Loch Toftingall BESS

Appendix 11.1 – Outline Water Construction Environmental Management Plan

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The business of sustainability

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1. INTRODUCTION

This Outline Water and Construction Environmental Management Plan (OWCEMP) forms an Appendix to the Environmental Report (ER) Chapter 13: Hydrology and Hydrogeology (ER Chapter) for Loch Toftingall BESS (the Proposed Development).

1.1 Guidance and Legislation

The following legislation and guidance documents have been used to inform the overall OWCEMP:

- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR)1.
- The Water Quality (Scotland) Regulations 20102.
- Groundwater Protection Policy for Scotland Version 3 (2009)3.
- The Construction Industry Research and Information Association (CIRIA)
- Environmental Good Practice on Site (C741)4.
- Guidance for Pollution Prevention (GPP) 1: Understanding your environmental responsibilities5. and
- Planning Advice Note (PAN) 61 – Planning and Sustainable Urban Drainage Systems6.

Relevant guidance and best practice document are subsequently provided in the relevant sections of this report.

[1] UK Government (2011) The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) [Online] Available at: http://www.legislation.gov.uk/ssi/2011/209/contents/made (Accessed 12/04/2023).

[2] The Scottish Government (2010) The Water Quality (Scotland) Regulations 2010 [Online] Available at: http://www.legislation.gov.uk/ssi/2010/95/contents/made (Accessed 14/04/2023).

[3] SEPA (2009) Groundwater protection policy for Scotland Version 3 [Online] Available at: https://www.sepa.org.uk/media/34371/groundwater-protection-policy-for-scotland-v3-november-2009.pdf (Accessed 14/04/2023).

[4] CIRIA (2015) Environmental good practice on site guide (fourth edition) (C741)

[5] NetRegs (2021) GPP 1: Understanding your environmental responsibilities – good environmental practices [Online] Available at: https://www.netregs.org.uk/media/1898/guidance-for-pollution-prevention-1-2022-update.pdf (Accessed 14/01/2023).

[6] Scottish Government (2001) Planning Advice Note 61: Planning and Sustainable Urban Drainage Systems [Online] Available at: https://www.gov.scot/publications/pan-61-sustainable-urban-drainage-systems/ (Accessed 14/04/2023).

2. DEVELOPMENT REQUIREMENTS

The OWCEMP takes into account specific activities during the construction, operational and decommissioning phases of the Proposed Development, including:

- Access tracks.
- Car parking spaces.
- Battery units.
- External equipment compound.
- Supporting infrastructure.

2.1 Potential Sources of Pollution

The identified potential sources of pollution as a result of the construction, operational and decommissioning phases of the Proposed Development, based on the findings of the ER, are as follows:

- De-watering of excavations.
- Runoff from exposed ground and material stockpiles.
- Runoff from roads and other impermeable surfaces.
- Increased runoff and acidification as a result of felling.
- Fuel and chemical storage/refuelling areas.
- Leaking/vandalised equipment.
- Battery fires and fire suppression.

2.2 Scoped Out Measures

The following measures have been scoped out based on the findings of the ER Chapter:

- Measures to protect groundwater abstractions and private water supplies.
- Groundwater Dependent Terrestrial Ecosystems (GWDTEs).

2.3 Regulation and Authorisation

All construction and engineering activities within or hydrologically connected to the water environment require SEPA authorisation under Controlled Activities Regulations (CAR). There are three levels of authorisation and the level required is site-specific and based on the level of risk of the activity to the water environment. The levels of authorisation are:

1. General Binding Rules (GBR): low risk activities. All development activities must comply with these rules. No application to SEPA is required.
2. Registration: medium risk activities. Application to SEPA is required to register an activity.
3. Licence: high risk activity. Simple or complex licences exist depending on the activity. Application to SEPA is required to obtain a licence for the activity.

Further guidance on the requirement for authorisation are outlined in the following documents:

- CAR – A Practical Guide (Controlled Activities Regulations)7.

[7] SEPA (2022) The Water Environment (Controlled Activities) (Scotland) Regulations 2011 V9.2: A Practical Guide [Online] Available at: https://www.sepa.org.uk/media/34761/car_a_practical_guide.pdf (Accessed 14/04/2023).

- Introduction to Controlled Activities Regulation8. and
- SEPA LUPS-GU-15: Planning guidance in relation to SEPA regulated sites and processes9.

The requirements for authorisation of specific activities are outlined in the relevant sections of this document.

2.4 Environmental Clerk of Works (ECoW)

An Environmental (or Ecological) Clerk of Works (ECoW) will be appointed for the construction period (commencement of development to final commissioning or end of construction period). The ECoW will hold an advisory role. In relation to the water environment, the scope of the ECoW role will include:

- Monitoring compliance with the mitigation outlined in the ER, OWCEMP and other relevant documentation relating to the planning condition and site licence, such as the Pollution Prevention Plan (PPP).
- Routine monitoring of water pollution prevention measures, such as silt management measures, and inspection following storm events. and
- Routine visual inspection and observation of watercourses for the presence of silt, discolouration and hydrocarbons.

[8] SEPA (n.d.) Introduction to the Controlled Activates Regulations [Online] Available at: https://www.sepa.org.uk/media/34800/introduction-to-the-controlled-activities-regulations.pdf (Accessed 14/04/2023).

[9] SEPA (2013) Land Use Planning System SEPA Guidance Note 15: Planning Guidance in Relation to SEPA Regulated Sites and Processes (LUPS-GU15) [Online] Available at: https://www.sepa.org.uk/media/136091/planning-guidance-in-relation-to-sepa-regulated-sites-and-processes.pdf (Accessed 14/04/2023).

3. OUTLINE MITIGATION FOR THE WATER ENVIRONMENT

3.1 Site Drainage

Drainage from the site will include elements of SuDS design, as detailed in the Outline Feasibility Surface Water Drainage Strategy prepared by ERM. SuDS is a method of controlling surface water runoff in a manner that replicates natural drainage patterns and has a number of benefits, including:

- Attenuating runoff, thus reducing peak flow and any flooding issues that might arise downstream.
- Treating runoff to a certain degree, which can reduce sediment and pollutant volumes in runoff before discharging back into natural drainage network.
- SuDS measures such as lagoons or retention ponds, when correctly implemented, will produce suitable environments for wildlife.

