Dickins Hydro Resources

Glen Etive Hydro Schemes, Construction Standards and Guidance

A Supplementary Document to the Construction Method Statements

In regard to the following Hydro projects:-

Chaorainn Hydro
Ceitlein Hydro
Fhaolain Hydro
Charnan Hydro
Gaoirean Hydro
Mheuran Hydro
Bhiorain Hydro

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1 Introduction

1.1 Scope of document

This document describes the working practices that contractors and subcontractors are expected to follow when working on projects commissioned by Dickins Hydro Resources Ltd or its affiliated companies.

This document does not cover mitigations that may be required for site specific environmental constraints – these are documented in the Works Information or Construction Method Statement for that project.

This document does not represent a Construction Phase Plan or activity-specific method statements or risk assessments – the Principal Contractor and subcontractors (where appropriate) are responsible for these documents.

1.2 References

The following documents have been used as source material or are referred to in this document:

[1] A guide to Hydro Power Construction Good Practice, Joint Publication by The Scottish Government, SEPA, Scottish Renewables, SNH. Version2, 2015.
[2] Pollution Prevention Guideline (PPG) 5: Works and Maintenance In or Near Water, SEPA. 2007
[3] Pollution Prevention Guideline (PPG) 6: Working at Construction and Demolition Sites, SEPA. 2012.
[4] Pollution Prevention Guideline (PPG) 21: Pollution Incident Response Planning, SEPA. 2014.
[5] Engineering in the Water Environment Good Practice Guide: Temporary Construction Methods, WAT-SG-29, SEPA. March 2009
[6] Guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste, SEPA & Scottish Renewables. Jan 2012
[7] Constructed tracks in the Scottish Uplands. 2nd Edition June 2013 updated Sept 2015

2 Preparation for construction

2.1 Planning the work

Most pollution incidents can be avoided by properly planning the work. As a minimum the following is expected:

- Appointment of Ecological Clerk of Works (ECoW).
- Identify the extents of the site and working areas.
- Identify the location of watercourses or water bodies that have the potential to be polluted by the works.
- Identify the drainage routes away from working areas.
- Plan site drainage to ensure that there is adequate space for sediment management controls.
- Identify potential sources of pollution.
- Prepare emergency response plans.
- Identification of personnel responsible for planning, inspection and maintenance of environmental controls.

2.1.1 Layout of working areas

The layout of working areas is to be planned to consider both health & safety and environmental hazards.

It is particularly important to plan the working areas to allow drainage to be managed effectively, for example:

- Locating working areas as far from watercourses as possible
- Where working areas must be close to watercourses:-

  leave a strip of undisturbed ground between the working area and the watercourse,
  wherever possible ensure that the working areas will drain away from the watercourse,
  leave adequate space for sediment management controls between the drainage point of the working area and the working area

The layout of working areas must be set out to consider the reinstatement of the site, this includes:

- The layout of working areas must consider the use of the working area throughout the works – this ensures that the area can be properly prepared and reduces the risk of the working area expanding throughout the work and the quality of reinstatement being compromised.
- Identification of all construction corridors, working areas and materials storage areas prior to construction to minimise footprint of the works
- Working areas and construction corridors to be kept to the minimum size necessary for the works

2.1.2 Emergency response plans

The Principal Contractor is responsible for preparing emergency response plans for the site, these are to include a pollution response plan in strict accordance with SEPA guidelines [4].

As a minimum Spill Kits are to be available wherever plant is in operation, these may be carried on the plant themselves or located close to the working area. Spare spill kits are to be kept at the main compound.

2.1.3 Drainage and sediment management plans

A sediment management plan should be prepared for the site, this should include:

- A site plan showing the location of sediment controls
- The unique identifier for each sediment control
- The calculations used to size the sediment controls
- The inspection regime for the sediment controls
- The inspection records for the sediment controls
- The responsibility for inspection and maintenance of sediment controls

2.2 Preparing the site

2.2.1 Identification and protection of ecology or archaeology

Areas that contain sensitive ecology or archaeology will be identified in the Construction Method Statement. These areas are to be identified and protected before construction work starts. As a minimum the sensitive areas should be identified by being bounded by ticker tape or orange net fencing. Where sensitive areas are located close to working areas (e.g. less than 5m separation), and/or they are particularly sensitive, they should be protected by clearly marking out the area of conflict.

