TECHNICAL APPENDIX 3.2: BORROW PIT APPRAISAL

Balmeanach Wind Farm

Prepared for: **Balmeanach Wind Farm Limited**

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DOCUMENT REFERENCES

TABLES

FIGURES

ANNEX

1.0 Introduction

This Borrow Pit Appraisal (BPA) has been undertaken by SLR Consulting Ltd (SLR).

The Proposed Development is located on moorland approximately 3km to the south of the settlement of Edinbane, approximately 8km to the east of Dunvegan and approximately 7km to the north of Struan on the Isle of Skye (**Figure 10.2.1**). Access to the site would be via the existing Ben Aketil Wind Farm access track from the A850, and then south east via the consented Ben Sca Wind Farm site access track onto the hillside.

The Applicant is currently seeking planning permission for an onshore wind farm comprising ten wind turbines with associated infrastructure. The Proposed Development would include the following key components:

- ten wind turbines;
- one met mast;
- turbine and met mast foundations and hardstanding areas;
- onsite tracks with associated turning heads;
- underground cabling along access tracks;
- one onsite substation;
- up to four borrow pits;
- one construction compound; and
- associated ancillary works.

1.1 Scope of Report

There has been substantial work undertaken to date at the site to inform the Proposed Development layout, including several phases of peat probing. The principal objective of this report is to provide an initial assessment of the aggregate requirements for the Proposed Development and identify potential borrow pits suitable for providing this aggregate.

This report provides details of the proposed borrow pits, which would be necessary to provide the aggregates required to construct the Proposed Development.

There are four proposed borrow pit search areas reviewed within this report. Selected because of their morphology, accessibility from proposed tracks, orientation and the expected proximity to suitable rock close to the surface. The proposed borrow pits are in areas where peat coverage is anticipated to be minimal and where bedrock may outcrop and potential aggregate reserves are expected to occur near the surface.

1.2 Sources of Information

The following sources of information have been reviewed and assessed:

- British Geological Survey (BGS) online map viewer and Geoindex[1];
- Scotland's Environment website[2]; and
- information gathered during site visits.

1 British Geological Survey (BGS) Geoindex website http://mapapps.bgs.ac.uk/geologyofbritain/home.html; http://www.bgs.ac.uk/geoindex/

2 Scotland's Environment Website www.environment.scotland.gov.uk

2.0 Geological Setting

2.1 Superficial Geology

The superficial geology onsite comprises of peat present across the flatter hill tops, and valley sides. Bedrock has been recorded as at or near the surface across some of the hill tops and steeper valley sides. Till deposits are recorded towards the south of the site, in flat lying areas and along river valleys.

The superficial geology of the site is detailed on **Figure 3.2.2**.

2.2 Bedrock Geology

The site is predominantly underlain by various subunits of the igneous Skye Lava Group as well as an igneous dyke suite. The lithologies are of Palaeogene age, with the dyke suite trending northwest to southeast. The majority of the site is underlain by the Hawaiite and Mugearite subunit, followed by the Basalt and Microgabbro subunit. The Trachyte subunit is found more locally in the east of the site.

There is one recorded igneous dyke present on the site. It belongs to the North Britain Palaeogene Dyke Suite and is present in the south of the site.

The superficial geology of the site is detailed in **Figure 3.2.2**. Details of the geological units present onsite and immediately adjacent to site are detailed in **Table 2-1**.

Table 2-1: Bedrock Geology Summary

Age	Stratigraphic Group	Unit	Subunit	Description
Palaeogene 66.0 – 23.03 Ma	Hebridean Province	North Britain Palaeogene Dyke Suite	-	Troctolite and bytownite.
	Skye Lava Group	-	Hawaiite and mugearite	Hawaiite and mugearite
		-	Basalt and microgabbro	Basalt and microgabbro
		-	Trachyte	Trachyte

2.3 Mining and Quarrying

Following review of publicly available records, there is no evidence of historic mining on-site.

2.4 Hydrogeology

The BGS groundwater vulnerability and regional hydrogeological mapping confirm that the superficial deposits, where present, and the bedrock beneath the site are unlikely to contain significant quantities of groundwater. The BGS classify the bedrock as a low productivity aquifer, whereby small amounts of groundwater may be present within the near surface weathered zone or secondary fractures.

2.5 Hydrology

The site is located within three main surface water catchment areas listed below:

- The River Ose to the south of the site which flows south west discharging into Loch Bracadale;
- The Red Burn to the north west of the site generally flowing northwards before discharging into Loch Greshornish; and

- The Abhann Coishleader to the north east of the site also generally flowing northwards towards Coishletter before discharging into Loch Greshornish.

2.6 Aerial Photography

Review of the aerial photography indicates the borrow pit locations are largely covered by vegetation with exposed bedrock shown at BP1 and BP2. It is also possible to identify stream courses, drainage ditches, and minor hagging from the photographs. The aerial photographs were used to identify the major geomorphological features, mainly as breaks of slope.

3.0 Borrow Pit Assessment

This section of the report provides an assessment of the potential borrow pits with an evaluation of their potential to meet the Proposed Development's aggregate requirements.

The assessment has been completed through a desk-based review of geological maps and memoirs and is supported by several site visits from SLR geologists. Potential borrow pit locations were inspected visually with a view to assess ground conditions and help determine the borrow pits suitability for use during construction of the site.

In exploring the four potential borrow pit locations, as defined on **Figure 3.2.1a-b**, consideration has been given with regards to the practical aspects of each borrow pit. The main aspects to consider are as follows:

- ease of access;
- rock type;
- overburden thickness;
- topography;
- current and historical uses;
- proximity to construction activities;
- visual impact; and
- impact on environmentally sensitive areas.

Steeper topography is preferable for quarrying, where soils coverage will be limited. Careful consideration was given to landscape and visual impacts, while other considerations included proximity to watercourses, places of archaeological interest, and forestry. The proposed borrow pits are in areas where the peat cover is typically thinner or vacant and aggregate reserves are expected to occur near the surface.

No intrusive site investigation works have been undertaken into the quality of rock that might be recovered at the time of preparing this BPA. However, it is anticipated that a full ground investigation will take place in advance of construction of the site. The investigation will include the testing of material from within the proposed borrow pit areas to assess its suitability for re-use.

3.1 Aggregate Requirements

The proposed turbine locations and their subsequent maintenance would require the construction of a purpose-built network of access tracks. These tracks would be single track with occasional passing places, un-metalled and would be constructed to the turbine suppliers' specifications conforming to the Specification for Highway Works[3].

A site investigation would be required to investigate each borrow pit location to confirm the material suitability and re-use potential of the bedrock. It would be at this stage that the bedrock recovered from the borrow pits would be subject to detailed geotechnical testing.

The indicative volumes of rock required for site infrastructure are summarised in **Table 3-1** and based on the materials calculator provided in **Annex 3.2A**.

3 Highways Agency, Manual of Contract Documents for Highway Works Volume 1 Specification for Highway Works, Series 600 Earthworks, Published February 2017.

Table 3-1: Aggregate Requirement Summary

Infrastructure Element	Volume of Aggregate Required (m^3)
Site Track (Excavated)	28,212
Turning Heads	12,375
Turbine Bases - formation only	2,645
Fill above Turbine Bases	8,250
Hardstandings	25,840
Met Mast	50
Substation Compound	1,050
Construction Compound	4,000
Estimated Total	82,422

It has been estimated that approximately 82,422m^3 of suitable quality rock would be required to construct the Proposed Development. This includes SHW classes 6F2, 6N/ 6P and concrete aggregate. If rock quality is not suitable for each of these engineering materials then there may be a requirement for imported materials.

No account has been taken in the calculations for the fortuitous 'winning' of rock during the construction phase for example during infrastructure excavations. If such rock was available, the amount extracted from the borrow pits would be reduced.

3.2 Borrow Pit Appraisal

This section of the report provides an assessment of the four potential borrow pits with an evaluation of their potential to meet the Proposed Development's aggregate requirements.

A total of four potential search areas were selected as possible borrow pit locations, shown on **Figure 3.2.1a-b**. Each location is reviewed in the sections below. Potential search areas have been highlighted with indicative excavation areas identified at each borrow pit location. All borrow pits could be extended or reduced in size depending on review of aggregate requirements and/or ground investigation data.

These rock types have been assumed for the borrow pits where there were no rock exposures at the surface. The geology encountered on site is supported by BGS geological maps for the site. Dimensions of the borrow pits, volume of superficial material to be removed and volumes of site won rock for each borrow pit have been estimated based on cross-sections developed through a digital terrain model. These are required to be confirmed by future intrusive ground investigation works.

3.2.1 Borrow Pit 1

Borrow Pit 1 (BP1) would be in the north of the site, at approximately NGR 134170, 847200, shown on **Figure 3.2.1a-b** with further details in **Table 3-1**. The underlying geology in this area comprises the Skye Lava Group Formation of Hawaiite and Mugearite.