The following best practice guidance should be used:

- CIRIA C648 – Control of water pollution from linear construction projects10.
- CIRIA C352 – Control of water pollution from construction sites11.
- CIRIA SuDS Manual (C753)12.
- CIRIA Guidance on the construction of SuDS (C768)13.
- SEPA WAT-RM-08 Regulatory Method: SuDS14.
- SEPA WAT-SG-75 Sector-specific Guidance – Construction Sites15.
- Water Assessment and Drainage Guide (WADAG)16.
- GPP5: Works and maintenance in or near water17.
- GPP4: Treatment and disposal of wastewater where there is no connection to the public fowl sewer18.

3.1.1 Authorisation

SuDS are a legal requirement for all developments draining to the water environment (other than a single dwelling or discharges to coastal water). All developments must comply with all conditions of the CAR Regulations General Binding Rules (GBR) including the requirement for SuDS.

Developments require authorisation for surface water runoff discharges under CAR regulations by a SEPA licence (Construction SuDS licence) for construction sites which:

- Exceed 4 hectares (ha) of area.

[10] CIRIA (2006) C648: Control of water pollution from linear construction projects: Technical Guidance [Online] Available at: https://www.ciria.org/ProductExcerpts/C648.aspx (Accessed 14/04/2023).
[11] CIRIA (2001) C532: Control of water pollution from construction sites: Guidance for consultants and contractors [Online] Available at: https://www.ciria.org/ProductExcerpts/C532.aspx (Accessed 14/04/2023).
[12] CIRIA (2015) C753: The SuDS Manual
[13] CIRIA (2017) C768: Guidance on the construction of SuDS
[14] SEPA (2019) WAT-RM-08: Regulatory Method Sustainable Drainage Systems (SUDS or SUD Systems) v6.4 [Online] Available at: https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/ (Accessed 14/04/2023).
[15] SEPA (2018) WAT-SG-75 Supporting Guidance Sector Specific Guidance: Construction Sites [Online] Available at: https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/ (Accessed 14/04/2023).
[16] SEPA (n.d.) Water Assessment and Drainage Assessment Guide [Online] Available at: https://www.sepa.org.uk/media/163472/water_assessment_and_drainage_assessment_guide.pdf (Accessed 14/04/2023).
[17] NetRegs (2018) GPP5: Works and maintenance in or near water [Online] Available at: https://www.netregs.org.uk/media/1418/gpp-5-works-and-maintenance-in-or-near-water.pdf (Accessed 14/04/2023).
[18] NetRegs (2021) GPP4: Treatment and disposal of wastewater where there is no connection to the public foul sewer [Online] Available at: https://www.netregs.org.uk/media/1887/guidance-for-pollution-prevention-4-2022-update.pdf (Accessed 14/04/2023).

- Contain a road or track length in excess of 5 km. and / or
- Include any area with a slope gradient of more than 250 m over 1 ha or 500 m length.

If the development is below the threshold criteria, a licence is not required, and the development can be authorised under GBR10 and no direct consultation with SEPA is required.

SEPA WAT-RM-08 Regulatory Method: SuDS provides further details on the licence requirements.

3.1.2 Pre-Earthworks Drainage

Pre-earthworks drainage relates to the required drainage measures to be installed prior to earthwork activities such as access track construction.

Best practice pre-earthworks drainage measures include:

- Cut-off/ diversion ditches.
- Temporary interception bunds.
- Swales.
- Retention ponds.

3.1.2.1 Purpose/ Aim

The aim of pre-earthworks drainage is to:

- Divert ‘clean’ surface water runoff and stormwater away from exposed soils of earthworks preventing further erosion.
- Prevent ‘clean’ water from mixing with potentially silt-laden water generated from construction works.

3.1.2.2 Installation

Pre-earthwork drainage should be installed immediately prior to earthworks and construction works commencing.

Temporary interception bunds and cut-off drainage ditches (‘clean water drains’) will be constructed on the ‘high side’ boundary of the earthwork operations to prevent surface water runoff entering excavations. Runoff collected in the drainage ditches will be diverted along a channel which follows the natural gradient of the ground, avoiding steep gradients.

The profile of the ditch can vary from a ‘v’ shape to a ‘u’ shape but should have a constant uniform depth. The profile of the ditch will depend on the soil type and stability.

The use of ‘u’-shaped vegetated ditches is preferential, these are also known as swales. The dimensions and gradient of swales will be kept to a minimum to prevent rapid flow of water. Swales to collect runoff will be placed on the downslope of earthworks and stockpiles and will be designed to treat potentially silty runoff before discharging back into the drainage system. This may include constructing check dams within the channel and employing silt management measures. The use of retention ponds allows for additional storage capacity during heavier rainfall events.

3.1.2.3 Reinstatement

All pre-earthworks drainage channels should be re-instated unless required for long-term drainage on the site. No exposed soils should remain, and turves should be emplaced to prevent erosion.

Where exposed soil is to be left for a long period before reinstatement or re-seeding, other measure to prevent erosion may be required:

- Geotextiles (biodegradable and non-biodegradable).

- Mulching/ binders/ hydro-seeding.
- Turf cut from other areas on site. and
- Surface roughening.

3.1.3 Earthworks Drainage

Drainage for permanent or semi-permanent earthworks such as access tracks is required to control surface water runoff and discharge to appropriate outlets.

Best practice pre-earthworks drainage measures include:

- Drainage ditches.
- Sumps.
- Culverts.

3.1.3.1 Purpose/ Aim

To manage surface water runoff from earthworks e.g., access tracks, and manage and allow for continuity of the natural drainage of surface water and groundwater from higher elevations to lower.

3.1.3.2 Pre-installation

Prior to access track and earthwork construction, site operatives will identify flush areas, depressions or zones which may concentrate water flow so that site drainage design will maintain hydrological connectivity. Site drainage design will be produced in advance of construction.

3.1.3.3 Installation

All earthworks will have a gravity drainage system and all water will drain to an adequately sized sump. If dewatering of excavations is necessary, wastewater will be treated by designed settlement lagoons and retention ponds, further details are provided in Section 3.2.5.

Trackside drainage ditches are to be constructed parallel to the access tracks and follow the same gradient as the access tracks. To allow for continuity of surface and ground water flow from the high-side of the track to low-side, culverts are required to be built crossing the track at appropriate intervals, as shown in Figure 1 to peak river flow plus a climate change allowance of 40% in the North Highland catchment in accordance with SEPA climate change allowances for flood risk guidance19. Further details of culvert design are provided in Section 3.4.4.

