mine workings;
- Ground stability issues associated with crossing areas of compressible ground such as peat or shallow workings associated with historic mining and quarrying activity; and

- Disturbance and/or loss of designated geological resources at the Firth of Forth SSSI, Kinghorn Coast GCR, Burntisland to Kinghorn Coast GCR and Abden GCR.

Table 12-7 Assessment of Construction Impacts presents a preliminary assessment of potential impacts and the likely significance of effects during construction taking account of embedded mitigation measures.

Table 12-7 Assessment of Construction Impacts

Potential Impact	Description	Receptor(s)	Receptor Sensitivity	Impact Magnitude	Significance
Release of substances to the ground causing pollution	Potential for plant to leak or spill oil and/ or fuel. Leaks and spillages could occur in any working area or compound along the underground cable or at the proposed converter station in which plant is operated or stored, including refuelling. Additionally, the potential exists for spills and drips to occur associated with stored fuels and chemicals brought onto the site to facilitate construction. There is potential that such spillages could enter the underlying uncontaminated strata and contaminate soils and shallow groundwater, as well as presenting a risk to human health. Mitigation measures are proposed including training, pollution prevention measures, responsible storage and handling and spill response measures which would reduce the risk or likelihood of such an impact, as well as likely reduce the magnitude of impact.	Underlying soils and geology	Low	Low	Negligible (Not significant)
		Human health (construction workers)	Medium	Low	Minor adverse (Not significant)
Reduction of soil quality during handling and storage	During the excavation and temporary storage of soils as part of underground cable installation and earthworks at the converter station, minor changes to soil characteristics, could occur due to handling and storage of topsoil and subsoil in inappropriate conditions. Soils stored in bunds are also susceptible to erosion from runoff during heavy rainfall or wind erosion during prolonged dry	Underlying soils	Low	Low	Negligible (Not significant)

Potential Impact	Description	Receptor(s)	Receptor Sensitivity	Impact Magnitude	Significance
	periods. The reduction in the quality of the soils could lead to the loss or alteration to one or more key important features. Mitigation measures are included including only handling soil in suitable conditions, separate storage of top and subsoil, controls on temporary storage bunds as well as the use of appropriate machinery. These are measures which will reduce the magnitude of the impact.				
Reduction of soil quality due to heavy trafficking	The tracking of heavy plant during construction could compact the ground surface/soils causing degradation of soil quality. In addition, compaction could lead to a decrease in infiltration and, therefore, potential water logging and increase of surface water runoff, and a reduction of local groundwater levels. Mitigation measures are proposed including strict controls on the movement of plant and machinery along clearly demarcated temporary haul roads and the use of crushed stone for temporary haul roads. Soils underlying temporary roads will be stripped and stored separately in accordance with soil handling and storage mitigation measures and then be used in reinstatement of temporary haul roads and other working areas.	Underlying soils	Low	Low	Negligible (Not significant)

Potential Impact	Description	Receptor(s)	Receptor Sensitivity	Impact Magnitude	Significance
Disturbance of potentially contaminated soils or ground water	Much of the land crossed by the Scottish Onshore Scheme is currently in agricultural use, however, previous land uses have included historic mining and quarrying activity as well as construction of transport infrastructure including existing and disused railway lines. Made/infilled ground is present in sections underlying the Scottish Onshore Scheme including restored coal mines, quarries and former railway lines. There is the potential for contamination to be encountered in excavated materials e.g. soils or infill material/made ground or in dewatering. The potential presence of contaminated soils or water encountered during construction could lead to adverse impacts including:	Underlying soils and geology	Low	Low	Negligible (Not significant)

Potential Impact	Description	Receptor(s)	Receptor Sensitivity	Impact Magnitude	Significance
	• Exposure of construction workers to potentially harmful contaminants and ground gases through direct contact or inhalation of vapours. • Disturbance of soils may alter the chemical conditions within the site soils resulting in mobilisation of potential contaminants • Contaminated material may be exposed in excavations, which could cause dissolution and/ or mobilisation of contaminants • Arisings from excavations could potentially result in the stockpiling and/or re-use of contaminated soils on the site. The exposure of contaminated soils could lead to migration of potential contaminants both on-site and off the site through dust generation, to underlying soils and to the water environment through leaching or surface runoff. Mitigation measures are proposed including further ground investigation, risk assessment, remediation (as appropriate) as well as working practices which will prevent or reduce impacts resulting from the disturbance of contaminated land.	Human health (construction workers)	Medium	Low	Minor adverse (Not significant)

