

Appendix 3.2 Borrow Pit Assessment

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Introduction

This Borrow Pit Assessment contains an initial review of the site to identify possible locations for the temporary extraction of rock to supply the Proposed Development with crushed rock for use in construction. It is anticipated that most of the extracted rock will be utilised for construction of access roads and crane hardstandings. If the material encountered is of the required quality, it may be also considered as source of aggregate to produce concrete for wind turbine foundations.

At this stage of development, an outline design has been completed for the Proposed Development's infrastructure. This design estimates that the project will require approximately 82,435 m³ of crushed rock for the construction of access roads, crane hardstandings, temporary construction compounds, substation compounds and structural rock for turbine foundations. Five borrow pit search areas have been identified which are estimated to yield approximately 102,220 m³ of rock for use in construction.

The geology of the site in general was assessed from site surveys and desktop studies. No intrusive geotechnical investigations have been undertaken to assess geology at the locations of the proposed extraction areas.

Scope

Project Background

An assessment of likely locations for the temporary extraction of rock at the Proposed Development has been commissioned. The proposed Development comprises the erection of nine wind turbines, the construction and modification of new and existing access roads and the installation of a new substation and energy storage facility. A site location plan is provided in Figure 1.1 of the EIAR. A detailed description of the Proposed Development can be found within the EIAR Chapter 3.

Scope of Assessment

This Borrow Pit Assessment has been prepared to identify potential sources of rock within the development site required for the construction of the wind farm.

The purpose of the of the assessment is to:

- Assess potential areas for the extraction of rock;
- Provide an estimate of the available aggregate from the source location;
- Identify overlying superficial soils;
- Identify underlying rock types;
- Detail management techniques for the extraction of rock and associated measures to protect the local environment.

The criteria used to identify locations for Borrow Pit Search Areas (BPSAs) took into consideration topography, anticipated rock quality, environmental and physical constraints and proximity to construction areas. The criteria adopted is discussed later in this report.

At this stage, the final quantities required to construct the development remain approximated. The design process will refine assumptions made on quantities of material required to construct the Proposed Development.

The quality of rock anticipated at the locations proposed for the BPSAs discussed in this report have been assessed against available literature and site walkovers. The final extent and estimate of material to be won at each of these locations will be confirmed following completion of an intrusive ground investigation exercise which will be undertaken if consent is granted for the Proposed Development.

Scottish Planning Policy (paragraph 243) states that “Borrow Pits should only be permitted if there are significant environmental or economic benefits compared to obtaining material from local quarries, they are time-limited; tied to a particular project and appropriate reclamation measures are in place”. In the case of the Proposed Development, onsite borrowing of rock provides significant environmental gains as the traffic volume on local roads would be significantly reduced due to the reduction in the requirement to import materials.

Site Description

Geography, Topography and Land Use

The Proposed Development is located within an area of approximately 680 Ha. The generally hilly ground comprises smooth rounded hills and a gently undulating landform with some sharp incisions from watercourses. The Proposed Development infrastructure lies between 140 m and 305 m AOD.

The site is rural in setting and contains areas of upland farming and commercial forestry areas of varying age and felling status. A network of existing forestry tracks is present on Site. There are various minor watercourses on site with the Palmullan Burn being the largest. There are no waterbodies on site.

Geology

Superficial Geology

The British Geological Survey (BGS) superficial geology map has no superficial geology data for the area where wind turbines are proposed. Parts of the site are noted as containing peat deposits. The majority of both the access routes from the public road to the wind turbine area are overlain by Till – Diamicton deposits.

A comprehensive program of peat depth probing has been completed and has included a Phase I and Phase II peat survey, details of which are incorporated within EIAR Chapter 9. The peat survey confirmed that most of the Proposed Development’s infrastructure is located on peat less than 0.5 m in depth. However, pockets of deeper peat were recorded, particularly in the south-eastern area of the site with depths of over 4 m recorded in some locations.

