

10. Technical Appendix 10.3: Watercourse Crossings Assessment

10.1 Executive Summary

- 10.1.1 There is the potential, were best construction practice not implemented, for watercourse crossings to lead to direct alteration to the physical characteristics of watercourses and for the release of sediments and/or chemical pollutants during construction to affect the quality of aquatic habitats and the quality of downstream water supply.
- 10.1.2 The purpose of this Technical Appendix is to provide a conceptual assessment of watercourse crossings and to outline the strategic approach to those proposed crossings. It does not comment on the detailed engineering design. The Principal Contractor (the Contractor) would have overall responsibility for designing water crossings, for the production of a final Watercourse Crossing Plan and for compliance with the Water framework Directive (WFD).
- 10.1.3 This Technical Appendix identifies proposed watercourse crossing points and outlines the key characteristics of the streams they shall span. Crossing points are assessed in relation to meeting requirements of the Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended (the 'CAR Regulations'), and likely crossing types and permitting requirements are set out.
- 10.1.4 Through adherence to best practice measures as specified in Scottish Environment Protection Agency (SEPA) guidance identified in this Technical Appendix, detailed design of watercourse crossings would ensure the uninhibited passage of fish at relevant locations and the provision of sufficient capacity to pass the climate change adjusted 1:200-year flood, and, include an allowance for potential partial blockage.
- 10.1.5 It is concluded that any new crossings proposed for the site would require Registration or a Simple Licence, subject to detailed design. In order to adopt a conservative approach, it is assumed that the crossings at larger streams would require a Simple Licence. However, this will need to be confirmed by the Contractor through further consultation with the Applicant and SEPA at detailed design stage. These crossings may only require Registration, dependant on detailed design.

10.2 Introduction

- 10.2.1 A number of new watercourse crossings are required for the Proposed Development. This Technical Appendix has been produced in order to meet the requirements of the Water Framework Directive (WFD) as set out below.
- 10.2.2 The purpose of this document is to provide a conceptual assessment of watercourse crossings and to outline the strategic approach to those proposed crossings. It does not comment on the detailed engineering design. The Principal Contractor (the Contractor) would have overall responsibility for designing water crossings, for the production of a final Watercourse Crossing Plan and for compliance with the WFD.
- 10.2.3 Field surveys of the Proposed Development site have been used to determine characteristics of the watercourses (such as the bed width, channel depth, bed substrate and bankside vegetation) in order to identify the likely level of authorisation required. This Technical Appendix also sets out the general principles of design which the Contractor will follow in order to minimise changes to the hydrological regime and reduce any potential impacts on river morphology and aquatic ecology.

10.3 Legislation

- 10.3.1 The principal legislation with regard to the water environment is provided by the WFD. The WFD aims to protect and enhance the quality of surface freshwater (including lakes, rivers and streams), groundwater, Groundwater Dependent Terrestrial Ecosystems (GWDTEs), estuaries and coastal waters.
- 10.3.2 The key objectives of the WFD relevant to this assessment are:
- To prevent deterioration and enhance aquatic ecosystems; and
 - To establish a framework of protection of surface freshwater and groundwater.
- 10.3.3 The WFD resulted in the Water Environment and Water Services (Scotland) Act 2003 (WEWS Act), which gives Scottish Ministers powers to introduce regulatory controls over water activities, in order to protect, improve and promote sustainable use of Scotland's water environment.
- 10.3.4 The Scottish Environment Protection Agency (SEPA) is the public body responsible for environmental protection in Scotland under both the Environment Act 1995 and the WEWS Act. Many SEPA policies relating to water are now delivered by the regulatory methods produced to implement the Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended (the 'CAR Regulations'). The CAR Regulations mean that it is an offence to undertake the following activities with regard to watercourse crossings without an authorisation under the CAR Regulations:
- Discharges to all wetlands, surface waters and groundwaters (replacing the Control of Pollution Act 1974);
 - Impoundments (dams and weirs) of rivers, lochs, wetlands and transitional waters; and
 - Undertaking of engineering works in inland waters and wetlands.

