

Renantis UK Limited

The Repowered and Extended Ben Aketil Wind Farm: Borrow Pit Assessment

Technical Appendix 9.5

663617-P9.5 (00)



RSK GENERAL NOTES

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Renantis UK Ltd The Repowered and Extended Ben Aketil Wind Farm: Borrow Pit Assessment P/G/663617/09/04/10-1 (00)



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1 INTRODUCTION

1.1 Purpose of this report

- 1.1.1 This report provides a Borrow Pit Assessment for the Proposed Development and associated development infrastructure.
- 1.1.2 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. Sourcing the aggregate from within the development would significantly reduce the traffic movements on local public roads from adjacent quarries. 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.
- 1.1.3 This report quantifies the aggregate requirement, an appropriate location within the site 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 which would be employed during all construction works.

1.2 Site location

- 1.2.1 The Proposed Development is located north-west of the high point of Ben Aketil within the north-western part of the Isle of Skye in the Highland Council area. The Proposed Development red line boundary (the Site) is shown in **Figure 2.1** of the EIAR.
- 1.2.2 The Site is located approximately:
 - 15 km west of Portree;
 - 3.5 km south of Edinbane;
 - 5 km east of Dunvegan;
 - 1.5 km east of Roskhill;
 - 1 km north of Feorlig; and
 - 0.3 km north of Caroy.
- 1.2.3 The Site sits within broadly undulating upland moorland, gently sloping downwards from north-east to south-west. The elevations of the Site range from 20 m above Ordnance Datum (AOD) near the crossing of the A863 over the Caroy River, to the peak of Ben Aketil at 266 m AOD (**Figure 2.2** of the EIAR). Ben Sca, which peaks at 283 m, is located approximately 1.1 km to the north-east of the Site.
- 1.2.4 Site access is currently gained via a track running southwards through forestry from the A850 in the north.



- 1.2.5 As well as being used for the generation of renewable energy, the Site is currently utilised by crofters, predominantly for sheep grazing. They generally access the site by 4x4 vehicle using the access track that extends northwards from the Upper Feorlig public road. Surrounding land uses include upland grazing, commercial forestry located immediately north and the operational Edinbane Wind Farm lies approximately 2.3 km to the east.
- 1.2.6 The Site is relatively remote, with the closest residences being crofters' cottages located near, but outside of, the south-western red line boundary along a public road in Upper Feorlig.

1.3 Development proposal

- 1.3.1 The Proposed Development infrastructure would include:
 - decommissioning and removal of the twelve existing turbines and related infrastructure including hardstandings and the existing operational control building;
 - erection of nine new turbines of approximately 5.6 to 6.6 MW each, with a maximum tip height of 200 m, a rotor diameter of approximately 140 m to 155 m and hub height of approximately 122.5 m;
 - hardstanding areas at the base of each turbine, each 3,820 m², with a maximum total area of 34,380 m².
 - approximately 9 km of new track, of which 1.5 km will consist of floating track;
 - approximately 2.3 km of upgraded track;
 - two substations and associated compounds including parking and welfare facilities;
 - an energy storage facility;
 - up to six construction compounds;
 - two potential borrow pits, to provide suitable rock for access tracks, turbine bases and hard standings; and
 - underground cabling linking the turbines with the substations.
- 1.3.2 Full details of the Proposed Development design are provided in **Chapter 2** of the EIA Report.

1.4 Aims

1.4.1 This report aims to undertake a review of available relevant Proposed Development information, including all track design specifications, to produce borrow pit designs and development plans in order to address the aggregate need for the Proposed Development construction and operational maintenance. Recommendations are 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.



1.5 Assessment method

- 1.5.1 The assessment has involved the following stages:
 - desk study;
 - site reconnaissance;
 - borrow pit design; and
 - environmental review.