An extract of the BGS superficial geology map for the site is contained within Figure A.1.

Bedrock Geology

The BGS bedrock geology map indicates that the part of the site where wind turbines are proposed is Duneaton Volcanic Formation – Basaltic Andesite, an igneous bedrock type.

The majority of both the access routes from the public road to the wind turbine area are underlain by Swanshaw Sandstone Formation – Sandstone, a sedimentary bedrock type. Carrick Volcanic Formation – Basalt and Basaltic Andesite also appears on part of the site.

An extract of the BGS bedrock geology map for the site is contained within Figure A.2.

Borrow Pit Search Areas

Five sites were identified as BPSAs.

The locations for each BPSA are identified within the BPSA Data Sheets contained within Figures B.1 – B.5. Photographs are provided in Figures C.1 – C.2.

Each site was selected based on a pre-determined criteria which included; peat depth, habitat, proximity to watercourses, topography, quality of rock anticipated and proximity to work areas.

No site investigation has been carried out on site and this would be required to assess the extent of rock and rock quality. Findings from the site investigation would also determine if the rock available would be suitable for use as a concrete aggregate.

Criteria for Selection of Borrow Pit Search Areas

The following section discussed the criteria used to select the optimum BPSAs across the site in more detail:

Avoiding areas of peat

Good practice advises that infrastructure should avoid areas of peat. As detailed above, peat deposits across the site vary from 0 m to over 4 m in depth. Peat depths greater than 1 m in depth were avoided during the BPSA selection process.

Habitat

The presence of sensitive habitats was taken into consideration during the selection of BPSA. Results from a national vegetation classification (NVC) survey and other ecological and ornithological surveys were taken into consideration during the selection process.

Cultural Heritage

Cultural Heritage features identified as part of the EIA have been mapped with appropriate buffers applied. These areas have been avoided during the BPSA selection process.

Watercourses

The risks associated with polluting adjacent watercourses from both silt runoff and fuel and hydraulic oils was taken into consideration during the selection of BPSAs. Watercourse buffers of 50 m were maintained for the selection of BPSAs.

Topography

To minimise the footprint of the excavation for borrow pits, steeply sloping ground is preferred. This reduces the likely extent of overburden required to be excavated to access the bedrock beneath. Therefore this reduces the susceptibility of the open excavation to surface water run-off.

Quality of rock

Visual inspection of exposed rock on site can give an indication that it is of good quality for construction. For example, should the rock be observed as having little evidence of weathering and the rock is generally blocky and seen to be outcropping close to the surface, these would all be good indications of borrow pit suitability. Testing will be undertaken as part of the site investigation works to determine the mechanical properties of the rock.

Haul Distances

Anticipated haul distances were taken into consideration during the selection process for BPSAs. Reducing haul distances between borrow pits and final placement has the following benefits:

- Reduces volume of site traffic/number of haul vehicles and hence air pollution;
- Reduces H&S risk; and
- Reduces tracking of vehicles in periods of wet weather when plant movements should be kept to a minimum.

Borrow Pit Search Area Locations

Using the selection criteria summarised above in conjunction with a site visit to undertake visual inspections resulted in the identification of five BPSAs. The data sheet for each BPSA is contained within Figure B.1 – B.5.

The selected locations are summarised as follows:

BP A

BP A is in the northern area of the site approximately 3 km from the northern site access option. There is evidence of good quality rock outcropping at this location. The topography is steeply sloping and suitable for a borrow pit. The location of this BPSA has also been selected to provide a source of stone for access track upgrades. Should this access option not be used in favour of the western option, this borrow pit would not be used. The initial borrow pit sizing has taken this into account, so the remaining four borrow pits would be able to yield sufficient rock to meet the Proposed Development's construction needs.

BP B

BP B is located on the proposed access track to site, south of the Palmullan Burn. It is intended to provide a source of stone for the onward track construction and the construction compound, together with supplementing road and hardstand construction on the main site. The topography is a relatively steep slope, which lends itself to an efficient borrow pit site.