2.2.2 Establishing the working areas

In general the reinstatement of the site is to be optimised by appropriate preparation before construction commences. This includes:

- Trees are not to be felled unless they have been identified as clear for felling.
- Separation of topsoil/turves and sub-soil on establishment of working areas.
- Excavated turf is to be stored turf-side up to encourage reinstatement.
- Creation of working areas as per plans and erection of fencing around these areas to prevent working areas extending without topsoil being stripped and stored.
- Period of disturbance of ground is to be minimised, reinstatement is to be done as soon as

construction work is complete in a given area, not on completion of entire site. Ie on a rolling basis.

- Where the construction corridor crosses stone dykes, these are to be taken down by hand. Once the construction is complete they are to be rebuilt by hand.
- Finished ground levels are to be graded to suit the natural ground profile.
- Small watercourses and natural drainage channels are to be preserved by installation of culverts, thereby maintaining flow of water to ground downstream.
- Bunds are to be placed within the pipe trench around the pipeline at intervals and below areas of particularly wet ground to prevent the pipe trench draining the ground around it.

2.3 Training

The environmental controls that are in place are to be described in the induction process for all site workers and visitors.

Site workers are to be trained on the environmental hazards and controls that are present, including the inspection and maintenance that will be outlined by the ECoW

3 Peat management

The impact of the works on peat will have been minimised through the design process. However there still may be an impact, where the works affect peat the following principles should be followed:

- Minimise plant movements and haul distances in relation to any earthworks activity including peat management.
- Develop appropriate temporary storage areas for excavated peat close to the excavation. Suitable storage areas are more appropriately sited in areas with lower ecological value (e.g. deforested commercial forestry sites) and low stability risk.
- Re-use should occur as soon as possible after excavation where practicable.
- Any peat re-use must tie into the surrounding ground levels to ensure that it does not dry out.
- Any peat that is temporarily stored should be kept wet prior to reinstatement.

If there is a significant impact on peat there will be more detail on peat management set out in the relevant site's Construction Method Statement.

4 Drainage and sediment management

Successful sediment management is achieved by:

1. Planning of site layout and sediment controls before work starts to be approved by the ECoW
2. Creation of cut-off drains and/or culverts to reduce the amount of water that enters working areas to a minimum
3. Having many small sediment traps to deal with dirty water rather than few large ones
4. Regularly inspecting and maintaining sediment traps and cut-off drains

The fundamental principle is to reduce the amount of water that could become contaminated with silt and will therefore need to be treated.

4.1.1 Cut-off drains and temporary culverts

Where the working area is below an area of ground that will drain onto it cut-off drains should be created to divert that water away from the working area and either around the working area or through a culvert.

Where the ground below the working area is normally saturated it is important to maintain the flow of

groundwater to it, therefore culverts should be placed at regular intervals.

Cut-off drains may be created by excavating a strip drain and/or the use of geo-textile or other suitable material as a fence.

Cut-off drains and culverts should be sized to accommodate at least the first 15mm of rain that falls on the catchment above them.

4.1.2 Storage of excavated material

Excavated material is to be stored in such a way that run-off from it is reduced and treated.

Excavated material should be stored at least 10m away from watercourses or waterbodies. Where there is no other option except to store excavated material within 10m of a watercourse or waterbody additional mitigations will be required and must be approved by Dickins Hydro and the ECoW in accordance with SEPA guidelines.

Excavated turves should be stored vegetation-side up and separately from sub-soils.

Excavated subsoil material that is to remain exposed for more than a few days should be compressed with a digger bucket to provide a smooth surface for water to run off and reduce the risk of erosion. Where the risk of erosion is high (e.g. due to the soil type) or the material cannot be located anywhere other than close to a waterbody or watercourse the stockpile may be covered with geo-textile or other suitable material.

4.1.3 Drainage from working areas

The routes of drainage from working areas should be positively identified. It may be necessary to create channels along or from the downhill side of working areas to allow contaminated water to be treated.

Incorporate the use of bottomless culverts for all water crossing which show on a 1:50K OS map.

4.1.4 Treatment of water contaminated with silt

The acceptable means of treating contaminated water include:

- Settlement ponds that have been excavated.
- Silt traps formed from geo-textile membrane as a fence to create a pond.
- Dispersal of water across undisturbed ground (note that this may not be acceptable if the ground is a sensitive habitat – for example a wetland or boggy area).