1.6 Desk Study

Information sources

- 1.6.1 The desk study involved a review of available relevant information sources on the ground conditions in and around the site. Information sources included:
 - Ordnance Survey (OS) mapping at 1:50,000, 1:25,000 and VectorMap Local raster mapping, Terrain 5 digital terrain model and OS OpenData mapping;
 - Historical OS mapping as available to view online;
 - High-resolution orthorectified aerial imagery;
 - British Geological Survey (BGS) online and digital geological mapping, 1:50,000 scale;
 - Scotland's Soils digital soil mapping, 1:250,000 scale; and
 - Data provided by the applicant, including turbine foundation and track design specifications.

1.7 Geology

1.7.1 Geological information is derived from the BGS Geolndex online geological mapping and the Geological Survey of Scotland, 1:50,000 geological map series (BGS, 2006; 2007; 2023). Additional information has been derived from Emeleus and Bell (2005) and Trewin (2002). Geology mapping is shown on Figures 9.1a and 9.1b of the EIAR.

Bedrock geology

- 1.7.2 The site is underlain by basalt lavas from the Skye Lava Group varying in composition from alkali basalt to hawaiite and mugearite, all of Palaeogene age. Some lavas include larger crystals of feldspar and are described as feldspar-phyric. The majority of the bedrock has a finely crystalline and relatively uniform texture and dark grey to brown colour.
- 1.7.3 A series of dykes is present across the site. These form part of the North Britain Palaeogene Dyke Suite and consist of basalt and microgabbro. The dykes all trend in a north-west to south-east direction and are associated with the Skye Central Complex that forms the Cuillin hills.
- 1.7.4 The area is cut by a series of north-west to south-east trending extensional faults crosscut by later north-south or north-east to south-west trending faults, relating to a period of



folding and basin formation. The faults are not geologically active and recent seismic activity in the area is very limited.

Superficial geology

- 1.7.5 Superficial deposits are dominated by peat, which is mapped as a blanket over the majority of the site. Some areas are indicated to have diamicton till, of Devensian age. Till is a very variable glacial sediment consisting of unsorted material ranging in size from clay to boulders, with a matrix of clay to sand. It is usually overconsolidated and has limited or no re-working by water from the glacier or other sources.
- 1.7.6 Alluvial deposits are present along the main watercourse valleys, notably the Caroy River, and consist of clay, silt, sand and gravel. Small alluvial fan deposits are present in locations where alluvium has been reworked by tributary streams.
- 1.7.7 The lower part of the Caroy River, near the coast, includes raised marine beach deposits and marine beach deposits, mainly gravel and sand and may contain shelly fragments.

1.8 Rock volumes

- 1.8.1 Calculation of aggregate requirement was undertaken by the applicant's design team, and a total required volume was provided for the purpose of borrow pit design and assessment. A contingency of 20% was added to the estimated total, to allow for underestimation in the requirements and for some of the excavated material being unsuitable for construction use.
- 1.8.2 The provided total aggregate volume required is **134,742m³**. Including 20% contingency, this amounts to a total of **162,000 m³**.
- 1.8.3 The initial 1,500 m section of track within the access area would require upgrading and widening for the construction phase. An additional volume of aggregate has been estimated for these works, totalling **4,500 m³**. It is anticipated that this material would be imported to the Proposed Development from a commercial source.
- 1.8.4 One borrow pit is anticipated to provide the aggregate requirement for the turbine area. The volumes of material to be supplied from each borrow pit are provided in Error! R eference source not found..

