ScottishPower Renewables

Earraghail Renewable Energy Development: Borrow Pit Assessment

Technical Appendix 10.3

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RSK GENERAL NOTES

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1 INTRODUCTION

1.1 This report provides a Borrow Pit Assessment for Earraghail Renewable Energy Development ('the proposed Development') and associated infrastructure.

1.2 The report forms a Technical Appendix to the Environmental Impact Assessment (EIA) Report for the proposed Development and should be read in conjunction with this document. It has been produced to address the requirement for aggregate for the proposed Development to supply the construction needs for new and upgraded access tracks and hardstanding areas, including ongoing supply for track maintenance during the operation of the proposed Development.

1.3 This report quantifies the aggregate requirement, appropriate locations within the application boundary from which this material can be sourced and addresses the suitability of the material for the required purpose. Potential impacts from aggregate extraction, processing and transportation are considered and assessed. Design and mitigation measures to avoid or minimise these impacts are set out, along with a number of good construction practices that would be employed during all proposed Development works.

Site location

1.4 The Site is between the village of Tarbert, to the north east, and the village of Skipness, to the south, situated within the northern part of Kintyre Peninsula in Argyll & Bute council and administrative area – centred on National Grid Reference (NGR) NR 88732 63637. The Site is owned by Forestry and Land Scotland (FLS), within the Corranbuie and Skipness coniferous woodland plantations and is located within an area of carbon-rich soils. The Site area is 1,455 hectares (ha) in total and the current land use is classified mainly as forestry with some regions of moorland.

1.5 The topography of the Site is variable and undulating and is dictated by seven small hills within the forested areas. Between the hills, the land is generally less than 14 % slope, with the exception of some land in the north Corranbuie forest area and throughout the south west of the Skipness forest area.

Development proposals

1.6 The proposed Development includes the following key elements:

- 13 wind turbines, up to 180 m to blade tip, including foundations and aviation lighting;
- ground mounted solar arrays;
- BESS units;
- crane hardstandings for wind turbine installation;
- transformer/switchgear housings located adjacent to turbines & solar arrays;
- new (10.4 km) and upgraded (12.9 km) access tracks including watercourse crossings where necessary, passing places and turning heads;

- underground electrical cabling;
- compound containing substation, control building and BESS;
- one main site construction and maintenance compound and a security compound;
- a permanent lattice construction meteorological mast, up to 105 m high;
- health & safety and other directional site signage;
- search areas for three new borrow pit areas; and
- additional development components to improve the overall ecological, environmental and social benefits accruing from the proposed Development, as follows:
    - ecological and environmental: peatland restoration; habitat improvement; native woodland planting
    - social: proposed new walking bothy on the Kintyre Way; circular walking route and viewpoint near Tarbert.

1.7 Full details of the project design are provided in **Chapter 3** of the EIA Report.

Aims

1.8 This report aims to undertake a review of available relevant site information, including all track design specifications, to produce borrow pit designs and development plans in order to address the aggregate need for the construction and operational maintenance associated with the proposed Development. Recommendations will be made for mitigation measures and reinstatement to minimise potential landscape, visual, hydrological and hydrogeological impacts from the excavations. Potential impacts from noise, dust and vibration are also considered.

Assessment method

1.9 The assessment has involved the following stages:

- Desk study;
- Site reconnaissance;
- Borrow pit design; and
- Discussion.

2 DESK STUDY

Information sources

2.1 The desk study involved a review of available relevant information sources on the ground conditions in the study area. Information sources included:

- Ordnance Survey mapping at 1:50,000, 1:25,000 and VectorMap Local raster mapping, Terrain 5 digital terrain model grid and contours and OpenData mapping;
- Historical OS mapping as available to view online;
- High-resolution orthorectified aerial imagery;
- British Geological Survey online and digital geological mapping, 1:50,000 scale;
- Scotland's Soils digital soil mapping, 1:250,000 scale;
- Data provided by the client, including turbine foundation and track design specifications; and
- Archive and extensive Site data held by RSK Group.

Geology

2.2 Geological information is derived from the BGS GeoIndex online geological mapping (BGS, 2021) and BGS map sheets Sound of Gigha (Sheet 20 and part of 21W) and Kilfinan (Sheet 29W and part of 21W) (BGS, 1996; 2000).

Bedrock geology

2.3 The study area is underlain by bedrock from the Beinn Bheula Schist Formation, part of the Southern Highland Group of the Dalradian Supergroup, of Pre-Cambrian age. This formation is described as 'psammite, quartzose to micaceous, locally gritty, with phyllitic semipelite'. Bedrock and superficial geology mapping are provided on **Figure 10.3.1**.

2.4 Two sets of dykes are mapped within the study area. The oldest trends roughly east west through the central part of the study area and consists of quartz microgabbro of the Central Scotland Late Carboniferous Tholeiitic Dyke Swarm. The younger dykes are shown to be olivine microgabbro of the Mull Dyke Swarm, part of the North Britain Palaeogene Dyke Suite. These dykes follow either a north west to south east or north east to south-west orientation and are generally limited in extent.

2.5 The study area lies across the Cowal Antiform, a major regional up-fold structure. The fold axis crosses the study area with a north east to south west orientation.

2.6 A number of minor inferred faults and slides are indicated on the geological mapping. These form two sets, oriented north-east to south-west and north-west to south-east. The area is largely without significant fault displacement.

2.7 One minor earthquake has been recorded within the study area. This was recorded in September 2008, with a Richter local magnitude (R_{ML}) of 1.8. Two further events have been recorded just outwith the study area boundary, both of smaller magnitude (R_{ML} 1.4 in 2009 and R_{ML} 1.1 in 2015). All recorded events in this region are of very minor significance.

Superficial geology

2.8 Superficial geology information is derived from the BGS GeoIndex online geological mapping superficial deposits 1:50,000 map (BGS, 2021).

2.9 The study area has limited superficial deposits. The Skipness River valley is indicated to have deposits of diamicton till. This is a highly variable glacial sediment consisting of unsorted material ranging in size from clay to boulders, usually with a matrix of clay to sand.

2.10 Some alluvium is also indicated along the Skipness River valley. Alluvium is variably formed from mixed clay, silt, sand and gravel and is typically associated with watercourses.

2.11 Some coastal sections are indicated to have raised marine deposits formed from sand and gravel. These are confined to isolated very narrow strips along the eastern coast.

Soils

2.12 The Soil Survey of Scotland digital soils mapping shows four soil types within the study area (James Hutton Institute, 1981).

2.13 The Soil Survey mapping does not identify extensive blanket peat within the study area, although almost all the study area is overlain by peaty gleys with peat and peaty podzols as secondary soils. Brown forest soils are present along the eastern coastal section.

2.14 The Carbon and Peatland 2016 map has been consulted to understand the carbon-rich soils, deep peat and priority peatland habitat within the study area (Scotland's Soils, 2016).

2.15 The majority of the study area is underlain by Class 5 soils; these represent areas of commercial forestry plantation on peat soils and have a lack of peatland vegetation. Part of the northern section of the study area, north and west of the area where most development is proposed, is underlain by Classes 1 and 2, which are considered to be nationally important carbon-rich soils, deep peat and priority peatland habitat. These areas are deemed likely to be of high conservation value. Part of the southern-most study area is underlain by Class 3, indicating that occasional peatland habitats can be found here. Mineral soils have been identified along the eastern edge of the study area.

Mineral Extraction

2.16 There is no evidence of mining within the area (BGS, 2021; Coal Authority, 2021).

2.17 Parts of all the study area lie within Mineral Assessment Areas for silica sand and silica rock, limestone, hard rock aggregate, limestone and dolomite (BGS, 2021). A Mineral Reconnaissance Programme report from the BGS covers part of the northern study area; the report is 'Gold mineralisation in the Dalradian rocks of Knapdale-Kintyre, south west Highlands, Scotland' (Gunn *et al*., 1996).

