Renantis UK Limited

The Repowered and Extended Ben Aketil Wind Farm: Drainage Impact & Watercourse Crossing Assessment

Technical Appendix 9.4

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RSK GENERAL NOTES

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1 INTRODUCTION

1.1 This report provides a Drainage Impact and Watercourse Crossing Assessment for The Repowered and Extended Ben Aketil Wind Farm and associated infrastructure (hereafter the Proposed Development).

1.2 The report forms a Technical Appendix to the Environmental Impact Assessment Report (EIAR) for the Proposed Development and should be read in conjunction with this document. It has been produced to address the requirement for new drainage infrastructure, including new and upgraded watercourse crossing structures, for the Proposed Development.

1.3 This document covers site drainage and watercourse crossings. These topics are interlinked and important to understand, as each has the potential to have significant environmental effects if not adequately addressed.

1.4 Within this Technical Appendix, the following definitions will be used: the 'Site' refers to everything within the application red line boundary and the 'Developable Area' refers to an area within the red line boundary defined by the applicant as the area where the turbines and associated infrastructure would be located.

1.5 For the purposes of the document, the study area is considered to be the Site plus a buffer zone of 2 km. Areas downstream, to a distance of 5 km from the Proposed Development, are also considered, as effects can be transmitted downstream for greater distances than 2 km.

Drainage Impact Assessment

1.6 This document will assess how the Proposed Development may affect the existing drainage system within the Site from both a water quality and a water quantity perspective. This assessment will identify any drainage issues, as well as appropriate mitigation measures to address these issues. This will ensure that drainage infrastructure is suitable for the Proposed Development and keep changes to the natural drainage to a practical minimum.

Watercourse Crossing Assessment

1.7 Watercourse crossings will be required on the proposed track layout for the Proposed Development. This document will provide background descriptions of the watercourse crossing locations and the process of layout design that has resulted in these crossings being proposed; it will also provide sufficient background information to support future applications for authorisation under the *Water Environment (Controlled Activities) (Scotland) Regulations 2011* as amended, (known as CAR).

Regulatory Background

1.8 Under the terms of CAR, it is an offence to undertake the following activities without an appropriate authorisation in place:

- discharge to any wetland, surface water or groundwater;
- disposal of waste water or effluent to land;
- abstraction from any wetland, surface water or groundwater;
- impoundment (dam or weir) of any river, loch, wetland or transitional water; and
- engineering works in any water or wetland.

1.9 With respect to drainage infrastructure, any formal discharge to water or to land may require authorisation. The Developer has a duty to manage water within the Site and discharging from the Site in a compliant manner. The drainage strategy provided here will establish the design requirements in order to manage post-construction water flows within and deriving from the Proposed Development.

1.10 With respect to watercourse crossings, any engineering works in inland waters or wetlands may require authorisation. The Scottish Environment Protection Agency (SEPA)'s document '*The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended): A Practical Guide*' specifies that authorisations are not normally required for engineering works on minor watercourses, where a minor watercourse is defined as one not shown on the 1:50,000 scale Ordnance Survey (OS) maps (Landranger series) (SEPA, 2023a).

1.11 On this basis, up to 19 watercourse crossings required for access to the Proposed Development would require authorisation. Additional crossing of minor watercourses would also be necessary but would not require formal authorisation beyond compliance with the General Binding Rules set out by SEPA (2023a).

1.12 This report is produced in compliance with the requirement of The Highland Council (THC) and SEPA and is in line with current best practice.

Development Proposals

1.13 The Proposed Development infrastructure would include:

- decommissioning and removal of the twelve existing turbines and related infrastructure including hardstandings and the existing operational control building;
- erection of nine new turbines of approximately 5.6 to 6.6 MW each, with a maximum tip height of 200 m, a rotor diameter of approximately 140 m to 155 m and hub height of 115 to 122.5 m;
- hardstanding areas at the base of each turbine, each 3,820 m^2, with a maximum total area of 34,380 m^2;
- approximately 9 km of new track, of which 1.5 km will consist of floating track ;
- approximately 2.3 km of upgraded track ;
- an energy storage facility;
- up to six construction compounds;
- a storage bund area;

- two potential borrow pits, to provide suitable rock for access tracks, turbine bases and hardstandings; and
- underground cabling linking the turbines with substations.

1.14 Full details of the Proposed Development design are provided in **Chapter 2** of the EIAR.

2 DRAINAGE CHARACTERISTICS

2.1 This section of the document outlines the existing drainage characteristics of the Site and the wider study area in order to determine a baseline against which to access changes to the drainage regime. Natural drainage characteristics are determined by topography, existing drainage features and natural catchment areas, rainfall characteristics, current land use and any existing drainage infrastructure.

Site Topography

2.2 The Proposed Development lies on relatively low undulating ground which slopes gently from north-east to south-west. Elevations range from <5 m above Ordnance Datum (AOD) in the southernmost part of the Site, to 268 m AOD near the eastern margin.

2.3 The highest point within the Site is the peak of Ben Aketil on the eastern margin of the Site at 268 m AOD. From Ben Aketil, the ground slopes down to the north, west and south. The westernmost part of the site begins to rise again on the western side of the Caroy River. The southernmost part of the site is just above sea level, near where the Caroy River flows into the sea loch Loch Caroy.

2.4 The Northern Site Access slopes down from the existing Ben Aketil Wind Farm and joins the A850 at approximately 50 m AOD.

2.5 Within the main part of the Site, the existing Ben Aketil Wind Farm lies along a shallow ridge that runs from Ben Aketil and Ben Sca (283 m AOD), north-westwards towards Ben Horneval (264 m AOD) and Strone Geers (185 m AOD). This ridge forms a watershed between the Caroy River, draining south, and the Red Burn, draining north.

Existing Drainage and Natural Catchments

2.6 The Site is located across two main catchment areas: the Caroy River and the Red Burn catchments (CEH, 2023). The majority of the Site and the Developable Area are located within the Caroy River catchment, while the north-east of the Site and the Northern Site Access are located in the Red Burn catchment. A small area in the south-east of the Site lies within the Allt nan Cat catchment which is part of the Isle of Skye coastal catchment between the Caroy River and the River Ose (SEPA, 2023b). Catchment areas are shown in **Figure 9.4** of the EIAR and details of the catchments are provided in **Table 9.4.1**.

Table 9.4.1: Overview of Watercourse Catchment Areas and Infrastructure

Catchment	Total Area (km^2)	% of Site Within Catchment	% of Catchment Within Site	Comments
Caroy River	13.1 km^2	86.7%	69.4%	Turbines 1, 2, 3, 6, 7, 8 and 9; BESS; substation extension; repowered substation; three temporary construction compounds; storage bund area; the southern borrow pit area and associated hardstandings and tracks lie within this catchment.
Red Burn	13.2 km^2	10.0%	7.9%	Turbines 4 and 5, two temporary construction compounds, the Northern Site Access, the northern borrow pit area and associated hardstandings and tracks lie within this catchment.
Allt nan Cat (Isle of Skye coastal)	10.0 km^2	3.3%	3.5%	A small section of the Southern Site Access and a temporary construction compound lie within this catchment.

Rainfall Characteristics

2.7 A review of the watercourse catchment and rainfall characteristics was undertaken using data from the FEH web service (CEH, 2023). Catchment statistics were provided for the main catchments in the Site.

2.8 Standard average annual rainfall (SAAR) for the catchments are as follows:

- Caroy River: 1,832 mm
- Red Burn: 1,908 mm

2.9 The calculations in Section 3 below make use of the figures for the Caroy River catchment, as this covers the majority of the land within the Site and is considered to be the more representative.

Catchment Land Use

2.10 Within the Site, land use primarily consists of the existing wind farm, rough grazing moorland, blanket bog, areas of improved grazing and some areas of natural and planted woodland. The existing northern access track runs from the A850 to the existing wind farm. Forestry is present around the Northern Site Access and the northern borrow pit area. Twelve existing Ben Aketil Wind Farm turbines lie in the north of the Site, linked by an existing track. Existing tracks within the Site include watercourse crossing structures.

2.11 A crofters' track runs from the north to the south of the Site. Sheep graze and roam across the Site, and cattle roam around the southern end of the crofter's track. A farm building is present in the south of the Site, just off the A863 and adjacent to the Southern Site Access. Several properties lie at Upper Feorlig, just outwith the southern Site boundary.

Existing Drainage Infrastructure

Waste Water

2.12 There is no existing waste water infrastructure, either foul drainage or surface water drainage, present within the Site.

Surface Water

2.13 The Site currently drains naturally, primarily via infiltration and overland flow to the existing watercourse network.

2.14 There is evidence of drainage modification in areas associated with existing wind farm infrastructure, existing tracks or areas of forestry. Alongside existing wind farm infrastructure and tracks, perimeter and trackside drainage is present. In the area of forestry adjacent to the Northern Site Access there are extensive drainage ditches which are in place to improve the ground for forestry growth.

2.15 Watercourses within the catchments appear mainly to be in near-natural condition. There is some evidence that a small number of natural watercourse channels within the Site have been modified and straightened.

2.16 The existing Caroy River crossing on the crofters' track, where there is an existing bridge structure and a culverted channel, shows evidence of having been straightened, and there is evidence of bank collapse in this area. In the south-east of the Site, tributaries of the Aketil Burn and Caroy River also appear to have been modified.

Private Water Supplies

2.17 No private water supplies (PWS) are known to be present within the Site. Within 2 km of the Site Boundary, seven PWS are identified. All of the PWS identified are located south of the Site. One of the PWS identified is located just south of the Site Boundary at Upper Feorlig; three are located at Caroy, just off the A863; and the other three are located towards Balmeanach. Further details of identified PWS within 2 km of the Site Boundary are provided in **Table 9.10** of Chapter 9 and locations are shown on **Figure 9.5**.

2.18 BGS GeoIndex (BGS, 2023) identifies no boreholes within the Site Boundary. Within 2 km of the Site, 21 boreholes are identified along the A850.

2.19 Within 2 km of the Site Boundary, OS mapping identifies one well at Tobar nan Craiceann and one spring at An Groban.

