ScottishPower Renewables

Hollandmey Renewable Energy Development: Borrow Pit Assessment

Technical Appendix 10.3

655098-P10.3 (04)

NOVEMBER 2021

RSK GENERAL NOTES

Project No.: 6550398-P10.3 (04)

Title: Hollandmey Renewable Energy Development: Borrow Pit Assessment

Client: ScottishPower Renewables

Date: 2nd November 2021

Office: Stirling

Status: Final

Author	Iain Storey	**Technical reviewer**	Catherine Isherwood
Date:	02/11/2021	Date:	02/11/2021

Project manager	Robert Beck
Date:	03/11/2021

CONTENTS

TABLES

FIGURES

1 INTRODUCTION

1.1 This report provides a Borrow Pit Assessment for Hollandmey Renewable Energy Development (RED) and associated development infrastructure, hereafter the 'proposed Development'.

1.2 The report forms a Technical Appendix to the Environmental Impact Assessment Report for Hollandmey RED 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 Site works.

Site location

1.4 The Site, defined as the area within the application boundary, is located approximately 8 km south-west of John o' Groats and 16 km east of Thurso, situated within the north eastern part of the Caithness and Sutherland area of the Highlands. The Site is privately owned. The Site lies within a Sweeping Moorland and Flows Landscape Character Area (LCA), which is described as a flat to gently undulating and smooth landform. The Site contains sections of agriculture and coniferous woodland plantation and is located within an area of carbon-rich soils. The Philips Mains Mire Site of Special Scientific Interest (SSSI), an area of Class 1 Peatland, is in the north east part of the Site. The Site area is 1,195 hectares (ha) in total and the current land use is classified as agricultural, moorland and forestry.

1.5 The Site is bounded to the south by parts of the Caithness and Sutherlands Peatlands Special Area of Conservation (SAC) which forms part of the Flow Country, an area of blanket bogs and freshwater loch habitats which form the largest area of peatland in the UK.

Development proposals

1.6 The proposed Development includes the following key elements:

- ten wind turbines of up to 5 MW capacity and maximum tip height of 149.9 m;
- hardstanding areas and crane pads at the base of each turbine, with a maximum combined area of 3,146 m^2;
- 15 MW ground mounted solar arrays;
- 15 MW battery energy storage system (BESS);
- transformer/switchgear housings located adjacent to turbines & solar panels;

- 12.01 km of access tracks (8.93 km of which is new (6.18 km normal track and 2.75 km floating track), 2.71 is upgraded existing track and 0.37 km is existing access track), including passing places and turning heads;
- watercourse crossings (upgrade of existing or new as required);
- underground electrical cabling;
- permanent met mast and LIDAR compound;
- up to two temporary Power Performance Masts (PPM);
- a temporary windfarm construction compound area and a temporary solar construction compound area;
- a control compound comprising a permanent control building, substation and BESS;
- closed-circuit television mast(s);
- communication mast(s);
- permanent control building;
- up to three borrow pit search areas; and
- health & safety and other directional site signage.

1.7 In addition, felling of approximately 24 ha of commercial tree planting would be required to accommodate access for the turbines.

1.8 Full details of the Development design are provided in **Chapter 2: Site Description and Design Evolution** of the EIA Report.

Aims

1.9 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 Site construction and operational maintenance. 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

1.10 The assessment has involved the following stages:

- Desk study;
- Site reconnaissance;
- Borrow pit design;
- 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 Site. 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;
- Archive and extensive Site data held by RSK Group.

Geology

2.2 Geological information is derived from the BGS GeoIndex online geological mapping 1:50,000 and 1:625,000 maps (BGS, 2020) and the Geological Survey of Scotland, 1:63,360/1:50,000 geological map series (Mykura, 1986; Peach *et al.,* 1914). Geology mapping is provided in **Figure 10.3.4**.

Bedrock geology

2.3 The Site is underlain by bedrock of the Middle Old Red Sandstone group of Early-Middle Devonian age, part of the Old Red Sandstone Supergroup. Rocks from this Supergroup dominate the Caithness and Orkney areas of Scotland. Two distinct formations have been identified within the Site. The south-east, south-west and north-western quarters of the Site are underlain by the Spital Flagstone Formation, described as sedimentary rocks comprising siltstone, mudstone and sandstone. The north-eastern quarter of the Site is underlain by the younger Mey Flagstone Formation, described as sedimentary rocks comprising sandstone, siltstone and mudstone.

2.4 Bedrock exposure within the proposed Development is limited, with the best exposure present in watercourse channels and an old flooded borrow pit near Hollandmey Steading. Where visible, it is characterised by a red colouration common in Old Red Sandstone strata and appears mainly to be formed of a strongly flaggy sandstone.

2.5 There are no mapped dykes or faults within the Site. There is inferred faulting shown 0.1 km east of the south eastern Site and extending eastward. There are two sets of inferred faults, trending ENE-WSW and NNW-SSE, respectively.

Superficial geology

2.6 Superficial deposits are shown to be present across the entire Site, except for a few very small zones within the northern section and surrounding area, and in part of the eastern Site. The majority of the Site is overlain by peat of Quaternary age. Parts of the Site

(particularly in the middle and southern regions) are overlain by Devensian till, comprising diamicton deposited during the last glacial period. Diamicton is a very variable glacial sediment consisting of unsorted material ranging in size from clay to boulders, usually with a matrix of clay to sand.