Photo 3-1
View east towards Edinbane Wind Farm from NGR NG 134074 847139 showing BP1

Table 3-2: Borrow Pit 1

Borrow Pit 1	
Dimensions	231 x 88m
Excavation Area	Approximately 17,055 m^2
Height of Excavation	Approximately 5.2 m
Gradient	Slope increasing gently towards the south
Details of Extraction	Combination of digging, drilling and blasting
Overburden Type and Depth	Peat / weathered bedrock
Extent of Aggregate Extraction	Approximately 57,066 m^3
Aggregate Composition	Skye Lava Group

3.2.2 Borrow Pit 2

Borrow Pit 2 (BP2) would be in the centre of the site, to the south of proposed T3, at approximately NGR 133905, 846690 shown on **Figure 3.2.1a-b** with further details in **Table 3-3**. The underlying geology in this area comprises Skye Lava Group Formation of Hawaiite and Mugearite.

Photo 3-2
View northwest towards Ben Aketil Wind Farm from NGR NG 133896 846682 showing BP2

Table 3-3: Borrow Pit 2

Borrow Pit 2	
Dimensions	Approximately 139 x 66 m
Excavation Area	Approximately 8,545 m^2
Height of Excavation	Approximately 5.2 m
Gradient	Slope increasing gently towards the east
Details of Extraction	Combination of digging, drilling and blasting
Overburden Type and Depth	Peat / weathered bedrock
Extent of Aggregate Extraction	Approximately 23,303 m^3
Aggregate Composition	Skye Lava Group

3.2.3 Borrow Pit 3

Borrow Pit 3 (BP3) would be in the south east of the site, to the north of proposed T10, at approximately NGR 134225, 845910 shown on **Figure 3.2.1a-b** with further details in **Table 3-4**. The underlying geology in this area comprises the Skye Lava Group Formation of Basalt and Microgabbro.

Photo 3-3
View north towards T3 from NGR NG 134286 845730 showing BP3

Table 3-4: Borrow Pit 3

Borrow Pit 3	
Dimensions	130 x 74 m
Excavation Area	Approximately 7,970 m^2
Height of Excavation	Approximately 5.2 m
Gradient	Slope increasing gently towards the east
Details of Extraction	Combination of digging, drilling and blasting
Overburden Type and Depth	Soil/weathered rock
Extent of Aggregate Extraction	Approximately 19,914 m^3
Aggregate Composition	Skye Lava Group

3.2.4 Borrow Pit 4

Borrow Pit 4 (BP4) would be in the north west of the site, adjacent to the construction compound, at approximately NGR 133220, 847205 shown on **Figure 3.2.1a-b** with further details in **Table 3-5**. The underlying geology in this area comprises the Skye Lava Group Formation of Basalt and Microgabbro.

Table 3-5: Borrow Pit 4

Borrow Pit 4	
Dimensions	150 x 100 m
Excavation Area	Approximately 15,343 m^2
Height of Excavation	Approximately 7.9 m
Gradient	Slope increasing gently towards the south east
Details of Extraction	Combination of digging, drilling and blasting
Overburden Type and Depth	Soil/weathered rock
Extent of Aggregate Extraction	Approximately 41,246 m^3
Aggregate Composition	Skye Lava Group

4.0 Proposed Borrow Pit Design

The indicative borrow pit volumes are presented in **Table 3-1** to **Table 3-4**. The design of the borrow pits anticipates extracting a net stone volume suitable for the sub-base requirements onsite, excluding imported top surface (base and capping) dressing which would require importing. This target capacity has been determined based on the estimated requirements for construction materials together with additional allowances for overburden material., should this be deemed of acceptable quality, otherwise overburdens will require importing It is envisaged that overburden/soils together with processing waste would be carefully stored adjacent to the excavation void for eventual use in the restoration process.

4.1 Marking Out and Overburden Stripping

The permitted extents of the borrow pit would be marked out with pegs, and overburden, including topsoil, subsoil and weathered rock horizons, would be stripped from within this delineated area.

The overburden and weathered rock horizons would be stripped using a combination of crawler tractor dozers and backtrackers with the material loaded by loading shovels. The overburden (including surface vegetation turves) would be carefully stripped and stored as a series of separate turves, topsoil, subsoil and weathered rock storage mounds to be used for reinstatement purposes.

4.2 Excavations within Rock

Once overburden and weathered rock horizons have been stripped, and stored, a suitably qualified geotechnical engineer/blasting engineer would assess the nature of the underlying solid rock strata. The engineer would provide advice on suitable extraction techniques including; extraction method, bench and cut face design parameters, and blasting design (if required).

If blasting is required, blasting would be undertaken in accordance with the Quarries Regulations 1999[4] and Annex D PAN 50[5].

A combination of digging, ripping and blasting would be utilised to excavate rock (subject to the nature of the material encountered, depth of weathering and level of fracturing) which would be processed using a mobile crushing and screening plant, which would be sited within the base of the working borrow pit.

4.3 Stockpiling of Materials

The initial overburden strip would be stored within temporary screening mounds around the perimeter of the borrow pit. The screening mounds would be at least 1.5m in height. The detail on the proposed screening mounds is shown within **Figures 3.2.4** to **3.2.7**.

The remaining unsuitable materials (weathered/unsuitable rock horizons) would be stockpiled within the base of the working borrow pit. The stockpiles would have a maximum height of 5m, with maximum side-slope gradients of 1(Vertical (V)) in 2.5(Horizontal (H)) and be in full compliance with the Quarries Regulations 1999[4] and Quarries National Joint Advisory Committee (QNJAC) Guidelines[6]. This material would be used as part of the restoration profiling on the cut faces.

4 Health and Safety Executive (2014)., Health and Safety at Quarries, Quarries Regulations 1999, Approved Code of Practice and Guidance (Second Edition).

5 Scottish Government (2000)., PAN 50 Annex D: Controlling the Environmental Effects of Surface Mineral Works.

6 Quarries National Joint Advisory Committee (2020), Available at: http://qnjac.co.uk/what-is-qnjac/. Last accessed April 2020.

4.4 Access Tracks/Haulage Routes

The proposed access to the borrow pit(s) would involve constructing access tracks from the main wind farm access track. The access tracks would include suitable roadside drainage ditches, with soakaways located, where appropriate.

The tracks (haulage routes) within the borrow pit would have a gradient of no steeper than 1(V) in 10(H).

4.5 Water Management/Drainage

The borrow pit(s) would feature a perimeter surface drain, which would aim to prevent water in-flow into the borrow pit. The water collected within the surface drains would be discharged either into the surrounding vegetation, or into suitably located settlement lagoons.

Where necessary, surface settlement lagoons would be constructed within the borrow pit. These would be constructed with the aim of containing any surface water collection within the excavation voids, and from collection of water from the perimeter surface drains. The lagoons would be contained within a bunded area at the base of the borrow pit, with suitable pumping systems installed allowing water to be pumped to soakaways as required.

4.6 Restoration

Upon completion of extraction at the borrow pit(s), surface profile restoration would be undertaken using the stockpiled overburden materials and other suitable materials excavated onsite (including peat) subject to review by the Environmental Clerk of Works (EnvCoW).

General fill material would be sourced from the stockpiles located within the borrow pit void. These would comprise of materials with unsuitable engineering properties for the Proposed Development construction such as weathered rock and unsuitable/poor quality rock horizons, and unsuitable materials arising from the crusher/blasting operations. This material would be utilised to provide the basis of the restoration profile.

The fill materials would be used as general fill to soften the benched profile of the excavations and provide a gentler sloping gradient than near vertical working face slope designs. The fill materials would also be used to provide a suitable gradient on the borrow pit floor to prevent ponding.

The stripped soils, and subsoil horizons which would be stored within perimeter screening mounds would be utilised as the surface dressing layer in which to provide a suitable medium for seeding and planting as appropriate.

The restoration of the borrow pit sites would not involve importing any material onto site. Only materials arising from the excavations would be utilised as part of the restoration scheme. The base of the borrow pit would re-use existing stockpiled materials/soils generated from the site excavations to create a habitat on the floor of the borrow pit, which would be a maximum of 2m thick across the floor area and if suitable, some of these soils could be used to 'dress' shallower side slopes but not on the steeper faces.

An EnvCoW would be in place, to monitor the restoration and aftercare of the borrow pits.

4.7 Best Practice Guidance Documents

A number of general pollution prevention measures would be employed to minimise the risks to ground and surface waters during the creation and use of the borrow pits. Extraction operations would be carried out in accordance with relevant SEPA Guidance for Pollution Prevention[7] and other codes of best practice, to ensure

[7] SEPA (2019)., *Guidance for Pollution Prevention (GPPs).* Available at https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/

that both ground and surface waters are not contaminated. These would include relevant codes of best practice relevant to the site, including:

- European Commission (EC) Water Framework Directive (2000/60/EC);
- Planning Advice Note (PAN) 50, Controlling the Environmental Effects of Surface Mineral Workings Scottish Government(2000)[5];
- Good Practice on Controlling the Effects of Surface Mineral Working on the Water Environment, Department of the Communities and Local Government and Mineral Industry Research Organisation. (2008);
- Guidance for Pollution Prevention (GPPs) (various dates and references), SEPA; and
- Environmental Good Practice on Site C692, CIRIA, (2010).