3 OUTLINE DRAINAGE STRATEGY

Introduction

3.1 This section provides an outline drainage strategy for the Proposed Development. The objective is to maintain site runoff within the natural catchment areas, and to maintain drainage to the study area watercourses following treatment and attenuation in order to mimic natural flow as closely as possible.

Waste Water Drainage

3.2 There is not currently a foul drainage network within the Site; this may be implemented as part of the development and would be confirmed post-consent.

3.3 Welfare facilities for use during construction would have suitably sized holding tanks and waste water would be removed by tanker for disposal at a licensed disposal facility.

3.4 It is unlikely that ground conditions within the Site would be suitable for a soakaway. Therefore, operational phase welfare facilities would utilise one of the following:

- A suitably sized holding tank with waste water removed from the Site by a tanker for disposal at a licensed disposal facility in line with construction phase proposals;
- A waste treatment package plant with associated discharge as a longer-term alternative; or
- Waterless composting toilet facilities with bottled water provided for washing and drinking.

Surface Water Drainage

3.5 The surface water drainage network for the Site would be designed taking into account THC's Supplementary Guidance: Flood Risk and Drainage Impact Assessment (2013), the Sustainable Urban Drainage Scottish Working Party's (SUDSWP) Water Assessment and Drainage Assessment Guide (2016) and CIRIA Publication C735 – the SuDS Manual (2015).

3.6 The following sections describe the requirements that lead to determination of the proposed outline drainage strategy and which inform sustainable drainage systems (SuDS) provision recommendations.

Allowable Discharge

3.7 Surface water flows from the Site would be directed, following appropriate treatment and attenuation, to the existing Site watercourses in order to maintain pre-development water quality characteristics and flow rate.

3.8 In line with THC's guidelines for development, it is anticipated that the allowable discharge from the Site would match that of the existing 1-in-2 year greenfield runoff rate. This is discussed in the following sections.

Post-development Discharge Criteria

3.9 Post-development surface water flows would be restricted to the discharge levels set out in THC's supplementary guidance document (THC, 2013) and would be in line with best practice. The development proposals recognise THC's requirements, within which three key design principles are noted:

- The post-development runoff rate and volume do not exceed the greenfield runoff rate for previously undeveloped sites. However, if infiltration to ground is not feasible, the additional runoff generated should be discharged from the site at flow rates below 2 l/s/ha.
- Formal on-site storage should be provided up to the 1-in-30 year return periods event (3.33% annual exceedance probability) and attenuation measures should be designed such that SuDS features would not surcharge during a 1-in-30 year return period rainfall event.
- The 1-in-200 year event (0.5% annual exceedance probability) should be contained on Site, unless it can be demonstrated that the 1-in-200 year event could be managed appropriately without causing increased flood risk elsewhere.

Greenfield Runoff Assessment

3.10 A review of the catchment characteristics relating to the Proposed Development was undertaken using the FEH Web Service (CEH, 2023). Catchment statistics for the Caroy River catchment are considered to be representative for the Site as most of the Proposed Development lies within this catchment. The following catchment statistics have been used in the calculations:

- Standard average annual rainfall (SAAR) of 1,832 mm for the Site;
- Standard percentage runoff (SPR) of 55.45%.

3.11 This information has been used to determine the Greenfield Runoff Rate that corresponds to the Site's existing characteristics. This has been calculated using the online Greenfield Runoff Estimation for Sites tool (UK SuDS, 2023), which gives the IH124[1] model results for the Site.

3.12 The construction phase land take is considered to represent the total area requiring drainage for the purposes of Greenfield Runoff calculations. To ensure that the value for this area incorporates the edges of tracks and hardstandings, as well as any drainage that is required for the proposed infrastructure, this is considered to be double the infrastructure footprint. Therefore, 33.6 ha is considered to represent the total area requiring drainage for the purposes of Greenfield Runoff calculations.

3.13 The 1-in-2 year Greenfield Runoff Rate has been calculated to be **703.21 l/s** based on a total drained area of **33.6 ha**.

3.14 The output from the Greenfield Runoff Estimation for Sites tool is provided in Annex A.

[1] The IH124 model provides a method for estimation of flow characteristics and flooding for small, ungauged catchments, derived by the institute of Hydrology (now Centre for Ecology and Hydrology). Details can be found in Marshall & Bayliss (1994).

Attenuation

3.15 THC's current guidance document (2013) requires that formal on-site storage is provided up to the 1-in-30 year return period event and attenuation measures should be designed such that SuDS features will not surcharge during a storm of this magnitude.

3.16 The drainage strategy for the Proposed Development aims to promote attenuation within the SuDS proposals to mitigate any additional surface water runoff generated as a result of the Proposed Development.

3.17 Approximate attenuation and storage volumes have been calculated as follows, using guidance provided in the SuDS Manual (CIRIA, 2015):

- For a 1-in-30 year return period event plus climate change allowance, storage of approximately 2,850 m^2 is required.
- For a 1-in-200 year return period event plus climate change allowance, storage of approximately 4,125 m^2 is required.

3.18 Attenuation volumes would be reviewed at the detailed design stage in order to ensure compliance with the 1-in-30 year and 1-in-200 year requirements as specified within THC's guidance documents.

Sustainable Drainage Systems

3.19 The outline drainage strategy seeks to implement a design that would match the pre-development Site characteristics. Site drainage is intended therefore to provide an appropriate degree of treatment and attenuation such that runoff discharge is no greater than pre-development greenfield runoff for the Site and that runoff quality would not risk any reduction in the water quality of the receiving waterbody.

Quality of Receiving Waterbodies

3.20 SEPA's Water Classification (SEPA, 2023c) and Water Environment (SEPA, 2023d) Hubs have been consulted to determine the existing baseline water quality for the main watercourses and waterbodies within the Site.

Surface Waterbodies

3.21 The Caroy River, which provides the main drainage for the Site, was classified in 2020 as 'Good' overall (SEPA, 2023c). It was also designated by SEPA in 2014 as having 'Good' overall condition, 'Good' water quality, a 'High' status for fish migration access, 'High' status for water flows and levels, 'Good' physical condition and 'High' freedom from invasive species (SEPA, 2023d).

3.22 The Red Burn, which drains the north-east of the Site and the Northern Site Access, was classified in 2020 as 'Good' overall (SEPA, 2023c). It was also designated by SEPA in 2014 as having 'Good' overall condition, 'Good' water quality, a 'High' status for fish migration access, 'High' status for water flows and levels, 'High' status for physical condition and 'High' freedom from invasive species (SEPA, 2023d).

3.23 Other watercourses providing drainage within the Site are not classified and assessed directly as their catchment sizes are too small and fall below the assessment size limit.

Based on the water quality of adjacent watercourses, it is assumed that the Site watercourses all have 'Good' status.

Receiving Waterbodies

3.24 The Caroy River drains south into Loch Caroy, part of Loch Bracadale. Loch Bracadale was classified as having 'High' overall status in 2020, 'High' overall ecology and 'High' water quality (SEPA, 2023c). Loch Caroy is designated as a Shellfish Water Protected Area (SWPA) which in 2014 was classified as 'Not at target objective' as a result of diffuse pollution (SEPA, 2023e).

3.25 The Red Burn drains north into Loch Greshornish. In 2020, its overall status was 'Good', overall ecology was 'Good' and water quality was 'Good' (SEPA, 2023c). Loch Greshornish forms part of the Loch Snizort SWPA which in 2014 was classified as 'Not at target objective' as a result of diffuse pollution (SEPA, 2023e).

Levels of Treatment

3.26 Surface water treatment systems should be based on catchment characteristics and the sensitivity of the receiving watercourse (CIRIA, 2015). Treatment would be required during the entire lifetime of a development, from construction through to decommissioning. Much of the construction phase surface water treatment could provide suitable water treatment for the operational phase.

3.27 SEPA's planning guidance on SuDS (2010) states that *'Each individual type of SUDS feature, such as a filter drain, detention basin, permeable paving or swale, provides one level of treatment.'*

3.28 All operations on the Proposed Development during construction and decommissioning would require at least two levels of treatment prior to discharge, as a result of the high sensitivity of the receiving waterbodies and the high potential for generating loose sediment associated with construction and excavation works. Areas of the Proposed Development with a higher pollution risk and any areas used for plant maintenance and refuelling, would require three levels of treatment.

3.29 During operation, one level of treatment, such as swales or filter drains, should be sufficient for most of the Proposed Development apart from any areas where potentially polluting materials such as fuel, oils and lubricants are used or stored. These areas would require at least two levels of treatment as a result of their higher pollution risk.

SuDS Components

3.30 The following SuDS features have been considered for inclusion within certain sections of the Proposed Development's drainage infrastructure in order to control, manage and treat surface water runoff during construction, operation and decommissioning of the Proposed Development.

Swales and Filter Strips

3.31 Swales are shallow, broad and linear vegetated drainage features that can be designed to store and/or convey surface runoff as well as providing water treatment. Where soil and groundwater conditions allow, swales can also promote infiltration. Vegetation within

swales varies but typically comprises grass or dense vegetation that can act to slow down flow rates and trap particulate pollutants in the water.

3.32 Filter strips are gently sloping vegetated strips of land that provide off-the-edge diffuse drainage. They provide some flow attenuation and treatment, but little or no water storage.

Filter Drains

3.33 Filter drains are also linear features, but rather than incorporating vegetation they include coarse graded rock which provides good drain stability whille also providing water storage and conveyance. Filter drains have a narrower footprint than swales and can be used in areas where space constraints prevent wider swales from being used. Filter drains provide some limited water treatment.

Check Dams

3.34 For either swales or filter drains that cross slopes, check dams provide a valuable means of attenuating water flow. These are typically placed across the swale or drain at intervals of 10-20 m. The design is such that the toe of the upstream dam is level with the crest of the next downstream dam. A small opening or pipe is placed at or near the base of each dam to allow limited flow to pass through rather than over the dam, in order to maintain low flow conveyance.

3.35 Check dams should be built into the sides of the swale or filter drain, to ensure that water flow cannot bypass the dam.