[19] SEPA (2022) Land Use Planning System SEPA Guidance: Climate change allowances for flood risk assessment in land use planning (LUPS-CC1). Available at: https://www.sepa.org.uk/media/594168/climate-change-guidance.pdf (Accessed 17/04/2023).

Figure 1 - Trackside drainage ditch and cross-drainage culvert

Permanent check dams can also be installed to slow the flow of water in ditches with steeper gradients and straightened channels to prevent erosion of channels. Water within channels should be allowed to flow and should not be stagnant, and tracks should be free from standing water through inclusion of camber or cross-fall. Track surface cross-drains can be installed on tracks with long gradients and limited camber and should be kept free of sediment.

Sustainable drainage systems such as swales with vegetated channels are preferential and will be designed to intercept, filtrate, and convey runoff. Permanent swales and drainage ditches adjacent to access tracks will have outlets at specified intervals to reduce the volume of water collected in a single channel and, therefore, reduce the potential for erosion.

Settlement lagoons should be installed at drainage ditch outlets, prior to discharge to watercourse. They should be constructed to allow for adequate attenuation of water and settlement of sediments to peak river flow plus a climate change allowance of 42% in the North Highland catchment in accordance with SEPA climate change allowances for flood risk guidance. Silt mats may be used at the outfalls of settlement lagoons and retention ponds to further aid the settlement of sediment from earthworks drainage. Further details on sediment management are provided in Section 3.2.

The use of retention ponds should be used to allow for additional storage capacity during heavier rainfall and storm events.

3.1.4 Management of Drainage from Surplus and Loose Materials

Careful consideration will be given to the location of topsoil and subsoil storage areas for all areas of the Proposed Development during construction. Storage areas will be either in a flat dry area away from watercourses or be protected by the addition of cut off drains above the storage areas to minimise the ingress of water.

The use of peat and soil stockpiles will be minimised by earthworks planning. However, where stockpiles are used, silt fences and silt mats will be employed to minimise sediment levels in runoff.

All stockpiled material will be stored at least 50 m from watercourses in order to reduce the potential from sediment to be transferred into the wider surface water system and will be regularly inspected to ensure that erosion of the material is not taking place.

An example of a stockpile / overburden and the installation of drainage ditch to divert runoff from the stockpile material is shown in Figure 2.

Figure 2 - Stockpile and drainage ditch (under construction)

In accordance with BS 3882 'Specification for Topsoil and Requirements for Use'20, any long-term stockpiling of topsoil should not exceed 3.0 m in height with a maximum side slope of 1 in 2. In its dry non plastic state, topsoil can be stockpiled in a 'loose tipped' manner and tracked in a compacting method reducing water ingress. Wetter soils can be stored in windrows for drying and later stockpiled for re-use. The re-wetting of peat will be carried out if there is a potential risk of the peat drying out. Mineral and peat soil stockpiles will not be allowed to dry out.

Loose materials such as crushed rock and stone will be prevented from entering watercourses through the employment of sediment pollution prevention measures in areas of loose material storage or generation, as outlined in Section 3.2.

Additionally, excavated stockpiles will be covered with a layer of topsoil and compacted. This will limit the amount of oxygen and water available to cause oxidation of iron pyrite and sulphides, should mining spoil be encountered during excavations. A schematic diagram of a proposed stockpile is provided below:

[20] BSI Group (2015) Specification for Topsoil and Requirements for Use. Available at: https://shop.bsigroup.com/ProductDetail/?pid=000000000030297815 (Accessed 04/04/2023).

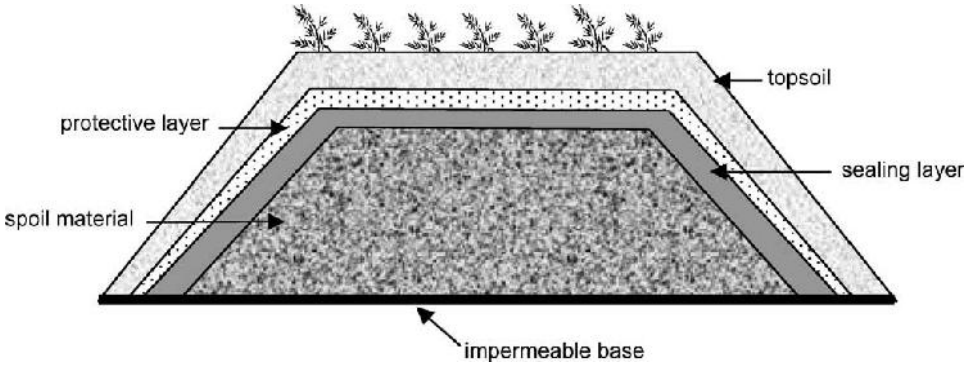


Diagram taken from Johnson & Hallberg 2005[21].

3.1.5 Discharge of Water

Discharge of water from the Proposed Development will depend on the water environment on Site and the quality of the final discharge. This section considers the discharge of surface water drainage to the water environment and does not consider foul drainage from temporary construction compound welfare facilities.

3.1.5.1 Discharge to Sewers

Discharge to foul sewer requires permission from Scottish Water. Scottish Water's starting position is that no new surface water connections to combined/ foul sewer will be accepted.

Scottish Water prefer that surface water is re-used on site where practicable, drained into a SuDS system, drained to ground through soakaway or to an existing watercourse and notes that pumping of water to one of these outlets may be required.

Where it is not practicable to discharge to SuDS, ground or watercourse, surface water may be drained to a combined/ surface water sewer and requires enquiry and an application to Scottish Water.

Further details are provided in Scottish Water Surface Water Policy advice note and guidance22 and GPP4.

3.1.5.2 Soakaway

Water contaminated with fine silt only can be discharged to vegetated surfaces and requires permission from SEPA and landowner.

Irrigation techniques, which may include the use of perforated discharge hoses or similar, will be employed to rapidly distribute discharge across a vegetated slope. This will be carried out in consultation with the ECoW.

Details on typical infiltration rates of soil types are provided in GPP5.

3.1.5.3 Drain to watercourse of SuDS System

Treated water can be discharged to watercourse, loch or SuDS systems. The discharge water must be in line with the baseline water quality and flood risk capacity of the receiving water.

[21] Johnson and Hallberg (2005) Acid mine drainage remediation options: a review [online] Available at: https://www.sciencedirect.com/science/article/abs/pii/S0048969704006199 (Accessed 17/04/2023).
[22] Scottish Water (2018) Surface Water Policy: Standard advice note and process guidance [Online] Available at: https://www.scottishwater.co.uk/help-and-resources/document-hub/business-and-developers/connecting-to-our-network (Accessed 17/04/2023).