Potential Impact	Description	Receptor(s)	Receptor Sensitivity	Impact Magnitude	Significance
Import of potentially contaminated materials	Without controls in place, imported construction materials, including natural or recycled stone to create building platforms, temporary haul roads and other working areas or imported materials for backfilling of the underground cable trench, could be contaminated and present a potential risk to construction workers, underlying uncontaminated strata and groundwater. Imported materials will be required during construction. Mitigation measures are proposed including suitable chemical testing of any imported material which will prevent contaminated material being brought to site.	Underlying soils and geology	Low	Negligible	Negligible (Not significant)
		Human health (construction workers)	Medium	Negligible	Negligible (Not significant)
Export of potentially contaminated materials	In the event of encountering contaminated soil or other materials that can neither be reused elsewhere on the Scottish Onshore Scheme or remediated onsite there may be a requirement to remove materials from site for disposal. Mitigation measures are proposed including testing of materials to be disposed of offsite to identify waste classification and disposal locations as well as measures to prevent overloading of vehicles removing waste.	Human health	Medium	Low	Minor adverse (Not significant)
Creation of new pathways for contamination to migrate	Subject to ground investigation and final design of the proposed converter station there is the potential for intrusive construction activities to create new migration pathways between made ground and deeper superficial strata and groundwater.	Underlying soils and geology	Low	Low	Negligible (Not significant)
		Human health (construction workers)	Medium	Low	Minor adverse (Not significant)

Potential Impact	Description	Receptor(s)	Receptor Sensitivity	Impact Magnitude	Significance
	As part of further ground investigation and design, risk assessment in accordance with Land Contamination Risk Management (LCRM) guidance should be undertaken.				
Release of ground gas associated with made ground and historic mine workings	There is the potential for excavation works to cause the release of ground gases which could be inhaled by construction workers. Investigation undertaken to date indicates that the risk of encountering gas is low, however further monitoring will be undertaken as part of pre-construction ground investigation to identify if additional mitigation is required.	Human health (construction workers)	Medium	Low	Minor adverse (Not significant)
Ground stability/subsidence as a result of ground conditions	The Scottish Onshore Scheme is located in an area with extensive historic mining and quarrying activity. Sections of the proposed underground cable route and converter station are located within areas where reinstatement has been undertaken including infilling/backfilling of mines or quarries. In addition, a short section of proposed underground DC cable route crosses an area in which peat is present within superficial deposits.	Human health (construction workers)	Medium	Low	Minor adverse (Not significant)

Potential Impact	Description	Receptor(s)	Receptor Sensitivity	Impact Magnitude	Significance
	There is the potential for subsidence to occur, for example collapse of trenches, where the load bearing capacity of infilled ground or peat deposits is insufficient. The detailed design of the Scottish Onshore Scheme will be informed by ground investigation and ground improvement measures will be applied as appropriate to reduce the risk of subsidence.	Localised peat deposits present within superficial geology	Low to medium	Low	Minor adverse (Not significant)
Disturbance or loss of designated geological sites	Sites designated for geological conservation purposes are present at the coastline where the proposed landfall is located. The landfall is proposed to be installed by trenchless methods (horizontal directional drilling). The ducts through which cables will be pulled will be installed at below ground level between 1.4m at it shallowest and up to 42.49m at its deepest before emerging on the seabed. There will be no direct impact on the cliff faces or exposed geological outcrops which form the designated sites.	• Firth of Forth SSSI • Kinghorn Coast GCR • Burntisland to Kinghorn Coast GCR • Abden GCR	Medium	Negligible	Negligible (Not significant)

Operation

Potential impacts on geology and ground conditions during the operation of the Scottish Onshore Scheme will be limited as the majority of effects will have occurred during construction. Once operational there will be regular inspection and maintenance of the Scottish Onshore Scheme, however, this will not result in likely significant effects on geology or ground conditions. In the event of repairs being required, for example due to a faulty section of underground cable, effects will be similar to those for construction but at a much smaller/localised scale limited to the section being repaired only.