Aggregate source	Required Volume (m ³)	Design Volume (m³)	Length (m)	Width (m)	Area (m ²)
Borrow Pit BP1	-	152,000	180	140	25,200
Borrow Pit BP2	-	14,000	70	70	4,000
Total (m ³):	134,742	162,000			

Table 9.3.1: Aggregate Volumes



1.9 Design optimisation

- 1.9.1 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 50¹, potential impacts on:
 - landscape;
 - ecology;
 - hydrology; and
 - hydrogeology.
- 1.9.2 Potential impacts on human beings relate principally to operational factors and include:
 - noise;
 - vibration;
 - dust; and
 - visibility.
- 1.9.3 The physical constraints of rock suitability and topography, 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 one borrow pit, to supply rock aggregate for the turbine area, with aggregate anticipated to be imported for upgrading of the proposed access area. The rock within the turbine area has been identified as potentially suitable for track and hardstanding construction; however, rock exposure within the turbine area is relatively limited and there may be local variations that restrict suitability of some of the aggregate, particularly for track running surfaces.
- 1.9.4 The borrow pit is adjacent to existing access tracks and have been designed to minimise visibility from the properties around Ben Aketil and from public walking routes through the Site boundary where possible.

¹ Scottish Government (1996). Controlling the Environmental Effects of Surface Mineral Workings. Planning Advice Note (PAN) 50: controlling the environmental effects of surface mineral workings. Accessed November 2021.



2 BORROW PIT METHOD OF WORKING

2.1 The Quarries Regulations 1999

2.1.1 The principles of the *Quarries Regulations 1999*, as set out in the Health & Safety Executive's document "Health and Safety at Quarries: The Quarries Regulations 1999 Approved Code of Practice" (HSE, 2013) would be followed by the appointed Contractor to provide a safe working environment during the development of the Proposed Development's borrow pits. The excavation designs must, in the first instance, provide safe and stable slopes which encompass the principle of '*design for closure*'. Haul and access roads should be of adequate width for the plant to be used on site and allow for the provision of edge protection in all locations where applicable.

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

- 2.2.1 The Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended provide a regulatory framework to prevent pollution of the groundwater environment. Related to these, the Scottish Environment Protection Agency's (SEPA) publication The Water Environment (Controlled Activities) (Scotland) Regulations (as amended): A Practical Guide) (2022) sets out good practice guidelines to prevent pollution of the groundwater environment. These guidelines reflect good operational practices and would be implemented at the Proposed Development.
- 2.2.2 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).

2.3 Borrow Pit 1: Development

The development plan for, and cross section of, Borrow Pit 1 is shown on Figure 9.5.1.

Topsoil stripping and storage

- 2.3.1 The peat depth surveys confirm that the proposed borrow pit area has limited peat cover. Peat depth records range from 0.2 to 0.8 m. Average peat and soil depth across the borrow pit footprint is 0.5 m, based on site records. The borrow pit is located on the western slope of Ben Aketil and is characterised by moorland habitat. The location of the borrow pit in relation to peat depth can be seen on **Figure 9.3** of the EIAR.
- 2.3.2 Borrow pit working would be undertaken in strips, with only enough aggregate removed to cover the needs of the Proposed Development.
- 2.3.3 Topsoil and peat acrotelm would be removed in strips from the 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.

2.3.4 As the borrow pit excavation develops, the topsoil and/or peat acrotelm would be removed in advance of the active excavation and would be used elsewhere in the Proposed Development as appropriate. 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

- 2.3.5 The Basalt and Microgabbro 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 70 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-east.
- 2.3.6 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.
- 2.3.7 The proposed location of the borrow pit is on a south-west facing slope within Gleann Eoghainn to the South of the existing Ben Aketil windfarm. The borrow pit has been designed to have one main working face, and two subsidiary faces, with a flat floor level at 70 m AOD. The faces would be up to 15 m in height, blasted at an angle of no more than 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.
- 2.3.8 The borrow pit would be accessed by a short spur from the access track.
- 2.3.9 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

- 2.3.10 Drainage would be directed to the western 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 to a sump. Collected surface water runoff from the borrow pit would then be treated to remove silt before being discharged overground. This may be modified as part of the restoration process, depending on the ecological outcomes desired following restoration.
- 2.3.11 Natural surface 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.

2.3.12 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.