2.7 Where visible, the till deposits are dominated by silts and clays. Some of the drainage channels are cut into the till and expose soft and moist clay-rich material below variable thickness peat and soil cover. Where the till has been exposed for some time, it dries out to form a hard clay-rich substrate.

2.8 Small areas of alluvium and river terrace deposits are present along the south-western boundary of the Site, loosely following but extending beyond the present-day river valley of the Link Burn. Alluvium is also found within the present-day river valley of the Gill Burn. Alluvium is a sorted or semi-sorted mixture of clay, silt, sand and gravel of fluvial origin deposited in the Holocene. This alluvium is bordered in some areas by river terrace deposits of gravel, sand, silt and clay of Quaternary age.

Rock volumes

2.9 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, to help to minimise the requirement for new aggregate. An average estimate volume of aggregate has been used, with a contingency of 25%. The contingency in the volume is to allow for under-estimation in the requirements and for some of the excavated material being unsuitable for construction use.

2.10 The calculated aggregate requirements are provided in **Table 10.3.1**.

Table 10.3.1: Estimate of aggregate volume requirement for construction

Infrastructure: tracks	Length (m)	Cross-sectional Area (m^2)	Volume (m^3)
Upgrade to existing track	2,800	1.9	5,320
New access track	5,600	3.4	19,040
Floating access track	2,660	5.2	13,832
Passing places (7 no.)	32	33.2	1,062
Sub-total tracks & passing places (m^3):			39,254
Infrastructure: turbines & compounds		**Area (m^2)**	**Volume (m^3)**
Turbines and crane hardstandings (10 no.)		3,146	33,216
Compound and laydown area		12,400	6,200
Solar compound area		2,500	1,250
Substation and battery storage area		1,750	875
Sub-total other infrastructure (m^3):			41,541
Total all infrastructure (m^3):			80,795
Total including contingency (m^3)			**101,000**

2.11 The initial section of track giving access into the proposed Development 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.

2.12 The volumes of material to be supplied from each identified borrow pit are provided in **Table 10.3.2.**

Table 10.3.2: Aggregate volumes by borrow pit

Aggregate source	Required Volume (m^3)	Design Volume (m^3)
Borrow Pit 1	22,000	30,000
Borrow Pit 2	53,000	70,000
Borrow Pit 3	5,000	8,000
Total (m^3):	**75,000**	**108,000**

Design optimisation

2.13 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.

2.14 Potential impacts on human beings relate principally to operational factors and include:

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

2.15 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 three borrow pits, 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; however, rock exposure within the Site is limited and there may be local variations that restrict suitability of some of the aggregate, particularly for track running surfaces.

2.16 All three borrow pits are adjacent to Site access tracks and have been designed to minimise visibility as necessary. Potential visibility is not a major concern as a result of the nearly flat-lying topography of the Site.

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: Development

3.4 **Figure 10.3.1** below shows a view across the area of Borrow Pit 1 (BP1), ND 29696 70957, together with an image of exposed bedrock located within a flooded former borrow pit near Hollandmey farmstead, 235 m south west of the borrow pit location.

Figure 10.3.1: (a) View NE across the upper part of BP1; (b) Exposed bedrock in a flooded former borrow pit near Hollandmey farmstead, NGR ND 2957 7071.

3.5 The existing topography of the proposed borrow pit area and the borrow pit development plan are illustrated in **Figure 10.3.5**. Borrow pit cross-section lines are shown on **Figure 10.3.4**.

Topsoil stripping and storage

3.6 The peat depth reconnaissance surveys confirm that the proposed borrow pit area has no peat cover. Soil is present across the area at depths of 0.3 to 0.45 m and no bedrock is exposed immediately at the borrow pit area. Bedrock is visible in the nearby crossing of the Burn of Hollandmey, and also in a former borrow pit 220 m south-west of BP1. This borrow pit is now flooded (**Figure 10.3.1(b)**). It has been assumed that the average depth of soil across the borrow pit footprint is 0.3 m, based on Site measurements. The borrow pit area is relatively flat with a gentle slope towards the south-east. The area is currently mixed rough grassland and bare cultivated soil, with conifer plantation in the north-eastern part.

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 would be removed in strips from the initial excavation area and would be stored in a temporary storage area. The storage mounds would not exceed 2 m in height, to minimise compaction of the soil, 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 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

3.10 The Spital Flagstone rock is relatively soft and therefore extraction by ripping is proposed as the most suitable extraction method. Roughton International. (2000) outlines current best practice for ripping, as follows:

> *"A ripper consists of one or more steel shanks or tines fitted to a strong frame that is mounted on the rear of a bulldozer. The ripper tines are drawn through the ground causing it to break."*

3.11 The number of tines used would depend on the strength and condition of the rock, and the ripping technique/equipment to be used would depend on the depth requirement for each section of the borrow pit. Access for a bulldozer is essential, and a haul road into the borrow pit would be required.

3.12 Ripping should be undertaken as far as possible downhill to obtain the benefit from the weight of the machine. Care is required to ensure that ripping makes best use of the natural fracture orientations in the bedrock – ripping is most effective when carried out in the direction of inclined fracture or bedding planes, as this helps to pull the tine into the rock.

3.13 The spacing of ripper passes influences the final size of material produced: close spacing produces finer-grade material as compared with a wider spacing. Cross-ripping can also limit production of oversized material that may require post-processing such as crushing. Ripping as deep as possible helps to loosen the maximum amount of material, but ripping

to partial depth can help to reduce the proportion of oversized material produced. Use of a second dozer to pull the ripper dozer may extend the range of the ripper into harder material, thus avoiding the need to blast or make use of a 'pecker' in harder sections.