BP C

BPC is located on the south side of the hill called Knockcronal. It provides favourable topography for being able to extract large volumes of stone with a relatively compact footprint. Material won from BP C will be used for access track and hardstand construction as it is conveniently located close to the wind turbine development area.

BP D

BP D is located to the south of the site on the north-eastern flanks of Clashverains. This borrow pit will supplement BP C and will provide rock for hardstand and access track construction in the southern part of the site. The topography is steeply sloping and its location reduces haul distances to the southern wind turbines.

BP E

BP E is located in the western part of the site, on the route of the western access option. BP E is located on an existing track in an area of commercial forestry which had been felled at the time of site visit. The proposed borrow pit is located on the on steeply sloping ground which will enable efficient rock extraction. The location of this BPSA has also been selected to provide a source of stone for access track upgrades. Should this access option not be used in favour of the northern option, this borrow pit would not be used. The initial borrow pit sizing has taken this into account, so the remaining four borrow pits would be able to yield sufficient rock to meet the Proposed Development's construction needs.

Construction Requirements

Rock Volume Requirements

A summary of the indicative volumes of rock required is summarised in Table 1.

Table 1 – Rock Volume Requirements

Infrastructure Item	Volume (m ³)
Access track (new)	26,548
Access track (upgrade)	8,649
Turbine formation	3,619
Crane hardstandings	26,123
Laybys	2,300
Met mast hardstanding and formation	697
Compounds	6,000
Substation and energy storage compounds	8,500
Total	82,435

A total volume of aggregate required for the construction of the Proposed Development would be expected to be approximately 82,435 m³. From the BPSAs, borrow pits have been sized to be able to meet this demand for material, as detailed in Table 2.

Table 2 – Rock Volume Requirements

Borrow Pit	NGR Reference	Approximate Dimensions (m)	Yield Volume* (m ³)
BP-A	237115, 602773	110 x 40 x 16	31,680
BP-B	237422, 600931	60 x 40 x 10	10,800
BP-C	237434, 600063	110 x 55 x 10	27,225
BP-D	237332, 599240	50 x 35 x 7	5,513
BP-E	235257, 600487	100 x 50 x 12	27,000

**Yield volumes in Table 2 assume a 90% recovery rate to allow for overburden and the presence of any unsuitable material.*

Additional Sources of Rock

As shown above, the five proposed borrow pits on site have the capacity to supply all required rock for the Proposed Development's construction. There are other potential sources of rock which are expected to be available on site.

Rock is likely to be recovered from turbine excavation works. Each turbine foundation will require an excavation of approximately 4 m in depth and a minimum diameter of 24 m. This could yield approximately 12,825 m³ of additional rock which could be used for infrastructure construction.

Should additional sources of rock be utilised, the volume of rock extracted from the borrow pits would be reduced accordingly.

Construction Methods

Extraction Operations

The requirement to produce various grades of aggregate for different use i.e. bulk fill, track sub-base, track capping etc would necessitate the use of specialist crushing and grading mobile plant. The operation to extract stone from the proposed locations is summarised as follows.

Preparation Works

Initial site investigation works would be undertaken prior to commencement of construction activities. The site investigation would determine the quantity and suitability of rock at each of the proposed borrow pit locations. Detailed designs for each of the borrow pits would be developed following review of the site investigation results.

Preparatory works associated with each of the borrow pits would commence at the start of construction for the proposed development. Borrow pits would be worked in accordance with Quarries Regulations 1999.

Information obtained from site visits and peat probing indicate there are limited soils and overburden at each of the BPSAs as detailed within the BP Data Sheets. On commencement of borrow pit development, soils and overburden materials would be stripped from the area and stored in a bund as described below.

Drainage

Prior to commencement of activities associated with the development of the borrow pits, a detailed drainage system incorporating adequate mitigation measures would be installed to prevent silt pollution around the perimeter of each borrow pit. This detail would be incorporated within the Project Construction Method Statement, Environmental Management Plan and Water Quality Management Plan which are expected to be required by conditions attached to any consent.