2.18 A number of existing borrow pits are present within the study area. It is understood that these are all related to the forestry works within the active forest areas.

Rock volumes

2.1 Calculation of aggregate requirement has been undertaken using details of the track and infrastructure design provided by Kiloh Associates. The access track route has been planned to make use of existing infrastructure where this is available and can be upgraded to a suitable standard for a wind farm access, to help minimise the requirement for new aggregate.

2.2 The Worst Case Scenario (WCS) estimated volume has been used, with a contingency of 5%. The combined use of the WCS plus an additional 5 % contingency is to allow for under-estimation in the requirements and for some of the excavated material being unsuitable for construction use. The WCS volume is 314,800 m^3, giving a total required extraction volume of 330,540 m^3.

2.3 The initial section of track giving access into the Site would require upgrading for the construction phase, although it is understood that this section should be suitable for plant to gain access to the location of BP1 in order to begin the aggregate extraction process. It is not anticipated that aggregate would require to be imported to site.

2.4 The volumes of material to be supplied by the three new proposed borrow pits is estimated to total 335,000 m^3, **Table 10.3.1** shows the volume to be extracted from each individual borrow pit.

Table 10.3.1: Aggregate dimensions and volume by borrow pit

Aggregate source	Location	Approximate dimensions			Volume (m^3)
		Width (m)	Length (m)	Depth (m)	
BP1 (new)	NR 8637 6663	100	80	28	85,000
BP2 (new)	NR 8833 6201	195	115	20	200,000
BP3 (new)	NR 9006 6175	88	94	15	50,000
BP4 (FLS)	NR 8774 6239	Information not available			
BP5 (FLS)	NR 8935 6217	Information not available			
				Total volume (m^3):	**335,000**

2.5 In addition, potential contingency material may be available from one or both of the existing Forest and Land Scotland (FLS) borrow pits within the Skipness forest area (the main development area). These locations, identified in this report as BP4 (FLS) and BP5 (FLS), have been used to maintain the existing forestry tracks and are known to provide suitable quality rock for the running surface of unbound tracks. It is anticipated that these borrow pits would only be used in the event that rock from the proposed site borrow pits is found not to be suitable for the running surface, or are unable to provide a sufficient quantity of high-grade material for the track running surface.

2.6 There is an additional borrow pit currently in the planning system awaiting consideration (planning application ref. 21/01154/MIN). It is intended that this borrow pit, proposed by Balfour Beattie and relating to a new overhead line development, would be released to SPR once Balfour Beattie have completed all onsite works and restoration.

Design optimisation

2.7 Design optimisation considers alternative directions and modes of working. The optimised borrow pit designs provide in the first instance for the rock requirement whilst also considering, in line with PAN 50, potential impacts on:

- Landscape;
- Ecology;
- Hydrology; and
- Hydrogeology.

2.8 Potential impacts on humans relate principally to operational factors and include:

- Noise;
- Vibration;
- Dust; and
- Visibility.

2.9 The physical constraints of rock suitability and topography, locations of existing borrow bits, and the requirement to plan for a suitable restoration scheme, have been primary considerations in the borrow pit design. The preferred option has been to open three borrow pits and potentially expand one or more of the three existing FLS borrow pits if required, to supply rock aggregate for the full proposed Development. The rock at the Site has been assessed visually by an experienced geotechnical specialist as potentially suitable for track and hardstanding construction. Rock exposure is good at the existing borrow pits, and along the trackside in a number of locations, however, rock exposure is limited at BP1. There may be local variations that restrict suitability of some of the aggregate, particularly for track running surfaces.

2.10 The three borrow pits and the existing FLS borrow pits are adjacent to Site access tracks and have been designed to minimise visibility as necessary.

3 BORROW PIT METHOD OF WORKING

The Quarries Regulations 1999

3.1 The principles of the *Quarries Regulations 1999* would be followed by the contractor appointed by ScottishPower Renewables to provide a safe working environment during the development of the Site borrow pits. The excavation designs have to provide, in the first instance, safe and stable slopes which encompass the principle of '*design for closure*'. Haul and access roads should be of adequate width for the plant used on site and allow for the provision of edge protection in all locations where applicable.

The Water Environment (Controlled Activities) (Scotland) Regulations 2011

3.2 The *Water Environment (Controlled Activities) (Scotland) Regulations 2011* as amended set out good practice guidelines to prevent pollution of the groundwater environment. These guidelines reflect good operational practices and would be implemented at the Site.

3.3 Where authorisations are required for process plant operation or consents to discharge (under the *Water Environment (Controlled Activities) (Scotland) Regulations 2011* as amended and the *Pollution Prevention and Control (Scotland) Regulations 2012*) these would be obtained in advance from the Scottish Environment Protection Agency (SEPA).

Borrow Pit 1 (BP1): Development

3.4 **Figure 10.3.A** below shows a view across the area of Borrow Pit 1 (BP1), together with a close-up view of the bedrock of bedrock exposure in the surrounding area.

Figure 10.3.A: (a) View SE across the area of BP1, NGR NR 8637 6663. (b) Close up view of rock exposure.

3.5 **Figure 10.3.2** illustrates the existing topography of the proposed borrow pit area and the proposed borrow pit development and restoration plans with borrow pit cross-section lines.

Topsoil stripping and storage

3.6 The peat depth reconnaissance surveys confirm that the proposed borrow pit area has limited shallow peat cover, with a small pocket towards the north-eastern margin having peat up to 0.55 m in depth. Most of the site has no peat with soil depths across the area

of up to 0.45 m. It has been assumed that the average depth of peat and soil across the borrow pit footprint is 0.4 m, based on Site measurements. The borrow pit area is located on a comparatively steep slope, sloping down towards the north west. The area is currently sparse commercial forestry with areas of moorland vegetation.

3.7 The borrow pit would be worked in strips, to ensure that only enough aggregate for the development is obtained and to limit the impacts of the borrow pit to as confined an area as possible.

3.8 Topsoil and, where required, peat acrotelm, would be removed in strips from the initial excavation area and would be stored in a temporary storage area. Topsoil and peat would be stored in separate mounds. The storage mounds would not exceed 2 m in height, to minimise compaction of the soil and peat, and would be shaped to promote shedding of water. Some limited blading would be undertaken on the soil mound surface to assist in shedding of water and to minimise surface erosion in wet conditions. Mounds would not be compacted.

3.9 As the borrow pit excavation develops, the topsoil and/or peat acrotelm would be removed in advance of the active excavation and would be progressively restored over the worked-out areas of the borrow pit where possible, to minimise duration of soil and peat storage. All removed topsoil, plus rock material unsuitable for use as aggregate or fill, would be used in the final restoration of the borrow pit.

Extraction of rock

3.10 The psammite and pelite bedrock would be obtained by blasting. The blast techniques to be used would depend on the depth of rock to the borrow pit floor level at 147 m AOD. Pattern blasting is recommended for the initial opening-up of the borrow pit, blasting at shallow depths initially at the borrow pit entrance and gradually increasing in depth as the land rises to the south-east.

3.11 Pattern blasting involves the drilling of blast holes on a grid layout, normally to a depth of up to 6 m, and is mostly used where no pre-existing natural face is present. Once the fragmented rock is removed, blasting can continue from the rock faces created, using continued pattern blasting or face blasting as appropriate. Face blasting typically involves one or two rows of blast holes drilled to the target depth parallel to and behind an existing face.

3.12 The existing site of the borrow pit is on sloping ground. The borrow pit has been designed to have two main working faces and four subsidiary faces, with an intermediate bench at 160 m AOD and a gently sloping floor level at 147 m AOD. Faces would be up to 15 m in height, blasted at an angle of 75° from the horizontal. The general direction of working would be to the south-east, with blasted rock removed and transported to the relevant area of construction.

3.13 Drainage would be directed to the south-west corner, where water treatment would be provided for the borrow pit. The borrow pit floor would have a gentle slope during rock extraction, to allow for free drainage out of the borrow pit. This may be modified as part of the restoration process, depending on the ecological outcomes desired following restoration.