5.0 Conclusion

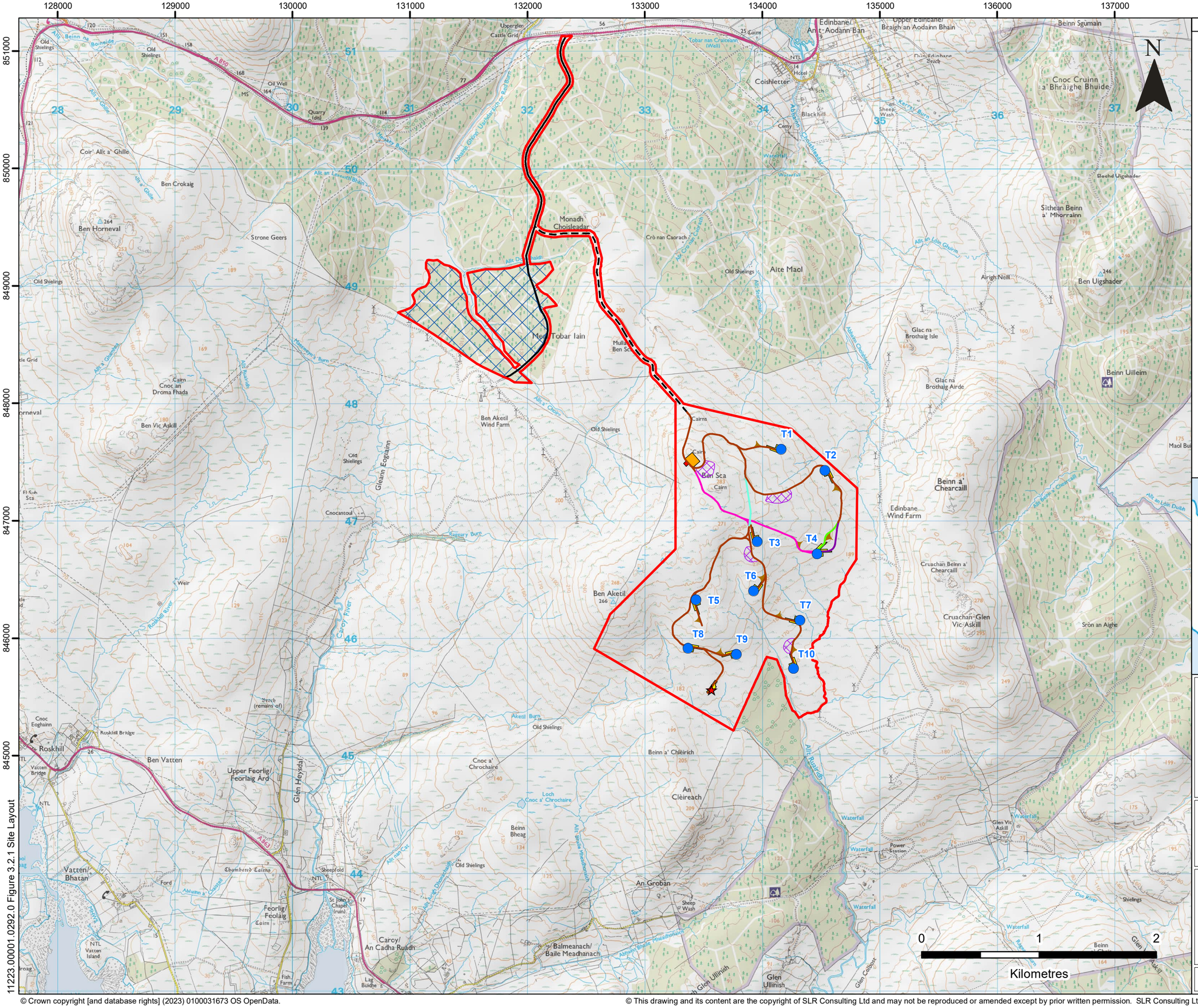
In summary, four borrow pits have been assessed as being capable of supplying all the aggregate required for the site, excluding the concrete for the turbine bases and a surface road dressing. The locations and methods of working would be managed to cause minimal impact to the ground conditions and water environment.

An approximate volume of excavated materials has been calculated for each of the proposed borrow pit locations, these volumes are based on initial calculations based on assumptions for the Proposed Development. These calculations would be verified by detailed intrusive investigation at the proposed locations, post-consent. Calculations do not take into consideration the 'winning' of materials along the route. Each of the proposed borrow pits selected could be increased or decreased in size, depending on the aggregate requirements or following an assessment of the suitability of aggregate materials following detailed ground investigation.

The quality of rock anticipated onsite is inferred from a visual assessment of rock outcrops and published information. An intrusive ground investigation, sampling and material laboratory testing will be required to confirm ground conditions onsite and the suitability of the borrow pit for aggregate production and use as engineering materials.

Prior to the construction of the Proposed Development, design and best practices, and any required mitigation measures, would be set out in full within a Construction Environmental Management Plan (CEMP) and agreed with the statutory bodies. An Outline CEMP is included in **Technical Appendix 3.1**.

FIGURES



LEGEND

- Application Site Boundary
- Proposed Turbine Location
- Proposed Permanent Met Mast
- Proposed Crane Hardstanding
- Proposed Construction Compound
- Proposed Substation
- Proposed Turning Head
- Potential Borrow Pit
- Proposed Habitat Management Area
- Existing Access Track
- Consented Access Track

Proposed Track Alignment

- Proposed
- Proposed Option A
- Proposed Option A1
- Proposed Option A2
- Proposed Option B

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TA 3.2 – BORROW PIT APPRAISAL

SITE LAYOUT

FIGURE 3.2.1a

Scale	Date
1:30,000 @ A3	JULY 2023

11223.00001.0292.0 Figure 3.2.1 Site Layout

133000
134000
135000
848000
847000

T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
BP1
BP2
BP3
BP4

Edinbane Windfarm

Ben Aketil 268m
Ben Sca 283m
Cairn
Wind Turbine
200m
250m
150m
Allt Ruairidh
Glac na Brothaig A

N

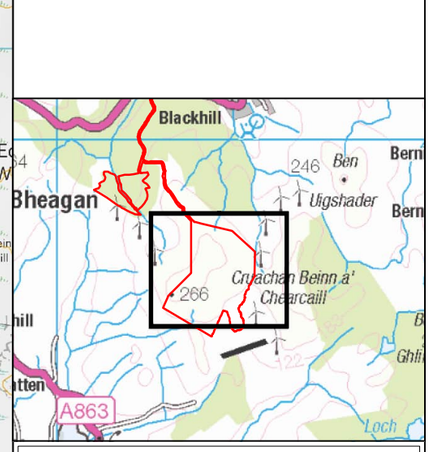
0 250 500
Metres

LEGEND

- Application Site Boundary
- Proposed Turbine Location
- Proposed Permanent Met Mast
- Proposed Crane Hardstanding
- Proposed Construction Compound
- Proposed Substation
- Proposed Turning Head
- Potential Borrow Pit
- Consented Access Track

Proposed Track Alignment

- Proposed
- Proposed Option A
- Proposed Option A1
- Proposed Option A2
- Proposed Option B



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TA 3.2 – BORROW PIT APPRAISAL

SITE LAYOUT

FIGURE 3.2.1b

Scale 1:10,000 @ A3

Date JULY 2023

11223.00001.0292.0 Figure 3.2.1 Site Layout

128000 130000 132000 134000 136000 138000

852000 850000 848000 846000

N

LEGEND

- Application Site Boundary
- 1 km Study Area
- Proposed Turbine Location
- Proposed Crane Hardstanding
- Proposed Construction Compound
- Proposed Substation
- Proposed Turning Head
- Potential Borrow Pit
- Existing Access Track
- Consented Access Track

Proposed Track Alignment

- Proposed
- Proposed Option A
- Proposed Option A1
- Proposed Option A2
- Proposed Option B

T1 T2 T3 T4 T5 T6 T7 T8 T9 T10

Ben Aketil Wind Farm

Edinbane Wind Farm

Superficial Geology

- Alluvial Fan Deposits - Gravel, Sand, Silt and Clay
- Alluvium - Clay, Silt, Sand and Gravel
- Alluvium - Silt and Gravel
- Alluvium – Gravel
- Marine Beach Deposits - Gravel, Sand and Silt
- Peat – Peat
- Raised Beach Deposits, 1 – Sand
- Raised Marine Beach Deposits of Holocene Age - Sand and Gravel
- Raised Marine Beach Deposits, Late Devensian - Sand and Gravel
- Shoreface And Beach Deposits - Sand and Gravel
- Till, Devensian – Diamicton
- Bedrock at or Near Surface

0 1 2 Kilometres

Uig
Loch Snizort
A855
A87
A850
Dunvegan
Portree
A863
ISLE OF SKYE
Drynoch
Sound of

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TA 3.2 – BORROW PIT APPRAISAL

