

13 Hydrology and Hydrogeology

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13. Hydrology and Hydrogeology

13.1. Summary

- 13.1.1. This Chapter assesses the potential effects of the Proposed Varied Development on hydrological and hydrogeological receptors during construction, operation and decommissioning.
- 13.1.2. The hydrological and hydrogeological assessment for the Proposed Varied Development was based on a desk study, site surveys, and consultation with Dumfries and Galloway Council (DGC), Marine Scotland, Scottish Water and the Scottish Environment Protection Agency (SEPA).
- 13.1.3. The design of the Consented Development as detailed in the Shepherds' Rig Wind Farm Environmental Impact Assessment (EIA) Report (Infinergy, 2018) and the Shepherds' Rig Additional Environmental Information Report (AEI) (Infinergy, 2019) was established through an iterative process which included the identification of technical and environmental constraints determined during the EIA process, through consultation with statutory bodies and members of the local community.
- 13.1.4. Most notably from a hydrological and hydrogeological perspective, the Proposed Varied Development reduces the number of turbines from 17 to 11 compared to the Consented Development's design whilst increasing the remaining turbine's size as well as reducing the length of new track required by approximately 1.3 km. The reduction in the turbine numbers means there are no longer three turbines within the catchment of the Black Burn and the need for a watercourse crossing over the Black Burn has been removed.
- 13.1.5. There are no statutory designated sites within the study area that are hydrologically connected to the Proposed Varied Development.
- 13.1.6. None of the Proposed Varied Development's infrastructure has been assessed as being at risk from river flooding and the turbine locations avoid potential surface water flooding areas.
- 13.1.7. There are no Groundwater Dependent Terrestrial Ecosystems (GWDTEs) that are hydrologically or hydrogeologically connected to the Proposed Varied Development infrastructure.
- 13.1.8. The Private Water Supplies (PWSs) within 1 km of the Site are all sourced from groundwater and / or are located over 250 m buffer zones from the Proposed Varied Development.
- 13.1.9. The Proposed Varied Development is located upstream of a Scottish Water surface water Drinking Water Protected Area (DWPA). Carsfad Loch is located on the Water of Ken 5.3 km south of the Proposed Varied Development, and raw water is pumped from Carsfad Loch to Lochinvar water treatment works (WTWs).

- 13.1.10. Construction of the Proposed Varied Development (including forest felling) has the potential to result in chemical pollution, erosion and sedimentation, impediments to flow, acidification of watercourses, changes in groundwater flow and increase in run-off and flood risk.
- 13.1.11. Measures including absorbent spill pads / kits and other measures highlighted within the Outline Construction and Environmental Management Plan (OCEMP) will effectively limit uncontained release of chemicals to minor fugitive releases. These would be minimised through best practice construction methods such as vehicle speed limits and regular vehicle and machine maintenance.
- 13.1.12. Similar effects have been assessed for the operation and decommissioning of the Proposed Varied Development.

Table 13.1 – Summary of Conclusions – Proposed Varied Development and Consented Development

2018 Section 36 Application, supported by Additional Environmental Information I (2019) and Additional Environmental Information II (2021) - the Consented Development	2026 Section 36C Application - the Proposed Varied Development
The EIA concluded that the effects to the hydrology and hydrogeology from the Consented Development were negligible and therefore not significant.	The EIA has concluded that the effects to the hydrology and hydrogeology from the Proposed Varied Development are Minor and therefore not significant.
Watercourses and Surface Water Although some construction areas are close to watercourses, measures like silt traps, lagoons, and buffer strips will prevent sediment from entering streams. As a result, erosion and sedimentation effects on sensitive watercourses are expected to be negligible and not significant under EIA regulations.	Watercourses and Surface Water The majority of the Proposed Varied Development infrastructure lies outwith 50 m of watercourses. Additional mitigation measures will reduce potential pollution of the watercourses from sediments and erosion. The conclusion of effect is the same, not significant.
Water Supplies Public, licenced and private water supplies near the project are highly sensitive but lie outside critical buffer zones. With planned protections, any impact is expected to be negligible and not significant under EIA rules.	Water Supplies No element of Proposed Varied Development is within 250 m buffer zone of known water supply sources. Any impact would be negligible due to dilution and distances. The conclusion of effect is the same, not significant.
Flood Risk	Flood Risk

The Proposed Development will slightly increase runoff but with SuDS measures and existing conditions, effects on water flow and flood risk will be negligible. Felling and construction are not expected to raise flood risk or significantly alter watercourse flows, remaining within EIA significance thresholds.	No change to the conclusion of effects, not significant.
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- 13.1.13. The proposed variations to the Consented Development will result in no change to the magnitude of effects on the water environment overall, including cumulative effects. The assessment of significance of effects remains unchanged from that outlined within the 2018 EIA Report and 2019 AEI Report.
- 13.1.14. Effects on the water environment associated with the Proposed Varied Development are considered to be not significant. This represents no change to the conclusions outlined in the 2018 EIA Report and subsequent AEI Reports for the Consented Development.

13.2. Introduction

- 13.2.1. This Chapter provides an assessment of hydrological and hydrogeological effects arising from the construction, operation and decommissioning of the Proposed Varied Development. This assessment was undertaken by Fluid Environmental Consulting Limited (Fluid).
- 13.2.2. SETT Wind Development Limited ('the Applicant') gained Section 36 consent and deemed planning permission from Scottish Ministers in August 2023 to construct and operate Shepherds' Rig Wind Farm ('the Consented Development'). The Consented Development comprises 17 turbines (15 turbines with a maximum blade tip height of 149.9 metres (m) and two turbines with a maximum blade tip height of 125 m) and associated infrastructure.
- 13.2.3. The Applicant is now applying to Scottish Ministers for consent under Section 36C of the Electricity Act 1989 (as amended) and the Town and Country Planning (Scotland) Act 1997 to vary the Consented Development. The proposed variations include:
- Removal of six turbines and associated crane hard standings;
 - Increase in the maximum blade tip height of the remaining 11 turbines to 220 m;
 - Increase in size of associated crane hardstandings to accommodate the larger turbines;
 - Relocation of eight turbines beyond the micro-siting allowance of the Consented Development, but within the same pattern of development;
 - Amendments to part of the track layout to reflect turbine removal and relocation (as outlined above);
 - Change to the number and location of required watercourse crossings to accommodate the amended track layout;

- Increase in size and capacity of the associated Battery Energy Storage System (BESS);
- Relocation of the temporary construction compound slightly beyond micro-siting allowance;
- Removal of the previously proposed anemometer mast; and
- Increase to the period of consent from 30 to 40 years.