Methods of on-site sediment and chemical pollution prevention and water treatment are outlined in Section 3.2 and Section 3.3.

Authorisation from SEPA is required for discharge of water from the Proposed Development to the water environment, as detailed in Section 3.1.5.

3.1.5.4 Tanker off Site

Water which cannot be treated on site and is not of a quality which can be released to water environment, will need to be tankered off site for appropriate treatment and disposal.

3.1.6 Provision for Storm Events

The Site itself is not at risk from flooding. In extreme storm events, there would be elevated levels of runoff from the hardstanding elements of the Proposed Development relative to greenfield flow rates, which has the potential to contribute to downstream, off-site flood risk.

In the baseline scenario, the water table is not at the ground surface, and hence some infiltration would be expected. Measures are proposed in this OWCEMP that would limit runoff rates in Section 3.2.

Temporary storage volume for storm runoff from hardstanding areas would be provided via settlement lagoons, further details of which are provided in Section 3.2.5.

Along the access tracks, drainage channels on the downslope would shed track runoff to adjacent rough ground approximately every 30m, to attenuate flow and allow natural filtration to remove sediments. In areas within 50m of a watercourse marked on an Ordnance Survey 1:50,000 scale map or where cross-slopes exceed 1 in 20, drainage channels will be bunded and outflow will be monitored daily in areas with on-going construction activity.

3.2 Sediment Pollution Prevention

Sediment pollution and release of excess sediments can result in detrimental effects to fish spawning habitats by covering the stream bed.

Mitigation measures should minimise mobilisation and release of sediments to the water environment. Water polluted by sediments are not allowed to leave the site untreated and the final discharge from the site must have acceptable levels of sediment (in line with baseline levels).

The contractor will work under a wet weather working policy during construction. Works that could mobilise sediments and impact the water environment would be stopped during heavy precipitation events.

Sediment pollution prevention is to be employed in line with the following best practice guidance:

- SEPA WAT-SG-26 - Good Practice Guide – Sediment Management23.
- SEPA WAT-SG-78 - Sediment Management Authorisation24.
- CIRIA C648 – Control of water pollution from linear construction projects25.
- CIRIA C352 – Control of water pollution from construction sites 26.

[23] SEPA (2010) WAT-SG-26: Engineering in the water environment: good practice guide – Sediment management [Online] Available at: https://www.sepa.org.uk/media/151049/wat-sg-26.pdf (Accessed 17/04/2023).
[24] SEPA (2012) Supporting Guidance (WAT-SG-78) Sediment Management Authorisation v1 [Online] Available at: https://www.sepa.org.uk/media/151062/wat-sg-78.pdf (Accessed 17/04/2023).
[25] CIRIA (2006) C648: Control of water pollution from linear construction projects: Technical Guidance [Online] Available at: https://www.ciria.org/ProductExcerpts/C648.aspx (Accessed 17/04/2023).
[26] CIRIA (2001) C532: Control of water pollution from construction sites: Guidance for consultants and contractors [Online] Available at: https://www.ciria.org/ProductExcerpts/C532.aspx (Accessed 17/04/2023).

- GPP5 - Works and maintenance in or near water27.

Best practice methods of sediment management and pollution prevention, and required authorisation are outlined in the following sections. This includes Working In or Near Water GEMP (TG-NET-ENV-512).

3.2.1 Authorisation

Under CAR Regulations authorisation is required for all sediment management works within inland surface water and surface water dependent wetlands.

The levels of authorisation are GBR, Registration or Licence and the required level is based on the environmental risk at the Site. More details are provided in SEPA guidance documents WAT-SG-78 Sediment Management Authorisation and WAT-RM-02 Regulation of Licence level Engineering Activities28.

3.2.2 Silt Traps and Silt Mapping

3.2.2.1 Purpose

Silt traps may be utilised to trap, temporarily store and filter sediment-laden runoff from excavation works at the Proposed Development, including hardstanding areas and access roads. This is to prevent discharge of silt-laden waters to watercourses or ground.

3.2.2.2 Installation

Silt traps and matting have a limited effective flow capacity and must be installed with the peak river flow plus a climate change allowance of an increase capacity of 40% in the North Highland catchment in consideration.

Silt traps and matting are to be installed at the following locations:

- Within drainage ditches but will be sited to avoid slopes with a gradient greater than 1 in 20.
- At the inlet (sump) or outlet side of culverts.
- At the outfall of settlement lagoons to filter sediment during times of heavy rainfall as shown in Figure 3.

3.2.2.3 Maintenance

The silt traps and silt matting will be monitored by the ECoW and should be cleared regularly and replaced when necessary.

[27] NetRegs (2018) GPP5: Works and maintenance in or near water [Online] Available at: https://www.netregs.org.uk/media/1418/gpp-5-works-and-maintenance-in-or-near-water.pdf (Accessed 17/04/2023).
[28] SEPA (2022) WAT-RM-02 Regulation of Licence Level Engineering Activities v8 [Online] Available at: https://www.sepa.org.uk/media/594105/wat-rm-02-v80.pdf (Accessed 17/04/2023).

Figure 3 - Silt Matting (combined with silt fencing)

3.2.3 Silt Fencing

3.2.3.1 Purpose

Silt fencing is a widely used form of silt trapping and provides a linear barrier for installation upstream of watercourses and lochs. Silt fences are cost-effective and practical methods of attenuating storm water runoff and intercepting sediment and silt.

3.2.3.2 Installation

Silt fences are a semi-permeable geotextile fabric arranged in the form of a fence (attached to timber posts) as shown in Figure 4.

Silt fences are to be used as perimeter controls on the site at the downslope end of earthworks or disturbed soils, and at watercourse crossings as shown in Figure 5. They should be used in conjunction with other sediment and water treatment solutions where required.

To comply with best practice, they should be installed as follows:

- Installed perpendicular to the gradient of the slope.
- Construct a trench on the up-gradient side.
- Install stakes on the down-gradient side.
- Position with a curve to the end of the fence in the up-gradient direction to help capture surface runoff as shown in Figure 4.

Silt fences should not be installed in the following:

- Within drainage ditches or channels.
- Running parallel to the direction of slope.