Regardless of the type of sediment trap it should be sized to accommodate the first 15mm of rainfall on the catchment that it serves.

Where possible the use of a cascade of sediment traps can be particularly effective, particularly if there is not much undisturbed ground for water to disperse over.

Sediment traps often become ineffective due to poor maintenance, particularly if they are draining a large area or the cut-off drains are ineffective. Therefore it is preferable to have several small traps that are regularly maintained.

All sediment traps must be uniquely identified and checked daily.

Silt that is not contaminated with construction materials (e.g. concrete dust) may be disposed of on site. Contaminated silt should be disposed of appropriately.

4.1.5 Use of sump pumps

Sump pumps may be used to remove water from within working areas, particularly excavations. Sump pumps must discharge away from watercourses or water bodies. If the discharged water is contaminated it should be treated as set out above.

5 In-river working

Working in rivers is only allowed during specified times of the year, the relevant dates are set out in the Construction Method Statement.

5.1.1 Use of plant or machinery with a watercourse

The use of plant or machinery within a watercourse is to be avoided unless there is no alternative.

Where plant or machinery is to enter a watercourse it must be inspected for leakage of fuel or oil and have its tracks or wheels cleaned away from the watercourse before it enters and removed immediately if there is any sign of it developing.

5.1.2 Diversion channels and pipes

Where diversion channels are to be created they should be lined, unless they run over clean rock.

Lined channels should have a shallow gradient to reduce the likelihood of the lining being dislodge in high flows. Steep diversions should use pipe instead of a lined channel wherever possible.

Diversions are to be sized to accommodate a flow of at least Q5 in the watercourse. The value of Q5 will be specified in the Construction Method Statement.

The principal contractor is responsible for the sizing of diversion channels. SEPA may wish to see evidence of the calculations used to determine the size of diversion required which should accommodate a 1 in 200 year flow.

5.1.3 Coffer dams

The height of the coffer dam affects the effectiveness of the river diversion, therefore this must be considered in conjunction with the diversion sizing.

The river bed must not be excavated to gain material to form coffer dams. Coffer dams must be lined, or covered, in such a way that they will not be eroded in the event that they are overtopped. Coffer dams should have a sufficient broad base to ensure that they are not overtopped and not breached in a flood event.

As well as un upstream coffer dam it is normally necessary to employ a coffer dam on the downstream side of the working area to avoid water backing up, particularly in high flow. Downstream coffer dams should be designed such that they are resistant to flooding in the event that the upstream coffer dam is overtopped.

5.1.4 Disturbance of river bed

The river bed should be disturbed as little as possible during the works. River bed material must not be removed from the river unless it is necessary to do so to excavate for the structures or diversions. River bed material must not be used as construction material.

When creating scour protection downstream of an in-river structure the river bed should be returned to its natural form as soon as possible downstream of the structure.

5.1.5 Use of bunds as a flood defence

For the avoidance of doubt bunds will not be used as flood defences.

6 Use of materials and plant

6.1.1 Fuel and oil

Fuel and oil is to be stored in bunded containers away from watercourses. Spill kits are to be located near fuel and oil storage and fuelling areas.

Refuelling of plant and machinery must only take place away from watercourses.

6.1.2 Plant and machinery

Wherever possible plant, including generators and pumps is to be used as far away from watercourses as possible.

Portable generators and pumps are to be placed on level ground on a drip tray with a volume of at least 110% of the fuel tank volume.

Plant and machinery is to be regularly maintained and inspected for leaks. Where a leak is identified any pollution must be dealt with in accordance with the pollution response plan and the equipment moved to an area where the impact of further pollution can be controlled. The equipment should be tagged as out of use until the problem has been rectified.

6.1.3 Concrete

Concrete and particularly cement must be stored and mixed away from watercourses. Designated areas must be identified for the mixing of concrete, these should have separate sediment traps as the sediment from those areas will be contaminated and must not enter the water environment.

Concrete preparation and movement should be planned to reduce the likelihood of spillage during mixing or transport.

Concrete mixing materials and digger buckets must be washed in the concrete mixing area or another designated area.

Concrete pours on in-river structures should only be conducted when the weather forecast has been checked and there is no risk of the site flooding within the next 24 hours.

6.1.4 Dust

In periods of dry weather it may be necessary to dampen tracks and working areas to reduce the amount of dust that is created.