Potential impacts of the Scottish Onshore Scheme during operation relate to

- Presence of new pathways to groundwater as a result of groundworks (e.g. foundations/piling or trenchless cable installation); and
- Within the proposed converter station, potential equipment failure, or spills during maintenance or refuelling, of diesel-powered infrastructure (e.g. back-up generators), resulting in direct release of contaminants to ground.

Table 12-8 Assessment of Operational Impacts presents a preliminary assessment of potential impacts and the likely significance of effects during operation taking account of embedded mitigation measures.

Table 12-8 Assessment of Operational Impacts

Potential Impact	Description	Receptor(s)	Receptor Sensitivity	Impact Magnitude	Significance
Presence of new pathways for contamination to migrate	Subject to ground investigation and final design of the proposed converter station there is the potential for intrusive construction activities to create new migration pathways between made ground and deeper superficial strata and groundwater. As part of further ground investigation and design, risk assessment in accordance with Land Contamination Risk Management (LCRM) guidance should be undertaken.	Underlying soils and geology	Low	Low	Negligible (Not significant)
	The proposed converter station will be manned by regular workers, or during occasional maintenance activities, there is a potential adverse impact on human health from contaminated soils/ groundwater, e.g. by direct contact with soil during maintenance activities, or from inhalation of soil vapour and/or ground gas inhalation by workers inside the building. As described for construction the final design of the proposed converter station will be informed by further ground investigation which will inform the requirement for additional mitigation measures. Based on investigation to date it is proposed that gas protection measures be incorporated in the design of the proposed converter station buildings.	Human health (site workers)	Medium	Low	Minor adverse (Not significant)
Release of substances to the ground causing pollution	During the operational phase of the Scottish Onshore Scheme back-up diesel generators will be present at the proposed converter station as well as associated fuel storage. In addition, other potential	Underlying soils and geology	Low	Low	Negligible (Not significant)

Potential Impact	Description	Receptor(s)	Receptor Sensitivity	Impact Magnitude	Significance
	contaminants will be present at the converter station. There is potential for a release to ground to occur due to equipment failure, during refuelling of diesel generators/ storage tanks or during maintenance activities. Subject to the final design/permeability of the converter station leaks or spills could leach into underlying soils or groundwater and cause contamination. Mitigation measures proposed are for the storage and use of fuels to be in accordance with Guidance for Pollution Prevention (GPP) 2: Above ground oil storage. Fuel and other potentially polluting chemicals will be stored at a minimum of 50 m away from watercourses (unless it is demonstrated that there is no pathway for migration of pollution), in an impermeable and bunded tank, with the bund capacity being 110% of the total tank volume. The back-up diesel generator will be located within an impermeable, bunded area in case of release during operation. When storing and handling fuels on site, appropriate spill control measures will be employed including appropriate training of personnel, spill kits available and regular inspections/maintenance of equipment.				

Decommissioning

During the 40-year operational lifetime of the Scottish Onshore Scheme, it is likely that refurbishment and plant replacement will extend its life rather than decommissioning. However, in the event that the Scottish Onshore Scheme ceases to be required then it could be decommissioned. A Decommissioning Plan will be prepared and planning permission obtained, if required, in accordance with the relevant legislation in place at the time.

Dependent on specific requirements the redundant underground cables could either be left in-situ (which would have the least environmental effect), or all or parts of the cable could be removed for recycling. Where recycling is not possible removed cables will be disposed of in accordance with the relevant waste disposal regulations at the time of decommissioning.

The main components of the converter station will be dismantled and removed for recycling, wherever possible. Where this is not possible disposal will be undertaken in accordance with the relevant waste disposal regulations at the time of decommissioning.