3.36 When made of soil (as opposed to rock), check dams are often called bunds or berms.

Silt Fences and Straw Bales

3.37 Silt fences, constructed from a closely woven synthetic geotextile material, and straw bales both provide temporary flow attenuation and excellent particulate filtration treatment for surface water runoff. These are particularly valuable for sediment management in runoff during construction works, as silt fences and pegged straw bales can be positioned along the main runoff routes to capture, slow and treat runoff. They can also provide temporary check dams if required in short-term drainage infrastructure.

3.38 Straw bales should not be used as the only form of water treatment, but can be useful as part of a hierarchy of treatment systems or as a short-term measure that can be deployed rapidly to allow longer-term measures to be established.

Settlement Ponds

3.39 Settlement ponds provide storage for site runoff and are a highly effective method of treatment and attenuation of surface water. They are particularly useful for developments where bulk earthworks form a significant part of the works.

Sumps

3.40 Sumps are essentially small settlement ponds, located in areas where there are space restrictions preventing use of a larger pond, or where large volumes of water or sediment

are not anticipated. Water can either discharge naturally from a sump or can be pumped out to an alternative location for discharge or further treatment.

Outline Drainage Strategy

3.41 The surface of access tracks would have a cross-fall in order to encourage runoff to drain into trackside ditches along the side of the track where necessary, and lateral and cross-drains would also be installed where required. Drainage outlets would be carefully located with erosion protection if required.

3.42 Settlement ponds would be used at borrow pit sites, construction compounds, BESS and substations for storage, attenuation and treatment of surface water. Settlement ponds may also be required at turbine and hardstanding locations, depending on the ground conditions present. The ponds would be established during construction to provide water management for the construction phase works.

3.43 Swales, filter strips and filter drains would provide attenuation, storage and treatment for access tracks and turbine hardstanding areas. Swales would form the preferred option where space and ground slopes are suitable, although it is likely that filter strips and filter drains would have to be used in some areas as a result of slope and space constraints. When providing drainage across slopes, check dams and berms would be used across the flow path of swales and filter strips to promote settling and infiltration. During construction, small sumps with silt fencing would be established periodically along track routes in order to manage entrained sediment within the surface water. The sumps and silt fencing would be removed at the end of the construction phase, once vegetation on the filter strips and swales has become established.

3.44 Temporary cut-off drains and bunds would be required around excavation areas including turbine bases and borrow pits, to capture clean runoff and divert it around construction areas. These may be converted into swales or filter drains at the end of the construction phase if long-term drainage is required.

Authorisation

3.45 Where proposals have potential to affect the water environment, the design of any works required to mitigate these effects must take into account the Proposed Development's characteristics and existing drainage conditions. Treatment and discharge of surface water to the water environment is regulated under CAR (*Water Environment (Controlled Activities) (Scotland) Regulations 2011* as amended) and forms an additional requirement to planning consent. Any formal authorisations under CAR that are needed for the drainage strategy would be put in place prior to work beginning on-site. It is anticipated that a Construction Runoff Permit would be required for the Proposed Development.

4 WATERCOURSE CROSSING ASSESSMENT

Route Selection

4.1 Prior to consideration of watercourse crossings in detail, SEPA would wish to ensure 'good practice' has been followed, including avoidance or minimisation of the number of crossings. The number of crossings is a function of the proposed access route, to connect the proposed turbines and other essential infrastructure for construction and operational purposes. Route selection takes into consideration a number of key factors including:

- Maximum track gradient suitable for the required traffic and loads for construction purposes;
- Track geometry including bend radii, junction layouts, passing infrastructure and turning circles;
- Stability and bearing capacity of the ground and adjacent slopes;
- The volumes of 'cut' and 'fill' required to ensure a suitable horizontal and vertical track alignment;
- Land take, determined by route length and other aspects of track geometry;
- The type and nature of bridging structures;
- Sensitivity of environmental receptors such as areas of deep peat or sensitive habitats; and
- Whole-life costs for construction and maintenance.

4.2 With these factors in mind, a preferred track geometry has been determined to connect the proposed turbines and other essential development infrastructure. Compromise is always required between competing constraints and concerns. The desire to site turbines and associated hardstanding areas on areas of shallow or no peat, plus a series of environmental and engineering constraints requiring avoidance of sensitive areas and potentially unstable or waterlogged ground, means that track geometry is constrained by ecological and hydrological features.

4.3 There is no link between 'optimum', in terms of a balance between environmental and engineering constraints, and 'best practice' in the Water Framework Directive context, which is oriented towards the water environment. However, there should not be obvious redundant crossings or crossings that are readily avoidable.

Access Track Design

4.4 The water environment and associated concerns formed an integral part of the track design process for the Proposed Development, which developed in an iterative manner in parallel with the proposed turbine and associated infrastructure layout. Options for limiting watercourse crossings on tracks have been restricted owing to other site constraints; however, the number of entirely new watercourse crossings has been kept to a practical minimum through careful design.

Access Route

4.5 Locations of all watercourse crossings within the Site are provided in **Figure 9.4.1**.

4.6 There are two access options for the Proposed Development: the Northern Site Access (via the A850) and the Southern Site Access (via the A863).

4.7 The Northern Site Access would make use of the existing wind farm access track, where there are three watercourse crossings (WC01, WC02 and WC03) that may require upgrading. The northern borrow pit area is adjacent to where the existing Northern Site Access meets the existing wind farm access track.

4.8 In the north-west of the Site, areas of floating track would be required for access to proposed turbines T1 and T2. Between turbines T1 and T2, a watercourse crossing (WC04) may require upgrading.

4.9 New track would be required for access to T1 in the north-west of the Site. This new track would head south and require new watercourse crossings (WC05 and WC06). New track would lead to T9 and a new watercourse crossing would be required to cross a tributary of the Caroy River at WC07. Two small sections of floating track would be located either side of this crossing.

4.10 New track would cross tributaries of the Caroy River at WC08 and WC09, before reaching T8. Between T8 and the existing crofters' track, a new watercourse crossing (WC10) would be required.

4.11 For access to the BESS, substations and T3, a section of new track would be required opposite the Northern Site Access to the Site; a new watercourse crossing (WC11) would be required here. The existing wind farm track between would also be used for access between turbines. A small section of floating track would be required for access to T4.

4.12 In the north-east corner of the Site, the proposed new track leading to T5 would include an area of floating track, and would require three new watercourse crossings (WC12, WC13 and WC14).

4.13 To the east of the existing crofters' track, an area of new track would lead to T7. A new watercourse crossing of the Rageary Burn (WC15) would be required, before the track reaches a temporary construction compound. New track would then cross a tributary of the Rageary Burn (WC16) before reaching T6.

4.14 South-west of T7, the existing crofters' track would require upgrading. A section of new track would be required around the crossing of the Caroy River (WC17) which would require replacing. Adjacent to this is the proposed southern borrow pit area and storage bund location.

4.15 The existing crofters' track would be upgraded to just north of Upper Feorlig. New track and a new crossing of the Caroy River (WC18) would be required. East of the Caroy River, a new crossing of the Aketil Burn (WC19) would be required.

4.16 From here new track would run south and meet the A863, forming the Southern Site Access. A small spur would lead to a temporary construction compound at the southern Site boundary, adjacent to the Allt nan Cat.

4.17 The proposed access track would be a total of 17.4 km. Of this, 8.4 km is existing track which would be upgraded in places and 9.0 km is proposed new track, including 1.5 km of floating track.

Removal or Modification of Existing Structures

4.18 Where a proposed new crossing is located adjacent to an existing crossing, it is considered best practice to remove the redundant structure.

4.19 Five watercourse crossings (WC01, WC02, WC03, WC04 and WC17; **Figure 9.4.1**), may require upgrading as part of the track upgrading process. If upgrading is required, it would be proposed to remove the existing structures and replace them with new bottomless arch or box culverts. It is expected that WC17 would require replacement with a new bridge structure.

4.20 It is likely that minor crossings X01, X02, X03 and X04 would also require upgrading.

Cable Crossing Locations

4.21 As cables would generally be laid alongside access tracks, cable crossings would normally be incorporated as part of track crossing structures. There are no plans for additional cable crossings of watercourses shown on 1:50,000 OS mapping.

Crossing Descriptions

4.22 The proposed crossings have been assessed using a catchment-based approach, involving a desk study and a walkover survey.

Desk Study

4.23 The desk study consisted of a review of the information regarding the Proposed Development, principally involving an examination of the proposed track layout and the identification of watercourses marked on the OS 1:50,000 scale maps which would require crossings.

4.24 The presence of an existing track has allowed effective minimisation of new crossings, as some of the required crossings are already in place; however, some upgrading and possibly extending of crossings will be required to ensure that they are of suitable standard for the Proposed Development construction traffic.

Walkover Survey

4.25 In November 2022, subsequent to issue of a finalised track layout, a walkover survey was undertaken during which the identified crossings were visited to obtain specific information about each crossing location. The survey was undertaken in mainly dry weather conditions. Information regarding previous high-water activity including flooding was recorded in order to allow an informed decision-making process with regard to crossing structures and sizing.

4.26 During the walkover survey, photographs and detailed field notes were taken to record dimensions of the watercourse channels and flood channels, where apparent the type of substrate and any other local information required to inform the proposed crossing type. Locations were recorded using a hand-held GPS unit, with better than 5 m accuracy.

Ecological Provision

4.27 **Chapter 7: Ecology** of the EIAR indicates that the design of new watercourse crossings would maintain hydraulic connectivity and allow the free passage of fish and other wildlife beneath. Watercourse crossings would also be of sufficient size so as not to restrict or concentrate flows downstream and to convey flows during periods of heavy rainfall.

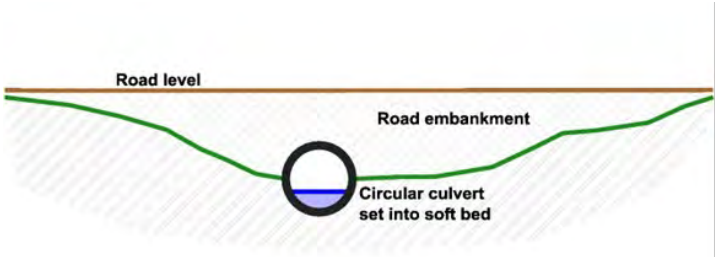
4.28 Proposed Development design and evolution has inherently minimised the requirement for near-watercourse working and the number of watercourse crossings to facilitate access tracks. Where watercourse crossings are required these have been sensitively designed to ensure the continued free passage of fish movements in accordance with SEPA guidance.