- 10.3.5 Any proposed access track water crossings would therefore require authorisation under the CAR Regulations¹. CAR regulations state that authorisation shall be required for engineering activities on watercourses recorded on 1:50,000 scale Ordnance Survey Maps.
- 10.3.6 The SEPA Position Statement on Culverting of Watercourses² (WAT-PS-06-02) and Supporting Guidance on Sediment Management³ (WAT-SG-78) have also been taken into account within this assessment, along with the supporting guidance provided in the River Crossings Good Practice Guide.

10.4 Identification of Watercourse Crossing Locations

- 10.4.1 Based on initial infrastructure design, a desk-based assessment was carried out by Ramboll to identify watercourse crossing locations based on 1:50,000 OS mapping and aerial imagery (captured 2019). Field surveys of potential watercourse crossings were then carried out in May 2019 and watercourse data was collected as recorded to GPS locations to a minimum accuracy of +/- 10m.
- 10.4.2 A total of 12 new watercourse crossings were identified as part of the Proposed Development and are presented in Figure 1. Photographs of the surveyed locations are presented in Technical Annex 1. The average channel width and depth in the vicinity of the potential watercourse crossing location, as well as the bed substrate material are presented below in Table 1.
- 10.4.3 Surveys were not carried out on four of the watercourses, at which new crossings are proposed, as the locations had not been confirmed at the time of the site walkover. Watercourses that were not surveyed were recorded to form minor tributaries to the River Tarff. In all of these cases, the channel width of all tributaries was noted to be less than 1m at their point of discharge to the River Tarff.

Table 1: Watercourse Crossing Locations

Crossing Location	Details	Easting	Northing	Conditions at closest survey point	
				Channel width (m)	Substrate
1	River Tarff	246854	802768	3	Bedrock/Cobble
2	River Tarff	246455	802768	2	Peat/Boulder
3	Caochan Uilleam	247722	802929	2.4	Bedrock/Boulder
4	Caochan Uilleam	247988	801515	3.5	Peat
5	Allt Creag Chomaich	249406	801423	4.2	Cobble/Boulder
6	Allt Lochan Iain	248841	800905	2.5	Cobble/Boulder

¹ SEPA, 2019. The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended): A Practical Guide, Version 8.4. [Available at: https://www.sepa.org.uk/media/34761/car_a_practical_guide.pdf]

² SEPA, 2015. SEPA Position Statement to support the implementation of the Water Environment (Controlled Activities) (Scotland) Regulations 2011. WAT-PA-06-02: Culverting of Watercourses (Version 2.0)

³ SEPA, November 2012, Engineering in the water environment: River Crossings Good Practice Guide (WAT-SG-25)

Crossing Location	Details	Easting	Northing	Conditions at closest survey point	
				Channel width (m)	Substrate
7	Caochan Uchdach	257018	802612	1.6	Gravel/Cobble
8	Allt Mor	257080	804112	1.6	Gravel/Cobble
9	Tributary to River Tarff (west)	246105	801750	N/S	N/S
10	Tributary to River Tarff (west)	246216	801586	N/S	N/S
11	Tributary to River Tarff (east)	246647	801341	N/S	N/S
12	Tributary to River Tarff (east)	246843	801932	N/S	N/S

10.5 Type of Crossings

10.5.1 The watercourse characteristics, both physical and ecological, will be matched to the most appropriate crossing type as part of detailed design. The potential crossing types and are described in below:

- Single span structures - recommended where there is a need to minimise disturbance to the bank and bed of the watercourse. Where it is possible to set back abutments from the watercourse it is possible to maintain bank habitats under the crossing. Taking in to account the maximum width of crossings to be undertaken on the Proposed Development, it is not anticipated that in-stream supports will be necessary at any crossings. Such crossings include half barrel culverts with a sufficient span to incorporate the existing bed and banks of watercourses.
- Bottomless Box/Arches - can be used where there are watercourses narrower than those appropriate for bridge construction, but which have a requirement to provide mammal and/or fish passage and ensure sufficient hydraulic capacity during peak flow periods. Arches minimise disruption to stream base. Box culverts may incorporate mammal ledges and can be buried below stream bed level to enable bed material replacement.
- Circular Culverts - where potential impact is negligible due to the size, location or typology of the watercourse circular culverts can be embedded into the channel to allow the natural bed to re-establish and where necessary provision can be made for mammals adjacent to the culvert. Where a circular culvert is utilised, it is assumed that neither natural bed material, or water velocity nor depth are critical other than in the purely hydraulic sense. Thus, circular culverts provide an economic and viable solution.
- Porous granular rock fill blanket and perforated pipes - where there is no clearly defined channel flow, flow can be maintained by a drainage blanket wrapped in geotextile placed below the road construction. Where such a crossing structure is utilised, flow is predominantly sub-surface interflow and a porous fill below the