Dust created from construction or demolition work should be treated as contaminated and must not enter the watercourse. In-river structures should be swept clean before the river diversion is removed.

7 Site traffic

Inconsiderate driving is one of the most common complaints in relation to construction activities. All operatives are to be briefed on the need to drive within the law and to show consideration to other road users. This is particularly important where a public road is used to travel between different sites. (see Traffic Management Plan).

8 Noise

Noise emissions are to be minimised to reduce the likelihood of disturbance to wildlife and the public. This is particularly true during typically quiet periods, therefore significant plant activity is to be restricted to normal working hours (08:00 to 18:00 Monday to Saturday).

In general plant and machinery is to be switched off when not in use and the use of portable radios is prohibited.

There may be further site specific noise restrictions set out in the Construction Method Statement.

9 Waste

Suitably marked and secured containers are to be situated on site for the storage and separation of waste. The Contractor is responsible for making arrangements for the proper servicing of welfare facilities. The burning of waste is strictly prohibited.

SEPA guidance [3] is to be followed, notably:

- The Contractor must identify waste on the site which will require to be registered with SEPA as an exempt activity;
- Waste produced and stored on site must be kept safe and secure in a designated area;
- Waste must be stored in such a manner as to prevent its escape or scavenging by vandals, thieves, trespassers or children;
- Waste from welfare facilities will be stored in a sealed unit which will be collected by a Company with the appropriate registration to a suitable registered site;
- Waste may only be carried by a person either registered with SEPA as a carrier of controlled waste or who is exempt from holding such registration;
- Transfer Notes must be kept for two years and available to SEPA officers on request;
- The Contractor must identify wastes hazardous to human health or the environment. In these cases a “Consignment Note” (which can be purchased from SEPA) must accompany the movement of waste;
- Waste may only be disposed of at a licensed Waste Management facility such as a landfill site, or at a site which has registered its activity with SEPA as being “exempt”. In both cases, strict controls operate which regulate the type and quantity of waste which may be accepted at the site by the operation;
- The transporter must check that the site to which waste is to be taken has the relevant licence or exemption. This may be checked with the local SEPA office.

10 Construction Methods

10.1 Penstock

- Prepare only 100m of ground for pipe laying at a time.
- Strip vegetation and top soil and lay to one side with loose rocks etc on the outside. **See Fig 3**
- Arisings placed on the opposite site.
- Lay down pipe between trench and arisings for welding then laying in the trench.
- Reinstate in reverse order.

10.2 Tracks on steeper slopes and higher areas

- Timing the works
  - Reducing the specification of the track, for example by using smaller vehicles or by restricting use during the winter, periods of poorer weather or when ground conditions are poor.

- Marking out the route
  - Aligning the track to fit the landscape and sensitive features, for example by avoiding impacts rather than compensating for them.

- Execution of mitigation options
  - Avoiding a ridge's crest as far as possible will help minimise the track's impact. **See Fig 4.**

10.3 Construction methods – excavated tracks

- Track construction should proceed uphill so that drainage can be managed effectively.
- Construct the side and cut-off ditches first.
- Minimise silts and fine sand being carried into surrounding waterbodies.
- Silt traps should be installed in drainage ditches before the ditch outlet.
- Wherever possible, machinery should work off the section of track most recently completed.
- Recycling of turfs and topsoil from newly excavated sections to the sides of the most recently completed section of track will help minimize damage and loss.

10.4 Soil and turf storage

- Recycle turfs and topsoil quickly to ensure faster regrowth.
- Soils should be stored to a maximum depth of 1m, on geotextile matting.
- Subsoil and topsoil should be kept separate.
- Soils should be kept damp to prevent them drying out and should be stored for a maximum of 12 months.

11 Reinstatement

11.1 Guiding Principles for Restoration

The key to successful restoration lies in managing the disturbance so that it lasts for as short a period as possible and planning the timing of the disturbance to offer the best conditions to do the work, which in turn will allow successful restoration. The restoration works should be overseen by an appointed Landscape Clerk of Works (LCoW).

The main environmental restriction on the development of this hydro scheme is the period between 1st June and 30th September allowed for in-river works. This determines that access to the intake locations must have been established prior to 1st June to allow the intakes to be constructed in the specified time period.