3.14 The proposed location of Borrow Pit 1 is on gently rising and slightly undulating ground. The borrow pit has been designed to have two levels, developed through two excavation phases. The initial phase would involve ripping and removal of material from the existing ground profile to a 69 m level. Phase two would involve excavation of the inner second faces to a 63 m level, with a 5 m bench between the levels. Access into the borrow pit area would be gained by a haul road entering from the southern margin and sloping down into the excavation area.

3.15 Faces have been designed to be 6 m in height with an angle of 75° from horizontal, to maintain stability within the excavation. The general direction of working would be from the north-west, downslope to the south-east, with the ripped rock removed and transported to the relevant area of construction via the haul route.

3.16 Borrow Pit 1 would be accessed from the existing track, 20 m to the south-west.

3.17 Effects during rock extraction from noise and dust would be minimised by keeping the use of processing plant to a minimum. Processing plant would be operated only for short periods of time, as necessary to provide the aggregate requirement for construction works. Careful design of the ripping process would minimise any requirement for crushing.

Drainage

3.18 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.

3.19 During ripping operations, joints and fractures in the zone below the target extraction level could potentially be opened up by the tines on the ripping equipment. In consequence, incident rainfall into the operational area would potentially infiltrate into the borrow pit. As a result of the natural landform, the borrow pit would form a depression below ground level and would therefore have potential for collection of surface water within the pit. The excavation may also intersect shallow groundwater. Groundwater monitoring would be undertaken prior to borrow pit excavation to identify the seasonally-highest groundwater level, to determine whether a groundwater abstraction consent would be required.

3.20 A water collection sump is likely to be required to collect surface water runoff within the excavation. Water would be pumped into a settlement pond from the sump as required to maintain a dry working area.

Restoration

3.21 Restoration for BP1 would involve converting the excavation into a pond and wetland feature. Excavation edges would be softened by ripping and any unusable material from the excavation would be used to create slopes and shallow areas within the pond, to increase the variety of habitats available. Once redesign is complete to the satisfaction of the Environmental Clerk of Works, the borrow pit would be allowed to flood.

Borrow Pit 2: Development

3.22 **Figure 10.3.2** below shows a view across the area of Borrow Pit 2 (BP2), ND 29736 70066, together with an image of bedrock exposed at the existing ford crossing in the Burn of Hollandmey located 264 m north of the borrow pit location.

Figure 10.3.2: (a) View north across BP2; (b) Exposed bedrock at the ford in the Burn of Hollandmey, NGR ND 2968 7045.

3.23 The existing topography of the proposed borrow pit area and the borrow pit development plan are illustrated in **Figure 10.3.6**. Borrow pit cross-section lines are shown on **Figure 10.3.4.**

Topsoil stripping and storage

3.24 The peat depth reconnaissance surveys confirm that the proposed borrow pit area has limited peat cover, with two small pockets at the margins with peat depths of 0.55 m and 0.7 m respectively. Most of the area has no peat and soil is present across the area at depths of up to 0.5 m. There is no bedrock exposed at the borrow pit area, although bedrock is visible in watercourse channels to both north and south of the borrow pit area. It has been assumed that the average depth of soil across the borrow pit footprint is 0.35 m, based on Site measurements. The borrow pit area has an almost flat topography, with localised undulations. It is characterised by marshy grassland habitat which becomes increasingly wet towards the north-western part. Conifer plantation runs parallel to the east side of the borrow pit.

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.

3.26 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.

3.27 As the borrow pit excavation develops, the topsoil and/or peat acrotelm would be removed in advance of the active excavation and would be 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

3.28 The Spital Flagstone rock is a relatively soft rock and therefore ripping is proposed over blasting. The ripping process is described fully under BP1 Development above and a similar process would be used for BP2.

3.29 The proposed location of the borrow pit is on almost flat ground with a bank of previously excavated material along the western edge beside the existing track. The borrow pit has been designed to have two levels and would be developed in two phases. The initial phase would involve ripping and removal of material from the existing ground profile to a 57 m level. Phase two would involve the excavation of the inner second faces to 51 m level, with a 5 m bench between the levels. Access into the borrow pit area would be gained by a haul road entering from the southern margin and sloping down into the excavation area.

3.30 Faces have been designed to be 6 m in height with an angle of 75° from horizontal, to maintain stability within the excavation. The general direction of working would be from west to east, with the ripped rock removed and transported to the relevant area of construction via the haul route.

3.31 The borrow pit would be accessed from the existing track, 10 m to the west.

3.32 Effects during rock extraction from noise and dust would be minimised by keeping the use of processing plant to a minimum. Processing plant would be operated only for short periods of time, as necessary to provide the aggregate requirement for construction works. Careful design of the ripping process would minimise any requirement for crushing.

Drainage

3.33 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.

3.34 During ripping operations, joints and fractures in the zone below the target extraction level could potentially be opened up by the tines on the ripping equipment. In consequence, incident rainfall into the operational area would potentially infiltrate into the borrow pit. As a result of the natural landform, the borrow pit would form a depression below ground level and would therefore have potential for collection of surface water within the pit. The excavation may also intersect shallow groundwater. Groundwater monitoring would be undertaken prior to borrow pit excavation to identify the seasonally-highest groundwater level, to determine whether a groundwater abstraction consent would be required.