SUPERFICIAL GEOLOGY

FIGURE 3.2.2

Scale 1:40,000 @ A3

Date JULY 2023

11223.00001.0293.0 Figure 3.2.2 Superficial Geology

128000 130000 132000 134000 136000 138000

852000 850000 848000 846000

N

T1 T2 T3 T4 T5 T6 T7 T8 T9 T10

0 1 2 Kilometres

LEGEND

- Application Site Boundary
- 1 km Study Area
- Proposed Turbine Location
- Proposed Permanent Met Mast
- Proposed Crane Hardstanding
- Proposed Construction Compound
- Proposed Substation
- Proposed Turning Head
- Potential Borrow Pit
- Existing Access Track
- Consented Access Track

Proposed Track Alignment

- Proposed
- Proposed Option A
- Proposed Option A1
- Proposed Option A2
- Proposed Option B

Geology Legend in Drawing 11223.00001.0295.0

Uig
Loch Snizort
A855
A87
A850
Dunvegan
Portree
A863
A87
ISLE OF SKYE
Drynoch

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TA 3.2 – BORROW PIT APPRAISAL

SOLID GEOLOGY

FIGURE 3.2.3a

Scale	Date
1:40,000 @ A3	JULY 2023

11223.00001.0294.0 Figure 3.2.3A Solid Geology

Legend

Bedrock Geology

PALAEOGENE

- North Britain Palaeogene Dyke Suite - Basalt and Microgabbro
- North Britain Palaeogene Dyke Suite - Hawaiite and Mugearite
- North Britain Palaeogene Dyke Suite - Olivine-Basalt
- North Britain Palaeogene Dyke Suite - Troctolite, Bytownite
- North Britain Palaeogene Dyke Suite – Gabbro
- North Britain Palaeogene Dyke Suite – Picrite
- Skye Lava Group - Basalt and Microgabbro
- Skye Lava Group - Basalt, Hawaiite and Mugearite
- Skye Lava Group - Feldspar-Phyric Hawaiite and Mugearite
- Skye Lava Group - Hawaiite and Mugearite
- Skye Lava Group - Mugearite, Feldspar-Phyric
- Skye Lava Group - Pyroclastic-Rock
- Skye Lava Group - Pyroclastic-Rock, Basaltic
- Skye Lava Group – Benmoreite
- Skye Lava Group – Hawaiite
- Skye Lava Group – Trachyte

Linear Geology

- Fault, Inferred, Displacement Unknown

11223.00001.0295.0 Figure 3.2.3B Solid Geology Legend

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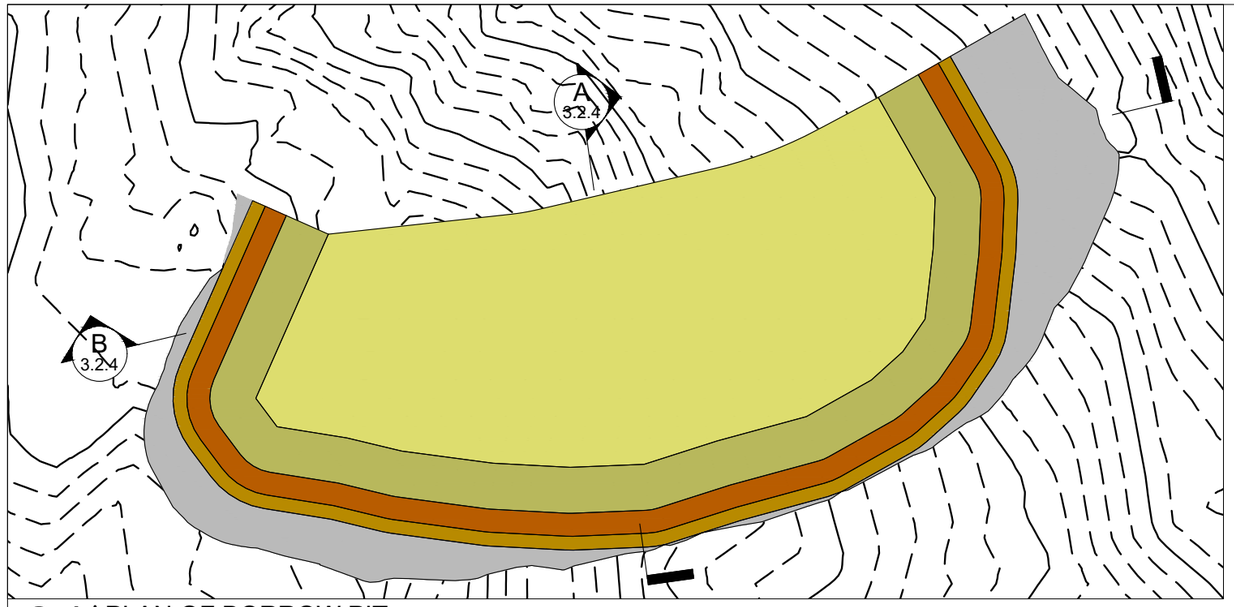
TA 3.2 – BORROW PIT APPRAISAL

SOLID GEOLOGY LEGEND

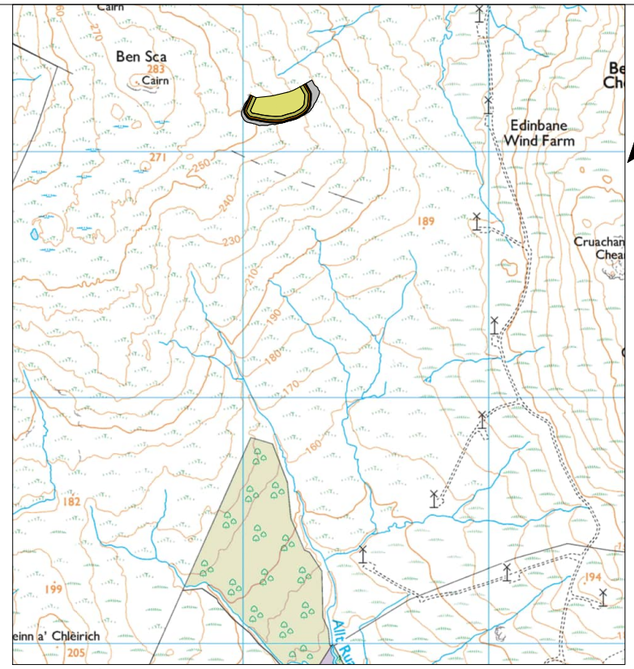
FIGURE 3.2.3b

Date JULY 2023



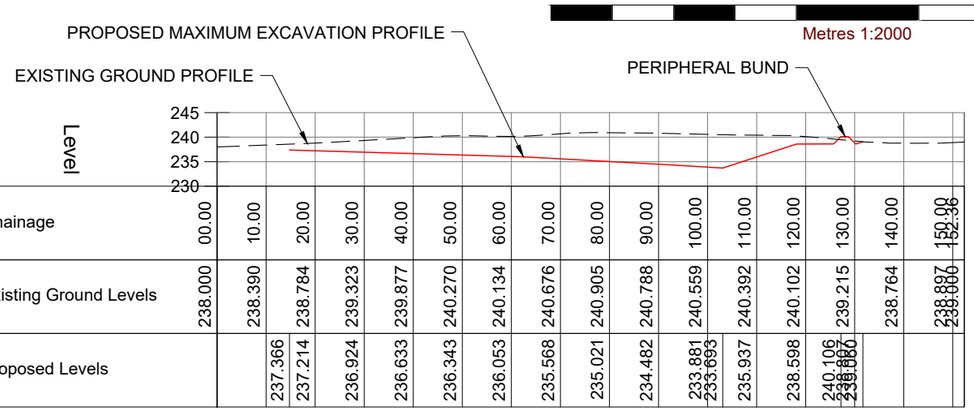
01 PLAN OF BORROW PIT
SCALE: 1:2000

0 20 40 60 80m 120 160 200
Metres 1:2000



02 LOCATION PLAN
SCALE: 1:25000

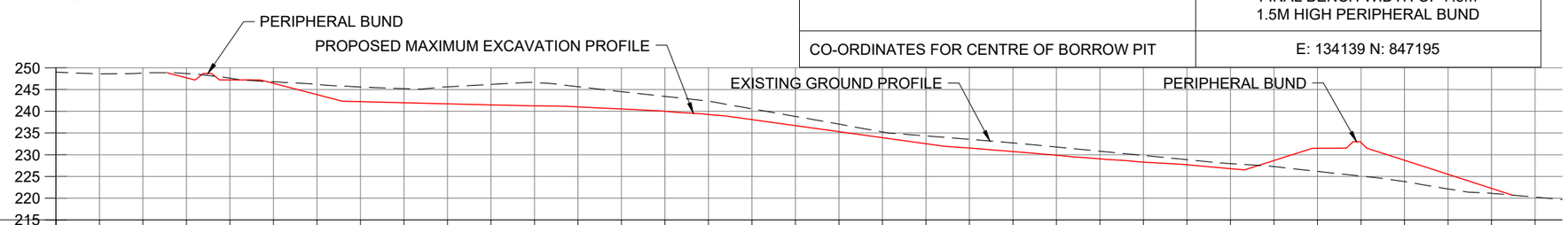
0 800m 2000
Metres 1:25,000



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	152.36
Existing Ground Levels	238.000	238.390	238.784	239.323	239.877	240.270	240.134	240.676	240.905	240.788	240.559	240.392	240.102	239.215	238.764	238.897	239.000
Proposed Levels			237.366	237.214	236.924	236.633	236.343	236.053	235.568	235.021	234.482	233.881	233.693	235.937	238.598	240.106	240.187