11.2 Moorland and Hill restoration

Best practice guidelines will be followed in the restoration of the temporary construction impacts. The general principles will include:

- Site management to contain working areas and access routes. Where stone dykes have been dismantled they are to be rebuilt by hand.
- All gates and fences are to reinstated unless it is explicitly agreed that this is not necessary.
- Finished ground levels are to be graded to suit the natural ground profile.

- Small watercourses and natural drainage channels are to be preserved by installation of culverts, thereby maintaining flow of water to ground downstream. Use of bottomless culverts for all burn crossing shown on a 1:50k OS map.
- Bunds are to be placed within the pipe trench around the pipeline at intervals within the areas of particularly wet ground or GWDTEs to prevent the pipe trench draining the ground around it in line with the guidance provided by SEPA. **See Fig 1.** below. Use of Bentonite in place of clay to be used for penstock bunds.
- Where banks have been disturbed and the natural vegetation has been removed coir matting is to be pinned in place over the banks to assist in holding soil in place while regeneration takes place.
- Site boundary to be marked out. Fenced if livestock require access. Any temporary fencing to be removed once construction complete.
- Prior to the commencement of any works, carry out long section survey of all the watercourses and natural drainage.
- Carry out works to natural drainage across the site, diverting or directing the watercourses so as to avoid erosion and outwash of disturbed soils.
- Control and prevention of silt run off and construction pollution into adjacent water courses by means of cut off drains, silt traps and attenuation ponds, all to be removed and restored at completion.
- Careful side stripping of top peat from all areas to be disturbed. Depth of strip to be at least 250mm but to be determined on site depending on ground conditions. Peat and turf to be lifted and stored in one operation where possible and retained as intact turfs where feasible.
- Defined top peat storage areas; avoiding mixing of materials and double handling where possible with top peat stored upper faces outmost to avoid desiccation.
- Rapid, progressive restoration as the project proceeds, wherever possible, to reduce the duration of visual impact and to reduce the risk of loss and damage and desiccation to stockpiled top peat and turfs.
- Temporary storage of any peat should be kept wet prior to reinstatement. To be checked by the ECoW weekly.
- Ground over which the penstock is to be laid must be reinstated within 7 days. Only 100m can be trenched at a time.
- De-compaction of road and working surfaces prior to soiling over during reinstatement.
- Careful reinstatement of undulating / rough landform over construction corridor using re-spread till, rock and peat prior to final shaping with top soil and including forming watercourses to natural irregular alignment to match existing character and integration of the construction site into the adjoining rough and uneven moorland. **See Fig. 3.**
- Use of low ground pressure machinery and avoidance of over compaction and blade grading in placement of peat. Top peat will, in preference, be placed by digger bucket, loosely graded with bucket teeth and left rough, open and undulating. Where intact turfs are being placed these will be lifted in as large a unit as feasible and placed right side up, lightly compacted and all roots buried.
- Burial of extensive areas of exposed rock. Where surrounding landscape has numerous boulders on the surface, consideration will be given to retaining irregular groups of rock in random distribution and part buried in peat.
- Surplus rock and arisings to form part of the borrow pit reinstatement works.
- Removal of temporary culverts over water courses at completion and reinstatement of hydrology at completion.
- Utilising the existing top peat and turf as the principle material for reinstatement by careful placement of turfs with roots well buried and creating a matrix of cover over the site if there is a shortage of suitable turf material.
- Give consideration to the continuation of stock exclusion / additional stock management to reduce deer and sheep grazing within the establishment period.
- Monitoring and management over a three-year post construction period to ensure

establishment takes place with remedial work carried out if required, required annually.

- The re-use of soils and peat should be limited to the areas already disturbed by the track construction and not placed on undisturbed vegetation.
- The level of success of restored and revegetated areas should be monitored and any problems addressed promptly. To be monitored by the LCoW for a period of up to three years

11.3 Improving tracks /reinstatement at upper levels

- Address the impact of bulldozed tracks across the open hillside.
- Tracks can result in significant erosion problems with deep gullies and large amounts of materials being carried downhill.
- It may be impractical to remove these tracks altogether. Therefore, regrading of the uphill 'cut', the creation of a drainage ditch, the use of a cambered surface and regraded downhill 'fills', together with the careful recycling of turfs to vegetate the previously bare cut and fill areas. **See Fig 2.**

11.4 Track removal / reinstatement

If the removal of a track is necessary, careful consideration should be given to the relative impacts of restoration, enhancement and maintenance. The desirable solution may not always be the most sustainable. However, good reinstatement of temporary tracks stems from good initial planning and construction of the tracks themselves. Their ongoing maintenance should be supervised by the LCoW during the period they are used to ensure the tracks structure is maintained and that the drainage systems are working correctly, as this will aid the reinstatement transition.