3.14 The borrow pit would be accessed directly from the access track to the north-west.

3.15 A current planning application (planning application ref. 21/01154/MIN) for a borrow pit, submitted by Balfour Beatty and relating to a new overhead line development, identifies a location immediately north east of the proposed location for BP1. Should this borrow pit be opened, it would be the intention to access the proposed area for BP1 from the Balfour Beatty borrow pit as this would provide an accessible working face from which to begin rock extraction.

3.16 Effects during rock extraction from noise and dust would be minimised by keeping the use of processing plant to a minimum. The blast pattern would be kept tight to maximise fragmentation, although some processing is likely to be required to produce aggregate of suitable grade for track construction. Blast design, including charge weights and delays, is the responsibility of the contractor. Processing plant would be operated only for short periods of time, as necessary to provide the aggregate requirement for construction works associated with the proposed Development.

Drainage

3.17 Natural slope runoff would be diverted around the active excavation area by construction of a low soil bund (0.5 m high) around the outer edge of the excavation, to ensure that runoff is prevented from flowing directly into the excavation. Blind ditches would be created as necessary to control water flow.

3.18 During blasting operations, joints and fractures in the sub-drill zone below the target extraction level are opened up by the expansion of gases generated by the explosives. In consequence, incident rainfall into the operational area would mostly infiltrate into the borrow pit floor. Any excess runoff would be diverted towards a constructed water collection sump, from where collected water would be allowed to discharge slowly into the trackside drainage system.

Restoration

3.19 The borrow pit excavation edges would be softened with respect to the immediately adjacent hillside by earthworks and/or restoration blasting as appropriate. Any unusable material from the excavation would be used in restoration of the borrow pit. Restored faces would have a maximum slope of 27° and stored topsoil would be replaced over the restored faces to facilitate re-vegetation and the final restoration of the borrow pit. Excavated peat would be used within the lower part of the borrow pit to create an area of peatland habitat.

3.20 Borrow pit floors would be ripped or routed to break up the surface and soils and turf material would be replaced over the area. Locally sourced heather brash may be used to help in the restoration process. The site soils would contain a natural rough moorland seedbank and it is anticipated that natural vegetation would re-establish over time. Additional seeding may be required; this would be assessed by the Environmental Clerk of Works at the point of restoration and a suitable upland grass seed mix would be identified for this process.

Part of the borrow pit would be kept available for track and hardstanding maintenance work during the lifetime of the proposed Development.

Borrow Pit 2 (BP2): Development

3.21 **Figure 10.3.B** below shows a view across the area of Borrow Pit 2 (BP2), together with a close-up view of the bedrock present at the site. **Figure 10.3.C** below shows the view from the borrow pit south down to the road, together with a view of the bedrock.

Figure 10.3.B: (a) view of rock face from access track, NGR NR 8833 6201. (b) Close-up photo of pelite and psammite bedrock within rock face.

Figure 10.3.C: (a) View SE across BP2. (b) Close-up of the psammite and pelite bedrock.

3.22 **Figure 10.3.3** illustrates the existing topography of the proposed borrow pit area and the proposed borrow pit development and restoration plans with borrow pit cross-section lines.

Topsoil stripping and storage

3.23 The peat depth reconnaissance surveys confirm that the proposed borrow pit area is largely without peat, with the majority of the records between 0.1 and 0.5 m. One record of 0.8 m is present indicating a small pocket of peat is to be found in this area and a record of 2.6 m is present immediately west of the north-western margin. Extensive areas of bedrock exposure are found across the area, particularly on the steeper sections of the slope. Average depth of peat and soil across the borrow pit footprint is 0.35 m, based on site measurements.

3.24 The site is an area immediately north and north-east of the access track, extending into the commercial forestry plantation. A rock face cutting is present immediately adjacent to

the track, leading into a slope with exposed bedrock and rough vegetation. Further to the north-east, the slope levels off into the main forestry area.

3.25 The borrow pit would be worked in strips, to ensure that only enough aggregate for the proposed development is obtained and to limit the impacts of the borrow pit to as confined an area as possible. If ground conditions make it possible, the area of deep peat near the north-western corner would be avoided during the borrow pit excavation works.

3.26 Topsoil and, where relevant, peat acrotelm, would be removed in strips from the initial excavation area and would be stored in a temporary storage area. Topsoil and peat would be stored in separate mounds. The storage mounds would not exceed 2 m in height, to minimise compaction of the soil and peat, and would be shaped to promote shedding of water. Some limited blading would be undertaken on the soil mound surface to assist in shedding of water and to minimise surface erosion in wet conditions. Mounds would not be compacted.

3.27 As the borrow pit excavation develops, the topsoil and/or peat acrotelm would be removed in advance of the active excavation and would be progressively restored over the worked-out areas of the borrow pit where possible, to minimise duration of soil and peat storage. All removed topsoil, plus rock material unsuitable for use as aggregate or fill, would be used in the final restoration of the borrow pit.

Extraction of rock

3.28 The psammite and pelite rock would be obtained by blasting. The blast techniques to be used would depend on the depth of rock to the borrow pit floor level at 261 m AOD. Pattern blasting is recommended for the initial opening-up of the borrow pit, blasting at shallow depths initially at the borrow pit entrance and gradually increasing in depth as the land rises to the north.

3.29 Pattern blasting involves the drilling of blast holes on a grid layout, normally to a depth of up to 6 m, and is mostly used where no pre-existing natural face is present. Once the fragmented rock is removed, blasting can continue from the rock faces created, using continued pattern blasting or face blasting as appropriate. Face blasting typically involves one or two rows of blast holes drilled to the target depth parallel to and behind an existing face.

3.30 The existing site of the borrow pit is on sloping ground. The borrow pit has been designed to have two main working faces and four subsidiary faces, with an intermediate bench at 271 m AOD and a gently sloping floor level at 261 m AOD. Faces would be up to 10 m in height, blasted at an angle of 75° from the horizontal. The general direction of working would be to the north-west, with blasted rock removed and transported to the relevant area of construction.

3.31 The substation is planned to be located to the south of the borrow pit, but in relative proximity to the active excavation. Rock extraction will begin at the southernmost part of the borrow pit area and will progress north and north-west from this area, to ensure that works are at increasing distance from the substation. As the working direction will be away from the substation, the risks associated with flyrock will be minimised and will decrease as borrow pit development continues.

3.32 Additional control measures, relating to staff, vehicles and mobile plant, will be put in place. No blasting would be permitted without suitable advance warning to all staff working in or around the substation, and all staff will be required to move to a suitable distance from the blast zone prior to blasting. Detailed safety and control measures will be put in place by the contractor before any borrow pit operations are undertaken and will be kept under review as the situation develops.

3.33 Drainage would be directed to the south east corner, where water treatment would be provided for the borrow pit. The borrow pit floor would have a gentle slope during rock extraction, to allow for free drainage out of the borrow pit. This may be modified as part of the restoration process, depending on the ecological outcomes desired following restoration.

3.34 The borrow pit would be accessed directly from the access track to the south and south west.

3.35 Effects during rock extraction from noise and dust would be minimised by keeping the use of processing plant to a minimum. The blast pattern would be kept tight to maximise fragmentation, although some processing is likely to be required to produce aggregate of suitable grade for track construction. Blast design, including charge weights and delays, is the responsibility of the contractor. Processing plant would be operated only for short periods of time, as necessary to provide the aggregate requirement for construction works.

Drainage

3.36 Natural slope runoff would be diverted around the active excavation area by construction of a low soil bund (0.5 m high) around the outer edge of the excavation, to ensure that runoff is prevented from flowing directly into the excavation. Blind ditches would be created as necessary to control water flow.

3.37 During blasting operations, joints and fractures in the sub-drill zone below the target extraction level are opened up by the expansion of gases generated by the explosives. In consequence, incident rainfall into the operational area would mostly infiltrate into the borrow pit floor. Any excess runoff would be diverted towards a constructed water collection sump, from where collected water would be allowed to discharge into the trackside drainage system.