TOTAL EXCAVATION VOLUME	74,121m³
OVERBURDEN VOLUME	17,055m³
NET STONE VOLUME	57,066m³
PERIPHERAL BUND FILL	5,478m³
NET STONE TONNAGE	114,132T
EXCAVATION AREA	17,055m²
EXCAVATION METHOD REQUIRED	DIGGING, DRILLING AND BLASTING
INFERRED DESIGN PARAMETERS	63 DEGREE FACES THROUGH COMPETENT ROCK MAXIMUM FACE HEIGHT OF 5.2m FINAL BENCH WIDTH OF 7.5m 1.5M HIGH PERIPHERAL BUND
CO-ORDINATES FOR CENTRE OF BORROW PIT	E: 134139 N: 847195

SECTION A
Scale: H 1:1250,V 1:1250. Datum: 230.000



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00	230.00	240.00	250.00	260.00	270.00	280.00	290.00	300.00	310.00	320.00	330.00	340.00
Existing Ground Levels	249.000	248.628	248.785	248.675	247.614	246.787	246.180	245.590	245.197	245.608	246.178	246.611	245.655	244.495	243.419	242.328	240.560	238.813	237.048	235.233	234.327	233.551	232.722	231.780	230.804	229.833	228.858	227.953	227.273	226.169	225.082	223.818	222.128	221.107	220.253
Proposed Levels				248.852	247.696	247.208	246.427	243.829	242.207	241.962	241.718	241.473	241.242	241.000	240.530	240.000	239.262	238.070	236.685	235.300	233.916	232.531	231.547	230.722	229.881	229.047	228.302	227.689	226.798	228.671	231.478	232.794	228.714	225.488	222.260	220.721

SECTION B
Scale: H 1:1250,V 1:1250. Datum: 215.000

0 10 20 30 40m 60 80 100
Metres 1:1250

NOTES

1. OVERBURDEN ASSUMED TO BE CIRCA 1M IN THICKNESS COMPRISING SOILS AND WEATHERED ROCK.
2. INITIAL STRIPPED OVERBURDEN TO BE PLACED IN PERIPHERAL BUND, WITH SUBSEQUENT OVERBURDEN AND WASTE MATERIALS TO BE STOCKPILED WITHIN FLAT BASAL AREA OF BORROW PIT PRIOR TO BEING USED IN RESTORATION.
3. DESIGN PARAMETERS ARE INDICATIVE AND SHOULD BE REFINED BASED UPON FINDINGS OF GROUND INVESTIGATIONS AND OR INITIAL EXCAVATIONS, TAKING INTO ACCOUNT GROUND CONDITIONS AND HYDROLOGICAL ISSUES.
4. ASSUMES INSITU CONVERSION FACTOR OF 2 TONNES PER m³.

LEGEND

- BENCH/BASE OF EXCAVATION
- EXCAVATION BATTER
- PERIPHERAL BUND
- BENCH
- EARTHWORK SLOPES

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BALMEANACH WIND FARM - EIA

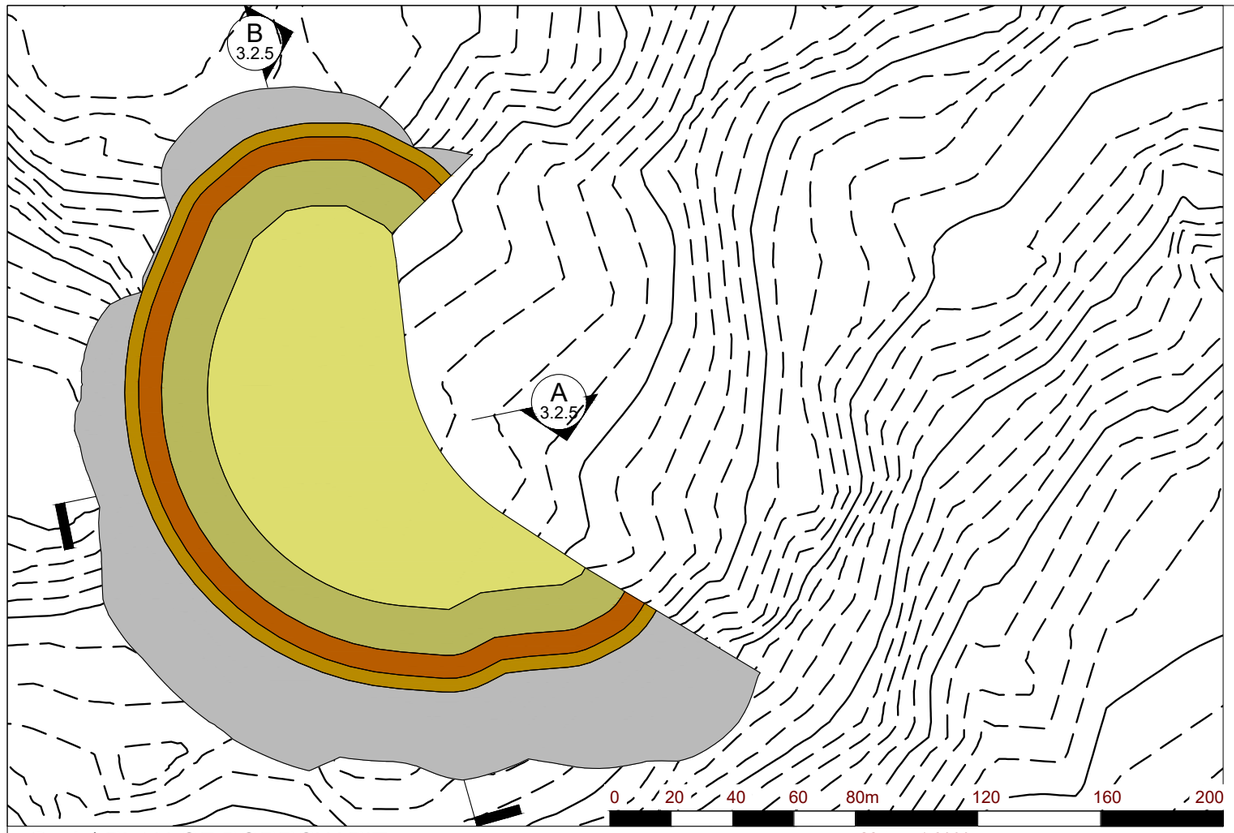
TA 3.2 BORROW PIT APPRAISAL

BORROW PIT 1

FIGURE 3.2.4

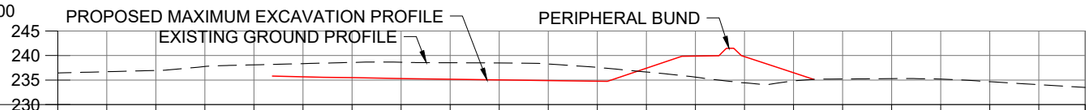
Scale: AS NOTED @ A3
Date: MAY 2023

Figure 3.2.4 – Borrow Pit 1.dwg



01 | PLAN OF BORROW PIT

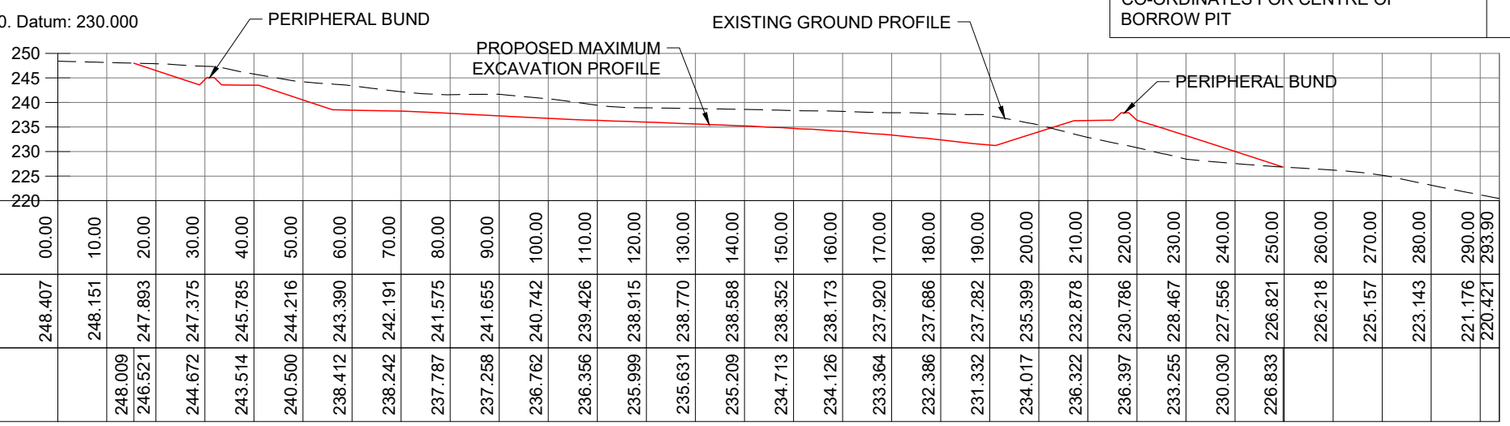
SCALE: 1:2000



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	209.45
Existing Ground Levels	236.448	236.704	236.955	237.764	238.104	238.352	238.595	238.634	238.533	238.488	238.281	237.579	236.641	235.607	234.443	234.836	235.222	235.301	235.204	234.671	234.061	233.500
Proposed Levels						235.807	235.667	235.497	235.307	235.172	235.043	234.897	234.775 234.751	237.418	239.893	241.476 239.771	236.497	235.144				