- Commence reinstatement as soon as the track is not required, preferably during a suitable dry-weather spell to avoid soil run off and potential land slips.
- Avoidance of ridge crests, where possible, during construction of temporary tracks will minimise the visual impact and speed up the reinstatement process.
- Match won turf when reinstating tracks of the same colour with the type in close proximity to the tracks.
- Rocks and boulders won during the track creation should be placed on the reinstated ground matching the pattern and form of the surrounding area.
- Where an access track is to be reinstated to an ATV track this will be to the width of 1.5m.

11.5 Upland path work and restoration. See Fig 5.

- The impact of undertaking pathwork should be carefully controlled to avoid further damage to the site.
- Keep disturbance of the site to a minimum, even if this takes more time.
- Protect the surrounding environment, particularly water courses, from pollution or sediment.
- Protect surrounding vegetation from damage, e.g. lay stored materials on matting.
- Make good use of all excavated materials, e.g. re-use turf from ditching for path edges, and soil for site restoration
- Keep the work site tidy and complete a section at a time if possible, to reduce visual impact and damage to vegetation through die back.

11.6 Borrow pit restoration

Borrow pits should be reinstated or partially reinstated if sufficient material to fully re-profile the borrow pit to the original landform is unavailable. If reinstating borrow pits using peat, then re-profiling must be in keeping with the environmental reinstatement objectives set down at the outset of the project. As a general guide it is considered that a depth of 0.5 – 1.5m of peat plus up

to 50cm of turf would be appropriate for habitat restoration. Full reinstatement of borrow pits would usually include:

- regrading of the landform, in particular the back wall of the pit
- refill of material, often with excess material from other parts of the works (NOTE: extreme care must be taken when using peat)
- reinstatement of vegetation, usually through replacement of removed and stored turfs
- partial reinstatement can leave the rock face exposed as a crag habitat.

12 Figures

Trench gradient %	Bunds interval should not exceed (m)
20	20
15	30
10	40
8	50
6	70
4	100
<3	200 to none