Under the SEPA CAR Licence system the contractor would be required to obtain a CAR Licence prior to works commencing. This process would ensure that the mitigation measures proposed meet the required level of detail expected by SEPA.

Mitigation measures may include (but not be limited to):

Overburden/loose soil would be stabilised and sheeted (should it be required). Mound heights would not exceed 3 m.

The floor of any excavation would be sloped into the hill, to provide attenuation of any accumulated run off. Sump points would be formed to allow settlement of suspended solids prior to dispersion by pump to vegetated areas away from local watercourses.

In addition, the following pollution prevention measures would be implemented to minimise any pollution risk that may arise through the increased surface run-off and sediment mobilisation likely to be generated by each extraction area.

Installation of vegetated cut-off drains, peripheral bunds and ditches around the working areas would intercept uncontaminated surface run-off and divert it around the works ensuring that uncontaminated surface water does not become laden with silt.

Installation of swales to collect runoff placed on the downslope of borrow pits and overburden areas to collect potentially silty run-off.

Silt traps, silt fences and/or straw bales would be used in conjunction with swales, if required, to capture suspended solids generated during the operation of the extraction areas and to minimise the spread of runoff to the wider environment.

Water discharge from sediment ponds would be directed to rough surface vegetation and kept away from direct discharge to watercourses.

Soils and Overburden Storage

Following the installation of the drainage system, topsoils and overburden would be stripped from the work area. Materials would be excavated separately and stockpiled adjacent to the borrow pit working areas. Stripped materials would be placed to provide a natural bunded barrier, which would help to prevent public access to the borrow pit and prevent surface run-off from entering the borrow pit from surrounding land. Temporary fencing would be used to provide an additional physical barrier to prevent unauthorised public access whilst the borrow pit is active. Additional overburden material not placed in the peripheral bund would be temporarily stored in an overburden area, located immediately adjacent to the working area. All soils would be stored in accordance with British Standard BS8601:2013 and BS 3882:2015.

As illustrated within the borrow pit data sheets, it is not anticipated that large quantities of peat will be encountered. Any peat encountered within the proposed borrow pit working area would be extracted and stockpiled in a dedicated area agreed with the Environmental Clerk of Works (ECoW). Peat management would be undertaken in accordance with a Soils and Peat Management Plan.

Rock Extraction and Processing

On completion of stripping soils and overburden from the footprint of the borrow pit, rock extraction activities would commence. This is likely to involve a combination of blasting and mechanical crushing.

Where blasting is required, it is proposed that a lightweight crawler mounted blast hole drill rig is deployed with associated compressor. On completion of blasting, stone will be taken to mobile mechanical stone crushers for subsequent processing. The final plant arrangement will be dependent on the phasing of the BPSA development and the anticipated volumes of rock to be extracted at each location.

Plant located at each of the borrow pits will be equipped with appropriate spill kits to address fuel/oil spillage should an incident occur. Fuelling of plant will be undertaken at predetermined locations agreed with the project ECoW.

Conclusion

The Proposed Development will have a requirement for approximately 82,435 m³ of construction stone material mainly for the construction of access roads, crane hardstandings and construction compounds.

A desktop study and site walkover were carried out to identify potential sources of construction stone and suitable areas for stone extraction within the site to provide enough rock material for the project.

Taking into consideration the existing environment, the geology of the area and the layout of the proposed development five BPSAs were identified. Key considerations in the selection process were rock quality and quantity, sustainability, haul distance, cost effectiveness and potential environmental impacts.

Intrusive investigation is required on all identified borrow pits to determine extent of rock, rock type and suitability for use as rock fill for the construction of access road, crane platforms and aggregate for use in concrete.

Based on initial calculations it is expected that there will be sufficient material acquired on site to match the construction requirements.

References

Legislation

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