13.2.4. Collectively, the proposed variations listed above are referred to as the 'Proposed Varied Development'.

13.2.5. The key element of the Proposed Varied Development is that turbine numbers are reduced, and the locations of three turbines (5, 6 and 7) are unchanged from the Consented Development. Locations of turbines 3, 8, 9 and 10 are within 200 m of their original position, relocated to incorporate the constraints associated with larger turbines. Four turbines (1, 2, 4 and 11) are over 200 m from a consented turbine location; however, no turbine is over 500 m from a consented location. All turbines are located within the same habitat types and catchments as the Consented Development. No significant additional impacts are therefore predicted.

13.2.6. The Chapter has been prepared with reference to the assessment undertaken for the Consented Development. The key historical documents include:

- Shepherds' Rig Wind Farm EIA Report, Chapter 13 Hydrology and Hydrogeology (Infinergy, 2018);
- Shepherds' Rig Additional Environmental Information Report I (Infinergy, 2019); and
- Shepherds' Rig Additional Environmental Information Report II (Infinergy, 2021).

13.2.7. This hydrology and hydrogeology assessment identifies water features of note. The information and data collated from the hydrological assessments have informed the Site layout to minimise the potential impacts on the water environment as a result of the Proposed Varied Development.

13.2.8. The Chapter presents the current environmental baseline in relation to this topic and associated links to other chapters such as terrestrial and aquatic ecology (**Chapter 12: Geology and Peat** and **Chapter 9: Ecology**) due to their potential dependence on the water environment. This is then followed by the identification and assessment of potentially significant effects on each receptor based on the baseline and assessment methodology set out. The assessment presents the effects on each receptor in the surface water catchments and sub-catchments containing proposed infrastructure. These effects are then grouped for the assessment section which discusses the effects in the round. Where relevant, mitigation, management and monitoring measures are then discussed and the residual effects determined.

13.2.9. The Chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects; and
- Statement of Significance.

13.2.10. This Chapter is supported by the following figures and appendices:

- **Figure 13.1:** Hydrological Context;
- **Figure 13.2a-b:** Hydrological Features;
- **Figure 13.3a-b:** Hydrogeological Regime;
- **Figure 13.4a-b:** Potential Groundwater Dependent Terrestrial Ecosystems;
- **Appendix 13.1:** Best Practice Methodology; and
- **Appendix 13.2:** Watercourse Crossing and Infrastructure within 50 m of Watercourse Inventory.

13.2.11. This Chapter should be read in conjunction with **Chapter 4: Description of Proposed Varied Development, Chapter 7: Forestry, Chapter 9: Ecology, and Chapter 12: Geology and Peat.**

13.3. Legislation, Policy and Guidelines

13.3.1. There is a wide body of legislation and guidance that has been used in relation to the assessment with key documents listed below:

Legislation

- Scottish Government Environmental Authorisation (Scotland) Regulations 2018 (EASR) (that came into effect 1st November 2025);
- Water Environment (Controlled Activities) (Scotland) Regulations (CAR) 2011 (as amended) A Practical Guide, Version 9.3 June 2023 (revoked);
- Water Services (Scotland) Act 2003 (WEWs Act);

- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017 (amends and revokes the Private Water Supplies (Scotland) Regulations 2006);
- The Public Water Supplies (Scotland) Amendment Regulations 2017 (amends the Public Water Supplies (Scotland) Regulations 2014);
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- National Planning Framework (NPF) 4: National Spatial Strategy for Scotland, approved by Scottish Parliament on 11 January 2023.

13.3.2. The Water Framework Directive (WFD) has been implemented in Scotland through the Water Environment and Water Services (Scotland) Act 2003 (WEWs Act), the Water Environment (Controlled Activities) (Scotland) Regulations (CAR) 2011 (as amended in June 2023 - revoked) and between the Consented Development and the Proposed Varied Development, the recent Environmental Authorisation (Scotland) Regulations 2018 (EASR) (that came into effect 1st November 2025).

13.3.3. As of 1 November 2025, Scotland's water regulation landscape has undergone a major transformation with the full repeal of the Water Environment (Controlled Activities) (Scotland) Regulations 2011, shifting all water-related activities, including abstraction, impoundment, engineering works, and discharges, under EASR 2018, as amended in 2025.

13.3.4. This change consolidates multiple environmental regimes: water, waste, industrial emissions, and radioactive substances, into a single, integrated authorisation system, marking a significant shift in regulatory oversight.

13.3.5. Key updates include a broadened regulatory scope that covers a wider range of activities, clarified definitions such as "regulated activity" and "best available techniques (BAT)," a flexible tiered authorisation structure, and the introduction of standardised technical schedules outlining requirements for monitoring, operational controls, and environmental standards.

13.3.6. While both CAR and EASR utilise General Binding Rules (GBRs), registrations, and permits, EASR introduces a combined permit system that streamlines compliance and reporting by integrating multiple activities under a single authorisation, reducing administrative burden and ensuring consistent standards across domains. Importantly, there is no transitional period; applications after 1 November 2025 must comply fully with EASR requirements.

13.3.7. The amended regulations clarify procedures for permit variation, surrender, and transfer, and reinforce the use of technical schedules and SEPA's updated guidance. It is essential that all permitting and compliance strategies are updated to reflect the EASR framework, with an emphasis on maintaining Scotland's core water protections while supporting sustainable resource use and regulatory certainty within an integrated, modernised system.

- 13.3.8. The transition from CAR to EASR, effective 1 November 2025, constitutes a legislative adjustment rather than a significant alteration to the EIA or regulatory process. As such, the methodology and conclusions established in the Consented Development and any supporting technical assessments related to CAR, will remain applicable beyond 1 November. It is considered that Consented Development's EIA remains robust and suited to current and future legislative and regulatory requirements.