Fig. 1 GWTDE bund guidelines

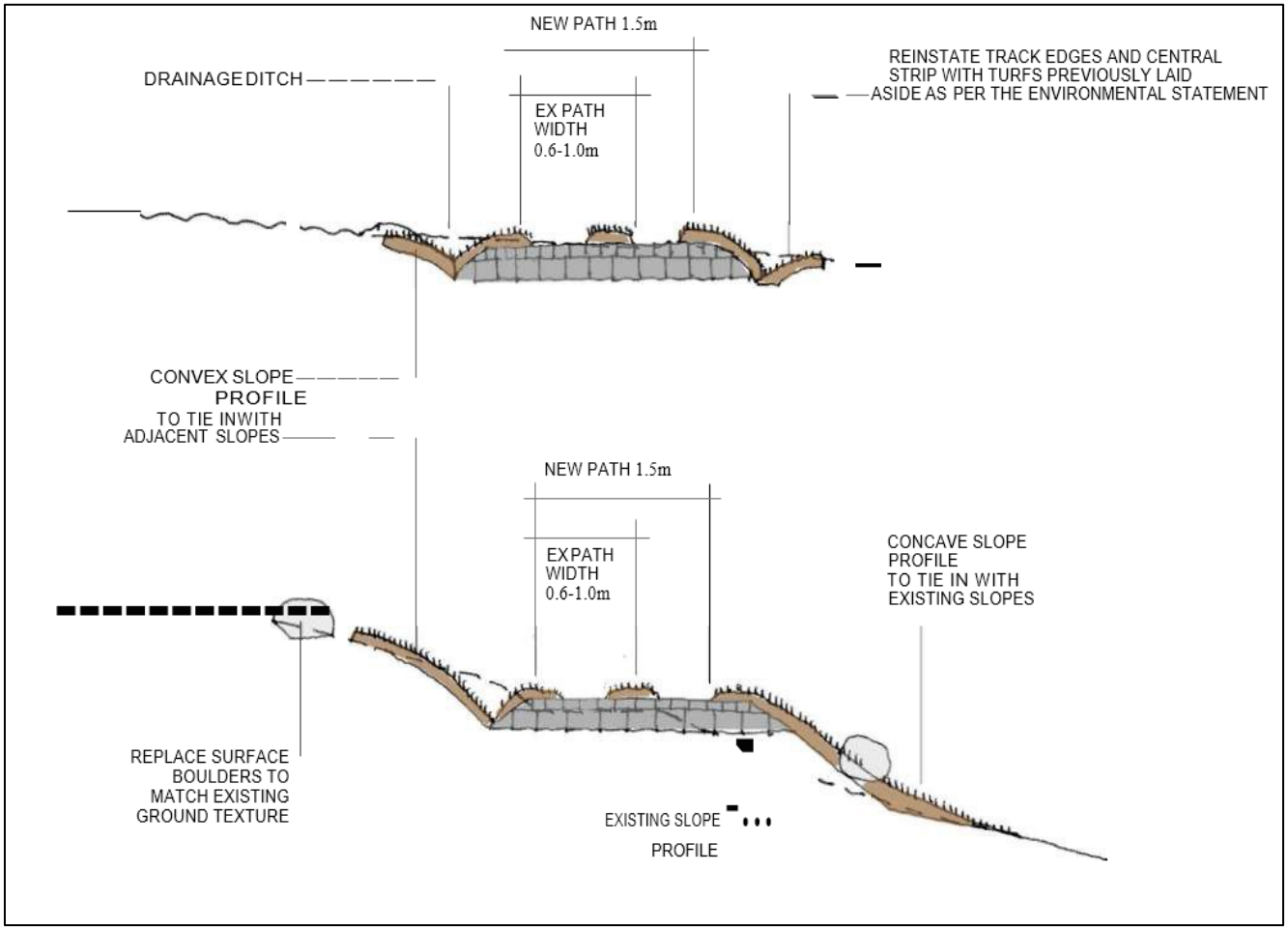

Fig. 2 Temporary access track to intakes during construction to be reinstated to allow ATV access afterwards on Bhiorain, Gaoirean, Charnan, Fhaolain and Ceitlein.