track provides flow continuity without concentrating the discharges into a narrow channel.

10.6 CAR Authorisations

10.6.1 As set out previously, the CAR Regulations advise on which activities are regulated by SEPA. In particular, Section 6 of the Water Environment Regulation Practical Guide sets out that CAR requires authorisation for the carrying out of building or engineering works, or works other than impounding works in:

- inland surface water (other than groundwater) or wetland; or
- in the vicinity of inland water or wetlands and having, or likely to have, a significant adverse impact on the water environment.

10.6.2 In order to allow for proportionate regulation based on the risk an activity poses to the water environment, there are three types of CAR authorisation as described in the following paragraphs.

10.6.3 The detailed design of bridges and other crossings will include the application to SEPA for the necessary consents under CAR.

Levels of Authorisation

General Binding Rules

10.6.4 General Binding Rules (GBRs) represent a set of mandatory rules which cover specific low risk activities. Activities complying with the rules do not require an application to be made to SEPA, as compliance with a GBR is considered to be compliance with an authorisation. Since the operator is not required to apply to SEPA, there are no associated charges. SEPA uses its statutory role in the land use planning system to highlight GBRs that may apply to a given proposal. The individual GBRs are described in more detail in the appropriate regime-specific sections of the Water Environment Regulation Practical Guide. They are numbered according to Schedule 3 of the CAR Regulations.

Registrations

10.6.5 These allow for the registration of small-scale activities that individually pose low environmental risk but, cumulatively, can result in greater environmental risk. Operators must apply to SEPA to register these activities. A registration will include details of the scale of the activity and its location, and there will be a number of conditions of registration that must be complied with. There is an application fee for registrations, though subsistence (annual) charges do not apply.

Licences

10.6.6 These allow for site-specific conditions to be set to protect the water environment from activities that pose a higher risk. Licences can cover linked activities on a number of sites over a wide area, as well as single or multiple activities on a single site. Application fees apply to all licences, and subsistence (annual) charges may apply. SEPA has simple licences and complex licences for activities for which different charges apply. A key feature of CAR licences, unlike GBRs and registrations, is that they require the applicant to nominate a 'responsible person' (i.e. an individual/partnership/company) to be held accountable for securing compliance with the terms of the licence.

10.7 Likely Levels of CAR Authorisation

New Watercourse Crossings

- 10.7.1 Where watercourse crossings span larger streams (>2m in width) identified during surveying of the site SEPA⁴ guidance typically requires that single span bridges and bottomless arch structures should be pursued, where practicable. It is anticipated that single span structures associated with the Proposed Development would not include construction on the river bed and that there shall be ≤20 m of total bank affected at each crossing. As such, these bridge crossings would be likely to fall under CAR Registration, subject to detailed design.
- 10.7.2 At the remaining potential watercourse crossing locations, it has been assumed for the purposes of this Technical Appendix that the proposed watercourse crossings could constitute culverts and would, therefore, involve construction on the bed or banks of the watercourses. Where feasible, bottomless arched culverts may be installed, however it is noted that closed culverts are likely to be appropriate at some locations due the small size of watercourses.
- 10.7.3 This suggests that any new crossings proposed for the site would require Registration or a Simple Licence, subject to detailed design. In order to adopt a conservative approach, it is assumed that the crossings at larger streams would require a Simple Licence. However, this will need to be confirmed by the Contractor through further consultation with the Applicant and SEPA at detailed design stage. These crossings may only require Registration, dependant on detailed design.
- 10.7.4 Where closed culverts are to be employed on single track roads and where the watercourses are less than or equal to 2m wide Registration shall be required.