Planning Policy

- 13.3.9. National Planning Framework (NPF) 4: National Spatial Strategy for Scotland, adopted by Scottish Ministers on 13th February 2023 replaces NPF3 and Scottish Planning Policy.
- 13.3.10. Some of the SEPA planning guidance is being reviewed and updated to reflect the NPF4 policies, for example, the Flood Risk Standing Advice and Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and GWDTEs. It still provides useful and relevant information, but some parts may be updated further in the future.
- 13.3.11. Dumfries and Galloway Council (DGC) formally adopted the Dumfries and Galloway Local Development Plan (LDP) 2 on the 3rd October 2019 and have started on LDP3. Relevant policies to this Chapter are:
- OP1: Development Considerations g) Water Environment Development proposals should maintain or enhance water quality and take account of the need to manage water quantity, including flooding. In securing these objectives they should also seek to contribute positively to the general environmental quality of their area.
 - NE6: Sites of National Importance for Biodiversity and Geodiversity
 - NE4: Sites of International Importance for Biodiversity; and
 - NE5: Species of International Importance;
 - NE11: Supporting the Water Environment;
 - NE12: Protection of Water Margins;
 - IN1: Renewable Energy
 - IN2: Wind Energy

SEPA Guidance

- 13.3.12. The Guidance for Pollution Prevention (GPP) includes the documents referred to below, which are the principal documents which establish best practice for preventing contamination of surface water from construction activities. Those relevant to the Proposed Varied Development include:
- GPP1: Understanding your Environmental Responsibilities – Good Environmental Practices version 1.2 (SEPA, DAERA, NRW & NIEA, June 2021) replaces PPG1:

General guide to the prevention of pollution (EA, SEPA & EHSNI, published 2013, withdrawn December 2015);

- GPP2: Above ground oil storage tanks (SEPA, NIEA & NRW, January 2018);
- GPP4: Treatment and disposal of sewage where no foul sewer is available (SEPA, DAERA, NRW & NIEA, 2021);
- GPP5: Works and maintenance in or near water (SEPA, DAERA, NRW & NIEA, January 2017);
- GPP6: Working at construction and demolition sites, version 1 (EA, SEPA & NIEA, 2023);
- GPP8: Safe storage and disposal of used oils (SEPA, DAERA, NRW & NIEA, July 2017);
- GPP21: Pollution incidence response planning, version 1.1 (SEPA, DAERA, NRW & NIEA, June 2021); and
- GPP26: Storage and handling of drums and intermediate bulk containers, version 1.2 (SEPA, DAERA, NRW & NIEA, 2017).

Additional SEPA Guidance

- WAT-G-014EASR Guidance: Registration Activity: Crossing with part of the crossing on the bed where watercourse bed width is 2 metres or less, version 1 (SEPA, 2025)
- WAT-SG-29 Temporary Construction Methods, Engineering in the Water Environment Good Practice Guide, (SEPA; 2009);
- WAT-SG-25 River Crossings, Engineering in the water environment, (SEPA, 2010);
- WAT-SG-75 Water Run-Off from Construction Sites, Sector Guidance, Sector Specific Guidance (SEPA, 2021);
- SEPA Flood maps / Indicative River & Coastal Flood Map (Scotland) (SEPA January 2014, updated April 2018 and 2022);
- Land Use Planning System Guidance Note 4 (LUPS GU4) - Planning Guidance on On-shore Windfarm Developments (SEPA, September 2017);
- Land Use Planning System Guidance Note 2 (LUPS GU2) - Planning advice on Sustainable Drainage Systems (SUDS) (SEPA, August 2010);
- Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, Land Use Planning System Guidance Note 31 (LUPS-GU31), version 3 (SEPA, 2017); and
- Guidance on Assessing the Impacts of Developments on Groundwater Dependent Terrestrial Ecosystems (SEPA, August 2024).

Other Relevant Guidance

- Control of water pollution from constructions sites. Guidance for consultants and contractors C532 (CIRIA, 2001);
- Environmental good practice on site C650 2nd Edition (CIRIA, 2005);
- Control of water pollution from linear construction projects: technical guidance C648 (CIRIA, 2006);
- The Construction Industry Research and Information Association (CIRIA), Environmental Good Practice on Site (C741) (2015);
- Good Practice During Windfarm Construction (Scottish Renewables, SNH, SEPA & Forestry Commission Scotland, 4th Edition 2019);
- Good Practice During Wind Farm Construction (NatureScot, July 2024);
- Managing Forest Operations to Protect the Water Environment Practice Guide (Forestry Commission Scotland, 2019);
- Practice guide for forest managers to assess and protect Groundwater Dependent Terrestrial Ecosystems when preparing woodland creation proposals (Forestry and Water Scotland Initiative, January 2018);
- Planning Advice Note 50 Controlling the Environmental Effects of Surface Mineral Workings (1996);
- Planning Advice Note 79: Water and Drainage (2006);
- Guidance on Road Construction and Maintenance (Forests and Water Guidelines Fifth Edition 2011, Forestry Commission);
- A Handbook of Environmental Impact Assessment, 5th Edition (SNH, 2018); and
- Design Guidance on River Crossings and Migratory Fish (Scottish Executive, 2000).

13.4. Consultation

- 13.4.1. **Table 13.2** provides details of consultations undertaken for the Proposed Varied Development with relevant regulatory bodies, together with action undertaken by the Applicant in response to consultation comments.