Restoration

3.38 The borrow pit excavation edges would be softened with respect to the immediately adjacent hillside by earthworks and/or restoration blasting as appropriate. Any unusable material from the excavation would be used in restoration of the borrow pit. Restored faces would have a maximum slope of 27° and stored topsoil would be replaced over the restored faces to facilitate re-vegetation and the final restoration of the borrow pit. Excavated peat would be used within the lower part of the borrow pit to create an area of peatland habitat.

3.39 Borrow pit floors would be ripped or routed to break up the surface and soils and turf material would be replaced over the area. Locally sourced heather brash may be used to help in the restoration process. The site soils would contain a natural rough moorland seedbank and it is anticipated that natural vegetation would re-establish over time.

Additional seeding may be required; this would be assessed by the Environmental Clerk of Works at the point of restoration and a suitable upland grass seed mix would be identified for this process.

3.40 Part of the borrow pit would be kept available for track and hardstanding maintenance work during the lifetime of the proposed Development.

Borrow Pit 3 (BP3): Development

3.41 **Figure 10.3.D** below shows a view of the area of Borrow Pit 3 (BP3), together with a close-up view of rock covering the current BP floor area.

Figure 10.3.D: (a) View of the proposed borrow pit looking north, NGR NR 9006 6175. (b) Close up view of BP floor area.

3.42 **Figure 10.3.4** illustrates the existing topography of the proposed borrow pit area and the proposed borrow pit development and restoration plans with borrow pit cross-section lines.

Topsoil stripping and storage

3.43 The peat depth reconnaissance surveys confirm that the proposed borrow pit area has very limited peat presence, with most of the area having soil depths of 0.05-0.4 m. One record of 0.65 m is present in part of the borrow pit area. Average depth of peat and soil across the borrow pit footprint is 0.30 m, based on site measurements.

3.44 The site is located within an area of recent clear-felled forestry. As a result, the ground conditions are very rough with broken branches and tree roots present across the area. The area slopes down towards the south.

3.45 The borrow pit would be worked in strips, to ensure that only enough aggregate for the development is obtained and to limit the impacts of the borrow pit to as confined an area as possible.

3.46 Topsoil and, where relevant, peat acrotelm, would be removed in strips from the initial excavation area and would be stored in a temporary storage area. Topsoil and peat would be stored in separate mounds. The storage mounds would not exceed 2 m in height, to minimise compaction of the soil and peat, and would be shaped to promote shedding of water. Some limited blading would be undertaken on the soil mound surface to assist in shedding of water and to minimise surface erosion in wet conditions. Mounds would not be compacted.

3.47 As the borrow pit excavation develops, the topsoil and/or peat acrotelm would be removed in advance of the active excavation and would be progressively restored over the worked-out areas of the borrow pit where possible, to minimise duration of soil and peat storage. All removed topsoil, plus rock material unsuitable for use as aggregate or fill, would be used in the final restoration of the borrow pit.

Extraction of rock

3.48 The psammite and pelite rock would be obtained by blasting. The blast techniques to be used would depend on the depth of rock to the borrow pit floor level at 210 m AOD. Pattern blasting is recommended for the initial opening-up of the borrow pit, blasting at shallow depths initially at the borrow pit entrance and gradually increasing in depth as the land rises to the north.

3.49 Pattern blasting involves the drilling of blast holes on a grid layout, normally to a depth of up to 6 m, and is mostly used where no pre-existing natural face is present. Once the fragmented rock is removed, blasting can continue from the rock faces created, using continued pattern blasting or face blasting as appropriate. Face blasting typically involves one or two rows of blast holes drilled to the target depth parallel to and behind an existing face.

3.50 The existing site of the borrow pit is on sloping ground. The borrow pit has been designed to have one main working face and two subsidiary faces, with a gently sloping floor level at 210 m AOD. Faces would be up to 15 m in height, blasted at an angle of 75° from the horizontal. The general direction of working would be to the north-east, with blasted rock removed and transported to the relevant area of construction.

3.51 Drainage would be directed to the south-east corner, where water treatment would be provided for the borrow pit. The borrow pit floor would have a gentle slope during rock extraction, to allow for free drainage out of the borrow pit. This may be modified as part of the restoration process, depending on the ecological outcomes desired following restoration.

3.52 The borrow pit would be accessed directly from the access track to the south.

3.53 Effects during rock extraction from noise and dust would be minimised by keeping the use of processing plant to a minimum. The blast pattern would be kept tight to maximise fragmentation, although some processing is likely to be required to produce aggregate of suitable grade for track construction. Blast design, including charge weights and delays, is the responsibility of the contractor. Processing plant would be operated only for short periods of time, as necessary to provide the aggregate requirement for construction works.

Drainage

3.54 Natural slope runoff would be diverted around the active excavation area by construction of a low soil bund (0.5 m high) around the outer edge of the excavation, to ensure that runoff is prevented from flowing directly into the excavation. Blind ditches would be created as necessary to control water flow.

3.55 During blasting operations, joints and fractures in the sub-drill zone below the target extraction level are opened up by the expansion of gases generated by the explosives.

In consequence, incident rainfall into the operational area would mostly infiltrate into the borrow pit floor. Any excess runoff would be diverted towards a constructed water collection sump, from where collected water would be allowed to discharge into the trackside drainage system.

Restoration

3.56 The borrow pit excavation edges would be softened with respect to the immediately adjacent hillside by earthworks and/or restoration blasting as appropriate. Any unusable material from the excavation would be used in restoration of the borrow pit. Restored faces would have a maximum slope of 27° and stored topsoil would be replaced over the restored faces to facilitate re-vegetation and the final restoration of the borrow pit. Excavated peat would be used within the lower part of the borrow pit to create an area of peatland habitat.

3.57 Borrow pit floors would be ripped or routed to break up the surface and soils and turf material would be replaced over the area. Locally sourced heather brash may be used to help in the restoration process. The site soils would contain a natural rough moorland seedbank and it is anticipated that natural vegetation would re-establish over time. Additional seeding may be required; this would be assessed by the Environmental Clerk of Works at the point of restoration and a suitable upland grass seed mix would be identified for this process.

3.58 Part of the borrow pit would be kept available for track and hardstanding maintenance work during the lifetime of the proposed Development.

Contingency Borrow Pits (FLS Borrow Pits and Balfour Beattie Borrow Pit)

3.59 Two existing borrow pits, BP4 (FLS) and BP5 (FLS) are present within the Skipness forest area, as part of FLS's active forestry operations, to provide material for ongoing maintenance of the forestry track network.

3.60 In addition, a new borrow pit is planned by Balfour Beattie to supply aggregate needs for an overhead line development. This is currently in the planning system (planning application ref. 21/01154/MIN). Should approval be granted, the intention is for Balfour Beattie to release the borrow pit to SPR for use within the proposed Development once all required extraction for the overhead line has been completed.

3.61 The intention is to supply all the proposed Development needs from the three new borrow pits already described. However, the nature of the bedrock in this area is known to be variable with some sections better able to provide high quality abrasion-resistant aggregate suitable for track running surfaces and other areas only suitable for sub-base and fill. In the absence of rock testing data from the three new borrow pits, the two existing FLS borrow pits and new Balfour Beattie borrow pit are proposed as contingency options for provision of supplementary aggregate for running surfaces in the event that this need cannot be completely fulfilled by the new borrow pit areas.

3.62 The development and methods of working would be the same as for the three new borrow pit areas. It is not possible to provide accurate design plans as the FLS borrow pits are active sites and will change in their current dimensions in line with ongoing track

maintenance requirements at the site. The Balfour Beattie borrow pit is not yet operational and photographs of the location are not currently available.

3.63 As the two FLS borrow pits are required for long-term track maintenance, restoration of the sites cannot be confirmed. Should the proposed Development require extraction from these sites, agreement with FLS is expected to require that the borrow pits are returned as active excavation areas to FLS once they are no longer needed.