Restoration

- 2.3.13 The borrow pit excavation edges would be softened with respect to the immediately adjacent hillside. This may require the use of blasting to remove a sharp upper edge, and will likely also involve earthworks from the stockpiles 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.
- 2.3.14 Part of the borrow pit would be kept available for track and hardstanding maintenance work during the lifetime of the Proposed Development.
- 2.3.15 Restoration would involve ripping the floor to break up the surface, and soils and turf material would be replaced over the area. The 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 an appropriately qualified and experienced person (e.g. environmental manager) at the point of restoration and a suitable upland grass seed mix would be identified for this process.

2.4 Borrow Pit 2: Development

- 2.4.1 **Photographs 9.5.1** and **9.5.2**, below, show a view across the area of Borrow Pit 2 (BP2).
- 2.4.2 The existing topography of the proposed borrow pit area and the borrow pit development plan are illustrated in **Figure 9.5.2**. Borrow pit cross-section lines are shown on **Figure 9.5.2**.





Photograph 9.5.1: View west of the area to be worked as BP2, NGR 131836 848274



Photograph 9.5.2: View north-west across BP2 from existing access track.

Tree felling, topsoil stripping and storage

- 2.4.3 The area is currently partially covered by semi-mature Sitka Spruce. Trees and roots would be removed prior to commencement.
- 2.4.4 Soil and peat depths across the area range from 0.2 to 2.8 m, with an average depth of 0.95 m. Areas of deeper peat along the north-eastern margin would be avoided by micrositing during rock extraction.
- 2.4.5 Borrow pit working would be undertaken in strips, with only enough aggregate removed to cover the needs of the Proposed Development.



- 2.4.6 Topsoil and 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.
- 2.4.7 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

- 2.4.8 The Basalt and Microgabbro 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 134 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-east.
- 2.4.9 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.
- 2.4.10 The proposed location of the borrow pit is on rising and slightly undulating ground. The borrow pit has been designed to have two working faces, with a gently sloping floor level at 134 m AOD. The highest face would be up to 8 m in height, blasted at an angle of up to 75° from the horizontal. The general direction of working would be to the south-west, with blasted rock removed and transported to the relevant area of construction.
- 2.4.11 The borrow pit would be accessed from a short access track link from the existing main site access track.
- 2.4.12 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

2.4.13 Drainage would be directed to the north-eastern 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.



- 2.4.14 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.
- 2.4.15 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, where it will be treated to remove silt, before being allowed to discharge slowly onto vegetated ground below the borrow pit.

Restoration

- 2.4.16 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.
- 2.4.17 The borrow pit floor would be ripped or routed to break up the surface and soils and turf material would be replaced over the area. 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 an appropriately qualified and experienced person (e.g. environmental manager) at the point of restoration and a suitable upland grass seed mix would be identified for this process.
- 2.4.18 Once the Proposed Development ceases operation, the borrow pit would be restored to peatland habitat more details in this regard are set out in **Technical Appendix 7.6** Outline Habitat Management Plan and the **Technical Appendix 9.2** Peat Management Plan of the EIAR.



3 ENVIRONMENTAL REVIEW

3.1 Assessment of environmental effects

- 3.1.1 Most potential environmental effects associated with borrow pit development have been considered within the relevant EIA Report chapters, in particular:
 - Landscape and Visual Assessment (Chapter 6);
 - Cultural Heritage and Archaeology (Chapter 7);
 - Ecology (Chapter 8);
 - Ornithology (Chapter 9); and
 - Noise (Chapter 12).
- 3.1.2 As a result, this section provides a brief review of environmental issues not addressed elsewhere.

3.2 Dust

- 3.2.1 Borrow pit operations are relatively small-scale, owing to the limited aggregate volume requirement for the turbine area track and hardstanding construction.
- 3.2.2 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.

3.3 Lighting

3.3.1 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.

3.4 Site stability

3.4.1 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.