SECTION A

Scale: H 1:1250,V 1:1250. Datum: 230.000



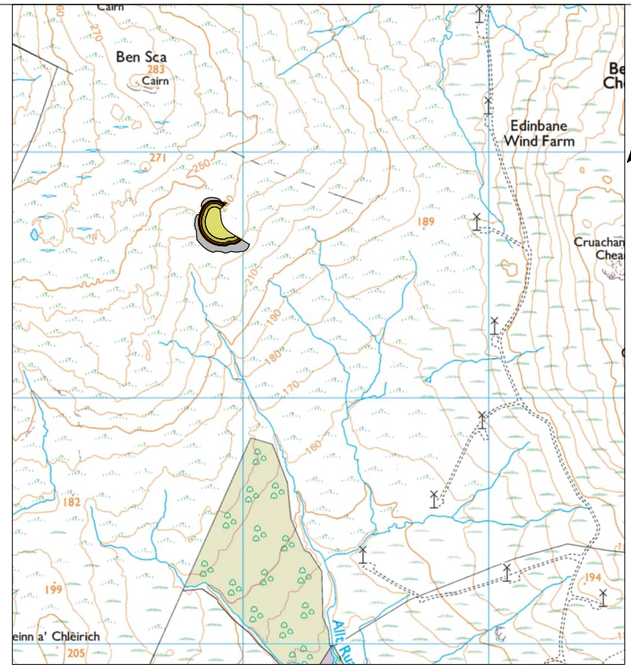
Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00	230.00	240.00	250.00	260.00	270.00	280.00	290.00	293.90
Existing Ground Levels	248.407	248.151	247.893	247.375	245.785	244.216	243.390	242.191	241.575	241.655	240.742	239.426	238.915	238.770	238.588	238.352	238.173	237.920	237.686	237.282	235.399	232.878	230.786	228.467	227.556	226.821	226.218	225.157	223.143	221.176	220.421
Proposed Levels			248.009 246.521	244.672	243.514	240.500	238.412	238.242	237.787	237.258	236.762	236.356	235.999	235.631	235.209	234.713	234.126	233.364	232.386	231.332	234.017	236.322	236.397	233.255	230.030	226.833					

SECTION B

Scale: H 1:1250,V 1:1250. Datum: 220.000

0 10 20 30 40m 60 80 100

Metres 1:1250



02 | LOCATION PLAN

SCALE: 1:25000

0 800m 2000

Metres 1:25,000

TOTAL EXCAVATION VOLUME	31,848m³
OVERBURDEN VOLUME	8,545m³
NET STONE VOLUME	23,303m³
PERIPHERAL BUND FILL	9,126m³
NET STONE TONNAGE	46,606T
EXCAVATION AREA	8,545m²
EXCAVATION METHOD REQUIRED	DIGGING, DRILLING AND BLASTING
INFERRED DESIGN PARAMETERS	63 DEGREE FACES THROUGH COMPETENT ROCK MAXIMUM FACE HEIGHT OF 5.2m FINAL BENCH WIDTH OF 7.5m 1.5m HIGH PERIPHERAL BUND
CO-ORDINATES FOR CENTRE OF BORROW PIT	E: 133883 N: 846710

NOTES

1. OVERBURDEN ASSUMED TO BE CIRCA 1M IN THICKNESS COMPRISING SOILS AND WEATHERED ROCK.
2. INITIAL STRIPPED OVERBURDEN TO BE PLACED IN PERIPHERAL BUND, WITH SUBSEQUENT OVERBURDEN AND WASTE MATERIALS TO BE STOCKPILED WITHIN FLAT BASAL AREA OF BORROW PIT PRIOR TO BEING USED IN RESTORATION.
3. DESIGN PARAMETERS ARE INDICATIVE AND SHOULD BE REFINED BASED UPON FINDINGS OF GROUND INVESTIGATIONS AND OR INITIAL EXCAVATIONS, TAKING INTO ACCOUNT GROUND CONDITIONS AND HYDROLOGICAL ISSUES.
4. ASSUMES INSITU CONVERSION FACTOR OF 2 TONNES PER m³.

LEGEND

- BENCH/BASE OF EXCAVATION
- EXCAVATION BATTER
- PERIPHERAL BUND
- BENCH
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BALMEANACH WIND FARM - EIA