Existing Watercourse Crossings

- 10.7.5 Existing watercourse crossings providing access to the site were installed with construction of the Stronelaig Wind Farm. Crossings comprise a combination of bridges and closed culverts. CAR licenses for existing crossings are held by SSE and such structures shall not be subject to upgrade or improvement works. No works shall be carried out in proximity to surface waters at existing watercourse crossings.

Land Drains and Peat Gullies

- 10.7.6 The site is covered by areas of degraded peat and as such gullies and smaller erosional features are present across the site. Such features are characterised by ephemeral flows during periods of surface runoff due to saturation of the surrounding peat soils. It is anticipated that such features will be identified and numbered on a detailed plan prior to construction. Where such gullies or runnels are to be crossed, they will be surveyed in further detail and a plan provided for each crossing so that crossings identified meet the required standards for construction. Detailed plans shall include the number and type of culverts to be installed prior to construction. Where such features are to be crossed by proposed access tracks, it is assumed that the watercourses at these locations would not require Registration as such channels are not recorded on 1:50,000 mapping.

⁴ WAT-PA-06-02, Section 2.3

10.8 Construction Requirements

- 10.8.1 Prior to the commencement of works, the contractor would be required to produce detailed watercourse crossing proposals within the Construction Environmental Management Plan (CEMP), which would contain the construction details for each proposed watercourse crossing. The CEMP must make reference to SEPA guidance, including the Position Statement on Culverting of Watercourses, Supporting Guidance on Sediment Management and the River Crossings Good Practice Guide, as well as potential fisheries, other interests and protected species.
- 10.8.2 As set out previously, the purpose of this Watercourse Crossing Assessment is only to provide a conceptual assessment of watercourse crossings and to outline the strategic approach to proposed crossings rather than to comment on the detailed engineering design. The construction Contractor will have overall responsibility for the undertaking of these water crossings and for the production of a final watercourse crossing proposals.

10.9 Watercourse Crossings

- 10.9.1 The detailed design of each watercourse crossing shall seek to ensure hydraulic conveyance is maintained to prevent any restriction of flows, as well as allowing the free passage of mammals and aquatic ecology, including provision of suitable ledges or mammal crossings to ensure free passage to otters during periods of high water-flow. Therefore, it is proposed each watercourse crossing would have sufficient capacity to pass the climate change adjusted 1:200-year flood, and, include an allowance for potential partial blockage.
- 10.9.2 Where closed culverts are employed, they shall be oversized such that the base of culvert may be below the natural bed level of the watercourse allowing the naturalisation of the culvert bed substrate. Culverts shall follow the natural flow path and gradient of watercourses to which they are installed and shall be designed such that they do not represent a barrier to fish and other fauna. Culverts shall not include screening.
- 10.9.3 Detailed flow calculations would be undertaken by the Contractor in order to inform detailed design and to inform applications for CAR authorisation. Were any new crossings identified, consideration would be given to any local variations in channel dimensions and to bankside conditions. Where feasible within micro-siting allowances, the narrowest locations will be selected, and the stability of the channel banks will also be considered. The Contractor shall submit a detailed plan of proposed watercourse crossings to SEPA for acceptance.
- 10.9.4 Splash boards and run-off diversion measures, including silt fencing adjacent and parallel to watercourses beneath crossings, will be used at all crossings during construction to prevent direct siltation of watercourses.
- 10.9.5 Anticipated watercourse crossing types and level of CAR authorisation are specified in Table 2 below.