3.35 A water collection sump is likely to be required to collect surface water runoff within the excavation. Water would be pumped into a settlement pond from the sump as required to maintain a dry working area.

Restoration

3.36 It is anticipated that part of BP2 would require to be kept available for track and hardstanding maintenance work during the lifetime of the proposed Development. It is likely that water will collect in the excavation in between periods of use and would require to be pumped out to allow for additional aggregate extraction as required.

3.37 Full restoration for BP2 would involve converting the excavation into a pond and wetland feature. Excavation edges would be softened by ripping and any unusable material from the excavation would be used to create slopes and shallow areas within the pond, to increase the variety of habitats available. Once redesign is complete to the satisfaction of the Environmental Clerk of Works, the borrow pit would be allowed to flood.

Borrow Pit 3: Development

3.38 **Figure 10.3.3** below shows a view across the area of Borrow Pit 3 (BP3), ND 28691 69719.

Figure 10.3.3: View south-east across BP3, NGR ND 2865 6977.

3.39 The existing topography of the proposed borrow pit area and the borrow pit development plan are shown in **Figure 10.3.7**. Borrow pit cross-section lines are shown on **Figure 10.3.4.**

Topsoil stripping and storage

3.40 The peat depth reconnaissance surveys confirm that the proposed borrow pit area has some limited peat cover. Two measurements in the centre of the excavation area record peat up to 0.6 m in depth in this part of the footprint. Much of the area has no peat and soil is present across the area at depths of up to 0.5 m. There is no bedrock exposure at the borrow pit area or in the immediate vicinity. It has been assumed that the average depth of peat and soil across the borrow pit footprint is 0.48 m, based on site measurements. The site forms a long shallow ridge running north-west from Turbine 2; borrow pit development is planned to remove the ridge feature in part to help create level ground for the turbine, crane pad and access track. Ground conditions are dry and

characterised by ling heather and mixed grassland vegetation with adjacent conifer plantation.

3.41 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.

3.1 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.

3.2 As the borrow pit excavation develops, the topsoil and/or peat acrotelm would be removed in advance of the active excavation and would be stored for use in borrow pit restoration. Any excavated material unsuitable for use as aggregate or fill would also be used in the borrow pit restoration.

Extraction of material

3.3 As there is no local exposure of bedrock, it is unclear at present whether the ridge feature at BP3 is formed by a bedrock ridge or is a glacial sedimentary mound. Pre-construction ground investigation would determine the nature of the material and appropriate excavation methods and uses.

3.4 If the material is Spital Flagstone, ripping would be undertaken in the same manner as described for Borrow Pit 1 Development. Should it be glacial sediments, excavation would be undertaken using an excavator. Glacial sediments are likely to require more grading to remove unsuitable finer material from the mix and to allow separation of oversize for crushing.

3.5 The borrow pit excavation is designed to take the ridge feature down to a level comparable with the surrounding flat-lying ground. This gives a total depth of excavation of up to 2 m. Exposed faces will have a slope no greater than 60° from horizontal, in unconsolidated material or bedrock to ensure the stability of faces. Working is intended to start from the access track route in a south-westerly direction to ensure that only required material is excavated.

3.6 The borrow pit would be accessed from the access track to Turbine 2 which is 10 m to the north-east.

3.7 Effects during rock extraction from noise and dust would be minimised by keeping the use of processing plant to a minimum. Processing plant would be operated only for short periods of time, as necessary to provide the aggregate requirement for construction works.

Drainage

3.8 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.

3.9 As the borrow pit topography is intended to produce a flat area, it is unlikely that significant volumes of surface water would collect on the surface and no water collection sump is recommended for BP3. It is highly unlikely that excavation would encounter groundwater at this location.

Restoration

3.10 It is anticipated that BP3 would be fully restored at the end of the construction period. Any unusable material from the excavation would be smoothed over the extraction area and remaining faces would be regraded to a maximum slope of 27° for long-term stability. Excavated peat would be placed across the borrow pit floor area to create an area of peatland habitat in continuity with the adjacent peatland. Topsoil would be used to restore slope faces unsuitable for peat restoration.

3.11 If necessary, 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. 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 Development track and hardstanding construction.

4.3 Dust emissions can arise from ripping, 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 ripping, 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 Hollandmey RED, 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.

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, decreasing to negligible following full restoration of the borrow pit areas.

6 REFERENCES

BGS (2020). GeoIndex online geological mapping. British Geological Survey. http://mapapps2.bgs.ac.uk/geoindex/home.html, accessed October 2020.

HSE (2013). Health and Safety at Quarries: The Quarries Regulations 1999, Approved Code of Practice and Guidance, 2nd Edition. HSE Books. Available at https://www.hse.gov.uk/pubns/books/l118.htm, accessed November 2020.

Mykura, W. (ed) (1986). Geological Survey of Scotland Sheet 116E: Wick (solid edition). Available at https://webapps.bgs.ac.uk/data/maps/, accessed October 2020.

Peach, B.N., Horne, J., Greenly, E., Pocock, T.I., Crampton, C.B., and Carruthers, R.G. (1914). Geological Survey of Scotland Sheet 116: Wick (solid and drift edition). Available at https://webapps.bgs.ac.uk/data/maps/, accessed October 2020.