Table 13.2 – Consultations

Consultee	Key Consultee Comments	Application Action
Dumfries and Galloway Council – Scoping Response 28th October 2024	No objections in principle. Response focuses on Landscape and visual, noise and access route to site. Routes leading to the site cross a number of bridges/structures, many of which may be unsuitable for heavy HGVs and larger AILs, and that have limitations on safe axle loadings and/or restricted parapet widths. Where a proposed access route crosses bridges and culverts, the applicant will require to get approvals and safe axle loadings (in respect of those structures) from the Council's Engineering Services (Bridges and Structures) unit.	The response focuses on landscape and visual, noise and the access route requirements. Therefore, there is no action to address within the hydrology and hydrogeology chapter. The route to the site is assessed in the offsite roadworks appraisal presented in Appendix 15.2.
The Scottish Government Energy Consents Unit - Scoping Opinion 15th November 2024	Scottish Water provided information on drinking water protected areas or Scottish Water assets on which the development could have any significant effect. Scottish Ministers request that the Company contacts Scottish Water. Scottish Ministers request that the Company investigates the presence of any private water supplies which may be impacted by the development. Developers should identify the main watercourses and waterbodies within and downstream of the proposed Development area, fish populations and any areas of Special Areas of Conservation where fish are a qualifying feature and proposed felling operations particularly in acid sensitive areas.	Assessments of potential impacts on the water environment, including Scottish Water assets and Drinking Water Protected Areas (DWPAs) are considered within this Chapter. Scottish Water has also been consulted further, see below. PWSs have been investigated as part of the Proposed Varied Development's assessment, see Section 13.6.45. Watercourses have been identified as part of the desk study and hydrology walkover. See Section 13.6 for the identified watercourses and Figure 13.2a-b, status is discussed in Chapter 9.
SEPA – Scoping Response	The proposals should demonstrate how impacts on local hydrology have been minimised and the site	The proposed changes to the turbine locations and infrastructure of the Consented

Consultee	Key Consultee Comments	Application Action
13 August 2024	layout designed to minimise watercourse crossings and avoid other direct impacts on water features. Measures should be put in place to protect any downstream sensitive receptors. Drawings showing: a) All proposed temporary or permanent infrastructure overlain with all lochs and watercourses; b) A minimum buffer of 50m around each loch or watercourse. If this minimum buffer cannot be achieved each breach must be numbered on a plan with an associated photograph of the location, dimensions of the loch or watercourse and drawings of what is proposed in terms of engineering works. Crossings must be designed to accommodate the 0.5% annual exceedance probability flows (with an appropriate allowance for climate change), or information provided to justify smaller structures. Advice on flood risk is available at Flood Risk Standing Advice and reference should also be made to Controlled Activities Regulations (CAR) Flood Risk Standing Advice for Engineering, Discharge and Impoundment Activities. If it is considered the development could result in an increased risk of flooding to a nearby receptor, then a flood risk assessment (FRA) must be submitted.	Development have been designed to minimise the number of watercourse crossings and maintain 50 m buffer zones around all 1:25,000 Ordnance Survey water features. Constraints input into the Proposed Varied Development's design is reported in Chapter 3: Alternatives and Scheme Evolution and elaborated on further within this Chapter. The requested drawings are provided as Figures 13.2a-b. A minimum of 50 m buffer has been applied to watercourses. A schedule of watercourse crossings is included as Appendix 13.2. The final design of watercourse crossings will be provided to SEPA prior to the construction phase and will be appropriately sized to convey the 1:200 year event plus an allowance for climate change. As with the Consented Development, given the remote nature of the Proposed Varied Development and the distance to receptors, a standalone Flood Risk Assessment has not been undertaken. Flood risk and increased run-off has been assessed as part of this Chapter. The potential for impacts on GWDTE has been considered as part of the assessment, refer to Section 13.6 and

Consultee	Key Consultee Comments	Application Action
	GWDTEs are protected under the Water Framework Directive. A set of drawings demonstrating all GWDTEs based on NVC survey and existing groundwater abstractions are outwith a 100m radius of all excavations shallower than 1m and outwith 250m of all excavations deeper than 1m and proposed groundwater abstractions. If the minimum buffers cannot be achieved, a detailed site specific qualitative and/or quantitative risk assessment will be required. Due to discrepancies in habitat definition and ambiguity in correspondence with NVC types the use of The UK Habitat Classification System (UKHab) as an alternative to NVC is not accepted. For pollution control and environmental management provide a schedule of mitigation, which includes reference to best practice pollution prevention and construction techniques (for example, limiting the maximum area to be stripped of soils and peat at any one time) and regulatory requirements.	Chapter 9 for habitat survey information. Pollution control and environmental management mitigation is outlined within this Chapter, as well as in Appendix 13.1: Best Practice Methodology, Appendix 12.2: Outline Peat Management Plan and Appendix 4.1: Outline CEMP. A Schedule of Mitigation is provided as Chapter 19.
Fisheries Management Scotland (FMS) – Scoping Response 1st August 2024	General response with regard to the potential risk of such developments to fish, their habitats and any dependent fisheries. The proposed development falls within the catchment relating to the Dee District Salmon Fishery Board (DSFB) and Galloway Fisheries Trust.	Fish and their habitats are assessed in Chapter 9.

Consultee	Key Consultee Comments	Application Action
NatureScot – Scoping Response 29 August 2024	In broad agreement with the proposed scope of the surveys within this section of the assessment and the intention to scope out certain protected areas and species from the EIA due to a lack of connectivity, or other factors.	Noted.
Dumfries and Galloway Council - Private Water Supply Information Request October 2024	DGC provided a list of PWSs within 5km of the Site.	Discussed in PWS Section 13.6.45 . The PWS information provided by DGC has been assessed as part of the EIA assessment.
Scottish Water Consultation - 11th August 2024	Confirmed a surface water Drinking Water Protection Area (DWPA) is downstream of the Site. The Carsfad catchment supplies Lochinvar Water Treatment Works (WTW) and it is essential that water quality and water quantity in the area are protected. The activity is a sufficient distance from the intake that it is likely to be low risk, however care should be taken and water quality protection measures must be implemented in accordance with SW's list of precautions for a range of activities. No PFAS should be present in any of the material used for this development and SW require confirmation of this. There does appear to be assets and other SW infrastructure including the WTW's by the approach road at the (National Grid Reference (NGR) NX 56712 93206 provided. CEMP detailing the Water Quality Protection Measures.	No PFAs will be used in the turbine construction. Appropriate mitigation measures to protect water quality are referred to within this Chapter as appropriate, as well as outlined in Appendix 13.1: Best Practice Methodology and Appendix 4.1: Outline CEMP . A CEMP detailing the Water Quality Protection Measures will be provided as conditions to planning. Scottish Water will be kept informed ahead of any construction works occurring on site and will be consulted through the planning condition discharge process to agree pollution prevention measures set out within the CEMP. An Outline CEMP is provided in Appendix 4.1 .