Table 2: Watercourse crossing locations

Crossing Location	Details	Likely Crossing Method	Likely Level of CAR Authorisation
1	River Tarff	Single span (bridge or half barrel culvert)	Simple License

Crossing Location	Details	Likely Crossing Method	Likely Level of CAR Authorisation
2	River Tarff	Single span (bridge or half barrel culvert)	Simple License
3	Caochan Uillen	Single span (bridge or half barrel culvert)	Simple License
4	Caochan Uillen	Single span (bridge or half barrel culvert)	Simple License
5	Allt Creag Chornaich	Single span (bridge or half barrel culvert)	Simple License
6	Allt Lochan Iain	Single span (bridge or half barrel culvert)	Simple License
7	Caochan Uchdach	Single span (bridge or half barrel culvert)	Registration
8	Allt Mor	Single span (bridge or half barrel culvert)	Registration
9	Tibutary to Riiver Tarff (west)	Closed Culvert	Registration
10	Tibutary to Riiver Tarff (west)	Closed Culvert	Registration
11	Tibutary to Riiver Tarff (east)	Closed Culvert	Registration
12	Tibutary to Riiver Tarff (east)	Closed Culvert	Registration

10.10 Track Drainage

- 10.10.1 To ensure that all drainage measures employed during the construction phase of the Proposed Development are maintained appropriately and remain effective, the performance of the drainage measures will be monitored. The drainage management works will, therefore, be supervised by the Ecological Clerk of Works (ECoW). All monitoring and supervision of the drainage management works will be recorded. It is noted that activities formerly carried out under GBR 10b (i.e. discharge of water run-off from a construction site to the water environment where the site, including any constructed access tracks) would now require a 'license' as the site exceeds 4 ha, contains >5km track/road or any area and potentially >1 ha or 500 m or road with gradient >25 degrees.
- 10.10.2 Greenfield 'clean' run-off and track run-off should be kept separate where possible and be channelled separately to suitably vegetated areas at least 50m from watercourses to allow the settlement of solids. Where settlement over vegetation is not ecologically sound (e.g. involving blanket bog, requiring only rain-fed nutrients), or where this is not practical due to the type or scarcity of vegetation cover and/or available area, silt traps or settlement lagoons will be utilised and monitored to ensure stored surface water is kept to a minimum.
- 10.10.3 Cross drains will be installed at regular intervals along trackside drainage. Cross drains will be installed as pipe culverts under the track surface. The frequency of cross drains should increase in areas where higher flows are anticipated such as in areas of high

surface flow (e.g. flushes or low lying areas); where bank seepages are noted; and where historical or active drains are intercepted. Requirements for a temporary silt trap at each end of a cross drain will be assessed prior to the works being undertaken.

- 10.10.4 Pipe culverts used for cross drainage will be long enough so that road fill does not extend beyond the end of a culvert. Pipes will be laid at grades at least 2% (1:50) but no greater than 10% (1:10) and angled 30 to 45 degrees cross-track to improve inlet efficiency. Check dams will be installed immediately above a cross drain inlet and silt traps are required at the inlet points to prevent blockage of the pipe due to silt build up.

Annex 1: Watercourse Crossing Photos

Location: WC 1 (River Tarff)



Photo 1: Downstream



Photo 2: Upstream

Location: WC 2 (River Tarff)



Photo 1: Downstream



Photo 2: Upstream

Location: WC 3 (Caochan Uilleim)



Photo 1: Downstream



Photo 2: Upstream

Location: WC 4 (Caochan Uilleim)



Photo 1: Downstream



Photo 2: Upstream

Location: WC 5 (Allt Creag Chomaich)



Photo 1: Downstream



Photo 2: Upstream

Location: WC 6 (Allt lochan Iain)



Photo 1: Downstream



Photo 2: Upstream

Location: WC 7 (Caochan Uchdach)