TA 3.2 BORROW PIT APPRAISAL

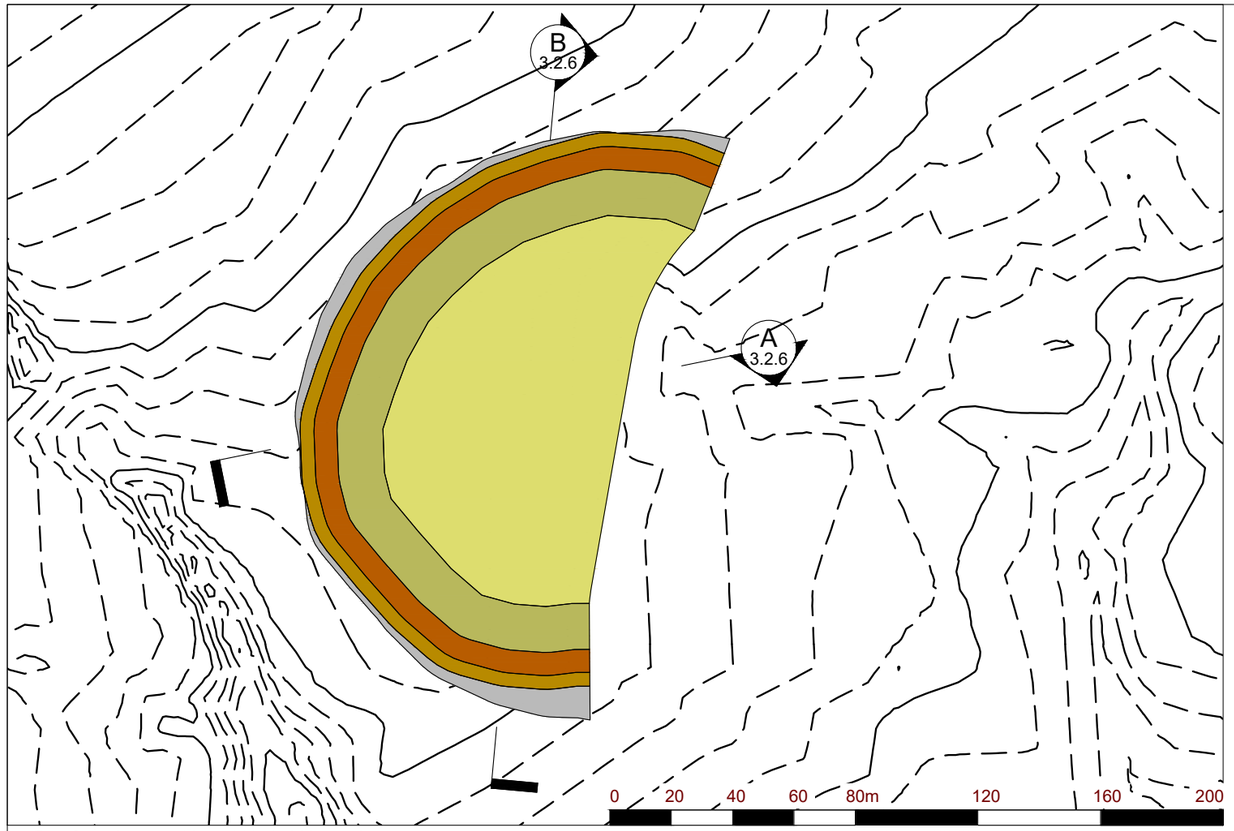
BORROW PIT 2

FIGURE 3.2.5

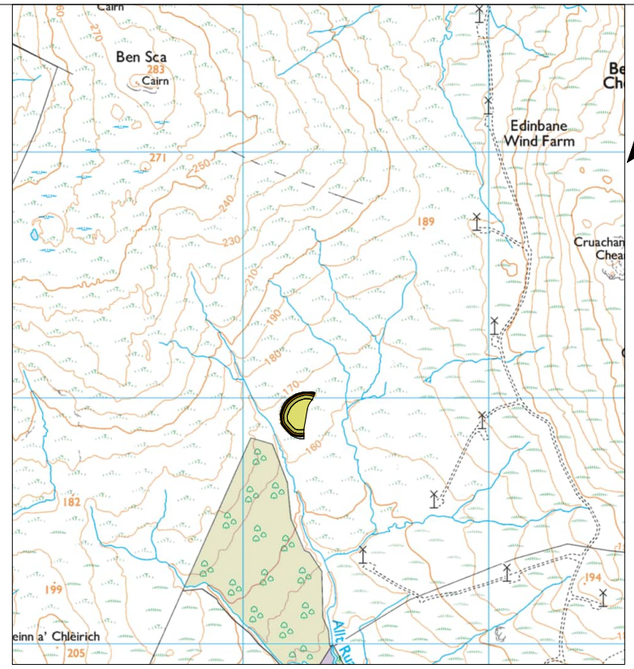
Scale: AS NOTED @ A3

Date: MAY 2023

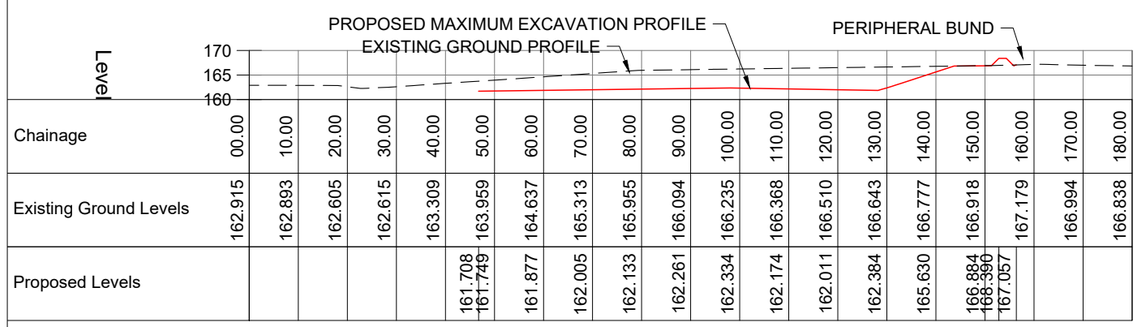
Figure 3.2.5 – Borrow Pit 2.dwg



01 | PLAN OF BORROW PIT
SCALE: 1:2000

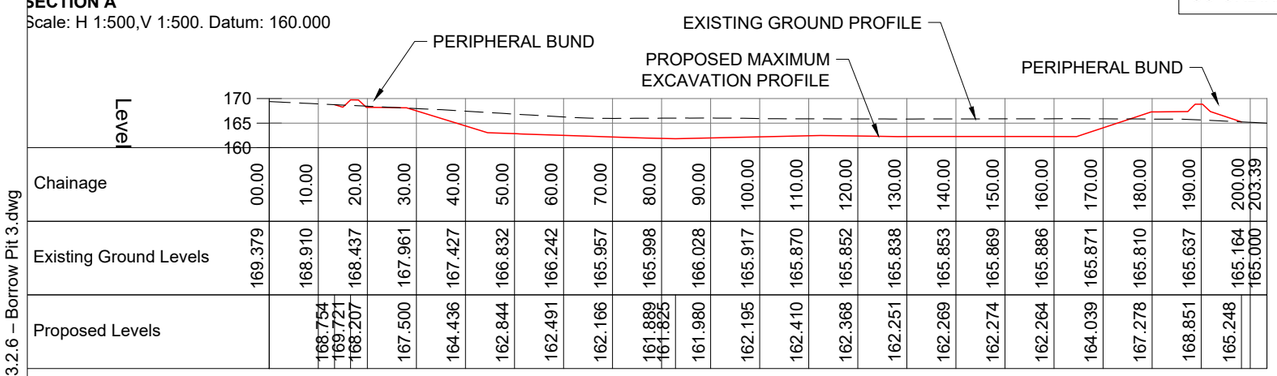


02 | LOCATION PLAN
SCALE: 1:25000



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00
Existing Ground Levels	162.915	162.893	162.605	162.615	163.309	163.959	164.637	165.313	165.955	166.094	166.235	166.368	166.510	166.643	166.777	166.918	167.179	166.994	166.838
Proposed Levels						161.708 161.749	161.877	162.005	162.133	162.261	162.334	162.174	162.011	162.384	165.630	166.884 168.390 167.057			

SECTION A
Scale: H 1:500,V 1:500. Datum: 160.000



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	203.39
Existing Ground Levels	169.379	168.910	168.437	167.961	167.427	166.832	166.242	165.957	165.998	166.028	165.917	165.870	165.852	165.838	165.853	165.869	165.886	165.871	165.810	165.637	165.164	165.000
Proposed Levels		168.754 169.721 168.207		167.500	164.436	162.844	162.491	162.166	161.889 161.825	161.980	162.195	162.410	162.368	162.251	162.269	162.274	162.264	164.039	167.278	168.851	165.248	

SECTION B
Scale: H 1:500,V 1:500. Datum: 160.000

TOTAL EXCAVATION VOLUME	27,884m³
OVERBURDEN VOLUME	7,970m³
NET STONE VOLUME	19,914m³
PERIPHERAL BUND FILL	3,222m³
NET STONE TONNAGE	55,768T
EXCAVATION AREA	7,970m²
EXCAVATION METHOD REQUIRED	DIGGING, DRILLING AND BLASTING
INFERRED DESIGN PARAMETERS	63 DEGREE FACES THROUGH COMPETENT ROCK MAXIMUM FACE HEIGHT OF 5.2m FINAL BENCH WIDTH OF 7.5m 1.5m HIGH PERIPHERAL BUND
CO-ORDINATES FOR CENTRE OF BORROW PIT	E: 134222 N: 845938

0 10 20 30 40m 60 80 100
Metres 1:1250

NOTES

1. OVERBURDEN ASSUMED TO BE CIRCA 1M IN THICKNESS COMPRISING SOILS AND WEATHERED ROCK.
2. INITIAL STRIPPED OVERBURDEN TO BE PLACED IN PERIPHERAL BUND, WITH SUBSEQUENT OVERBURDEN AND WASTE MATERIALS TO BE STOCKPILED WITHIN FLAT BASAL AREA OF BORROW PIT PRIOR TO BEING USED IN RESTORATION.
3. DESIGN PARAMETERS ARE INDICATIVE AND SHOULD BE REFINED BASED UPON FINDINGS OF GROUND INVESTIGATIONS AND OR INITIAL EXCAVATIONS, TAKING INTO ACCOUNT GROUND CONDITIONS AND HYDROLOGICAL ISSUES.
4. ASSUMES INSITU CONVERSION FACTOR OF 2 TONNES PER m³.

LEGEND

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- EXCAVATION BATTER
- PERIPHERAL BUND
- BENCH
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BALMEANACH WIND FARM - EIA