4 CONCLUSIONS

- 4.1.1 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 methods 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.
- 4.1.2 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, decreasing to **Negligible** following full restoration of the borrow pit areas.



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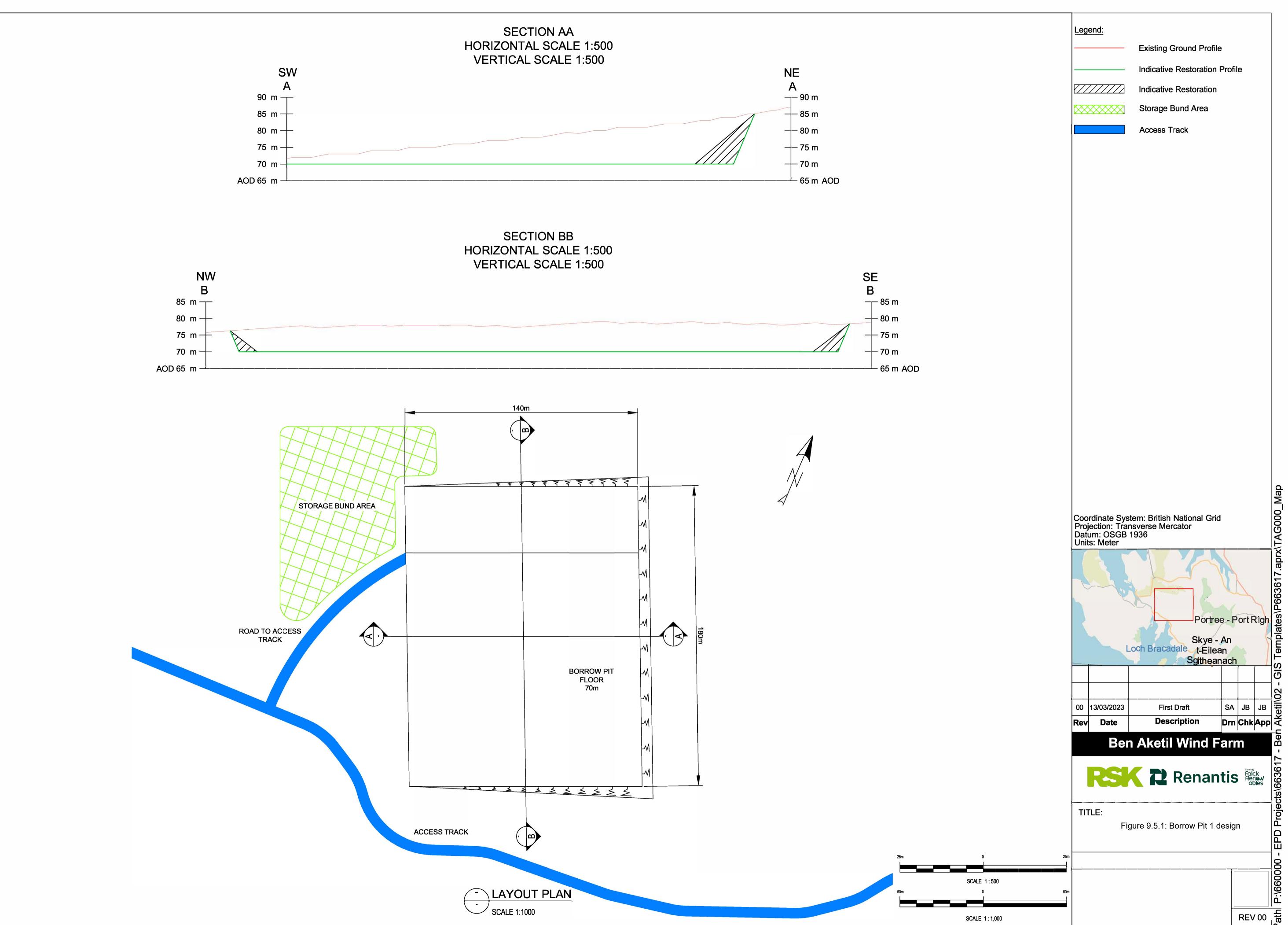
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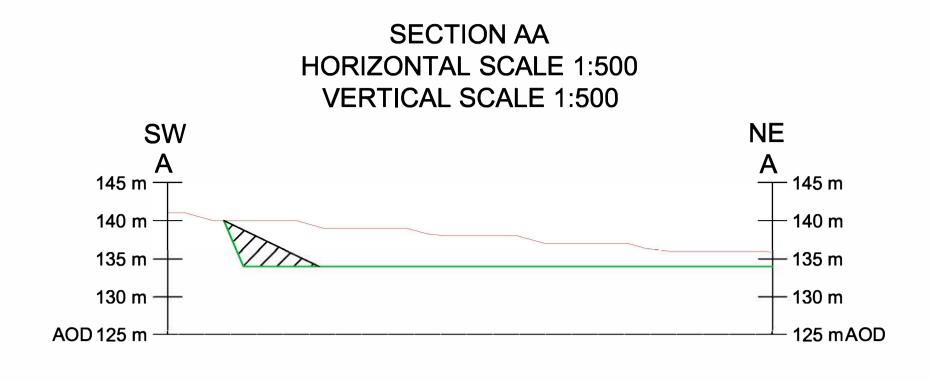