Photo 1: Downstream



Photo 2: Upstream

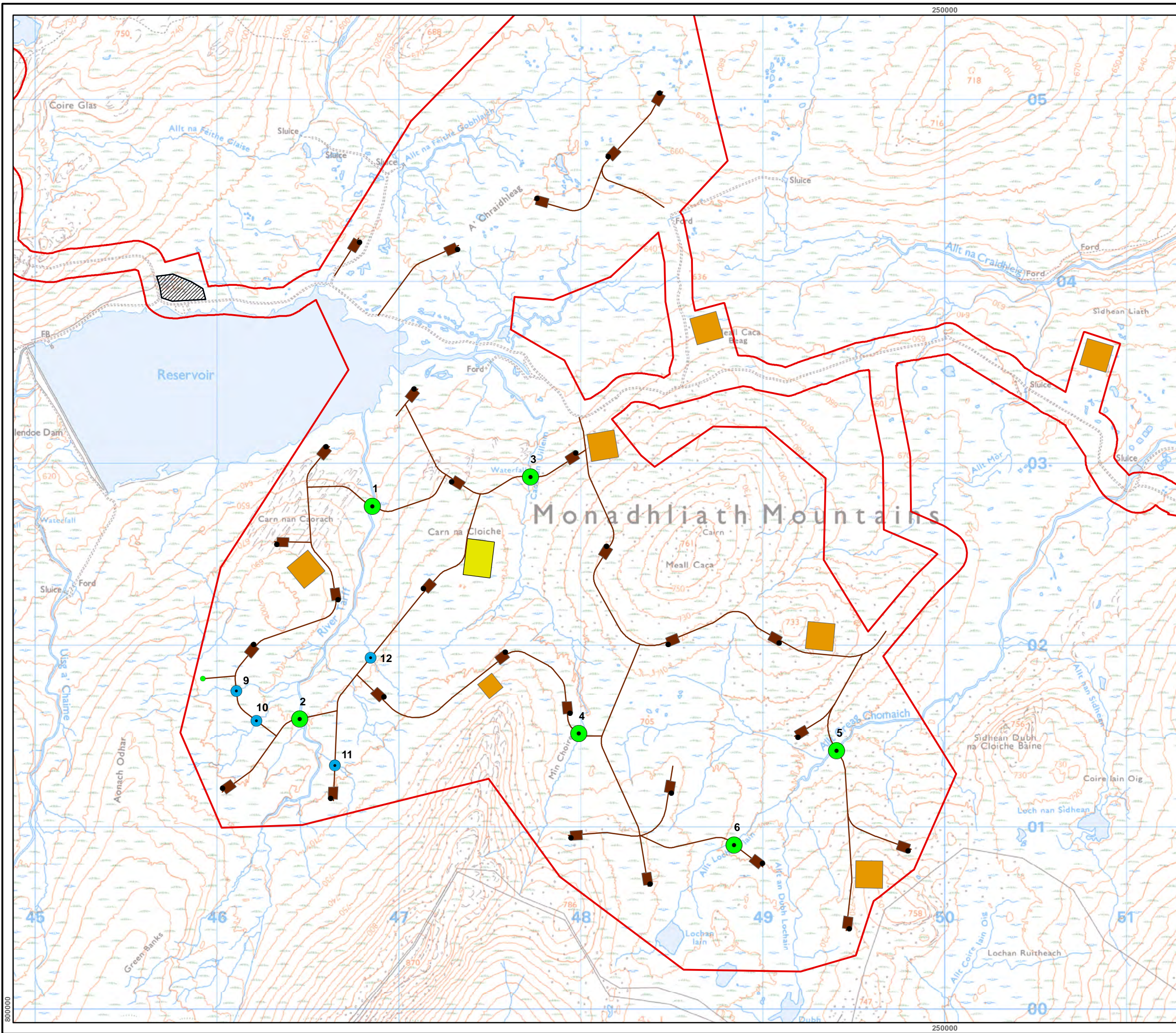
Location: WC 8 (Allt Mor)



Photo 1: Downstream



Photo 2: Upstream



Key

- LiDAR
- Turbine
- Track
- Borrow Pit Search Area
- ▨ Batching Plant
- ▭ Compound
- Hardstanding
- ▭ Site Boundary
- Substation
- Watercourse Crossings
- Survey Status
- Surveyed Crossing
- Desktop Review