Crossing Details

4.29 The following table, **Table 9.4.2**, includes details of all the crossings which require authorisation, together with photographs of the watercourse and a recommendation of the crossing type to be used. All crossings are shown on **Figure 9.4.1**.

Table 9.4.2: Details of Watercourse Crossings Requiring Authorisation

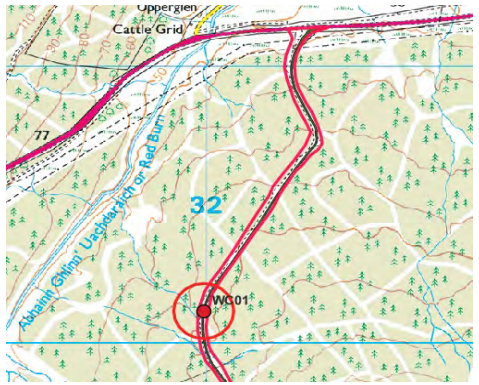
Watercourse Crossing Details	
Crossing:	WC01
Location:	Northern Site Access
Watercourse:	Unnamed tributary of Red Burn (Red Burn catchment)
NGR:	NG 31984 50088
Description:	Existing circular culvert under track with subsidiary culverts. Small watercourse with poorly defined channel of width around 0.5 m. Channel banks are well-vegetated with heather, grassland and forestry. Peat depths in the area are around 0.5 m.
Catchment Area:	0.20 km^2
Crossing Type:	Existing circular culvert, may require extending or replacing



Existing culvert under track, and indicative cross-section of circular culvert (not to scale)

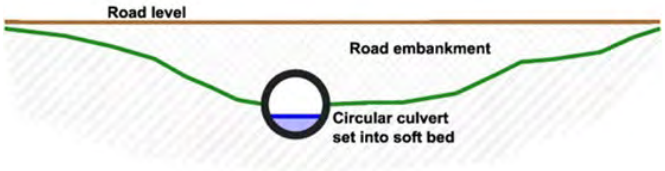
View upstream (SE) showing vegetated channel and end of main culvert

View downstream (NW) showing a subsidiary culvert



Watercourse Crossing Details

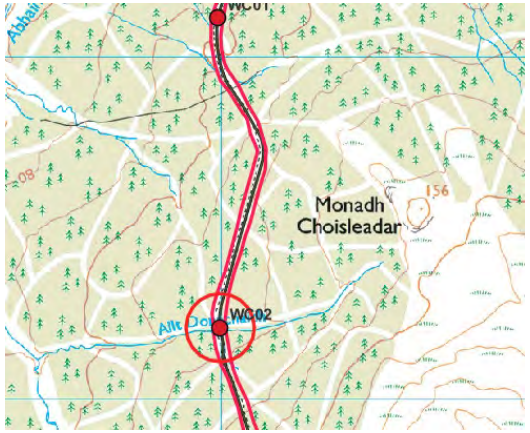
Crossing:	WC02
Location:	Northern Site Access
Watercourse:	Allt Donachaidh (Red Burn catchment)
NGR:	NG 31997 49200
Description:	Existing circular culvert under track. Small watercourse with a relatively well-defined channel which becomes slightly incised. Channel width is variable, between 0.5 - 1 m. Banks are well-vegetated with rushes, grass and heather. Peat depths in the area are around 1.5 – 2.0 m.
Catchment Area:	0.45 km^2
Crossing Type:	Existing circular culvert, may require extending or upgrading



Existing culvert (upstream) and indicative cross-section of circular culvert (not to scale)

View upstream (E) of Allt Donachaidh channel

View downstream (W) showing incised channel and small flood plain area



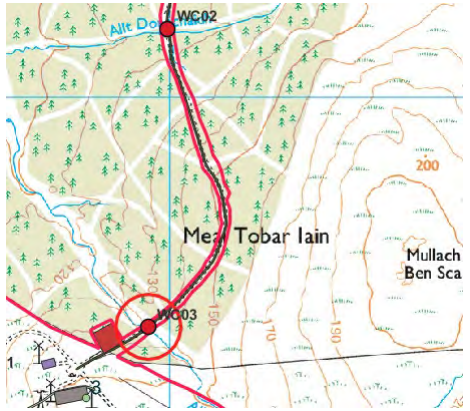
Watercourse Crossing Details

Crossing:	WC03
Location:	Northern Site Access
Watercourse:	Allt a' Choire (Red Burn catchment)
NGR:	NG 31926 48288
Description:	Existing bridge on existing track. Moderately large watercourse with a well-defined channel in bedrock. Channel width is variable, between 1 - 3 m and channel is moderately incised in places both up- and downstream. Banks are well-vegetated with grass. Peat depths in the area are around 0.5 m.
Catchment Area:	2.19 km^2
Crossing Type:	Existing bridge structure

Existing bridge structure

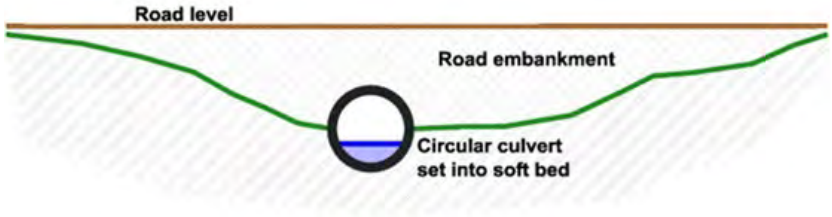
View upstream (SE) showing widening channel

View downstream (NW) showing rocky channel and steeply incised banks



Watercourse Crossing Details

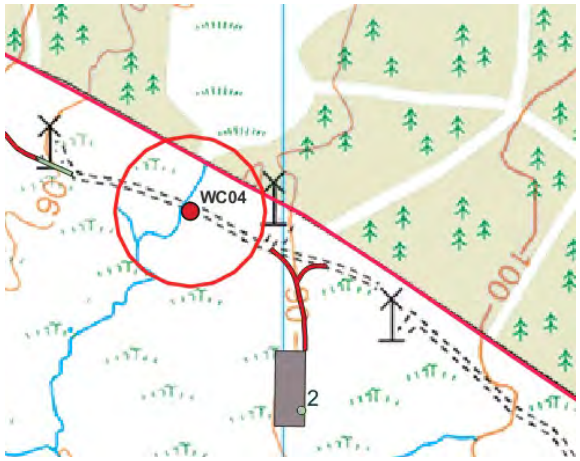
Crossing:	WC04
Location:	Existing wind farm track, between T1 and T2
Watercourse:	Unnamed tributary of Caroy River (Caroy River catchment)
NGR:	NG 30869 48711
Description:	Existing circular culvert with subsidiary culvert under track. Boggy area in flood channel of varying width without well-defined banks or flow channel. Area is vegetated with rushes, grass and heather. Peat depths in the area are around 2.5 – 3.0 m.
Catchment Area:	0.08 km^2
Crossing Type:	Existing circular culvert, may require extending or upgrading



Existing main culvert and indicative cross-section (not to scale)

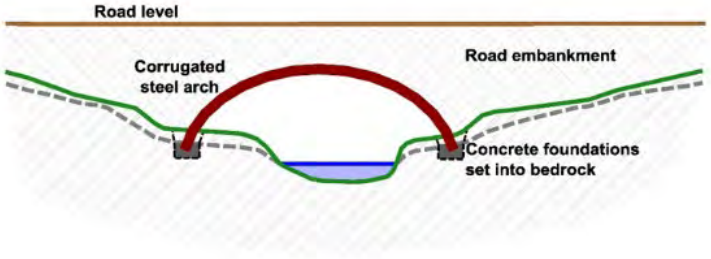
View upstream (NE) of boggy channel

View downstream (S) of boggy area and slightly more defined channel



Watercourse Crossing Details

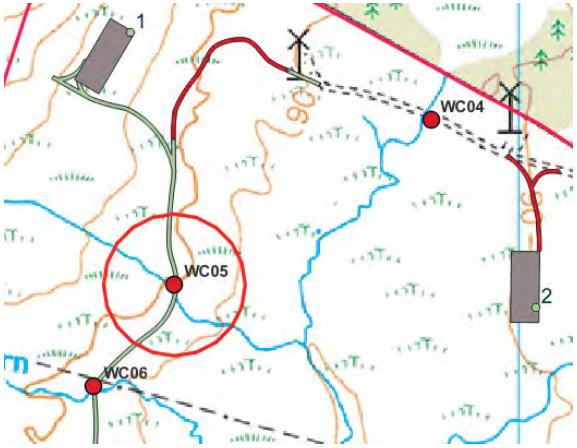
Crossing:	WC05
Location:	New track between T1 and T9
Watercourse:	Unnamed tributary of Caroy River (Caroy River catchment)
NGR:	NG 30505 48470
Description:	New crossing. Small watercourse with a poorly-defined channel of variable width (0.5 – 1 m). Channel is not incised but is quite distinct, particularly upstream where it is very boggy, and the area is well-vegetated with moss, grass and rushes. Peat depths in the area are around 1.0 m.
Catchment Area:	0.28 km^2
Crossing Type:	New crossing, bottomless culvert



View across channel showing boggy ground conditions and indicative cross-section of bottomless culvert (not to scale)

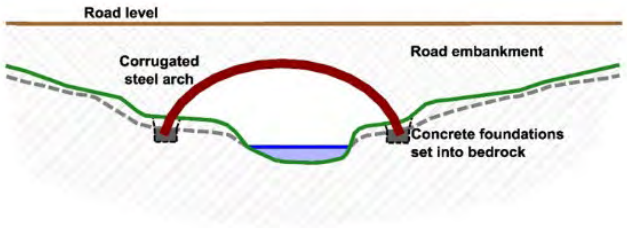
View upstream (NW) of boggy channel area dominated by rush vegetation