The scale and nature of activities undertaken during decommissioning will be similar to those described for construction, and will be temporary during the period of decommissioning activities. Following removal of the converter station and underground cables (should they be removed) and the reinstatement of the land there will be no further potential effects on geological and hydrogeological receptors. The potential effects from decommissioning should therefore be regarded as being the same as for construction.

12.8 Additional Mitigation

While the preliminary assessment has not identified any likely significant effects because of the mitigation embedded in the design and construction of the Scottish Onshore Scheme, additional mitigation measures have been identified which could further prevent or reduce potential impacts. Additional mitigation measures comprise design measures not already embedded in the design of the Scottish Onshore Scheme as well as additional or non-standard construction mitigation measures. Key additional mitigation measures comprise:

- Further ground investigations, including ground gas monitoring, are to be undertaken in advance of and to inform the detailed design of the Scottish Onshore Scheme. A Ground Gas Risk Assessment will be undertaken in accordance with CIRIA guidance ‘Assessing Risks Posed by Hazardous Ground Gases to Buildings’ (C665).
- The results of preliminary ground investigation and, where appropriate additional ground investigation will inform the final design of the Scottish Onshore Scheme including trenchless crossings.
- The results of preliminary ground investigation and, where appropriate additional ground investigation as well as groundwater level monitoring will inform the design and application of groundwater control and drainage measures.
- Where the proposed underground DC cable route crosses areas of potential ground instability such as made or infilled ground, loose sands or localised/buried peat deposits, additional trench supports may be installed to mitigate against the risk of collapse.
- Where the proposed underground DC cable route crosses localised/buried peat deposits, subject to further design these may be removed from the trench and reused in

reinstatement plans. A peat management plan will be prepared setting out how peat deposits will be handled, stored and reinstated, or where this is not feasible, disposed of.

12.9 Residual Effects

The residual effects are those effects taking into account all mitigation i.e. embedded and additional mitigation. As noted above, with embedded mitigation as part of the design of the Scottish Onshore Scheme and application of standard construction measures during its construction, no likely significant effects are expected to occur. Nevertheless, additional mitigation has been identified which provides further opportunity to avoid or further reduce adverse effects through detailed design and construction.

Construction

Release of substances to the ground causing pollution

There is the potential for plant to leak or spill oil and/ or fuel. Leaks and spillages could occur in any working area or compound along the underground cable or at the proposed converter station in which plant is operated or stored, including refuelling. Additionally, the potential exists for spills and drips to occur associated with stored fuels and chemicals brought onto the site to facilitate construction. Mitigation measures are proposed including training, pollution prevention measures, responsible storage and handling and spill response measures which will reduce the risk or likelihood of such an impact, as well as reduce the magnitude of impact to **low**. With mitigation in place the magnitude of the impact is assessed as **low** with the effect ranging from negligible to **minor adverse** and therefore **not significant**.

Reduction of soil quality during handling and storage

While underlying soils are generally considered to be of **low** sensitivity, during the excavation and temporary storage of soils as part of underground cable installation and earthworks at the converter station, soils could be impacted through inappropriate handling and storage of topsoil and subsoil. Mitigation measures are included including only handling soil in suitable conditions, separate storage of top and subsoil, controls on temporary storage bunds as well as the use of appropriate machinery. With mitigation in place the impact magnitude is assessed as **low** which results in a **negligible** effect which is **not significant**.

Reduction of soil quality due to heavy trafficking

The tracking of heavy plant during construction could compact the ground surface/soils causing degradation of soil quality. Underlying soils are generally considered to be of **low** sensitivity. Mitigation measures are proposed including the use of clearly demarcated haul roads and strict controls on the movement of plant and machinery. With mitigation measures in place the magnitude of the impact is **low** resulting in a **negligible** effect which is **not significant**.

Disturbance of potentially contaminated soils or ground water

Previous land uses and the presence of made ground increase the risk of encountering potentially contaminated land during construction. This includes excavated soils as well as potentially contaminated water pumped out of excavations. The potential presence of contaminated soils or water encountered during construction could lead to adverse impacts

on construction workers (**medium** sensitivity) or underlying geology and soils (**low** sensitivity) and the water environment (assessed in **Chapter 8 Water Environment and Flood Risk**). Mitigation measures are proposed including further ground investigation, risk assessment, remediation (as appropriate) as well as working practices covering the handing, storage and disposal of materials. With embedded and additional mitigation measures in place the magnitude of the impact is **low**. This results in **negligible** or **minor adverse** effects which are **not significant**.