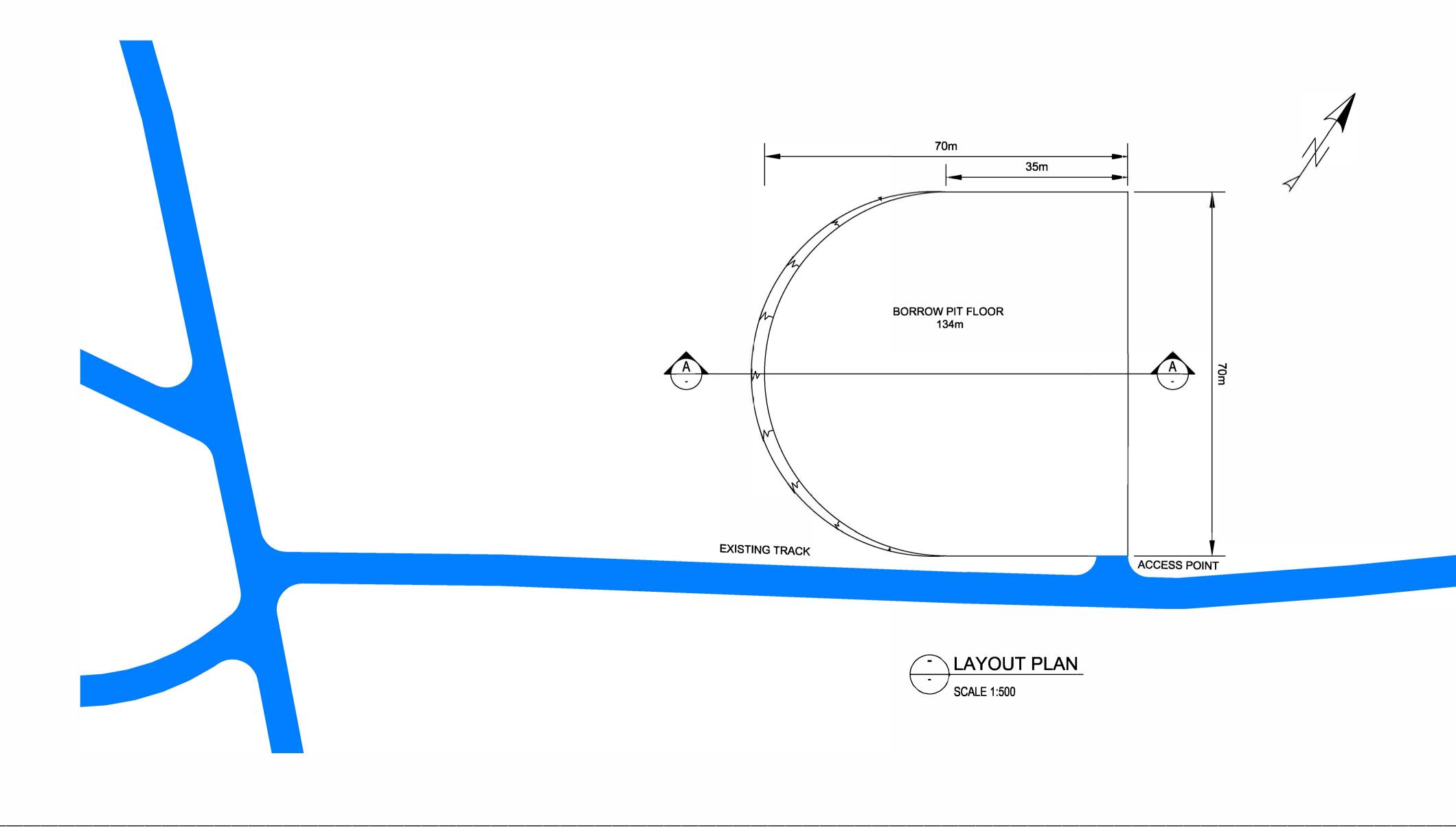
6 FIGURES

Figure 9.5.1: Borrow Pit 1 design Figure 9.5.2: Borrow Pit 2 design