Roughton International (2000). Guidelines on Materials and Borrow Pit Management for Low Cost Roads. Department for International Development report reference R6852. Available at https://assets.publishing.service.gov.uk/media/57a08d7e40f0b649740018ba/R68524.pdf, accessed November 2020.

Legend

- Application Boundary
- Proposed Borrow Pit Area
- Proposed Windfarm Construction Compound Area (Temporary)
- Proposed Laydown Area
- Proposed Hardstanding
- Proposed Control Compound
- Proposed Solar Area
- Proposed Solar Construction Compound Area (Temporary)
- Existing Access Track
- Upgraded Existing Acccess Track
- Proposed Access Track
- Proposed Access Track - Floating
- Proposed Turbine Location (T9 - Proposed Test Mast Location (Temporary))
- Proposed Permanent Met Mast
- Proposed Reference Mast Location (Temporary)

Superficial Geology

- Till, Devensian
- Hummocky Glacial Deposits
- Alluvium
- Blown Sand
- River Terrace Deposits
- Marine Beach Deposits
- Peat

Bedrock Geology

- Spital Flagstone Formation
- Mey Flagstone Formation
- Fault, Inferred

Borrow Pit Assessment

- Cross-Section Line

Rev	Date	By	Comment
E	10/11/2021	CI	Layout change
D	28/10/2021	CI	Infrastructure & Boundary update
C	19/08/2021	CI	Infrastructure update

SCOTTISHPOWER RENEWABLES

1:25,000 Scale @ A3

0 1 km

Hollandmey Renewable Energy Development

Figure 10.3.4: Geology Mapping Bedrock & Superficial

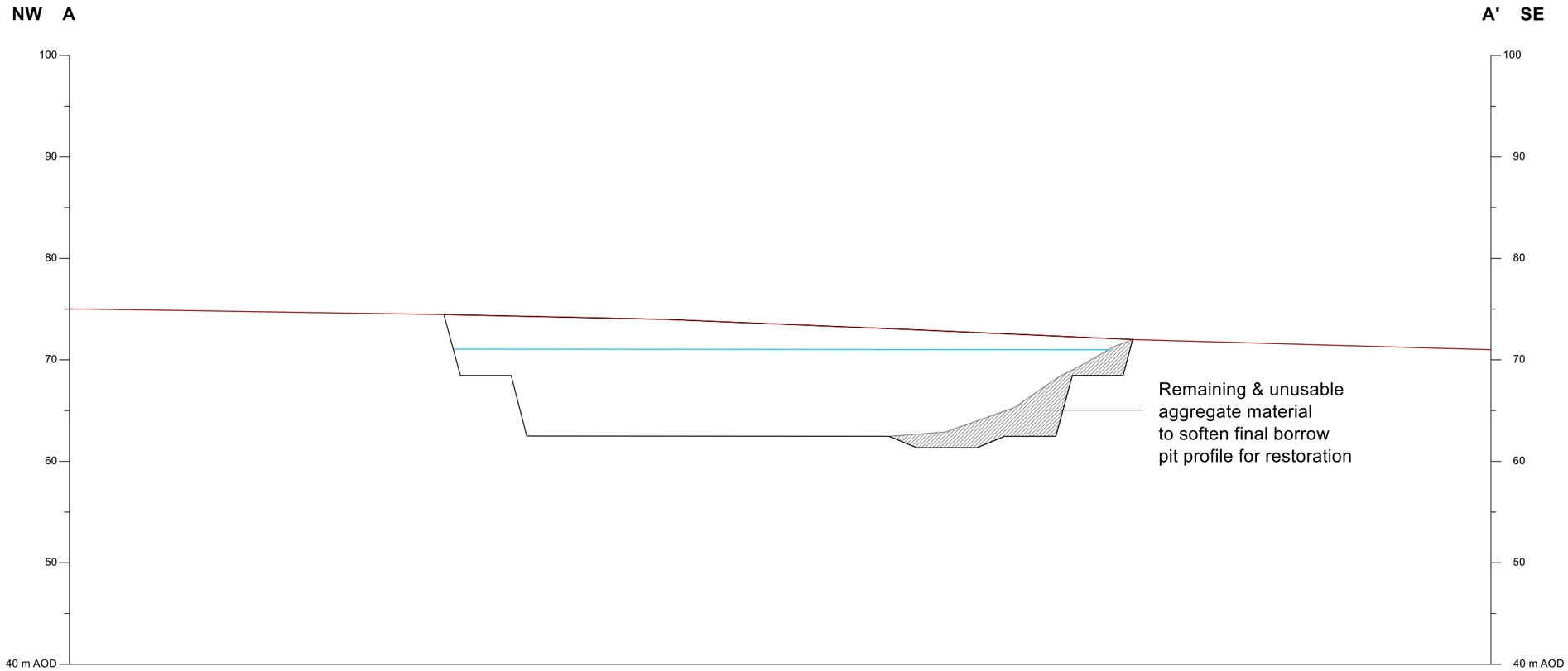
Drg No	HMY_Geo_CI
Rev	E
Date	10/11/2021
Figure	10.3.4