View downstream (SE) of channel



Watercourse Crossing Details

Crossing:	WC06
Location:	New track between T1 and T9
Watercourse:	Maesweyn's Burn (Caroy River catchment)
NGR:	NG 30396 48323
Description:	New crossing. Moderate watercourse with a well-defined channel of variable width (0.5 – 2.5 m). Channel is well-established with rocky bed and banks. Banks are well-vegetated with grass and heather. Peat depths in the area are variable, between 0.15 – 0.9 m.
Catchment Area:	0.44 km^2
Crossing Type:	New crossing, bottomless culvert



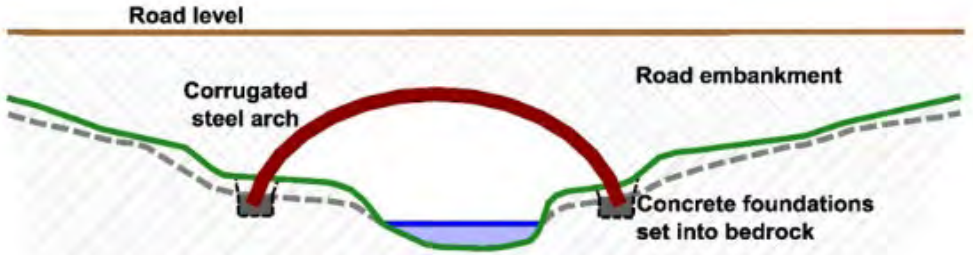
View across channel looking west and indicative cross-section of bottomless culvert (not to scale)

View upstream (SW) of channel showing vegetated banks

View downstream (NE) showing meandering channel with high banks

Watercourse Crossing Details

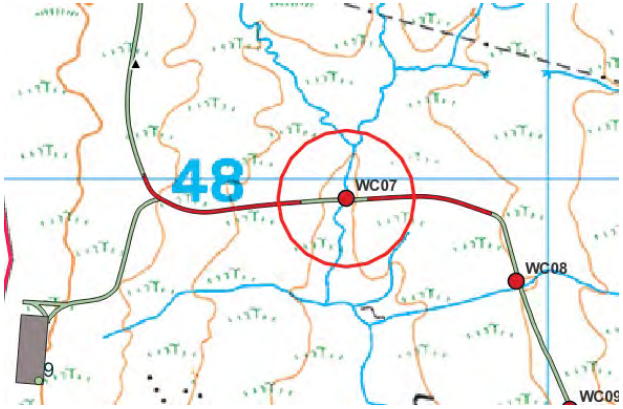
Crossing:	WC07
Location:	New track between T8 and T9
Watercourse:	Unnamed tributary of Caroy River (Caroy River catchment)
NGR:	NG 30710 47971
Description:	New crossing. Moderate watercourse with a well-defined channel of width around 2 – 3 m). Channel is relatively shallow, with a rocky and cobbly bed and unstable soil banks in areas. Banks are well-vegetated with grass and heather. Peat depths in the area are around 0.2 – 0.5 m.
Catchment Area:	1.88 km^2
Crossing Type:	New crossing, bottomless culvert



Indicative cross-section of bottomless culvert (not to scale)

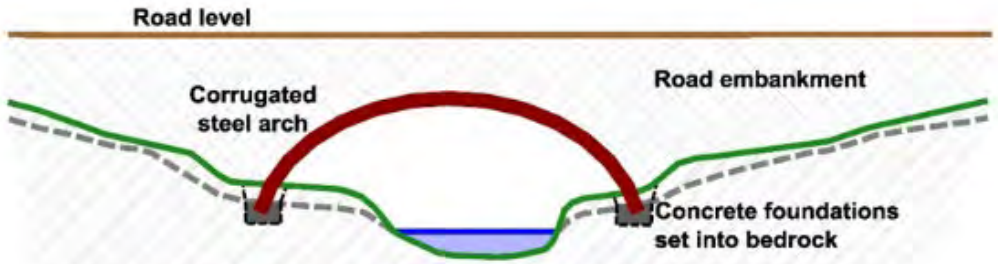
View upstream (N) showing cobbles and boulders within channel

View downstream (S) showing soil banks in foreground



Watercourse Crossing Details

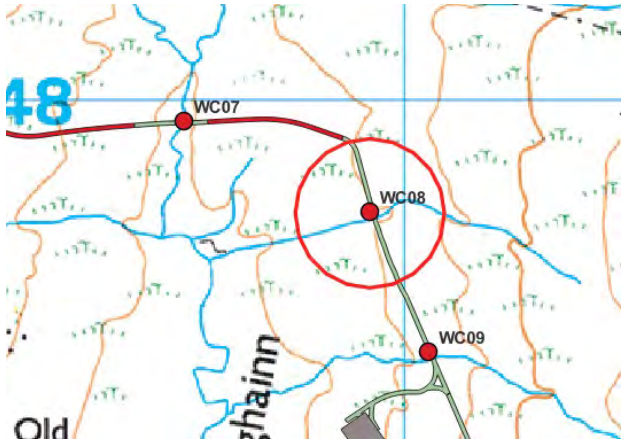
Crossing:	WC08
Location:	New track between T8 and T9
Watercourse:	Unnamed tributary of Caroy River (Caroy River catchment)
NGR:	NG 30955 47839
Description:	New crossing. Small watercourse with a poorly-defined boggy channel of variable width (0.5 – 1 m). Main flow channel is indistinct but banks are clear in places. The area is heavily vegetated with grass, rushes and moss. Peat depths in the area are around 0.5 m.
Catchment Area:	0.26 km^2
Crossing Type:	New crossing, bottomless culvert



Indicative cross-section of bottomless culvert (not to scale)

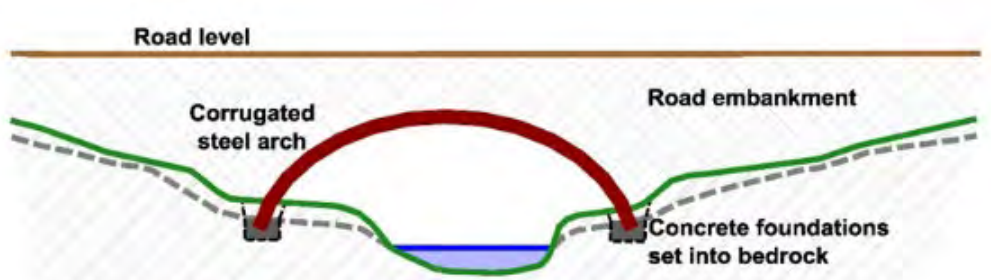
View upstream (E) showing poorly-defined channel

View downstream (W) showing boggy channel with mossy vegetation in foreground



Watercourse Crossing Details

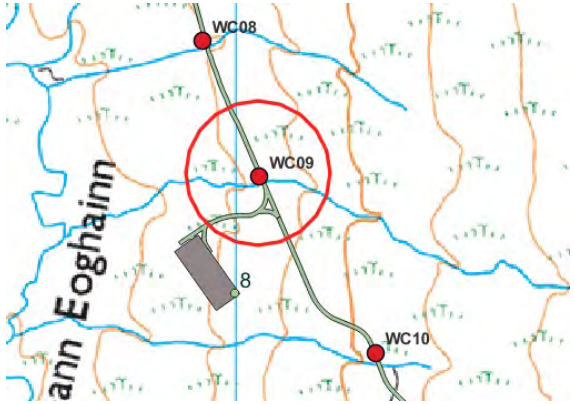
Crossing:	WC09
Location:	New track between T8 and T9
Watercourse:	Unnamed tributary of Caroy River (Caroy River catchment)
NGR:	NG 31030 47646
Description:	New crossing. Small watercourse with a moderately well-defined channel of width of ~0.5 m. Banks are steep, notably on the south side, and well-vegetated with grass, heather and rushes. Peat depths in the area are around 0.5 m.
Catchment Area:	0.23 km^2
Crossing Type:	New crossing, bottomless culvert



Indicative cross-section of bottomless culvert (not to scale)

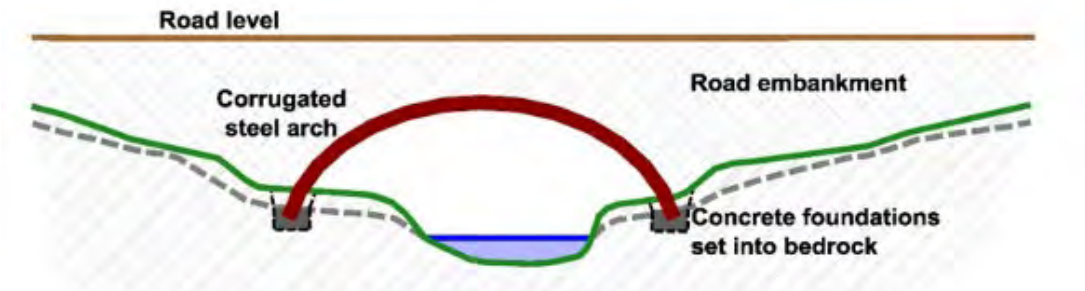
View upstream (E) showing banks dominated with rush vegetation

View downstream (W) showing meandering channel and steep banks



Watercourse Crossing Details

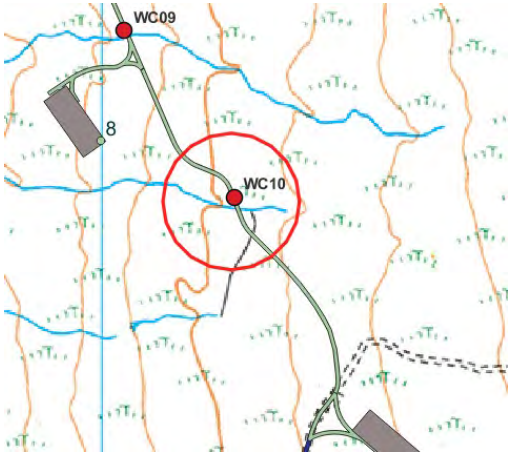
Crossing:	WC10
Location:	New track between T7 and T8
Watercourse:	Unnamed tributary of Caroy River (Caroy River catchment)
NGR:	NG 31190 47402
Description:	New crossing. Small watercourse with an steeply incised channel of variable width less than 1 m. Banks are well-vegetated with heather and grass, and are boggy in areas. Peat depths in the area are around 0.5 m.
Catchment Area:	0.18 km^2
Crossing Type:	New crossing, bottomless culvert