13.5. Assessment Methodology and Significance Criteria

Study Area

- 13.5.1. The hydrology and hydrogeology study area (the Core Study Area) is defined by the Proposed Varied Development's application boundary (the 'site'). A wider study area of 5 km from the proposed wind turbine locations has also been considered to assess potential impacts on the downstream water environment (the Wider Study Area). The core study areas and wider hydrological context are shown in **Figure 13.1**. At distances greater than 2 km within upland catchments, it is considered that schemes are unlikely to contribute to a hydrological impact, in terms of chemical or sedimentation impacts, due to dilution over distance of potentially polluting chemicals, unless a direct pathway exists, such as a watercourse.
- 13.5.2. A smaller 1 km buffer of the site is used to assess the PWS (the PWS study area).
- 13.5.3. A 5 km buffer is used for the cumulative assessment, focusing on those schemes within the same hydrological catchment.

Desk Study

- 13.5.4. The assessment was predominantly based on a desk study with site visits for verification. The desk study involved collating and assessing the relevant information:
- Identification of underlying geology and hydrogeology;
 - Collation of data provided through consultations;
 - Identification of groundwater vulnerability;
 - Assessment of topography and slope characteristics;
 - Identification of catchments, watercourses, springs and water features; and
 - Collation of flood plain information and water quality data.
- 13.5.5. Reference was also made to the following sources of information:
- Previous EIA Report Chapter 13 by Arcus (2018) and Additional Environmental Information (AEI) by Arcus (2021), submitted by Infinergy;
 - Centre for Ecology and Hydrology (CEH): National River Flow Archive (NRFA) website for river flow data (accessed October 2024 and March 2026, <http://www.ceh.ac.uk/data/nrfa/data/search.html>);
 - Meteorological Office website for rainfall data (accessed March 2026, <http://www.metoffice.gov.uk/climate/uk/averages/>);
 - Ordnance Survey Mapping 1:10,000 scale digital Open data, 1:25,000 scale Explorer map 326 Ayr & Troon and map 320 Castle Douglas, Loch Ken & New Galloway and

1:50,000 scale Landranger map 70 Ayr, Kilmarnock & Troon and map 77 Dalmellington & New Galloway

- Google Earth and Bing map aerial imagery (accessed March 2026);
- British Geological Society GeoIndex database, 1:50,000 (accessed March 2026, <https://mapapps2.bgs.ac.uk/geoindex/home.html>);
- British Geological Society Geology Viewer (accessed March 2026, <https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/>);
- SEPA Water Classification Hub (accessed October 2024 and March 2026, <https://www.sepa.org.uk/data-visualisation/water-classification-hub/>);
- Hydrogeological Map of Scotland (Scale 1:625,000, Institute of Geological Sciences, 1988);
- British Geological Society Groundwater Vulnerability Map of Scotland User Guide: Groundwater Vulnerability (Scotland) GIS dataset, Version 2 (2011) (accessed March 2026 <https://nora.nerc.ac.uk/id/eprint/17084/1/OR11064.pdf>);
- SEPA Indicative River and Coastal Flood Map (accessed March 2026, <https://map.sepa.org.uk/floodmaps>);
- Scottish Drinking Water Protected Area for surface water, Scottish Government Website Maps (accessed March 2026, <https://www.gov.scot/publications/drinking-water-protected-areas-scotland-river-basin-district-maps/>);
- The Galloway Fisheries Trust (2025). (Accessed: August 2025, <https://www.gallowayfisheriestrust.org/>);
- The River Basin Management Plan for the Solway Tweed River Basin District 2009–2015 (SEPA), and
- Multi-Agency Geographic Information for the Countryside (MAGIC) website (accessed March 2026, <http://magic.defra.gov.uk/>).

Field Surveys

13.5.6. The following field surveys were carried out to inform the assessment:

- Hydrology Walkover – a site walkover was undertaken October 2024 and March 2026 following layout changes, to visually inspect surface water features and to obtain an understanding of the local topography and hydrological regime. It provided familiarisation, a review of potential GWDTEs and an inspection of the Proposed Varied Development's design in regard to proximity to water features and watercourse crossings (see **Appendix 13.2**).
- The baseline conditions of the site had not substantially altered since the previous Consented Development EIA walkovers (2013 and 2018). Some minor changes in ecological habitat and forestry coup growth and felling stages were observed.

Assessment of Likely Effect Significance

- 13.5.7. The key issues for the assessment of potential effects on the hydrological and hydrogeological resources relating to the Proposed Varied Development include:
- potential chemical pollution effects on the hydrological environment;
 - potential erosion and sedimentation effects on the hydrological environment;
 - potential impediments to stream flow;
 - potential effects on private and public water supplies;
 - potential changes in soil and peat interflow patterns;
 - potential effects on the hydrological function of GWDTEs;
 - acidification of watercourses; and
 - potential for an increase in runoff and flood risk.
- 13.5.8. Effects during construction, operation and decommissioning have been assessed, as well as potential cumulative effects.

Elements Scoped Out of Assessment

- 13.5.9. The SEPA Landfill Map has not identified any areas of contaminated land within the Core Study Area and no effects are anticipated. Should potentially contaminated land be encountered during excavations; however, this would be tested and appropriate action taken in accordance with The Environmental Protection Act 1990. Potential effects arising from contaminated land have, therefore, been scoped out of this assessment.