Datum: OSGB36 Projection: TM

Legend

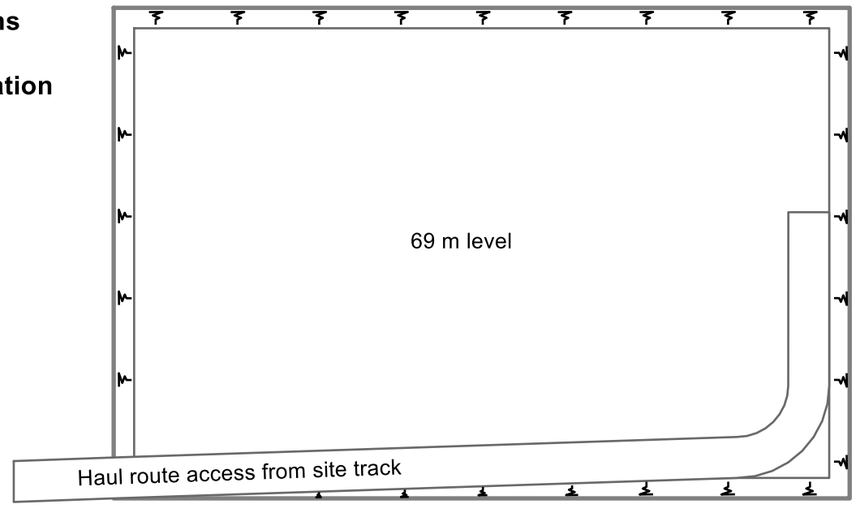
- Existing Ground Profile
- Excavation Profile
- Indicative Restoration
- Post-Restoration Water Level

BP1 cross-section

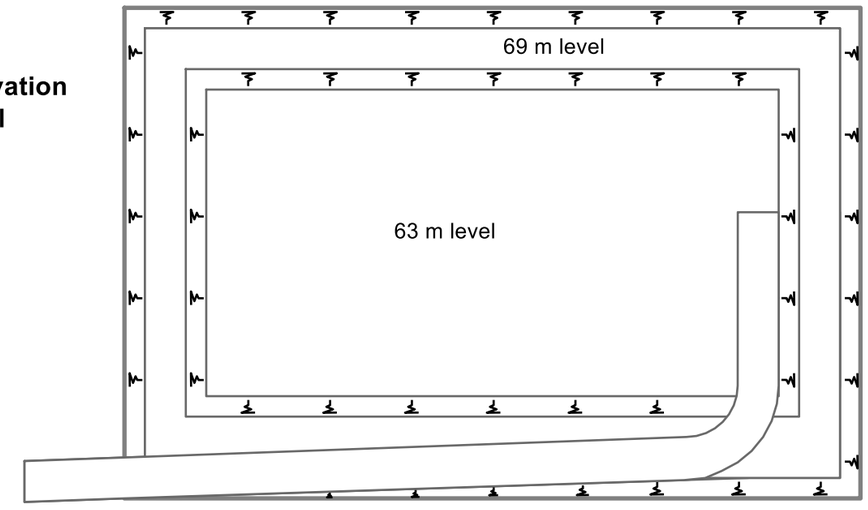


BP1 design plans

Phase 1: excavation of first level



Phase 2: excavation of second level



SCOTTISHPOWER RENEWABLES

Rev	Date	By	Comment
C	10/11/2021	CI	Title change
B	21/01/2021	CI	Second draft
A	01/12/2020	CI	First draft

Cross-section 1:500 @A3

0 20 m

Hollandmey Renewable Energy Development

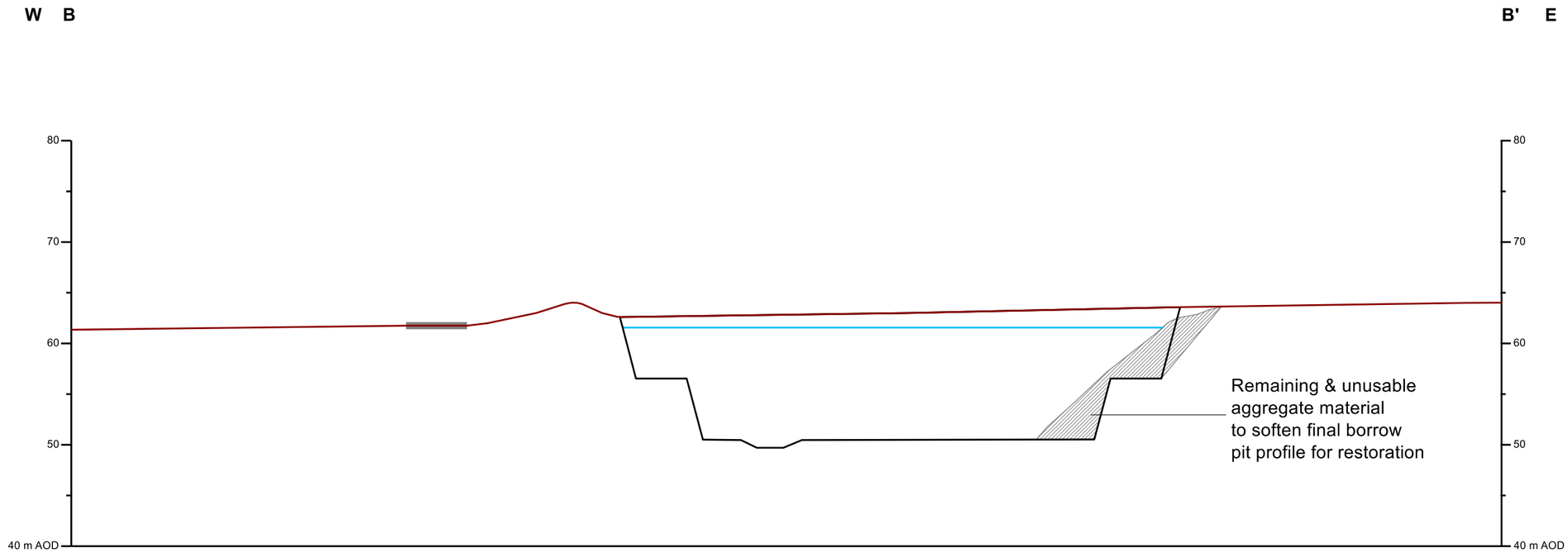
Figure 10.3.5: Borrow Pit 1 - Design and Restoration