Figure 4 - Typical Silt Fencing

Figure 5 - Silt Fencing at Watercourse Crossing

3.2.3.3 Maintenance

Silt fencing will be monitored by the ECoW and should be cleared regularly of sediment and silt build-up, and after heavy rainfall and storm events. Silt fencing will should be replaced, when necessary, as monitored by the ECoW.

3.2.4 Check Dams

3.2.4.1 Purpose

Check dams will facilitate the settlement of suspended solids by slowing the flow of water within the drainage ditches. An example of a typical check dam is shown in Figure 6.

3.2.4.2 Installation

Check dams will be installed within drainage ditches at regular intervals, where appropriate. Appropriately sized stone pitching will be used within the dam in order to provide a rough surface for water within the drainage ditch to pass over.

Figure 6 - Check Dam Example

3.2.5 Settlement Lagoons

3.2.5.1 Purpose

Retention of contaminated water to allow for the settlement of silt and sediments to an acceptable level (in line with baseline level) prior to discharge to the water environment.

3.2.5.2 Installation

Settlement lagoons will be implemented where appropriate across the Site. They take the form of large trenches dug into the ground and are often bunded.

Settlement lagoons should be installed so as to retain water long enough for silt to settle out. The length of time required will depend on the type of silt with finer silts and clays taking longer to settle.

Further measures may include the use of flocculent to further facilitate the settlement of suspended solids. The appropriateness of flocculent use must be discussed with SEPA prior to its introduction into settlement lagoons. Flocculants can be pollutants if the incorrect dosage is used. Further guidance on the required dimensions of the settlement lagoon are provided in GPP5.

To comply with best practice, they should be installed as follows:

- Install energy dissipation methods (e.g., rip-rap) at the inlet to minimise flow.
- Install inlet pipe work vertically to dissipate energy of flow in.
- Install a lined inlet chamber and outlet weir with materials such as geotextiles.
- Install a long outlet weir.
- Install two or three lagoons in a series to increase silt retention and storage as shown in Figure 7.

Figure 7 - Settlement Lagoon Series

3.2.5.3 Maintenance and Operation

Settlement lagoons should be inspected regularly by the ECoW to ascertain the functionality of the system. To comply with best practice, the following maintenance measures are to be conducted:

- All settlement lagoons will be actively managed to control water levels and ensure that any runoff is contained, especially during times of rainfall.
- A constant pumped inlet rate should be maintained.
- Inlet chamber should be emptied of silt regularly.
- Discharge quality to be monitored frequently.

Settlement lagoon outflow discharge may be pumped, when required, for maintenance purposes. A 'Siltbuster' is a method of pumping excess silt-laden water and treated prior to discharge, as shown in Figure 8.

Figure 8 - Settlement Lagoon and Siltbuster Pumping Water for Treatment

Any pumping activities will be supervised and authorised by the Contractor's Project Manager.

Methods for discharge of outflow water from a settlement lagoon are detailed in the following section.

3.3 Chemical Pollution Prevention

Pollution from fuels and other chemicals can cause a variety of detrimental effects to freshwater ecology and can lead to loss of aquatic flora and fauna. Cement pollution and concrete wash-out can lead to increases in alkalinity and raise the pH of watercourses, which can be toxic to aquatic flora and fauna.

Chemical pollution prevention is to be employed on site in line with best practice guidance, including the following:

- SEPA Groundwater Protection Policy for Scotland (Section F)29.
- SEPA WAT-SG-31: Special Requirements for Civil Engineering Contracts for the Prevention of Pollution30.

[29] SEPA (2009) Ground Protection Policy for Scotland v3 [Online] Available at: https://www.sepa.org.uk/media/34371/groundwater-protection-policy-for-scotland-v3-november-2009.pdf (Accessed 17/04/2023).
[30] SEPA (2006) WAT-SG-31: Prevention of pollution from Civil Engineering Contracts: Special Requirements Version 2 [Online] Available at: https://www.sepa.org.uk/media/152220/wat_sg_31.pdf (Accessed 17/04/2023).

- SEPA WAT-SG-32: SEPA Guidance on the Special Requirements for Civil Engineering Contracts31.
- CIRIA Control of Water Pollution form Construction Sites (C532)32.
- GPP5: Works and maintenance in or near water33.
- GPP8: Safe storage and disposal of used oils34.
- GPP13: Vehicle washing and cleaning35.
- PPG18: Managing fire water and major spillages36.
- GPP21: Pollution incident response planning37.
- GPP22: Dealing with spills38.
- GPP26: Safe storage – drums and intermediate bulk containers39.

To reduce the potential for a chemical pollution incident, areas of high-risk activities are to be located away from watercourses and drainage paths. Areas of high risk include:

- Fuel and chemical storage.
- Refuelling areas.
- Material stockpiles.
- Vehicle and equipment washing areas. and
- Site compounds/parking areas.

3.3.1 Storage of Chemicals and Oil

Potentially contaminating chemicals stored on site will be kept within a secure bunded area to prevent any accidental spills from affecting hydrological resources. The bunded area will be within the construction compound and will be underlain by an impermeable ground membrane layer to reduce the potential pathways for contaminants to enter watercourses and groundwater.

Oil storage areas will be covered in order to prevent rainwater collecting within the bunded area.

The chemicals storage area would be kept secure to prevent theft of vandalism. A safe system for accessing the storage area would be implemented by the Construction Contractor.

The following measures should be employed under best practice guidance for storage of chemicals and oils:

[31] SEPA (2006) WAT-SG-32: Prevention of pollution from Civil Engineering Contracts: Guidelines for the Special Requirements Version 2 [Online] Available at: https://www.sepa.org.uk/media/152233/wat_sg_32.pdf (Accessed 17/04/2023).
[32] CIRIA (2001) C532: Control of water pollution from construction sites – Guidance for consultants and contractors
[33] NetRegs (2018) GPP5: Works and maintenance in or near water [Online] Available at: https://www.netregs.org.uk/media/1418/gpp-5-works-and-maintenance-in-or-near-water.pdf (Accessed 17/04/2023).
[34] NetRegs (2021) GPP8: Safe storage and disposal of used oils [Online] Available at: https://www.netregs.org.uk/media/1900/guidance-for-pollution-prevention-8-2022-update.pdf (Accessed 17/04/2023).
[35] NetRegs (2021) GPP13: Vehicle washing and cleaning [Online] Available at: https://www.netregs.org.uk/media/1882/guidance-for-pollution-prevention-13-2022-update-v2.pdf (Accessed: 04/04/2023).
[36] NetRegs (2000) PPG18: Managing fire water and major spillages [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 25/01/2022).
[37] NetRegs (2021) GPP21: Pollution Incident Response Planning [Online] Available at: https://www.netregs.org.uk/media/1674/ppg-18.pdf (Accessed 17/04/2023).
[38] NetRegs (2018) GPP22: Dealing with spills [Online] Available at: https://www.netregs.org.uk/media/1643/gpp-22-dealing-with-spills.pdf (Accessed: 04/04/2023).
[39] NetRegs (2021) GPP26: Safe Storage – drums and immediate bulk containers [Online] Available at: https://www.netregs.org.uk/media/1885/guidance-for-pollution-prevention-26-2022-updated.pdf (Accessed 17/04/2023).