Assessment Methodology

- 13.5.10. The significance of any impacts of the Proposed Varied Development on baseline conditions is assessed in this Chapter. The combination of the sensitivity of the receptor and the magnitude of the potential effect combine to determine the significance of that impact.
- 13.5.11. There are no published guidelines or criteria for assessing and evaluating effects on hydrology, hydrogeology, geology or peat within the context of an EIA. The assessment is based on a methodology derived from EIA regulation guidance, IEMA guidance, the SNH publication - A Handbook on Environmental Impact Assessment (SNH [now NatureScot] 2018), and professional judgement and expertise. The methodology is also based upon relevant SEPA guidance including Assigning Groundwater Assessment Criteria for Pollutant Inputs (SEPA, 2010). The methodology sets a list of criteria for evaluating the environmental effects, as follows:
- The type of effect (i.e. whether it is strongly positive, positive, strongly negative, negative, neutral or uncertain);

- The likelihood of the effect occurring based on the scale of certain, likely, or unlikely;
- Sensitivity criteria are based on both the likely effect on a receptor due to a particular activity, as well as the importance of the resource under consideration or designated value of the receptor; and
- The magnitude of change is the potential effect in relation to the resource that has been evaluated, quantified using the scale high, medium or low and included the consideration of timing, scale, size and duration of a potential impact.

13.5.12. The sensitivity and magnitude of potential effect criteria described in this section were considered appropriate for the conditions and environments prevailing at the site.

Sensitivity of Receptors Assessment Criteria

13.5.13. Sensitivity criteria are based on both the ability of a receptor to accommodate the anticipated impact of the likely changes, as well as the importance of the resource under consideration or designated value of the receptor (e.g. a designated area of international or national importance has a higher value and therefore higher sensitivity than other areas of lower status). Evaluation of sensitivity of geology, hydrology, hydrogeology and peat requires a considerable degree of judgement, based on defined characteristics and values and professional experience.

13.5.14. The sensitivity criteria used in this assessment is presented in **Table 13.3**.

Table 13.3 – Sensitivity Criteria

Sensitivity of Environment	Definition
Very High	Private water supply abstraction for human or stock consumption (surface water or groundwater). Public drinking water supply abstraction (surface water or groundwater). Surface water classified under the WFD as 'high' (or equivalent older chemical or biological monitoring designation). Groundwater classified under the WFD as 'good'. Watercourse designated under the Freshwater Fish Directive or known to have fish spawning grounds. Groundwater vulnerability to pollution Class 5. Internationally or nationally designated sites (e.g., Ramsar, SPA, SAC, SSSI, National Nature Reserves, Marine Nature Reserves). Habitats listed in Regional Biodiversity Action Plans or Annex I habitats that are groundwater dependent. Internationally important species sensitive to hydrological change.
High	Private water supply abstraction not for human or stock consumption (surface water or groundwater).

Sensitivity of Environment	Definition
	Public non-drinking water supply abstraction (surface water or groundwater). Surface water classified under the WFD as 'good' (or equivalent older chemical or biological monitoring designation). Watercourse known to support important fishery population. Groundwater vulnerability to pollution Class 4. Sites designated at a regional level, e.g. Regionally Important Geological/geomorphological Sites (RIGS), considered worthy of protection for their historic or aesthetic importance Other water dependent habitats.
Medium	Surface water classified under the WFD as 'moderate' (or equivalent older chemical or biological monitoring designation). Sites designated at a local level. Groundwater vulnerability to pollution Class 3 or 2.
Low	Surface water classified under the WFD as 'poor or bad' (or equivalent older chemical or biological monitoring designation). Groundwater classified under the WFD as 'poor'. Groundwater vulnerability to pollution Class 1.

Magnitude of Change Assessment Criteria

- 13.5.15. Magnitude of change is the potential effect in relation to the resource that has been quantified using the scale high, medium or low and includes the consideration of timing, scale, size and duration of a potential impact.
- 13.5.16. The magnitude of the potential effect criteria is presented in **Table 13.4**.

Table 13.4 – Magnitude of Potential Effect Criteria

Magnitude of Potential Effects	Definition
Very High	Impact resulting in loss of feature or use. Fundamental (long-term or permanent) changes to surface water and groundwater (in terms of quantity, quality and morphology).
High	Substantial but non-fundamental and short to medium term changes to the surface water and groundwater (in terms of quantity, quality and morphology).
Medium	Impact on feature or use.

Magnitude of Potential Effects	Definition
	Detectable but non-fundamental and temporary changes to the surface water and groundwater (in terms of quantity, quality and morphology).
Low	Impact but of insufficient magnitude to affect feature or use. No perceptible changes to the surface water and groundwater (in terms of quantity, quality and morphology).

- 13.5.17. The magnitude of the potential effects has been assessed based on the location of the receptor and the proximity of operational infrastructure, or construction activity taking place. The magnitude of potential effect takes into account the good practice and standard embedded mitigation methods described in this Chapter and **Appendix 13.1**.

Significance Assessment Criteria

- 13.5.18. The predicted significance of the effect was determined through a standard method of assessment based on professional judgement while considering sensitivity and magnitude of change as detailed in **Table 13.5**.
- 13.5.19. The combination of the sensitivity and magnitude of potential effect combine to provide a matrix categorisation of significance (major, moderate and minor), subject to professional judgement.
- 13.5.20. **Major** and **Moderate** effects are considered to be **significant** in the context of the EIA Regulations. Where the significance of effect is assessed as being moderate or above, further site-specific mitigation is required.

Table 13.5 – Significance Criteria

Magnitude of Potential Effects	Sensitivity of Environment			
	Very High	High	Medium	Low
Very High	Major	Major	Moderate	Moderate
High	Major	Moderate	Moderate	Minor
Medium	Moderate	Moderate	Minor	Minor
Low	Minor	Minor	Minor	Minor

- 13.5.21. Embedded design measures are set out within the Best Practice Methods and Outline CEMP (provided as **Appendix 13.1** and **Appendix 4.1** respectively) which sets out specific mitigation which relates to the Proposed Varied Development. They comprise good practice methods and works that are established and effective measures to which the Applicant will be committed to through the Proposed Varied Development's lifetime.

- 13.5.22. Although the OCEMP is draft and will evolve to take account of consultee feedback and detailed design, there is sufficient confidence in the effectiveness of the measures set out in the OCEMP for them to be treated as part of the Proposed Varied Development for the purposes of this assessment. Measures and procedures outlined in the OCEMP will be adopted and incorporated into a single working document to be agreed with statutory consultees and DGC following consent by way of an appropriately worded planning condition. For ease of reference through this Chapter, reference to specific sections in the OCEMP, detailing the appropriate embedded mitigation measures, are provided.
- 13.5.23. Accordingly, the identification of likely significant effects from the Proposed Varied Development is considered following implementation of the measures in **Appendix 13.1** and **Appendix 4.1**.
- 13.5.24. Effects assessed as **major** or **moderate** significance are considered to be **significant** for the purposes of The Environmental Impact Assessment (Scotland) Regulations 2017 ("the EIA Regulations"). Effects assessed as minor or less are considered to be not significant for the purposes of the EIA Regulations.