Import of potentially contaminated materials

Without controls in place, imported construction materials, including natural or recycled stone to create building platforms, temporary haul roads and other working areas or imported materials for backfilling of the underground cable trench, could be contaminated and present a potential a risk to construction workers (**medium** sensitivity) or underlying uncontaminated strata (**low** sensitivity) and groundwater. Mitigation measures include appropriate sourcing and testing of any imported material which will prevent contaminated material being brought to site. As effective controls can be put in place to prevent the impact, the magnitude is assessed as **negligible** resulting in a negligible effect which is **not significant**.

Export of potentially contaminated materials

During construction there is the potential to encounter extant contaminated materials including soils and/or groundwater. In the event of encountering contaminated soil or other materials that can neither be reused elsewhere on the Scottish Onshore Scheme or remediated onsite there may be a requirement to remove materials from site for disposal. Mitigation measures are proposed including testing of materials to be disposed of offsite to identify waste classification and disposal locations as well as measures to prevent overloading of vehicles removing waste. The export of contaminated materials has the potential to impact construction workers during their handling and disposal. The sensitivity of workers is **medium**. With mitigation the magnitude of the impact is **low** which results in a minor adverse effect which is **not significant**.

Creation of new pathways for contamination to migrate

Subject to ground investigation and final design of the proposed converter station there is the potential for intrusive construction activities to create new migration pathways between made ground and deeper superficial strata and groundwater. As part of further ground investigation and design, risk assessment in accordance with Land Contamination Risk Management (LCRM) guidance will be undertaken to identify the requirement for additional mitigation. The sensitivity of underlying soils and geology is considered to be **low** and with mitigation in place the magnitude of the impact is **low** resulting in a **minor adverse** effect which is **not significant**.

Release of ground gas associated with made ground and historic mine workings

There is the potential for excavation works to cause the release of ground gases which could be inhaled by construction workers. Investigation undertaken to date indicates that the risk of encountering gas is low, however further monitoring will be undertaken as part of pre-construction ground investigation to identify if additional mitigation is required. The sensitivity of workers is **medium**. With mitigation the magnitude of the impact is **low** which results in a minor adverse effect which is **not significant**.

Ground stability/subsidence as a result of ground conditions

Sections of the proposed underground DC cable route and converter station are located within areas where reinstatement has been undertaken including infilling/backfilling of mines or quarries. A short section of proposed underground DC cable route crosses an area in which peat is present within superficial deposits. The load bearing capacity in these areas has the potential to cause subsidence for example causing excavations or trenches to collapse and impact construction workers. The sensitivity of workers is **medium**. Measures will be incorporated into the design of excavations to ensure their stability, this could include additional mitigation such as the use of trench supports or the removal of less stable material such as peat. As a result, the magnitude of the impact is **low**. This results in a **minor adverse** effect which is **not significant**.

The removal of peat deposits would potentially have secondary effects recognising the relative importance of peat. Peat deposits are present in limited areas to the north of the proposed underground DC cable route and northwest corner of the proposed converter station site. Given the localised extent of peat and the condition of peat identified in the ground investigations to date the sensitivity of peat is conservatively assessed as **low to medium**. Additional mitigation is proposed that where peat is known to be present, then a peat management plan will be prepared setting out how peat deposits will be handled, stored and reinstated, or where this is not feasible, disposed of. As a result, the magnitude of the impact is **low**. This results in a **minor adverse** effect which is **not significant**.

Disturbance or loss of designated geological sites

The proposed landfall requires ducts/cables to cross sites designated for geological conservation purposes. Four overlapping sites are present along the cliffs forming the coastline: the Firth of Forth SSSI and three GCRs. The sensitivity of these sites is **medium**. As the landfall will be installed using HDD there will be no impact on the exposed geology which is present. Ducts/cables will be installed at significant depth as they cross the cliffs into the Firth of Forth emerging on the seabed. As a result, the magnitude of the impact is **negligible**. This results in a negligible effect which is **not significant**.