- Storage tanks (above or below ground) should have sufficient strength and structural integrity to hold without leak or burst and bunded in accordance with SEPA guidance, and double-skinned tanks should be used for List I substances.
- Storage containers should have a minimum design life of 20 years.
- All storage containers are closed and locked when not in use.

Chemical storage areas are to be removed from Site as part of decommissioning, any remnant in-situ storage facilities must be appropriately maintained and monitored for degradation and release of oils or chemicals.

3.3.2 Spillage of Chemicals and Oil

The construction compound will have a bunded area and this area will be underlain by an impermeable ground membrane layer. The bund will have a capacity of 110% of the stored liquid containers (including fresh concrete). This will reduce the potential for accidental spillages to contaminate surface water or groundwater.

Best practice guidance on the prevention of spillages of chemical outlines the following measures:

- Areas where transfer and handling of chemicals is to occur should have impermeable surface.
- Drainage systems onsite should be designed to enable the containment of spillages and appropriate disposal and treatment. and
- Emergency procedures are implemented for a spillage incident and leak detection measures (if appropriate).
- Regular maintenance and inspection of chemical storage facilities to be conducted (may be carried out by onsite ECoW).
- Provision and training in the use of spill kits, as outlined below.

An appropriately sized spill kit(s) will be provided, maintained and located at strategic points across the Site, as shown in Figure 9. It is also recommended that all vehicles on-site have spill kits in the event of a spillage from a vehicle. This will contain materials, such as absorbent granules and pads, absorbent booms and collection bags. These are designed to halt the spread of spillages and will deploy, as necessary, should a spillage occur elsewhere within the construction compound.

Figure 9 - Spill Kit Provision on Site

Speed limits for vehicles transporting concrete will be set at a maximum of 15 miles per hour (mph) and will be monitored. Maximum vehicle load capacities will not be exceeded. Although tracks will be maintained in good condition, vehicle loads will be reduced when a rougher surface is identified prior to track maintenance.

All maintenance and operation of machinery, and use of chemicals and oils on site, will be conducted on suitable absorbent spill pads to minimise the potential for groundwater and surface water pollution. All machinery will be equipped with drip pans to contain minor fuel spillage or equipment leakages.

Appointed refuelling personnel will be trained in the correct methods of refuelling on site to ensure that pollution incidents are prevented, and a quick response plan is implemented, should a spill occur, to minimise the impact of spills. Toolbox talks will be carried out by the ECoW to personnel on site on the risks of chemical and oil spillages and the procedures in place to handle these.

Regular vehicle and machinery maintenance will be conducted (through daily checklists) to ensure that there is minimal potential for fuel or oil leaks / spillages to occur.

Figure 10 shows examples of drip trays and bunds.

Figure 10 - Drip Trays and Bunds to Prevent Chemical Spills

3.3.3 Concrete, Cement, and Grout

Concrete, cement and grouts which are batched and transported on-site will be subject to the same requirements as outlined in Section 3.3.1.

To comply with best practice, concrete, cement and grout mixing and washing areas should:

- Be sited in an impermeable hardstanding or geotextile within a designated area.
- Be sited at least 10 m from any watercourse or surface water drain, rock outcrop or sinkhole.
- Install settlement and re-circulation systems for water re-use in the batching process to minimise water use, treatment requirements and risk of pollution.
- Designated and contained washing areas for batching plant and vehicles (further details of vehicle washing provided in Section 3.3.4).
- Collect contaminated wash waters which cannot be reused and discharge to foul sewer or tanker off-site (further details of discharge of water is provided in Section 3.1.5). Contaminated water should never be released to the water environment.

To prevent pollution, it is important that all concrete pours are planned and that specific procedures are adopted where there may be a risk of surface water or groundwater contamination, in accordance with CIRIA C532. These procedures will include:

- Ensuring that all excavations are sufficiently dewatered before concrete pours begin and that dewatering continues while the concrete cures. However, construction good practice will be followed to ensure that fresh concrete is isolated from the dewatering system. and
- Ensuring that covers are available for freshly placed concrete to avoid the surface of the concrete washing away during heavy precipitation.

3.3.4 Vehicle Washing

There will be a wash-out facility within the construction area consisting of a sump overlain with an impermeable geosynthetic membrane. The geosynthetic membrane will filter out the concrete fines leaving clean water to pass through to the sump. The sump water will be pumped to a licenced carrier and taken off-site for approved disposal.

No washing of concrete-associated vehicles will be undertaken outside the wash out facilities, and the area will be signposted, with all site contractors informed of the locations.

The frequency of concrete plant washout may also be reduced through the use of retarders.

Figure 11 displays a typical concrete wash-out facility.

Figure 11 - Concrete Wash-out Facility

In the event that plant and wheel washing is required, dry wheel wash facilities and road sweepers will be provided to prevent (as far as is practicable) mud and debris being carried from within the site onto the public road.

Signage will be put in place to direct all plant vehicles to use wheel wash facilities. The track section between the wash facility and the public road will be surfaced with tarmac or clean hardcore and the area surrounding the facilities will be kept clean and in good condition.

The wheel wash facility, which will work on a closed cycle, shall be operated throughout the construction period. Wheel wash facilities will be located within a designated area of hardstanding at least 50 m from the nearest watercourse. It is expected that these facilities shall be sited adjacent to the site entrance. An example of a dry-ramp wheel wash facility is shown in Figure 12.

Should debris be spread onto the site access or public road adjacent to the Proposed Development, then road sweepers will be quickly utilised to clean affected areas. Loose debris will also be periodically removed from on-site tracks. All heavy goods vehicles (HGVs) taking construction materials to and from the site will be sheeted to prevent the spillage or deposit of material on the highway.