Nature of Effect

- 13.5.25. In addition to determining the significance of the effect, the assessment process also includes a qualitative description regarding the nature of the effect. These terms add information about how the effect would affect receptors.

Table 13.6 – Nature of Effect

Term	Nature of Effect Descriptors
Adverse	An effect which has the potential to decrease receptor value or status relative to baseline conditions.
Beneficial	An effect which has the potential to increase receptor value or status relative to baseline conditions.
Short-term	Effects that persist only for a short time, e.g. during the construction (or decommissioning) phase only; includes reversible effects.
Medium-term	Effects that may persist until additional mitigation measures have been implemented and become effective.
Long-term	Effects that persist for a much longer time, e.g. for the duration of the operational phase (essentially until the development ceases or is removed/ reinstated); includes effects which are permanent (irreversible) or which may decline over longer timescales.
Temporary	A reversible effect where recovery is possible and for which effects would persist only for a short or medium-term.
Frequent	Refers to a recurring effect that occurs repeatedly; in some cases a lower level of impact may occur with sufficient frequency to reduce the ability of a receptor to recover effectively.

- 13.5.26. Unless otherwise stated, identified potential effects are considered to be adverse.

Assessment of Cumulative Effects

- 13.5.27. A cumulative effect is considered to be an additional effect on hydrological resources arising from the Proposed Varied Development in combination with other proposed developments likely to affect the hydrological environment. At distances greater than 5 km, it is considered that schemes are unlikely to contribute to a cumulative hydrological effect due to attenuation and dilution over distance of potentially polluting chemicals. Therefore, for the purposes of the assessment of potential cumulative effects on the immediate catchment and hydrological regime, only proposed developments, which require large scale construction/excavation, within approximately 5 km of the Proposed Varied Development have been considered. The methodology followed to assess the cumulative effects are the same as those used for the Proposed Varied Development in isolation.

Limitations to Assessment

- 13.5.28. Baseline conditions have been established from a variety of sources, including historical data, but due to the dynamic nature of certain aspects of the environment, conditions have the potential to change prior to the construction of the Proposed Varied Development.
- 13.5.29. The nature of some hydrological features means that some may not manifest themselves at all times and may or may not be present as a result of extreme weather conditions. The fieldwork was undertaken in a range of weather conditions; however, it is possible that some small, minor features may have been missed as a result of their ephemeral or temporary nature.
- 13.5.30. PWS information was available from the Consented Development's EIA Report (Infinergy, 2018) and information was requested again from DGC in 2024 to confirm that there are no PWSs near the Proposed Varied Development. It is recognised that council information may be incomplete and that information on supplies serving abandoned properties and livestock welfare may not be available. However, it is considered that all potential PWSs within the catchments of the Proposed Varied Development have been adequately identified, and that there are none within 100 m of the tracks and 250 m of turbines, borrow pits or construction compounds. Overall, it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant environmental effects on hydrology and hydrogeology.

Assumptions

- 13.5.31. It is assumed that the design, construction, and completed stages of the Proposed Varied Development would satisfy minimum environmental standards, consistent with contemporary legislation, practice, and knowledge.
- 13.5.32. In regard to hydrology, management of water-borne pollution and protection of natural heritage areas, SEPA has statutory obligations in terms of the management and control of pollution into water resources in Scotland. Where careful design has avoided sensitive receptors, it would be reasonable to assume that the adoption of SEPA's Best Practice

Guidelines will, in general, prevent pollution to acceptable standards and make the majority of any 'significant' effects unlikely. Best practice assumed to be in place during construction, and which has been considered in the assessment of effects, is set out in **Appendix 13.1**. Specific 'additional' mitigation measures may be required in certain areas or at certain times of the site development, and these are set out in the assessment where relevant.

- 13.5.33. The purpose of this assessment is to identify significant effects and the key areas of the Proposed Varied Development infrastructure where specific additional mitigation and management measures are required to mitigate any significant effects. The assessment of effects has been undertaken based on the assessment of baseline conditions across the Study Area with reference to the relevant sections in this Chapter.
- 13.5.34. Additional assumptions that have been taken into consideration during the assessment are as follows:
- No PFAS will be present in any of the material used for this Proposed Varied Development;
 - Construction programme is anticipated to last 21 months;
 - Micrositing will be limited to 100 m;
 - Forestry works during construction and operation will be undertaken as set out in **Chapter 7**;
 - Any widening of existing tracks within 50 m of watercourses will be undertaken on the side furthest from the watercourse works will not encroach into or closer to the watercourses.

13.6. Baseline Conditions

- 13.6.1. The following section describes the existing hydrological and hydrogeological conditions within and surrounding the site. This includes the physical characteristics as well as designated sites, water bodies, groundwater dependent habitats, their quality and their use.
- 13.6.2. The hydrological context of the site is shown in **Figure 13.1**.
Topography, Land Cover and Land Use
- 13.6.3. The site occupies an upland location which is used as a commercial forestry plantation, with areas of peat within the site. The site rises from approximately 200 m above ordnance datum (AOD, approximately equivalent to sea level) at the south-eastern boundary to 401 m AOD at Craigeingillan Hill in the northern section of the site.
- 13.6.4. The site is bounded to the south-east by the B729 and by an unnamed public road adjacent to the Water of Ken and by the Poliferie Burn to the north-east. The site is bounded to the north-west by open moorland and by plantation forestry to the south-west.

- 13.6.5. There are a number of existing tracks and two borrow pits within the site associated with commercial forestry operations.
- 13.6.6. Downstream of the site the natural hydrology is significantly altered by dams, aqueducts and pipelines for the Kendoon Power Station built circa 1935 as part of the Galloway Hydroscheme (comprising six power stations (Drumjohn, Kendoon, Carsfad, Earlstoun, Glenlee and Tongland), six dams (Clatteringshaws, Carsfad, Earlstoun, Ken and Deugh, Loch Doon & Muck and Tongland) and a series of tunnels, aqueducts and pipelines.