Indicative cross-section of bottomless culvert (not to scale)

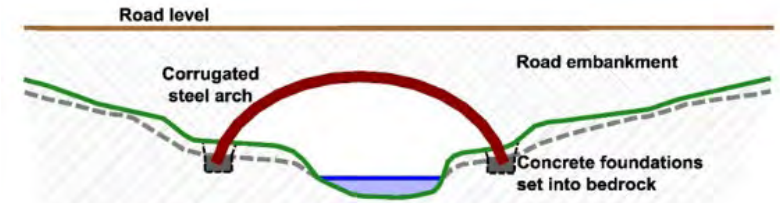
View upstream (E) of heavily-vegetated channel

View downstream (W) of poorly-defined channel with grassy vegetation



Watercourse Crossing Details

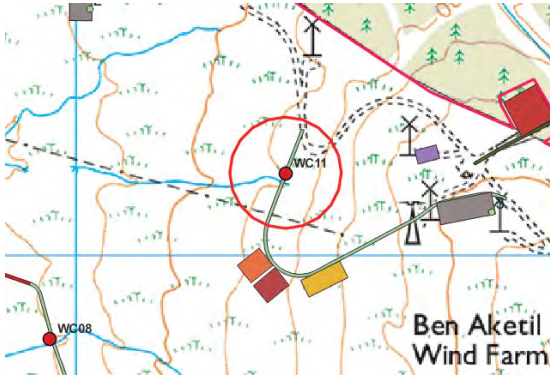
Crossing:	WC11
Location:	New track between T2 and T3
Watercourse:	Unnamed tributary of Caroy River (Caroy River catchment)
NGR:	NG 31371 48128
Description:	New crossing. Small watercourse with a steeply incised channel of width less than 0.5 m. Channel is very heavily vegetated with heather and some grass. Peat depths in the area are around 1.5 m.
Catchment Area:	0.11 km^2
Crossing Type:	New crossing, bottomless culvert



View of incised channel and indicative cross-section of bottomless culvert (not to scale)

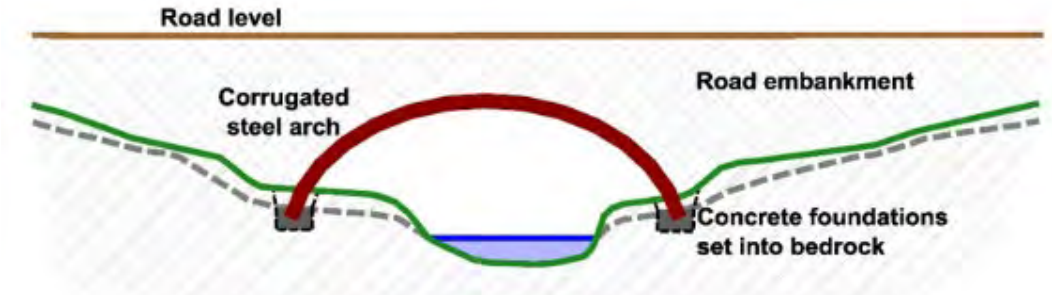
View upstream (E) of channel dominated by heathery vegetation

View downstream (W) of heavily-vegetated channel



Watercourse Crossing Details

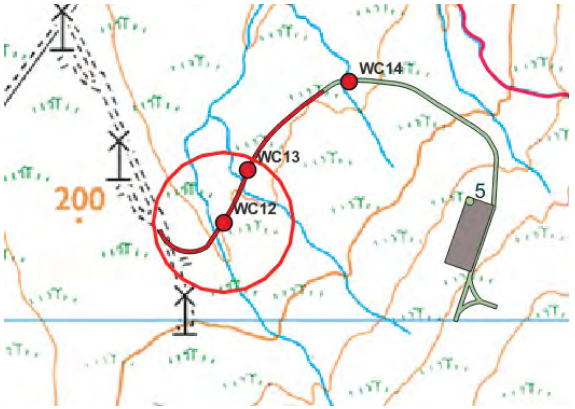
Crossing:	WC12
Location:	New track between T4 and T5
Watercourse:	Unnamed tributary of Allt a' Choire (Red Burn catchment)
NGR:	NG 32460 47143
Description:	New crossing. Small watercourse with a poorly-defined channel of variable width (~1 m). Channel is slightly incised with low banks and the area is very boggy, and vegetated with rushes and moss. Peat depths in the area are around 1.0 – 2.0 m.
Catchment Area:	0.17 km^2
Crossing Type:	New crossing, bottomless culvert



Indicative cross-section of bottomless culvert (not to scale)

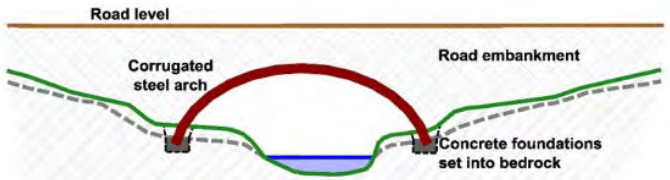
View upstream (SE) of boggy area

View downstream (NW) of poorly-defined channel and rush vegetation



Watercourse Crossing Details

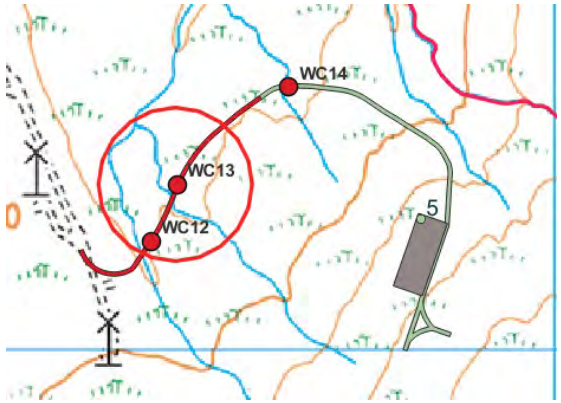
Crossing:	WC13
Location:	New track between T4 and T5
Watercourse:	Unnamed tributary of Allt a' Choire (Red Burn catchment)
NGR:	NG 32496 47203
Description:	New crossing. Small watercourse with a poorly-defined channel of variable width (0.5 – 1 m). Channel is slightly incised, less clear upstream where it is very boggy, and the area is well-vegetated with grass and rushes. Parts of the main flow channel are in a peat pipe. High peat banks (~1 m) are present at the sides of the channel. Peat depths in the area are around 1.5 m.
Catchment Area:	0.13 km^2
Crossing Type:	New crossing, bottomless culvert



View across channel looking downstream and indicative cross-section of bottomless culvert (not to scale)

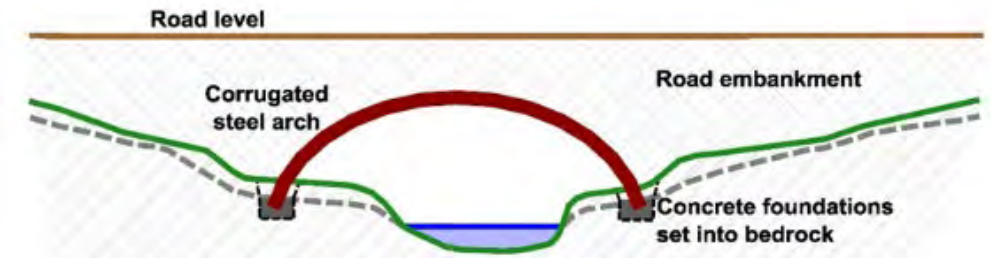
View upstream (SE) showing boggy area with moss vegetation

View downstream (NW) showing peat banks at channel sides



Watercourse Crossing Details

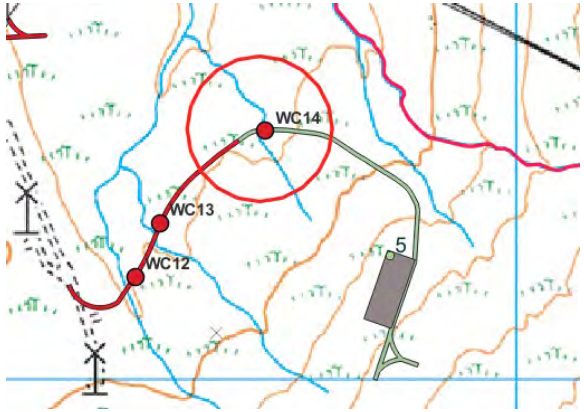
Crossing:	WC14
Location:	New track between T4 and T5
Watercourse:	Unnamed tributary of Allt a' Choire (Red Burn catchment)
NGR:	NG 32648 47339
Description:	New crossing. Small watercourse in narrow, indistinct channel (~0.5 m wide). Channel appears to be cut into peat. Wider area is grassy with boggy areas. Peat depths in the area are around 2.0 m.
Catchment Area:	0.12 km^2
Crossing Type:	New crossing, bottomless culvert



Indicative cross-section of bottomless culvert (not to scale)

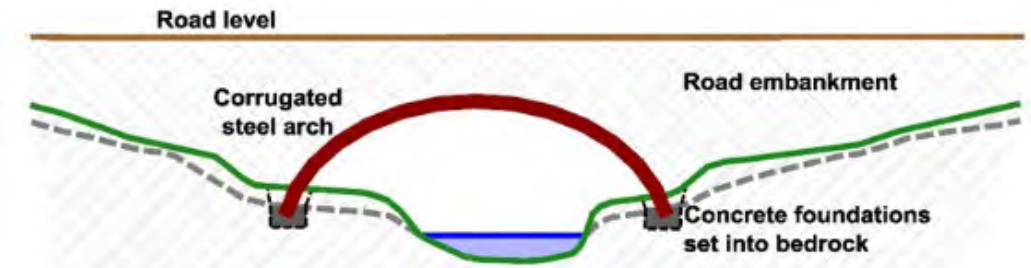
View upstream (SE) of well-vegetated channel banks