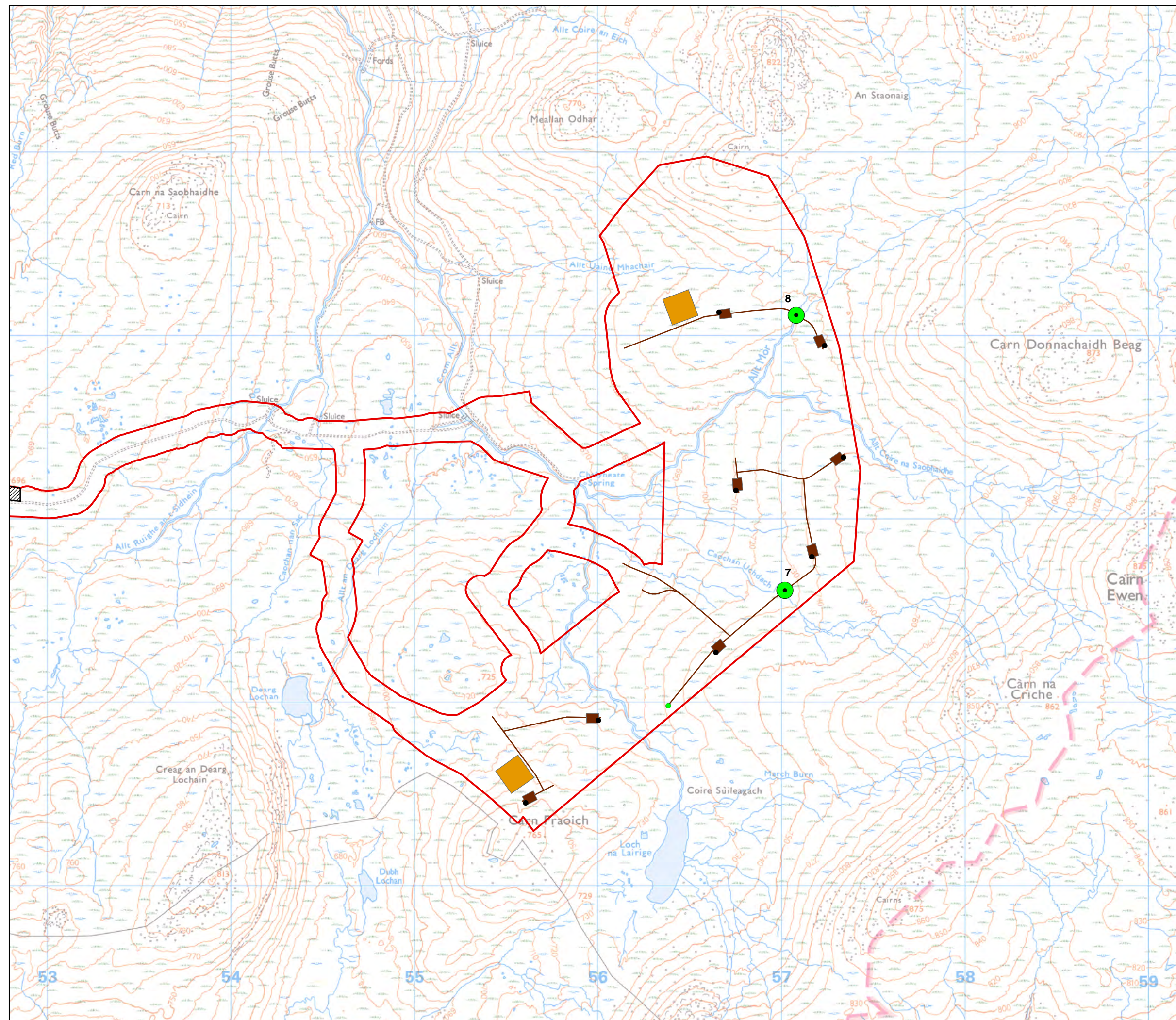
0 200 400 600 800 1,000 m

Scale: 1:20,000 @ A3



Figure 1(a)
Watercourse Crossings

Cloiche Wind Farm
Technical Appendix 10.3



- Key**
- Site Boundary
 - LiDAR
 - Turbine
 - Track
 - Borrow Pit Search Area
 - Batching Plant
 - Compound
 - Hardstanding
 - Substation
 - Watercourse Crossings
 - Survey Status
 - Surveyed Crossing
 - Desktop Review

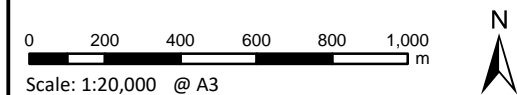


Figure 1(b)
Watercourse Crossings