3.64 **Figure 10.3.E** shows a view north across the area of BP4 (FLS), together with a view of the bedrock of the borrow pit wall. **Figure 10.3.F** shows a view north across the area of BP5 (FLS), together with a close-up view of the bedrock of the borrow pit wall.

Figure 10.3.E: (a) View of BP4 (FLS) looking N, NGR NR 8774 6239. (b) Close up view of the borrow pit wall.

Figure 10.3.F: (a) View of BP5 (FLS) looking N, NGR NR 8935 6217. (b) Close up view of the borrow pit wall.

3.65 Both FLS borrow pits are active with steep faces at approximately 75° and loose rock within the quarried area. Commercial forestry covers the land surrounding all the FLS borrow pits.

Topsoil stripping and storage

3.66 The peat depth reconnaissance surveys confirms that the areas surrounding the FLS borrow pits and proposed Balfour Beattie borrow pit all have limited peat cover, with soil depths mainly under 0.5 m. Some pockets of peat are present.

3.67 The borrow pits would be worked in strips, to ensure that only enough aggregate for the proposed development is obtained and to limit the impacts of the borrow pits to as confined an area as possible.

3.68 Topsoil and, where relevant, peat acrotelm, would be removed in strips from the initial excavation area and would be stored in a temporary storage area. Topsoil and peat would be stored in separate mounds. The storage mounds would not exceed 2 m in height, to minimise compaction of the soil and peat, and would be shaped to promote shedding of water. Some limited blading would be undertaken on the soil mound surface to assist in shedding of water and to minimise surface erosion in wet conditions. Mounds would not be compacted.

3.69 As the borrow pits excavation develops, the topsoil and/or peat acrotelm would be removed in advance of the active excavation and would be progressively restored over the worked-out areas of the borrow pit where possible, to minimise duration of soil and peat storage. All removed topsoil, plus rock material unsuitable for use as aggregate or fill, would be used in the final restoration of the borrow pits, probably within the three new borrow pits and the Balfour Beattie borrow pit, so that the FLS pits can be retained as active excavation areas to supply future need.

Extraction of rock

3.70 The psammite and pelite rock would be obtained by blasting. The blast techniques to be used would depend on the depth of rock to the borrow pit floor level. As the borrow pits already have existing faces, it is likely that face blasting would be the main extraction method. Face blasting typically involves one or two rows of blast holes drilled to the target depth parallel to and behind an existing face.

3.71 Drainage would be directed to the appropriate area of the borrow pits, where water treatment would be provided for the borrow pits. The borrow pit floors would have a gentle slope during rock extraction, to allow for free drainage out of the borrow pit.

3.72 The borrow pits would be accessed directly from the access track at the borrow pit entrances.

3.73 Effects during rock extraction from noise and dust would be minimised by keeping the use of processing plant to a minimum. The blast pattern would be kept tight to maximise fragmentation, although some processing is likely to be required to produce aggregate of suitable grade for track construction. Blast design, including charge weights and delays, is the responsibility of the contractor. Processing plant would be operated only for short periods of time, as necessary to provide the aggregate requirement for construction works.

Drainage

3.74 The current drainage plan for the existing borrow pits would be followed. The drainage installed for the Balfour Beattie borrow pit would be retained and extended as necessary.

3.75 Natural slope runoff would be diverted around the active excavation area by construction of a low soil bund (0.5 m high) around the outer edge of the excavation, to ensure that runoff is prevented from flowing directly into the excavation. Blind ditches would be created as necessary to control water flow.

3.76 During blasting operations, joints and fractures in the sub-drill zone below the target extraction level are opened up by the expansion of gases generated by the explosives. In consequence, incident rainfall into the operational area would mostly infiltrate into the

borrow pit floor. Any excess runoff would be diverted towards a constructed water collection sump, from where collected water would be allowed to discharge into the trackside drainage system.

Restoration (Balfour Beattie borrow pit only)

3.77 It is anticipated that the Balfour Beattie borrow pit would be restored following the construction phase.

3.78 The borrow pit excavation edges would be softened with respect to the immediately adjacent hillside by earthworks and/or restoration blasting as appropriate. Any unusable material from the excavation would be used in restoration of the borrow pit. Restored faces would have a maximum slope of 27° and stored topsoil would be replaced over the restored faces to facilitate re-vegetation and the final restoration of the borrow pit. Excavated peat would be used within the lower part of the borrow pit to create an area of peatland habitat.

3.79 Borrow pit floors would be ripped or routed to break up the surface and soils and turf material would be replaced over the area. Locally sourced heather brash may be used to help in the restoration process. The site soils would contain a natural rough moorland seedbank and it is anticipated that natural vegetation would re-establish over time. Additional seeding may be required; this would be assessed by the Environmental Clerk of Works at the point of restoration and a suitable upland grass seed mix would be identified for this process.

4 ENVIRONMENTAL REVIEW

4.1 Most potential environmental effects associated with borrow pit development have been considered within the relevant EIA Report Chapters. As a result, this Section provides a brief review of environmental issues not addressed elsewhere.

Dust

4.2 Borrow pit operations are small-scale, owing to the small aggregate volume requirement for the wind farm track and hardstanding construction.

4.3 Dust emissions can arise from blasting, processing, loading-out and stockpiled material. They are sensitive to weather conditions, typically being worst in dry and windy weather. Water sprays would be available on site for use in dust suppression in dry and windy conditions, to control and minimise dust emissions. Any processing plant brought to site would have integral dust suppression systems to control dust emissions during processing. Effects from dust would be limited to active excavation at the borrow pits, notably during blasting, processing and loading-out of oversized and processed material. With appropriate controls in place, effects from dust emissions would be negligible.

Lighting

4.4 Any lighting associated with the borrow pits should have a clearly defined purpose and be directed to where it is required in order to provide a safe working environment. Lighting would only be used when necessary and would be switched off when not required.

Site stability

4.5 Site stability has been assessed as part of the survey and design work for the borrow pits and has been incorporated into the design as part of a safe working environment. The proposed restoration scheme takes into consideration the requirement for long-term safety with respect to future land use.

5 CONCLUSIONS

5.1 This report sets out details with respect to the operational design for the borrow pits for the proposed Development, in order to supply the need for the proposed access track, turbine foundations and hardstanding requirements for the proposed Development. The borrow pit design and recommended method of operation are in line with the *Quarries Regulations, Approved Code of Practice, 1999* (as amended) to provide a safe working environment and minimise risk of instability.

5.2 An Environmental Review of potential effects from the borrow pit operation has been undertaken. Use of best practice working methods and other mitigation methods as appropriate would be put in place during all borrow pit operations. It is concluded that residual effects would be minor, long-term and adverse during borrow pit operation.