View downstream (NW) of steeply incised channel



Watercourse Crossing Details

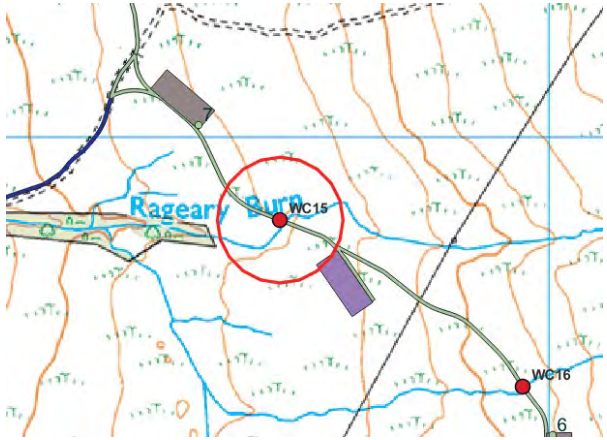
Crossing:	WC15
Location:	New track between T6 and T7
Watercourse:	Rageary Burn (Caroy River catchment)
NGR:	NG 31571 46857
Description:	New crossing. Small watercourse with a relatively well-defined narrow channel (~0.5 m). Banks are well-vegetated with grass and heather. Peat depths in the area are around 1.5 m.
Catchment Area:	0.23 km^2
Crossing Type:	New crossing, bottomless culvert



Indicative cross-section of bottomless culvert (not to scale)

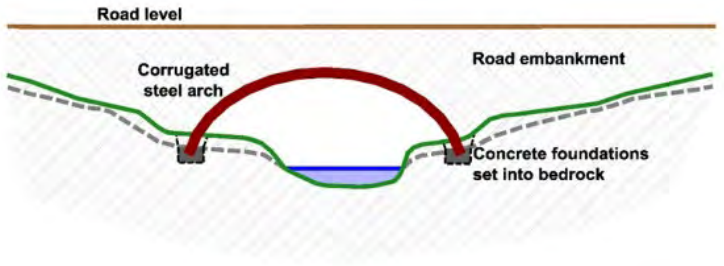
View upstream (NE) of channel and grassy vegetation

View downstream (SW) of channel



Watercourse Crossing Details

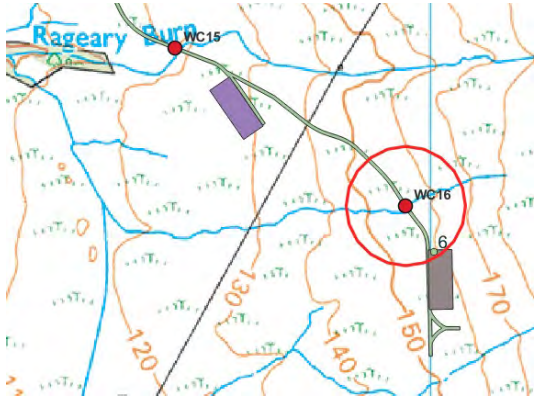
Crossing:	WC16
Location:	New track between T6 and T7
Watercourse:	Unnamed tributary of Rageary Burn (Caroy River catchment)
NGR:	NG 31959 46597
Description:	New crossing. Small watercourse with a narrow channel (~0.5 m) which becomes more well-defined downstream. Banks are well-vegetated with grass and heather. Peat depths in the area are around 0.5 m.
Catchment Area:	0.11 km^2
Crossing Type:	New crossing, bottomless culvert



View across channel and indicative cross-section of bottomless culvert (not to scale)

View upstream (E) of poorly defined channel

View downstream (W) of well-vegetated channel



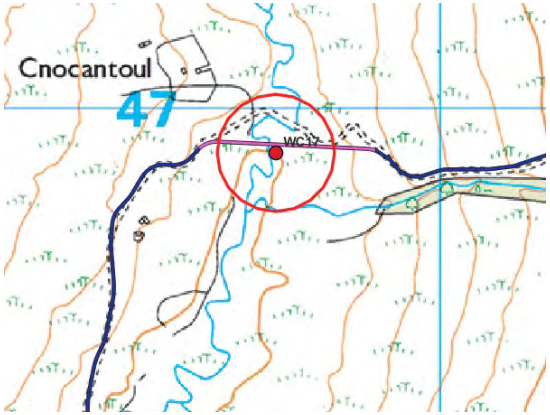
Watercourse Crossing Details

Crossing:	WC17
Location:	Crofters' track
Watercourse:	Caroy River
NGR:	NG 30712 46926
Description:	Existing bridge structure and culverts under existing track which will require relocating and replacing. Moderate, well-defined watercourse of width around 2 - 3 m. Bed is cobbles with bedrock outcrop. Banks are vegetated with grass. Original channel shows significant peat banks with localised instability following re-routing of main channel. Peat depths are <0.5 m.
Catchment Area:	3.93 km^2
Crossing Type:	Existing bridge structure, requires relocating and replacing

Existing bridge structure

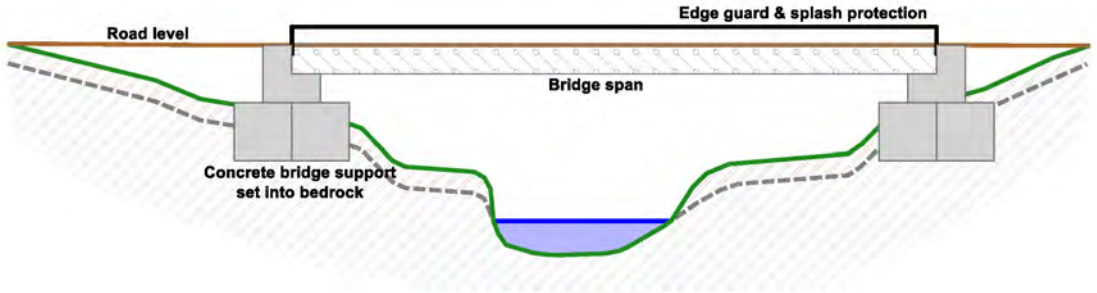
View upstream (N) of channel showing cobbles in-stream

View downstream (S) of straightened channel



Watercourse Crossing Details

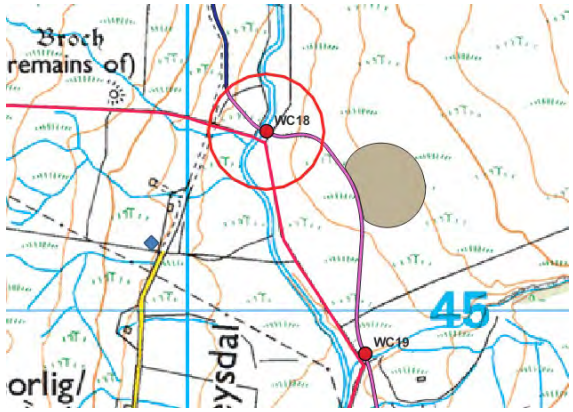
Crossing:	WC18
Location:	Caroy River between existing crofters' track and Southern Site Access
Watercourse:	Caroy River
NGR:	NG 30138 45307
Description:	New crossing required adjacent to existing ford. Moderate, well-defined watercourse roughly 4 m wide. Western bank is vegetated with grass; eastern bank is more steeply sloping with potential instability. Bedrock, cobbles and boulders exposed in channel in areas. Peat depth is ~0.5 m.
Catchment Area:	7.60 km^2
Crossing Type:	New crossing, bridge



Indicative cross-section of bridge (not to scale)

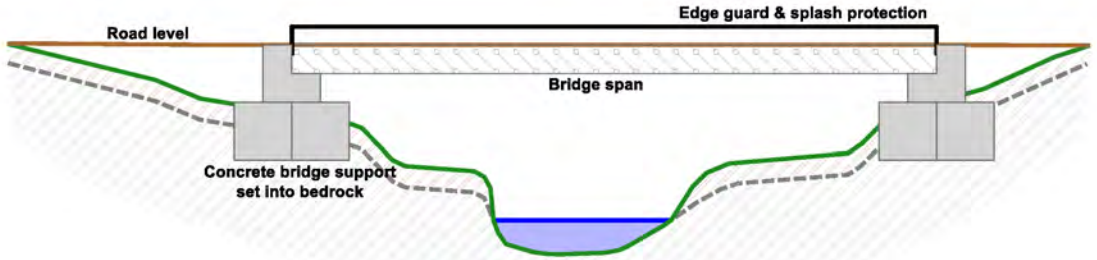
View upstream (N) showing steep eastern bank

View downstream (S) of existing ford



Watercourse Crossing Details

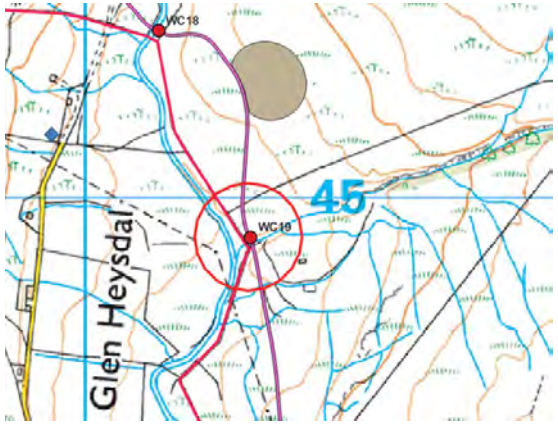
Crossing:	WC19
Location:	North of Southern Site Access, where Aketil Burn meets Caroy River
Watercourse:	Aketil Burn
NGR:	NG 30307 44918
Description:	New crossing required adjacent to existing ford. Moderate watercourse within a well-defined channel. Upstream banks are high, rocky and well-incised. Bedrock, boulders and cobbles are present in channel. Banks are vegetated with grass. Peat depths in the area are around 0-0.5 m.
Catchment Area:	2.73 km^2
Crossing Type:	New crossing, bridge



Indicative cross-section of bridge (not to scale)

View upstream (NE) of boulders and cobbles in channel

View downstream (SW) of raised channel banks and existing ford



Additional Watercourse Crossings

4.30 In addition to the 19 watercourse crossings detailed above, a crossing of six minor watercourses would be required. Four of these are existing circular culverts under existing tracks. Locations and details are provided in **Table 9.4.3**.