TA 3.2 BORROW PIT APPRAISAL

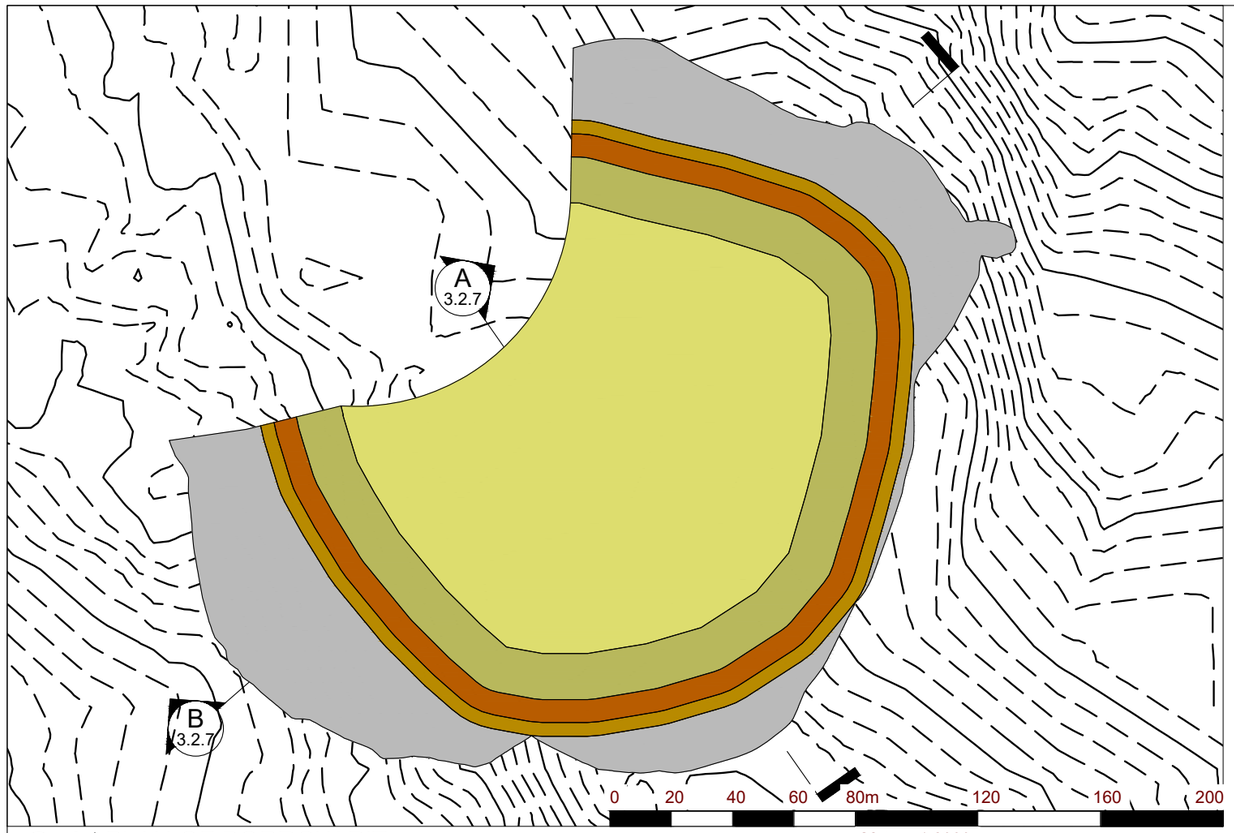
BORROW PIT 3

FIGURE 3.2.6

Scale: AS NOTED @ A3

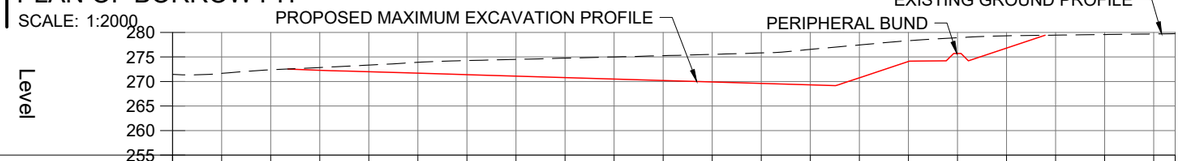
Date: MAY 2023

Figure 3.2.6 – Borrow Pit 3.dwg

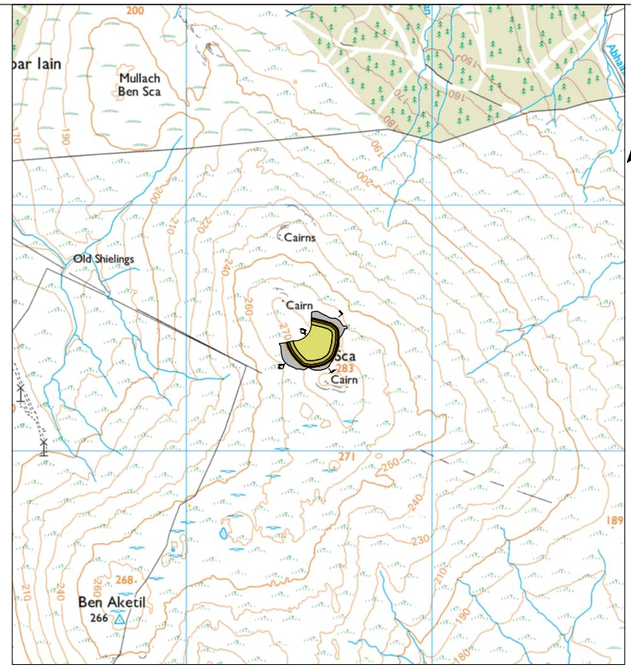


Metres 1:2000

01 | PLAN OF BORROW PIT
SCALE: 1:2000



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	204.39
Existing Ground Levels	271.438	271.657	272.407	272.852	273.347	273.907	274.261	274.504	274.760	275.010	275.266	275.534	275.829	276.545	277.446	278.312	278.920	279.314	279.451	279.571	279.681	279.747
Proposed Levels			272.531	272.290	271.996	271.697	271.399	271.100	270.801	270.503	270.204	269.906	269.607	269.308	269.153	270.750	274.078	275.722	276.810	279.427				



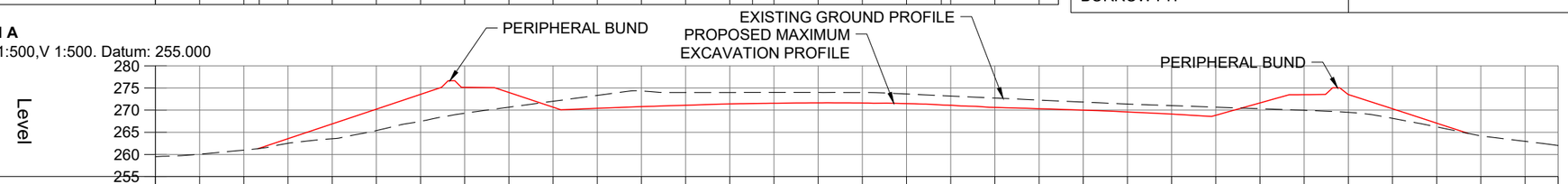
02 | LOCATION PLAN
SCALE: 1:25000

0 800m 2000

Metres 1:25,000

TOTAL EXCAVATION VOLUME	56,589m³
OVERBURDEN VOLUME	15,343m³
NET STONE VOLUME	41,246m³
PERIPHERAL BUND FILL	10,062m³
NET STONE TONNAGE	82,492T
EXCAVATION AREA	15,343m²
EXCAVATION METHOD REQUIRED	DIGGING, DRILLING AND BLASTING
INFERRED DESIGN PARAMETERS	63 DEGREE FACES THROUGH COMPETENT ROCK MAXIMUM FACE HEIGHT OF 7.9m FINAL BENCH WIDTH OF 7.5m 1.5m HIGH PERIPHERAL BUND
CO-ORDINATES FOR CENTRE OF BORROW PIT	E: 133523 N: 847432

SECTION A
Scale: H 1:500,V 1:500. Datum: 255.000



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00	230.00	240.00	250.00	260.00	270.00	280.00	290.00	300.00	310.00	317.49
Existing Ground Levels	259.499	260.053	260.969	262.517	263.535	265.395	267.479	269.305	270.666	272.002	273.333	274.324	273.983	273.986	273.995	273.991	273.977	273.648	273.186	272.731	272.271	271.818	271.378	271.020	270.673	270.324	269.975	269.517	268.151	266.217	264.193	262.955	262.000
Proposed Levels			261.283	263.559	266.894	270.229	273.563	276.649 276.142	273.997	270.667	270.411	270.797	271.103	271.407	271.551	271.646	271.606	271.482	271.100	270.615	270.325	270.002	269.598	269.117	268.837	271.630	273.503	273.526	270.320	267.062	264.751			

SECTION B
Scale: H 1:500,V 1:500. Datum: 255.000

0 10 20 30 40m 60 80 100

Metres 1:1250

NOTES

1. OVERBURDEN ASSUMED TO BE CIRCA 1M IN THICKNESS COMPRISING SOILS AND WEATHERED ROCK.
2. INITIAL STRIPPED OVERBURDEN TO BE PLACED IN PERIPHERAL BUND, WITH SUBSEQUENT OVERBURDEN AND WASTE MATERIALS TO BE STOCKPILED WITHIN FLAT BASAL AREA OF BORROW PIT PRIOR TO BEING USED IN RESTORATION.
3. DESIGN PARAMETERS ARE INDICATIVE AND SHOULD BE REFINED BASED UPON FINDINGS OF GROUND INVESTIGATIONS AND OR INITIAL EXCAVATIONS, TAKING INTO ACCOUNT GROUND CONDITIONS AND HYDROLOGICAL ISSUES.
4. ASSUMES INSITU CONVERSION FACTOR OF 2 TONNES PER m³.

LEGEND

- BENCH/BASE OF EXCAVATION
- EXCAVATION BATTER
- PERIPHERAL BUND
- BENCH
- EARTHWORK SLOPES

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BALMEANACH WIND FARM - EIA

TA 3.2 BORROW PIT APPRAISAL

BORROW PIT 4

FIGURE 3.2.7

Scale: AS NOTED @ A3

Date: JUNE 2023

Figure 3.2.7 – Borrow Pit 4.dwg

ANNEX 3.2A: MATERIALS CALCULATOR

Infrastructure	Length m	As built surface width m	As built area m2	Thickness m	Number	Volume m3	Final Volume m3	Notes:
Site Track (Excavated)	9404	6	56424	0.5	1	28212	28212	
Turning Heads	55	50	2750	0.5	9	12375	12375	
Turbine Bases - formation only	23	23	529	0.5	10	2645	2645	
Fill above Turbine Bases	30	30	900	2	10	18000	8250	Less volume of bases 15*650m3 =7150m3
Hardstandings	68	38	2584	1	10	25840	25840	
Met Mast	10	10	100	0.5	1	50	50	
Substation	35	30	1050	1	1	1050	1050	
Construction Compound	100	80	8000	0.5	1	4000	4000	
TOTAL REQUIREMENT						92172	82422	All volume measurements in m^3

Potential Volume of Rock to be sourced on site	
BP1	57,066
BP2	23,303
BP3	19,914
BP4	41,246
Total Volume from Site	141,529
Import requirements (shortfall)	-59107
Total import	-59107
plus 10% contingency	-65018