Operation

Presence of new pathways for contamination to migrate

Subject to ground investigation and final design of the proposed converter station there is the potential for intrusive construction activities to create new migration pathways between made ground and deeper superficial strata and groundwater. As part of further ground investigation and design, risk assessment in accordance with Land Contamination Risk Management (LCRM) guidance (Ref 11.11) should be undertaken. The sensitivity of underlying soils and geology is considered to be **low** and with mitigation in place the magnitude of the impact is **low** resulting in a **minor adverse** effect which is **not significant**.

The proposed converter station will be manned by regular workers, or during occasional maintenance activities, there is a potential adverse impact on human health from contaminated soils/ groundwater, e.g. by direct contact with soil during maintenance activities, or from inhalation of soil vapour and/or ground gas inhalation by workers inside the building. The sensitivity of workers at the proposed converter station is **medium**. As described for construction the final design of the proposed converter station will be informed

by further ground investigation which will inform the requirement for additional mitigation measures including gas protection measures in the design of the proposed converter station buildings. With mitigation in place the impact magnitude is **low** and effects **minor adverse** and therefore **not significant**.

Release of substances to the ground causing pollution

During the operational phase of the Scottish Onshore Scheme back-up diesel generators will be present at the proposed converter station as well as associated fuel storage. In addition, other potential contaminants will be present at the converter station. There is potential for a release to ground to occur due to equipment failure, during refuelling of diesel generators/ storage tanks or during maintenance activities. Subject to the final design/permeability of the converter station leaks or spills could leach into underlying soils or groundwater and cause contamination. Mitigation measures are embedded in the design of the converter station as well as with regard to the storage and handling of potential contaminants. With mitigation in place the magnitude of the impact is **low** resulting in a **negligible** effect which is **not significant**.

12.10 Summary

This chapter assesses the potential impacts and likely significant effects of the Scottish Onshore Scheme on geology and ground conditions. This includes underlying soils, superficial and bedrock geology, existing sources of land contamination including those associated with historic mining or quarrying activity, and sites designated for geological conservation purposes.

Baseline conditions at, and in the vicinity of, the Scottish Onshore Scheme have been established through a combination of desk study and preliminary ground investigation at targeted locations within the proposed converter station and along the proposed underground DC cable route. Underlying geology comprises glacial till and made ground overlying Carboniferous strata. Made ground or infilled ground is present throughout typically associated with the reinstatement of former coal mining or quarrying sites. In some localised areas to the north of the Scottish Onshore Scheme peat is recorded to be present within superficial deposits. While the majority of the land crossed by the Scottish Onshore Scheme is used for agriculture, historically a large part of the area has been subject to previous mining and quarrying activity with the potential to encounter contaminated soil and groundwater. In addition, geological conservation sites comprising the Firth of Forth Site of Special Scientific Interest (SSSI) and three Geological Conservation Review sites ((GCRs) are present on the coastline where the proposed landfall is located.

An assessment of potential impacts and likely significant effects was undertaken. The majority of potential impacts are associated with the construction of the Scottish Onshore Scheme as this is when most impactful or disturbing works such as excavations and trenching will occur. Potential impacts could affect underlying geology and soils, groundwater (addressed in **Chapter 8 Water Environment and Flood Risk**) as well as human health. The assessment does not identify any likely significant effects as a result of measures embedded in the design of the Scottish Onshore Scheme or standard mitigation applied during its construction, however, additional mitigation is also proposed to avoid or further reduce the risk of potential impacts.

Key mitigation measures include the design of the Scottish Onshore Scheme seeking to avoid potentially contaminated land as much as possible through route and site selection, the proposed use of Horizontal Directional Drilling (HDD) to avoid impacts on designated geological sites along the coastline as well as following a range of good practice measures during construction. While there is the potential to encounter contamination a range of measures are proposed to ensure it is identified, handled and disposed of such that it will not affect the environment or human health.

Overall, the likely effects of the Scottish Onshore Scheme are assessed as negligible to minor Adverse and therefore are not significant.

12.11 References

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