Table 9.4.3: Overview of Minor Watercourse Crossings

Name	NGR	Comments
X01	NG 32004 49949	Existing culvert under Northern Site Access which may require upgrading. Minor tributary of the Red Burn through area of forestry.
X02	NG 32004 49163	Existing culvert under Northern Site Access which may require upgrading. Minor tributary of the Allt Donachaidh.
X03	NG 30133 45950	Existing culvert under crofter's track which may require upgrading. Minor tributary of the Caroy River.
X04	NG 30040 45557	Existing culvert under crofter's track which may require upgrading. Minor tributary of the Caroy River.
X05	NG 30325 44836	New crossing required for the Southern Site Access. Minor tributary of the Caroy River.
X06	NG 30339 44767	New crossing required for the Southern Site Access. Minor tributary of the Caroy River.

4.31 Small-scale drainage features are common across the Site, particularly in areas around watercourse headwater channels. There would be further drainage requirements along the proposed access routes to maintain existing drainage capacity in these areas, particularly during periods of wet weather.

Enhancement Opportunities

4.32 The repowering and extending proposals for the Site bring potential opportunities for improvement or enhancement of existing watercourse crossing structures that are not in line with current best practice.

4.33 The most notable opportunity relates to WC17, where the existing crossing would require replacement as a result of a change in the track alignment. The river channel has been straightened in this location, to facilitate installation of a modest bridge structure (**Photograph 9.4.1**). Relocation of the crossing would allow consideration of the opportunity to restore the river's natural course, helping to restore the freshwater habitats and natural flow patterns in this section of the river (**Photograph 9.4.2**). This opportunity would be investigated as part of the detailed design process in consultation with SEPA and local landowners.

Photograph 9.4.1 View of existing crossing showing cobbles dredged from the channel to either side of the bridge. View N from NGR NG 3071 4695.

Photograph 9.4.2 View of original river channel and current twin pipe culvert crossing. View N from NGR NG 3075 4694.

4.34 Other existing pipe culvert crossings may also provide opportunities for enhancement through replacement of closed culverts with open-bottomed structures and reinstatement of natural watercourse channels. Any suggestions for reinstatement works would be investigated as part of the detailed design process in consultation with SEPA and local landowners as appropriate.

5 CONCLUSIONS

5.1 This report has assessed the relevant aspects of drainage associated with the Proposed Development. It sets out an outline drainage strategy on which to base detailed design plans, recognising the requirements of THC and SEPA, and taking current best practice guidance into account.

5.2 Currently, the Site drains semi-naturally via overland flow, drainage ditches and natural channels to the existing watercourses in and around the area. The outline drainage strategy promotes maintenance of natural runoff characteristics where possible, and drainage infrastructure to mimic these characteristics where required. Runoff attenuation and treatment proposals are to be designed to prevent any detrimental effects to the water quality or quantity of existing waterbodies. The outline drainage strategy makes use of existing SuDS features within the detailed engineering design to mimic the existing runoff characteristics.

5.3 Proposed SuDS to be incorporated in the detailed design strategy include the use of swales and filter strips, filter drains, check dams, silt fences and straw bales, settlement ponds and sumps at different stages of the Proposed Development. During construction, small sumps with silt fencing would be established periodically along track routes.

5.4 Watercourse crossing locations have been identified and assessed, and appropriate conceptual crossing designs have been suggested for new crossings to ensure that the watercourses retain their natural hydromorphology and ecological characteristics. A total of 14 new regulated crossings and five crossings that may require upgrading have been identified, plus six additional minor crossings. Crossing design would take account of flood water conveyance requirements. Details would be provided post-consent within the detailed design specifications, including any proposals for replacement of existing structures that may be in poor condition or under-sized in terms of their conveyance capacity.

5.5 All necessary authorisations under CAR would be put in place prior to any Site works taking place.

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7 ANNEX A

Print Close Report

HR Wallingford

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Emma Barrie
Site name:	Ben Aketil
Site location:	Skye

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	57.42704° N
Longitude:	6.47485° W
Reference:	279105218
Date:	Jan 23 2023 17:33

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 33.6

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Specify SPR manually

Soil characteristics	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.55

Hydrological characteristics	Default	Edited
SAAR (mm):	1867	1832
Hydrological region:	1	1
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.95	1.95
Growth curve factor 100 years:	2.48	2.48
Growth curve factor 200 years:	2.84	2.84

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

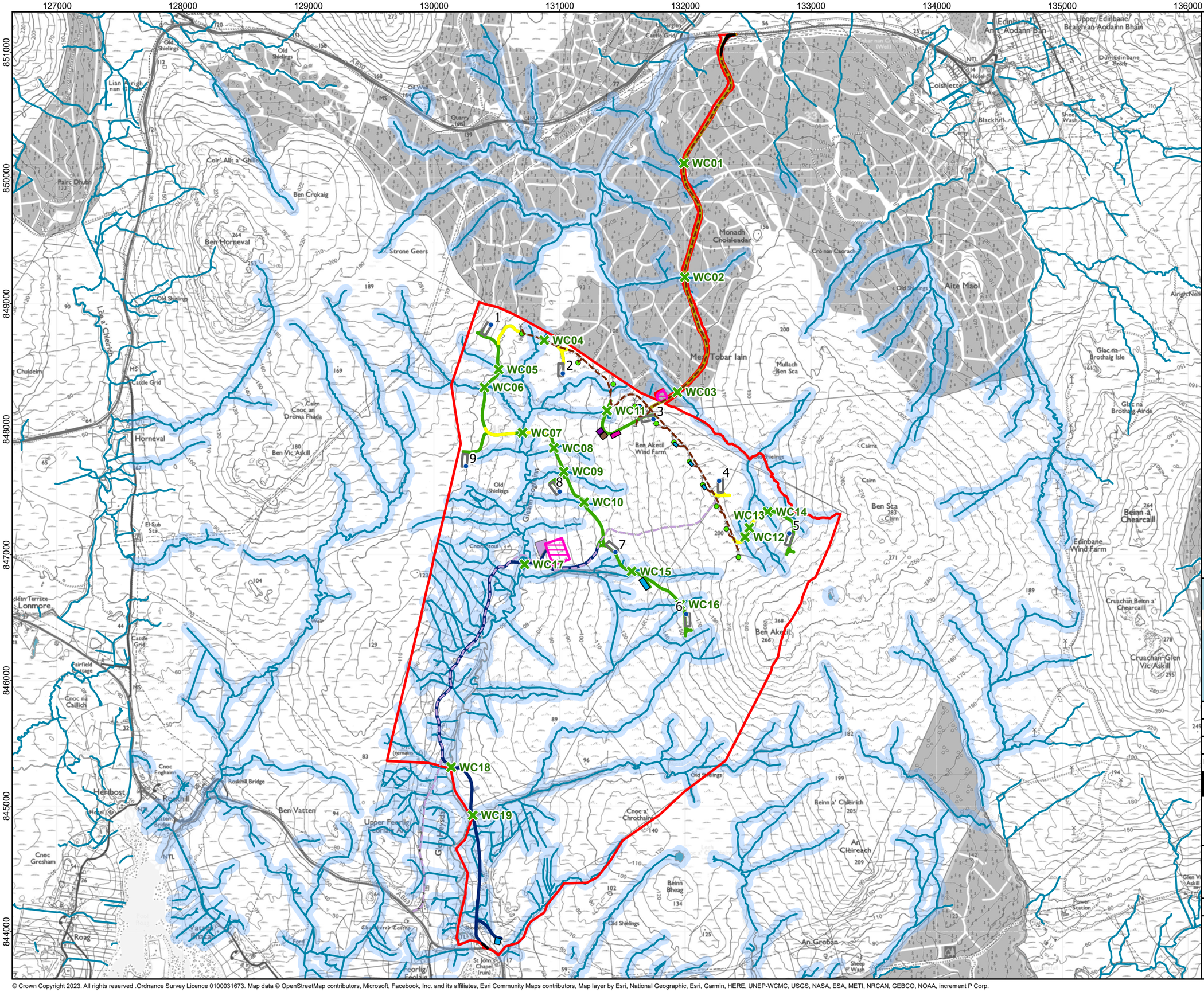
Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	304.17	703.21
1 in 1 year (l/s):	258.54	597.73
1 in 30 years (l/s):	593.13	1371.26
1 in 100 year (l/s):	754.34	1743.97
1 in 200 years (l/s):	863.84	1997.12

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

FIGURES

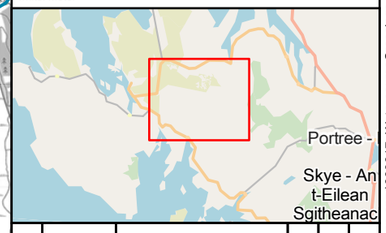
Figure 9.4.1: Watercourse Crossing Locations



Legend:

- The Site
- Proposed New Turbine Locations
- Existing Turbine Layout
- Hardstanding
- Existing Access Track
- Existing Crofters' Track
- Bell mouth junction modification
- Wind Farm Access Track
- Floating Access Track
- Northern Access Track
- Southern Access Track
- Construction Compound
- Substation and Compound Area (Repower)
- Substation and Compound Area (Extension)
- Storage Bund
- Borrow Pit
- Battery Storage
- Watercourse Crossing
- Watercourse
- Surface Water Feature
- Surface Water 50m Buffer

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
01	28/04/2023	Revised Logo	DL	SA	DB
00	02/03/2023	Watercourse Crossings	DL	SA	DB

Ben Aketil Wind Farm

RSK Renantis Folk Renewables

TITLE: Figure 9.4.1:
Watercourse crossing locations

ID:P663617_TechnicalApp_663617_WatercourseCrossings

0 0.5 1
Kilometres
Scale: 1:28,000 @ A3

N W E S

REV 01