Figure 12 - Vehicle Wheel Wash Facility

3.4 Activities in the Water Environment

Temporary activities related to construction phase works within the water environment include construction of temporary and permanent watercourse crossings.

3.4.1 Authorisation

Engineering activities within the water environment, including construction of watercourse crossings, culverting, diversions and dewatering requires authorisation under the Controlled Activities Regulations (CAR).

3.4.2 Watercourse Diversions

Temporary watercourse diversions may be required for construction works to be conducted on the banks of a watercourse, within wetlands or a watercourse channel. The requirement for this should be avoided and designed out where possible.

Where required, watercourse diversions are to be installed in line with the following best practice guidance:

- SEPA WAT-SG-29: Temporary Construction Methods40.

Isolation of a watercourse to allow works may be in the following good practice methods:

- Partial isolation (cofferdam).
- Partial isolation (cassion).
- Full isolation (temporary diversion).

[40] SEPA (2009) WAT-SG-29: Engineering in the Water Environment Good Practice Guide: Temporary Construction Methods First Edition [Online] Available at: https://www.sepa.org.uk/media/150997/wat_sg_29.pdf (Accessed 17/04/2023).

- Full isolation (gravity / flume pipe).
- Full isolation (over-pumping / siphon).

3.4.2.1 Full isolation: over-pumping / siphon

Allows for a whole section of the channel to be isolated, and water is diverted downstream using a pump or siphon in order to retain hydrological continuity. This temporary diversion may be utilised prior to establishing a long-term watercourse diversion for permanent infrastructure within watercourses.

The section of the watercourse requiring diversion will be isolated using barriers that span the full width of the existing watercourse. This keeps a stretch of the watercourse dry, and the water is transferred downstream of the works area by mechanical assistance (pumping), until a long-term diversion is operational.

The pump and associated pipework need not be in the isolated area, as shown in Figure 13.

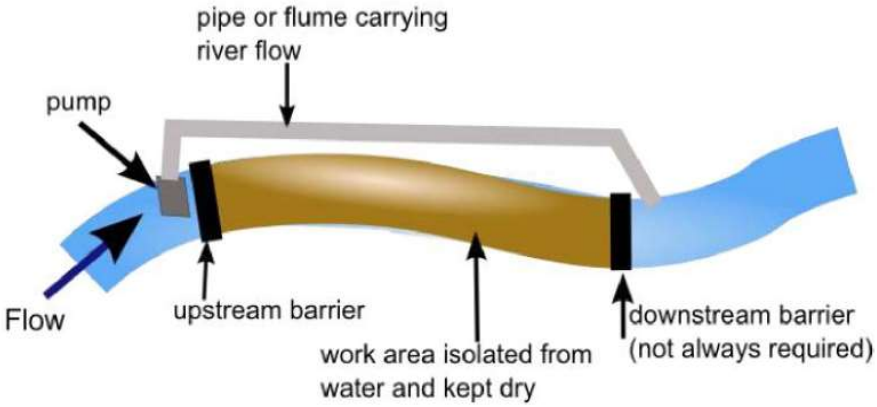


Figure 13 - Typical Over Pumping Arrangement

It may be necessary to pump water from upstream of the barrier to downstream of the works area, i.e., maintain 'normal' flow in the watercourse either side of the isolated reach. Depending on the gradient of the watercourse, it may also be necessary to install a full width barrier downstream of the work area to prevent ingress of water, as shown in Figure 14.

Figure 14 - Watercourse Diversion (Full Isolation - Over Pumping)[41]

Pumps will be kept at least 10m from the edge of the channel and on drip trays or within bunds that have a capacity 110% of that of the fuel tank.

3.4.3 Watercourse Crossings

There are no new watercourse crossings required for the Proposed Development.

3.4.4 Culverts

Culverts are used to create artificial channels and allow for the continuity of water drainage and balance upstream and downstream of infrastructure associated with the Proposed Development e.g., access tracks.

Closed culverts are sufficient for cross-drainage under an onsite access track, as outlined in Section 3.1.3.

Culverts will be installed and designed in line with best practice guidance, including CIRIA C689, and incorporate the following criteria:

- Culverts will be well bedded to avoid settlement and protected by an adequate cover of road material.
- The substrate and side/ head walls will be reinforced in order to prevent erosion.
- The culverts will be designed such that it does not cause a barrier to movement of fish or other aquatic fauna.
- Culvert floors will have the same gradient (not exceeding a slope of 3 %) and level, and carry similar bed material and flow, as the original stream.
- There shall be no hydraulic drop at the culvert inlet or outlet.

[41] SEPA (2009) WAT-SG-29: Engineering in the Water Environment Good Practice Guide: Temporary Construction Methods First Edition

- The width of the culvert will be greater than the active channel width of the watercourse.
- The culvert must not exacerbate or create flooding.
- Culverts will be used to conduct water under the access tracks.
- Any fences or screens fitted on the inlet or outlet of the culvert will be designed to allow at least 230 mm of space between the bars of the screen of fence, up to the high-water level.
- A natural stone headwall will be provided upstream and downstream of culverts to protect the road embankment. Further protection will be provided to the banks using soft engineering techniques as much as possible. and
- Where there is risk of bed erosion upstream or downstream of culverts, natural stone rip-rap will be provided.

3.4.5 Dewatering

Dewatering may be required for excavations or construction of foundations. Dewatering is regulated under CAR GBR15 if less than 10m3 per day.

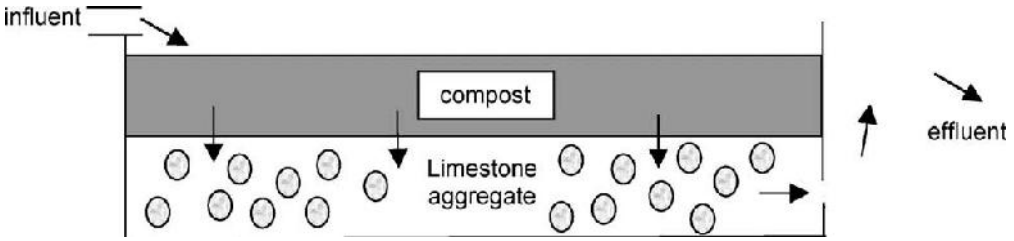
Dewatering should be employed in line with the following best practice guidance:

- SEPA WAT-SG-29: Temporary Construction Methods.
- SEPA Good Practice Guide WAT-SG-28: Intakes and Outfalls42.
- SEPA Regulatory Method WAT-RM-11: Licensing Groundwater Abstractions including Dewatering43.