Drg No	HMY_BPs_CI
Rev	C
Date	10/11/2021
Figure	10.3.5

Legend

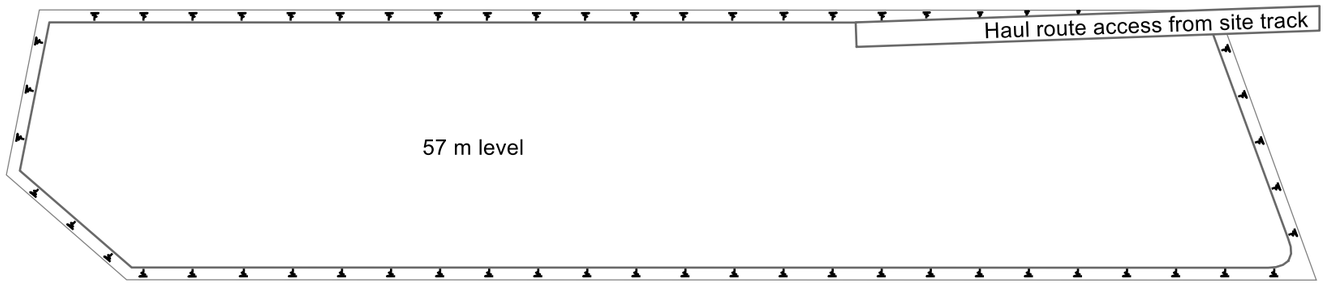
- Existing Ground Profile
- Cross-Section Profile
- Indicative Restoration
- Post-Restoration Water Level
- Upgraded Access Track

BP2 cross-section

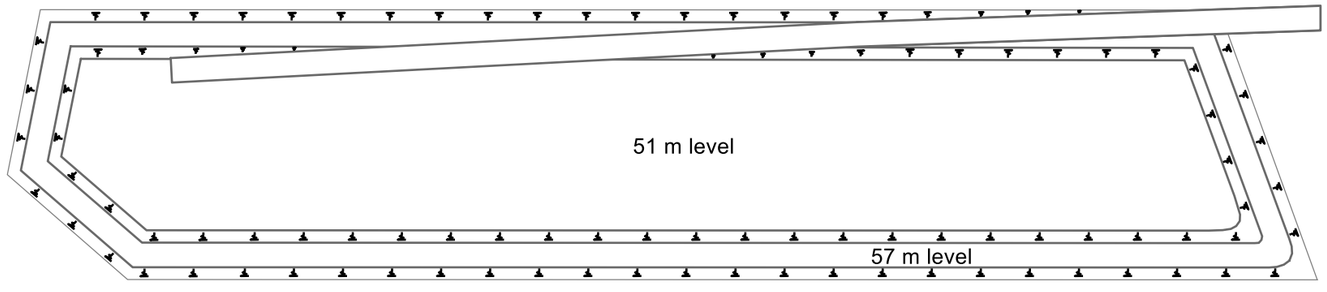


BP2 design plans

Phase 1: excavation of first level



Phase 2: excavation of second level



SCOTTISHPOWER RENEWABLES

Rev	Date	By	Comment
C	10/11/2021	CI	Title change
B	21/01/2021	CI	Second draft
A	01/12/2020	CI	First draft