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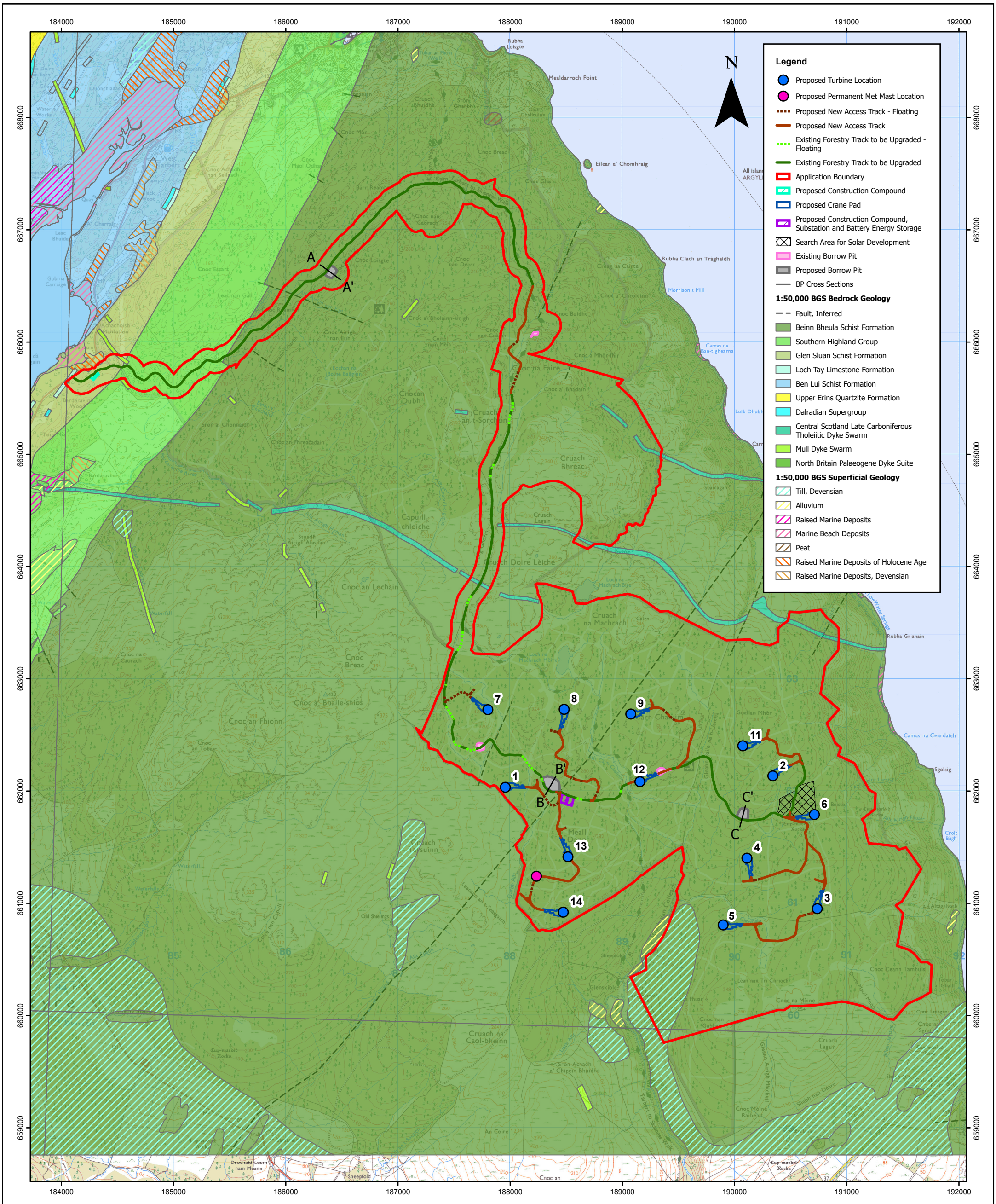
7 FIGURES



SCOTTISHPOWER RENEWABLES

Earraghail Renewable Energy Development

Borrow Pit Assessment

Geology Mapping

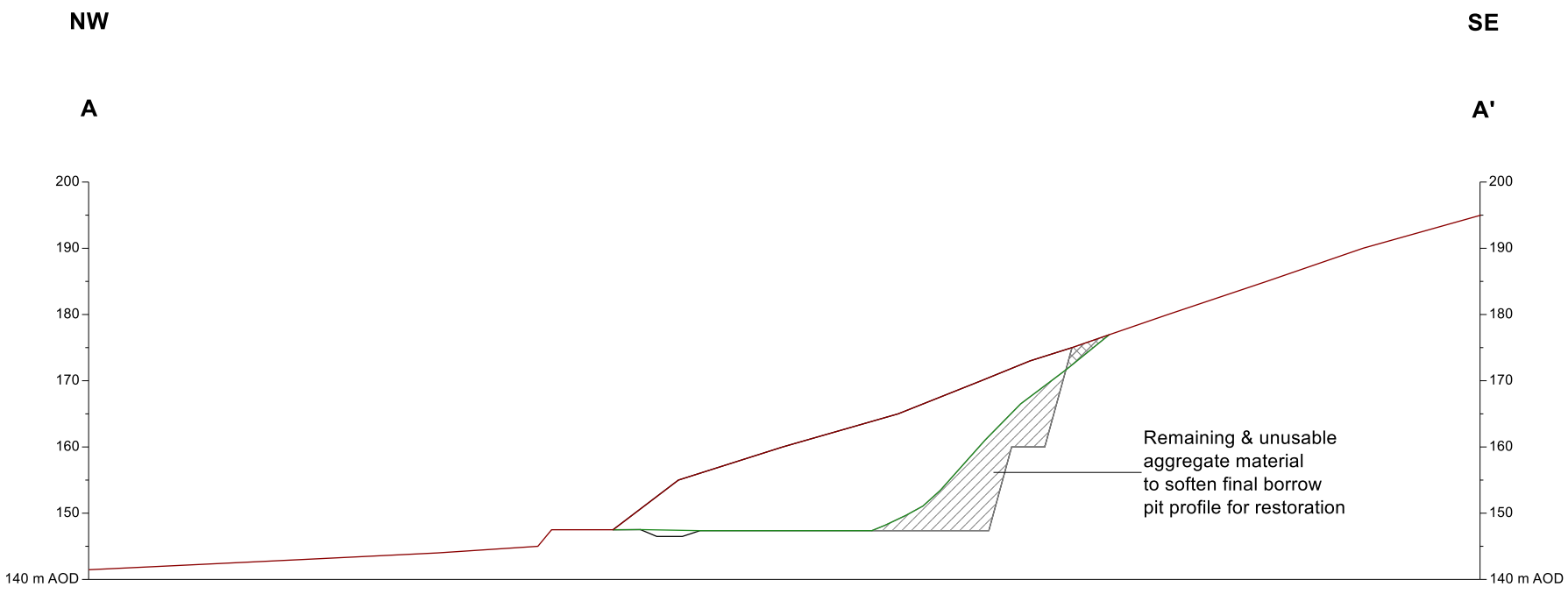
Rev	Date	By	Comment
D	01/12/21	CM	Revised track and logo
E	06/12/21	CM	Updated RLB
F	13/01/22	CM	Updated turbine locations

1:31,000 Scale @ A3

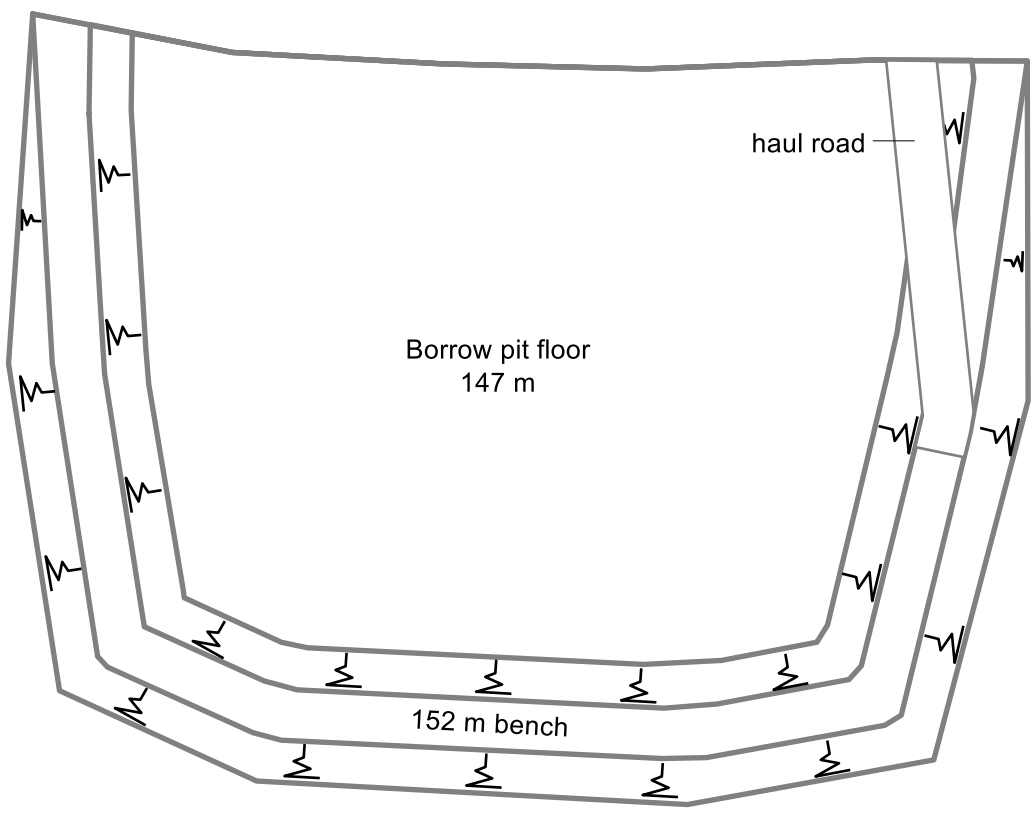
0 0.25 0.5 1 Km

Figure	Date	Rev	Dwg No.	Datum: OSGB36 Projection:TM
10.3.1	13/01/22	F	EHAIL-RSK-I-063	