If the dewatering volume is greater than 10m3/ day, a CAR licence is required, and SEPA WAT-RM-11 is to be referred to. Discharge of water as a result of dewatering must not cause further erosion and energy dissipation measures should be put in place as outlined in SEPA WAT-SG-28 guidance.

Dewatering must consider the impact on other groundwater abstractions and groundwater dependent terrestrial ecosystems (GWDTE). Further information on the protection of GWDTE are provided in Section 3.5.

Alkali (limestone) may be added to the base of dewatering pits to buffer acidic water, should intrusive site investigations indicate the presence of acid mine water in near surface groundwater. Settlement lagoons may also be constructed with a composting layer also allow for the treatment of any ochre water before being discharged into the hydrological system. A schematic diagram44 is displayed below:



[42] SEPA (2019) WAT-SG-28: Engineering in the Water Environment Good Practice Guide: Intakes and outfalls Second Edition [Online] Available at: https://www.sepa.org.uk/media/150984/wat_sg_28.pdf (Accessed 17/04/2023).
[43] SEPA (2017) WAT-RM-11: Regulatory Method: Licensing Groundwater Abstractions including Dewatering [Online] Available at: https://www.sepa.org.uk/media/151997/wat-rm-11.pdf (Accessed 17/04/2023).
[44] Johnson & Hallberg 2005. “Acid mine drainage remediation options: a review” [online] Available at: https://www.sciencedirect.com/science/article/abs/pii/S0048969704006199 (Accessed 17/04/2023).

3.5 Measures to Protect Water Environment from Tree Felling and Removal

The following measures will be implemented during tree felling as part of the Proposed Development to ensure that harvesting methods are in accordance with good practice:

- Timber will be stacked on drier slopes at least 50m from watercourses and not blocking roadside drains.
- Brash will not be stockpiled within 50m of a watercourse.
- The area within 50 m of watercourses shall be regarded as a “sensitive area”.
- During felling operations within “sensitive areas”, silt traps or temporary dams will be used in local ditches to prevent sediment entering watercourses, and silt fences will be constructed locally between working areas and watercourses.
- Any work in “sensitive areas” to be approved by the Infrastructure Contractor’s Project Manager and the ECoW.
- If felling is to occur in the riparian zone (the interface between land and a flowing surface water body) of a watercourse, trees will be felled away from the watercourse.
- Brash mats will be used for vehicle trafficking to protect bare soils.
- Silt traps will be installed in existing and new drainage ditches downstream of felling areas and construction activities but will be sited to avoid slopes with a gradient greater than 1 in 20.
- Silt fences and traps will be cleaned out on a regular basis and following heavy precipitation.
- Silt matting if used to be checked on a daily basis and replaced as required.

3.6 Measures for Onsite Battery Storage Fire Suppression

The presence of onsite battery energy storage system (BESS) may result in battery fires. This can result in a significant environmental impact to water environment receptors as a result of contaminated runoff from water used to supress any fire.

The following measures will be implemented to minimise the fire risk of the BESS compound:

- Procuring components and using construction techniques which comply with all relevant legislation.
- Including automatic fire detection systems in the development design.
- Including automatic fire suppression systems in the development design.
- Including redundancy in the design to provide multiple layers of protection.
- Designing the Proposed Development to contain and restrict the spread of fire through the use of fire-resistant materials, and adequate separation between elements of the BESS.
- Ensuring that Scottish Fire and Rescue Service (SFRS) recommendations and requirements are addressed to enable an adequate emergency response to a fire.
- Work with SFRS to develop their Tactical Response Plan in case of an incident.

The SFRS will be included in discussions regarding BESS hazards and in developing an adequate response as part of the Emergency Response Plan. Training exercises with the SFRS will be planned prior to construction. Standard Operating Procedures and Standard Operating Guidance will be updated and tested on a regular basis.

As part of the design, all enclosures will include adequate Heating Ventilation or Air Conditioning (HVAC) installations to maintain the temperature for proper operation of the batteries as per manufacturer’s recommendations. In the event of a fire, ventilation should be maintained throughout all stages. The BESS compound will also include a gas-based extinguishing fire suppression system.

A minimum of two types of automatic fire detection system will be installed which will allow very early warning. These systems will be fitted with fire resistant wires and components.

As water has been proven to be the most effective agent to fight fire from batteries as it provides a cooling effect, a sprinkler system will be installed within BESS containers. A procedure for battery submersion will be developed by the SRFS, as this is effective at cooling the batteries. As the batteries will continue to release gases, several batteries should never be submerged in a confined space without adequate ventilation. Prior to construction a plan of how to supply enough water in the event of a battery fire should be discussed with the SRFS.

As a result of water being used as part of the cooling system in the emergency response to a battery fire, contaminated water will be produced. To prevent this resulting in a pollution incident, the design of the BESS compound will include a shut-off mechanism. The area surrounding the compound will also be bunded so any contaminated water will be captured and hydrologically disconnected from the Allt Eireannaich as well as other surface and groundwater receptors. Following an event, the contaminated water can be pumped out and removed from Site before being disposed of appropriately.

3.7 Water Quality Monitoring Programme

A surface water monitoring programme will be established prior to the construction phase of the Proposed Development. An indicative monitoring programme is set out below.

Surface water monitoring would be undertaken at locations on the principal watercourses downstream of the Proposed Development infrastructure and upstream of other non-natural influences, where possible.

Regular visual inspections of surface watercourses are proposed, especially during major excavation works, as these allow rapid identification of changes in levels of suspended solids that could indicate construction related effects are occurring upstream. Potential effects can then be investigated, and remedial action taken to prevent further effects, if necessary.

To supplement the visual inspections, it is anticipated that there would be a number of surface water monitoring points for extractive sampling and analysis. Details will be agreed with SEPA in advance of construction.

The following sampling frequency is proposed in order to establish baseline hydro-chemical conditions of surface water constituents:

- Once every month for twelve months prior to the construction phase.
- The following sampling frequencies are proposed in order to monitor surface water conditions against baseline conditions:
- Once a month in-situ monitoring and sampling for the duration of the construction phase. and
- Once a month in-situ monitoring and sampling for 12 months during the post construction phase.

Establishing baseline conditions for surface waters will enable any trends in levels of critical parameters to be assessed and deviations from the norm identified and rectified through water management measures.

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