Cross-section 1:500 @A3

0 20 m

Hollandmey Renewable Energy Development

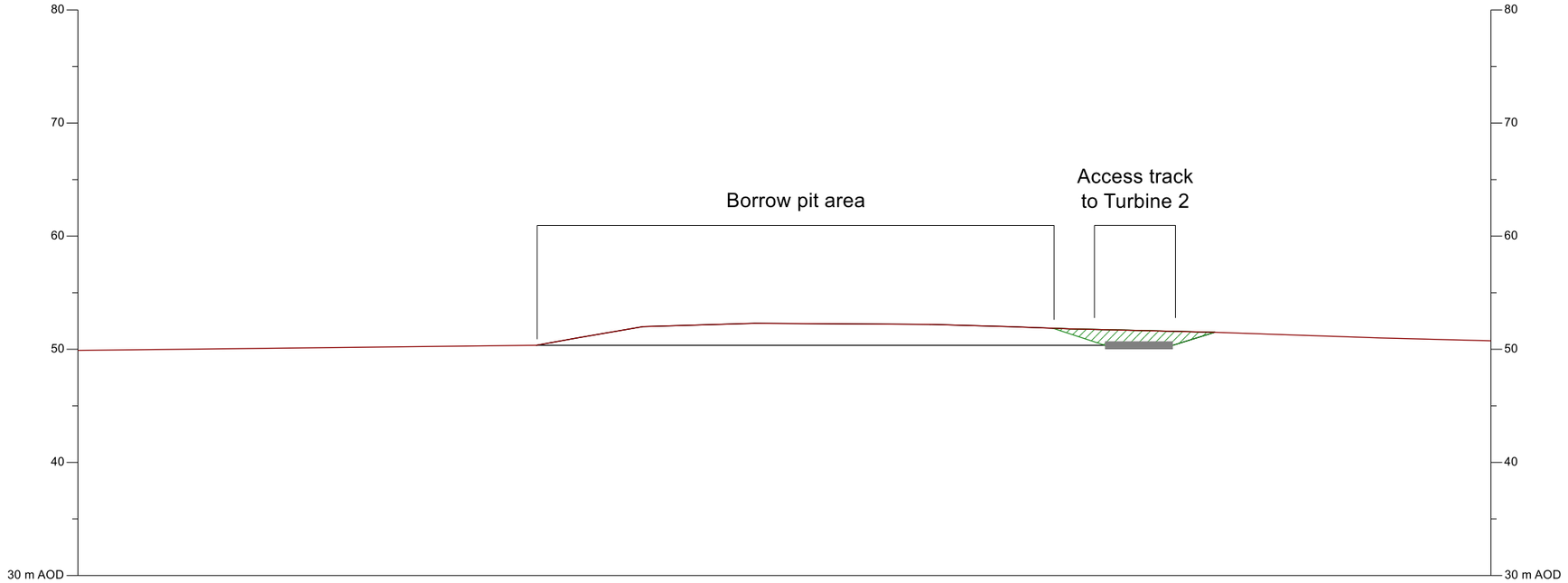
Figure 10.3.6: Borrow Pit 2 - Design and Restoration

Drg No	HMY_BPs_CI
Rev	C
Date	10/11/2021
Figure	10.3.6

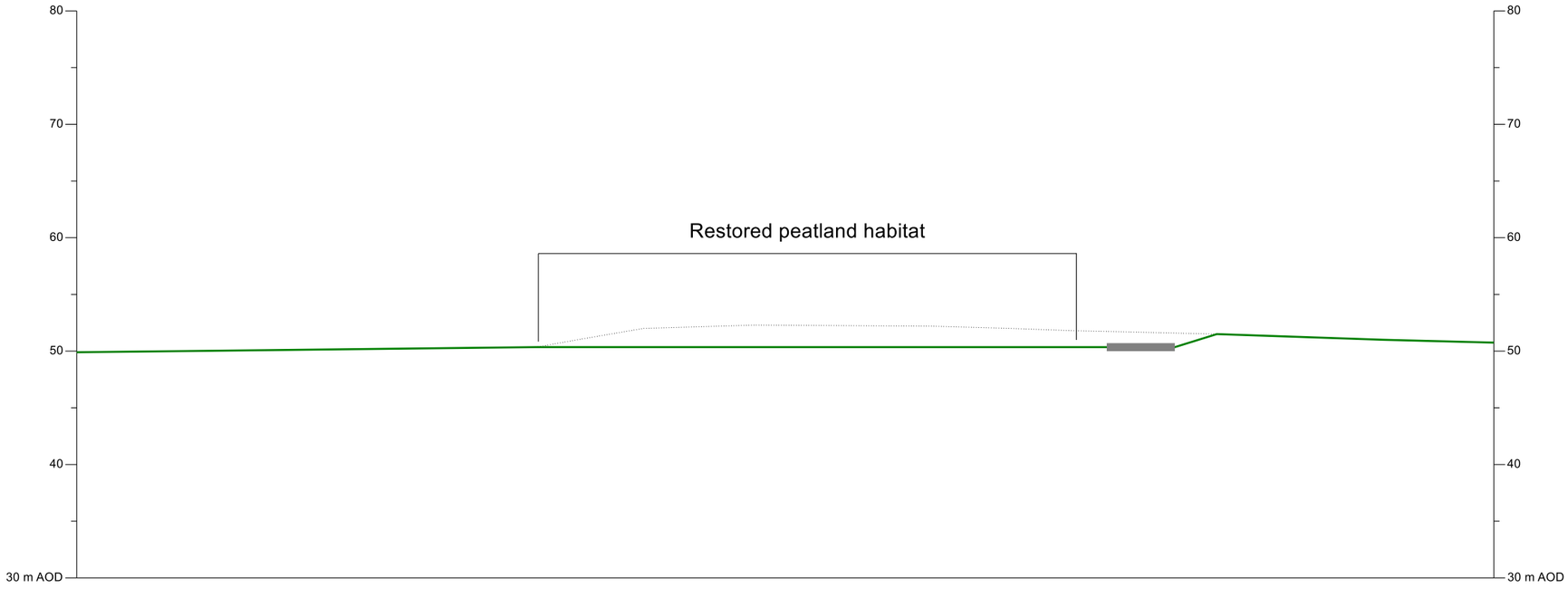
Legend

- Existing Ground Profile
- Excavation Profile
- Excavation for Track Construction
- Track Surface
- Restored Profile

BP3 cross-section



BP3 restored profile



SCOTTISHPOWER RENEWABLES	C	01/11/2021	CI	Update scale bar	Cross-section 1:500 @A3	0 20 m	**Hollandmey Renewable Energy Development** Figure 10.3.7: Borrow Pit 3 - Design and Restoration
	B	21/01/2021	CI	Second draft			
	A	01/12/2020	CI	First draft			
	Rev	**Date**	**By**	**Comment**			

Drg No	**HMY_BPs_CI**
Rev	**D**
Date	**10/11/2021**
Figure	**10.3.7**