BP1 cross-section



BP1 design plan



Legend

- Existing Ground Profile
- Excavation Profile
- Indicative Restoration
- Restoration Blasting
- Indicative Restoration Profile

SCOTTISHPOWER RENEWABLES

Earraghail Renewable Energy Development

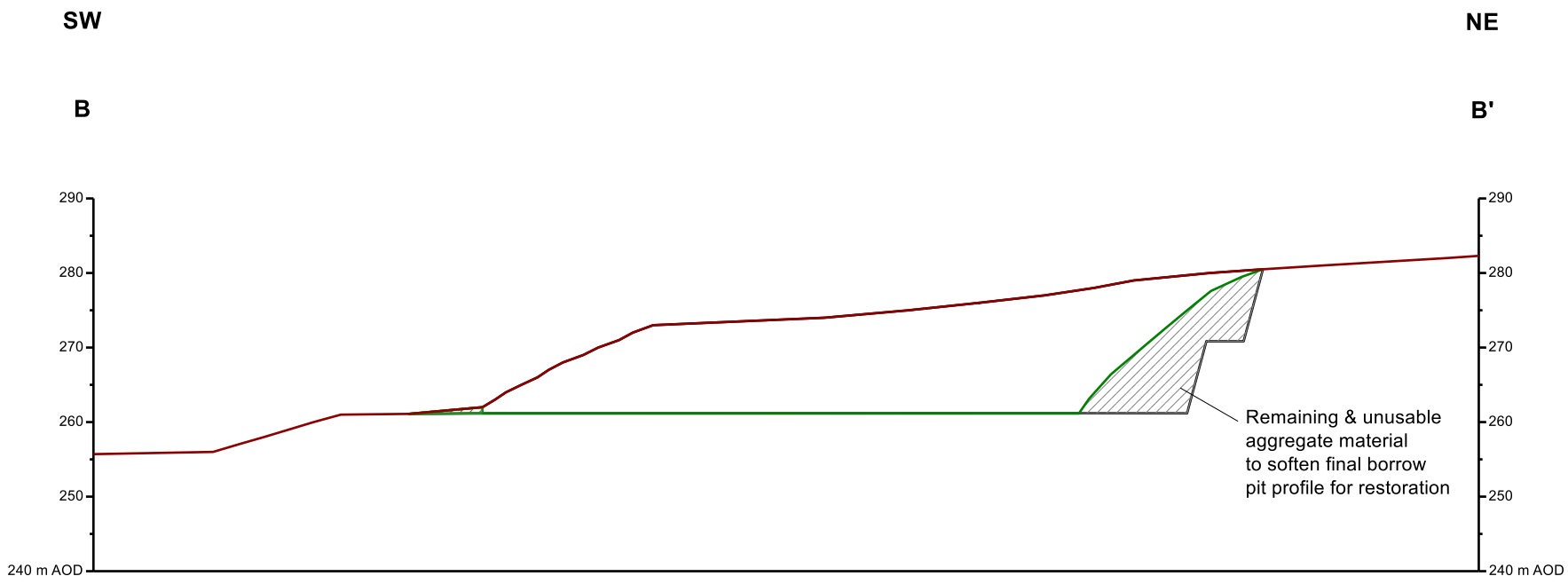
Figure 10.3.2: Borrow Pit 1 Design Plan

Rev	Date	By	Comment
B	02/12/21	CI	Logo update
A	01/09/21	CI	Borrow Pit 1 design

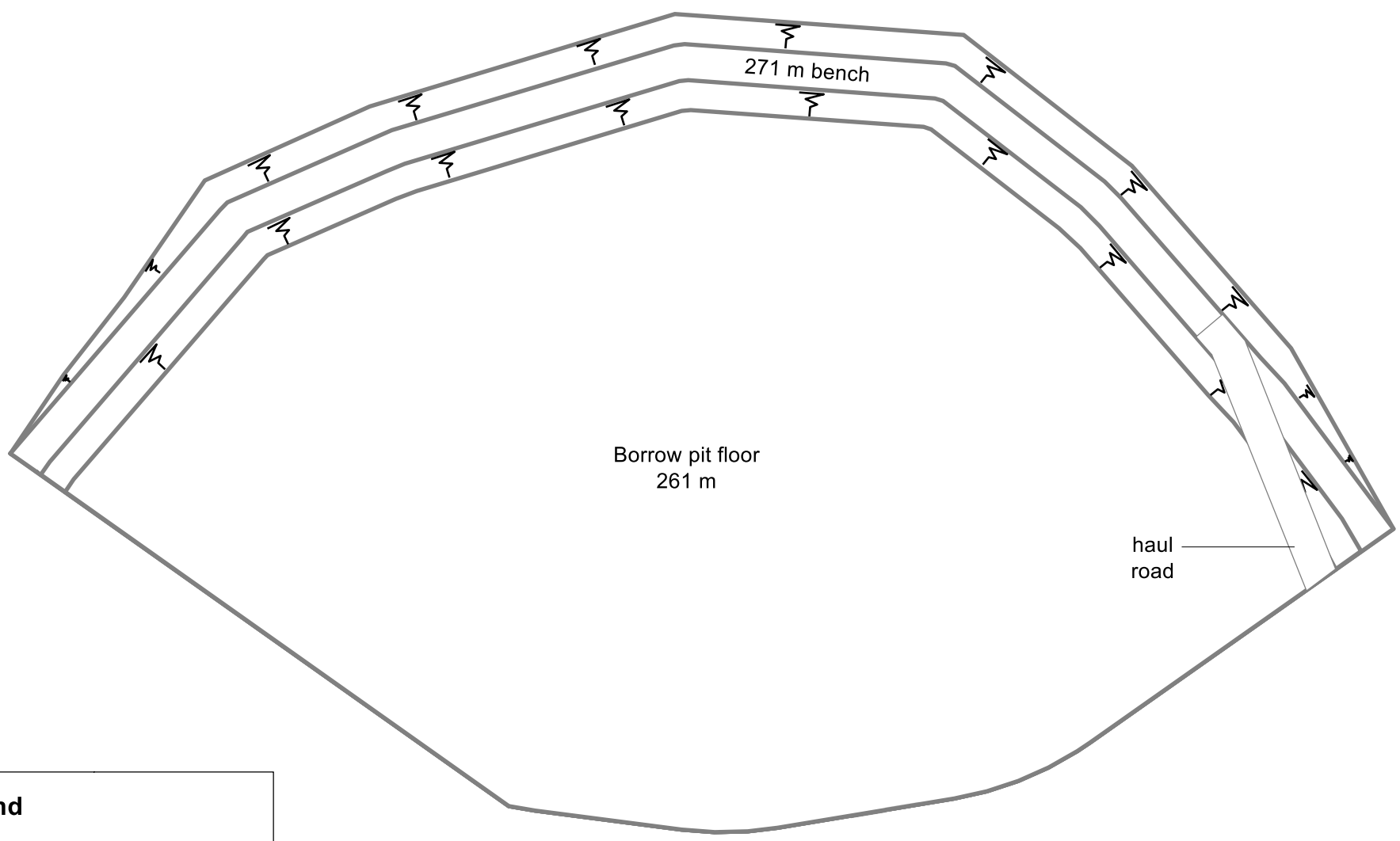
Not to scale

Figure	Date	Rev	Dwg No.	
10.3.2	02/12/21	B	EAR-RSK-BPdes	Datum: OSGB36 Projection: TM