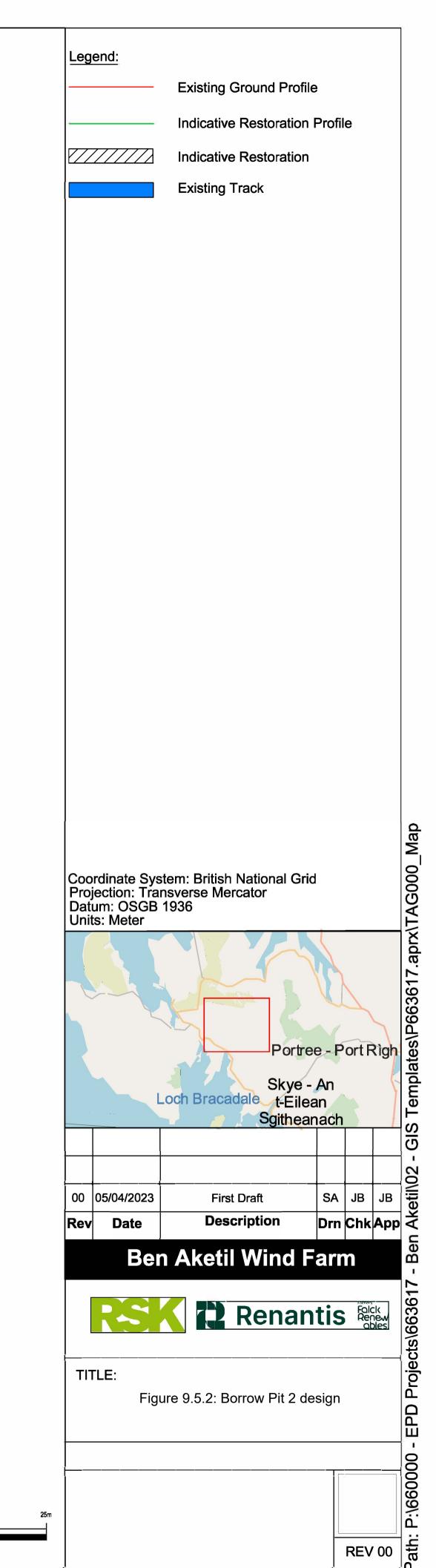


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SCALE 1:500