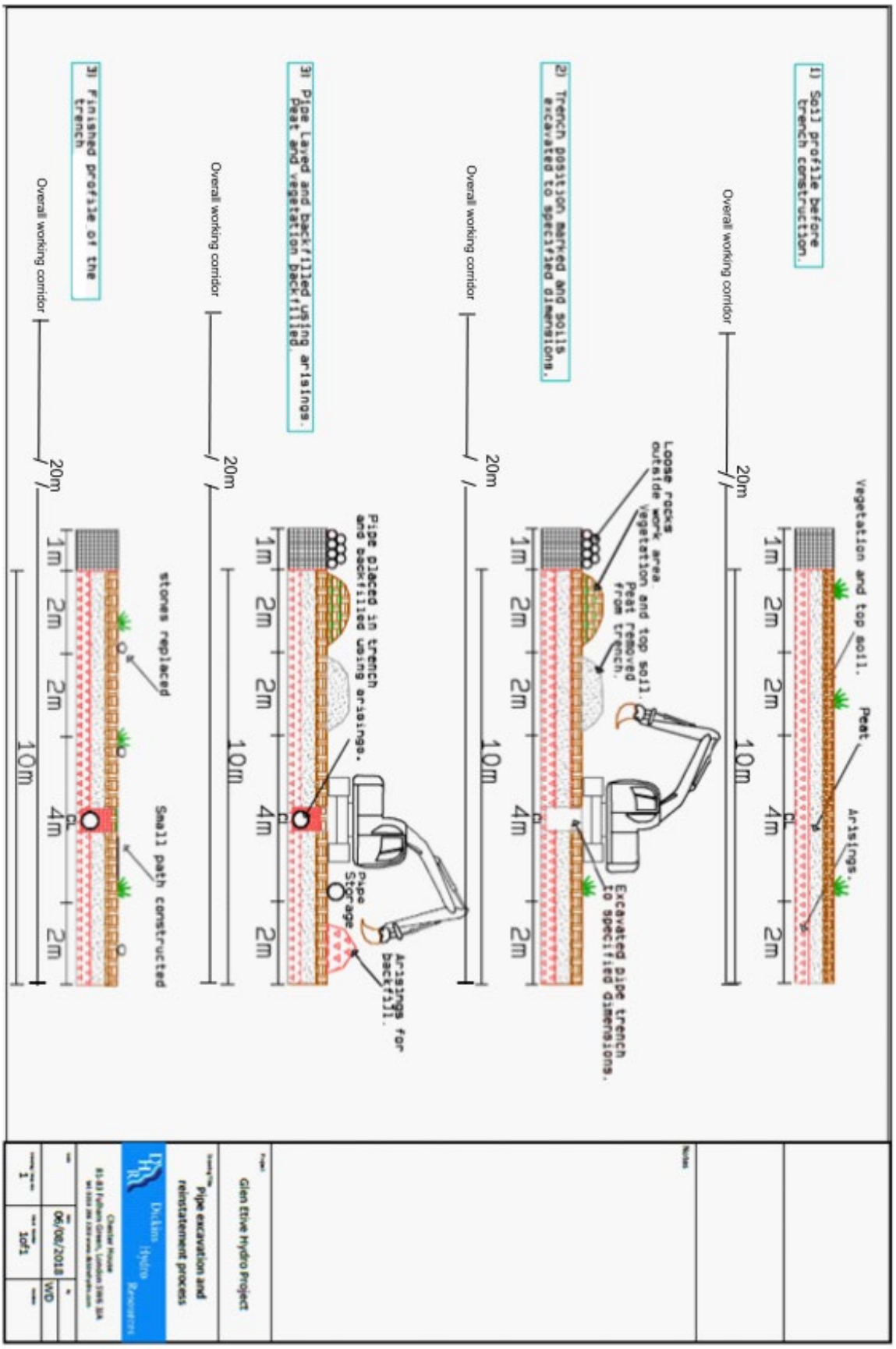

Fig 3. Penstock excavation process for working within half of the 20m corridor

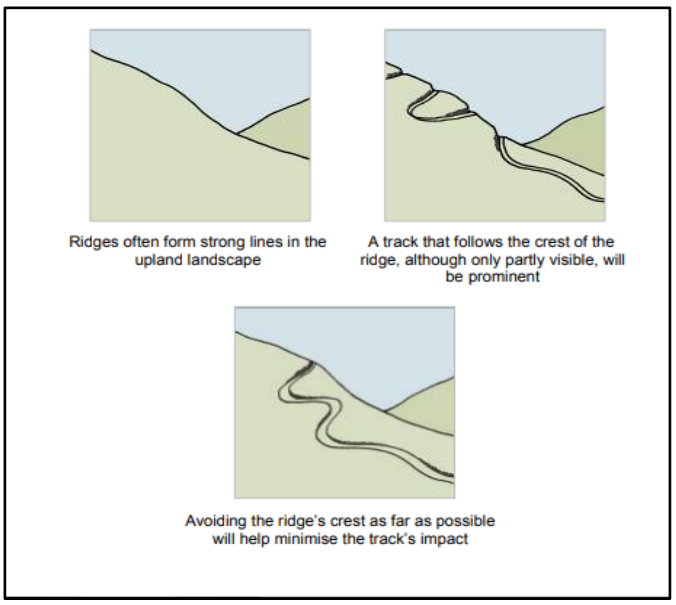

Fig 4. Track mitigation on ridges

SITE PROBLEM	PATHWORK	RESTORATION
Flat, boggy path. Several braids on either side of the path, deep wet hollows forming.	New geotextile path slightly raised over the bog, with cross-drains.	Turf edges of path. Turf to revegetate and deter use of braids beside the path.
Steep, rough zig-zagging path. Braids on both sides, short-cuts across corners.	Re-align and pitch the path with waterbars, and gradual curves to reduce gradient.	Turf edges of path, create side banks to contain path use. Use blocking boulders and turf binds to discourage short-cutting.
Very wide erosion on a moderate slope. Numerous braids merging with no defined path.	Construct a new aggregate path, with waterbars, on a curved line.	Turf path edges to define path. Spot turf, re-seed and fertilise remaining areas of erosion adjacent to new path.
Unstable eroding slope above established path line.	Stone revetment to contain bank and stabilise slope.	Turf over the top of the revetment and any gaps in the wall.

Fig 5. Restoring upland path work