BP2 cross-section



BP2 design plans



Earraghail Renewable Energy Development

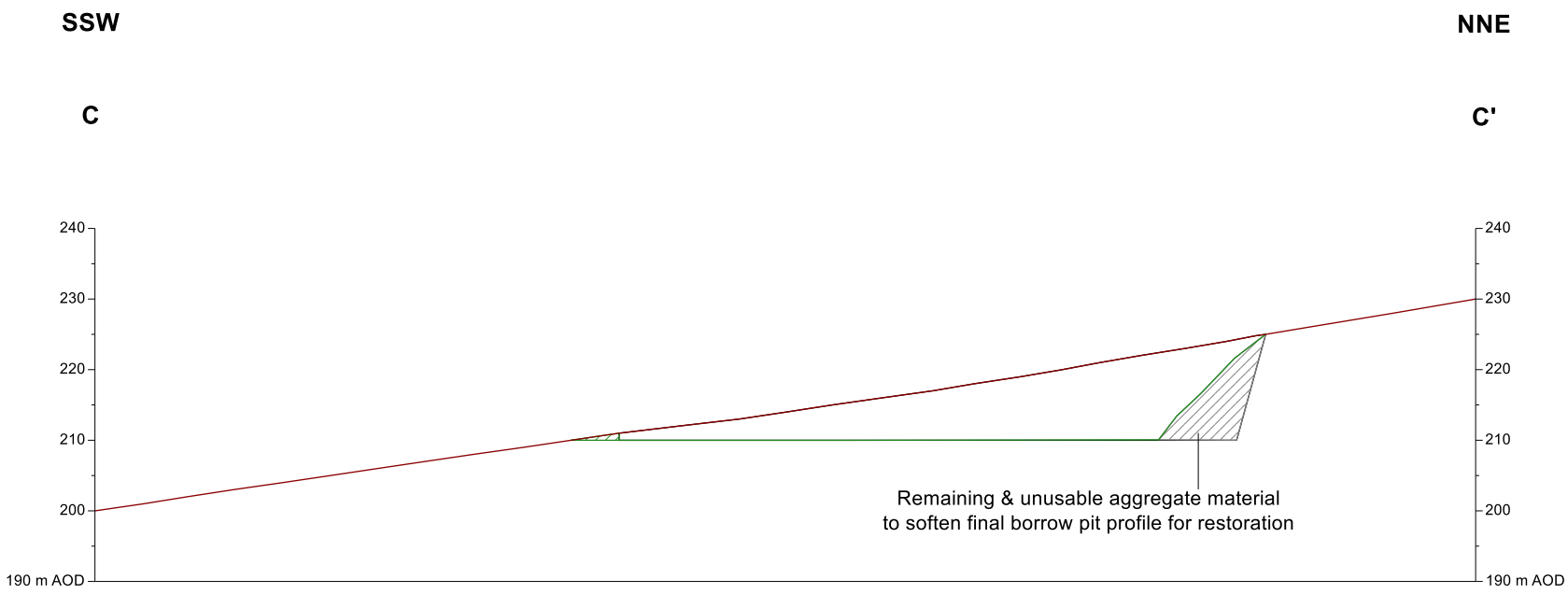
Figure 10.3.3: Borrow Pit 2 Design Plan

Rev	Date	By	Comment
B	02/12/21	CI	Logo update
A	01/09/21	CI	Borrow Pit 2 design

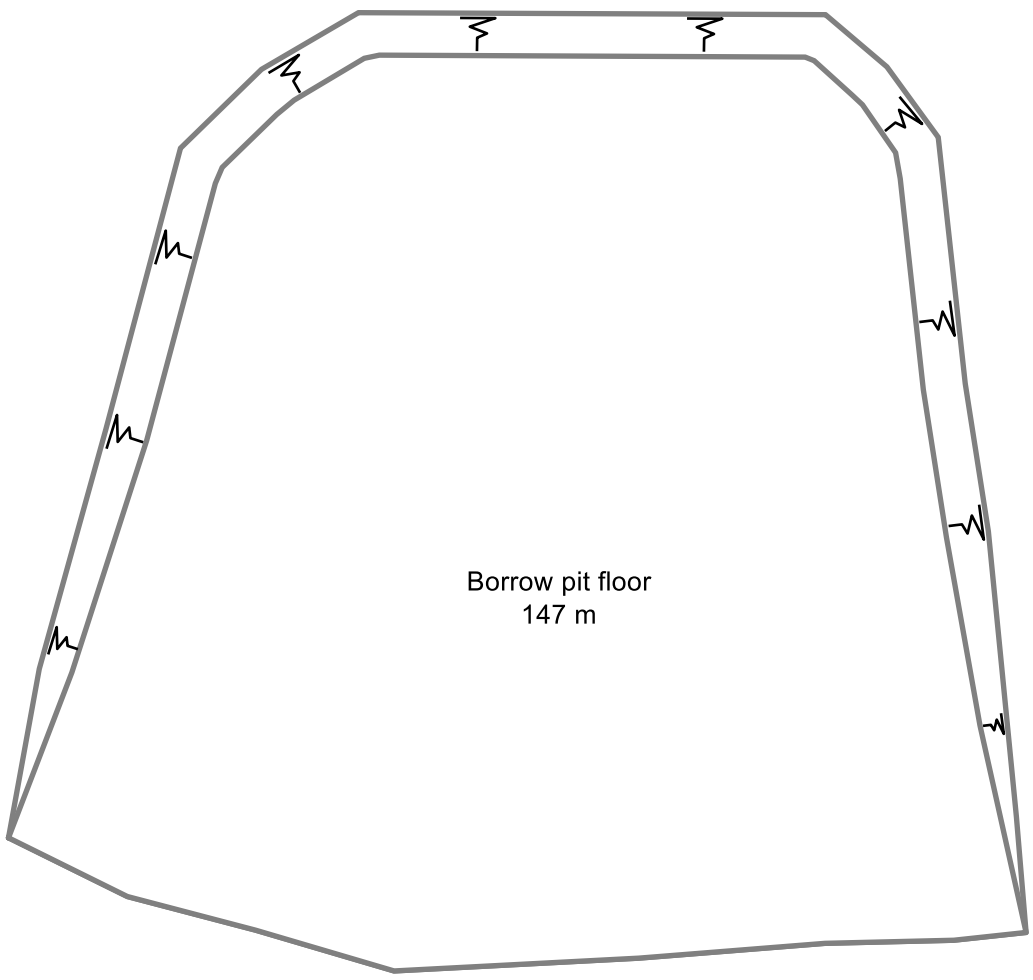
Not to scale

Figure	Date	Rev	Dwg No.	
10.3.3	02/12/21	B	EAR-RSK-BPdes	Datum: OSGB36 Projection: TM

BP3 cross-section



BP3 design plan



Legend

- Existing Ground Profile
- Excavation Profile
- Excavation for Track Construction
- Indicative Restoration
- Indicative Restoration Profile

SCOTTISHPOWER RENEWABLES

Earraghail Renewable Energy Development

Figure 10.3.4: Borrow Pit 3 Design Plan

Rev	Date	By	Comment
B	02/12/21	CI	Logo update
A	01/09/21	CI	Borrow Pit 1 design

Not to scale

Figure	Date	Rev	Dwg No.	
10.3.4	02/12/21	B	EAR-RSK-BPdes	Datum: OSGB36 Projection: TM