Meteorological Summary

- 13.6.7. There are four rainfall gauges within 15 km of the site, their locations and their average annual rainfall are listed below
- The National River Flow Archive (NRFA) report Average Annual Rainfall (AAR 1961 - 1990) at the Afton Water at Afton Reservoir gauging station (ID 79001) ~ 8 km north of the site, as 2,165 mm;
 - Drumjohn SEPA station (ID 115557) situated ~10 km to the north-west at approximately NGR NX 52455 97510, which had average annual rainfall of 1,670 mm between 2015 and 2025;
 - Craigdarroch SEPA station (ID 115541) situated ~10 km to the east at approximately NGR NX 74560 91140, which had an average annual rainfall of 1,717 mm between 2015 and 2025;
 - Long-term average rainfall data (1981 to 2000) obtained by the Meteorological Office at the Glenlee gauging station, ~12km south, was 1,721 mm.
- 13.6.8. The average annual rainfall across Scotland is approximately 1,570 mm, therefore the site is considered to have a high average annual rainfall compared to the rest of Scotland.

Hydrology

- 13.6.9. Based on Scotland's Environment mapping, the site spans the River Dee (Solway) catchment of the Solway Tweed River basin district.
- 13.6.10. **Figure 13.2a-b** shows the main hydrological features, including watercourses, water bodies and their catchments.
- 13.6.11. The whole of the site is within the Water of Ken catchment which flows through the Kendoon Loch, Carsfad Loch, Earlstoun Loch to Loch Ken. Loch Ken discharges the River Dee which ultimately discharges to the Solway Firth at Kirkcudbright.
- 13.6.12. The majority of the site drains to the east through a series of tributaries to the Water of Ken upper catchment, which drains to the Kendoon Loch.
- 13.6.13. The western section of the site drains to the south-west into the Marbrack Burn catchment before joining the Water of Deugh which becomes the Kendoon Loch downstream.

- 13.6.14. The upper section of the Kendoon Loch discharges to the Water of Deugh via a dam, which joins the Water of Ken downstream of the Kendoon Power Station (NGR NX 60425 87610). The lower section of the Kendoon Loch discharges via a dam to the Water of Ken and an aqueduct and pipeline towards the Kendoon Power Station.
- 13.6.15. The site can be split into five main sub-catchments:
- Poliferie Burn (6.373 km length, >10 km² catchment size) – the catchment of the Poliferie Burn covers the northern section of the Site. It drains the Site north to the Poldores Burn or east to the Poliferie Burn. The Poldores Burn meets the Poliferie Burn at NGR NX 63425, 96143. The Poliferie Burn meets the Water of Ken approximately 1.5 km downstream at NGR NX 63825,94700.
 - Craigengillan Burn (~240 ha catchment size) - the catchment of the Craigengillan Burn covers the majority of the northern and western section of the site, which drains to the southeast before joining the Water of Ken at NGR NX 63480 93740. Craigengillan Burn measures up to 2.5 m width and 0.75 m depth with a stony bed. Water within Craigengillan Burn was observed to be moderately fast flowing and of a dark, peaty colour. The Craigengillan Burn is fed by the following tributaries:
 - Hare Strand - well-defined watercourse with grassed shallow sided banks, measuring approximately 1 m width by 0.5 m depth. Dark, peaty, slow flowing water was observed the site walkover.
 - Goat Strand - issues on the southern slope of Craigengillan Hill and drains south before joining Craigengillan Burn;
 - Black Burn (~98 ha catchment size) - originates on the northern side of Marscalloch Hill in the south-western section of the site and drains northeast before a confluence with the Water of Ken (upstream of High Bridge of Ken) at NGR NX 63465 93650. Dark, peaty, slow flowing water was observed during the site walkover;
 - Dry Burn (~111 ha catchment size) - The southern section of the site is drained by the Dry Burn, which originates on the eastern side of Marscalloch Hill and flows to the southeast before joining the Water of Ken (upstream of High Bridge of ken) at NGR NX 63260 91185; and
 - Marbrack Burn - Unnamed tributaries of Marbrack Burn issue in the north-western section of the site and drain to the southwest. These unnamed tributaries were observed to be heavily vegetated, slow flowing and had water of a dark, peaty colour with ochre ferrous deposits on the watercourse bed (possibly leaching from the surrounding peat).
- 13.6.16. Morphology is typical of upland, dendritic network watercourses, which are generally evenly dispersed through flat boggy ground from their upper reaches, becoming increasingly steep and faster flowing as they progress downstream, becoming flatter as reach the primary rivers.

- 13.6.17. Drainage of the site was observed to be significantly altered by forest drainage comprising larger linear drains around and through coups and ridge and furrow drainage within the forestry coup. Based on the geomorphology of the surrounding moorland, where there is evidence of drainage of the areas, it is likely that the natural drainage was already altered prior to the forestry drainage.
- 13.6.18. Existing forestry access track watercourse crossings were observed to be of singular circular piped culvert construction and therefore, mostly not suitable for fish passage. Larger watercourses are conveyed by double circular culverts with stone headwalls.
- 13.6.19. The B729 public road watercourse crossings downstream were bridge type crossings at Craigengillan Burn and Dry Burn which would allow the potential of fish passage.

Surface Water Quality

- 13.6.20. Within 1 km from the Proposed Varied Development, the following waterbodies are identified as defined within the SEPA Water Classification Hub:
- The Water of Ken (upstream of High Bridge of Ken) (ID: 10559) It is classified as having an overall status of 'Poor' due to pressures from morphological alterations creating barriers to fish passage associated with culverting. Future objective is to achieve a 'Good' status by 2027.
 - The Water of Deugh (Carsphairn Lane to Water of Ken) (ID: 10562) is a Heavily Modified Waterbody with an overall status of 'Poor' overall status due to abstractions, flow regulation and morphological alterations affecting fish passage, all of which as associated with hydroelectricity generation. Future objective is to achieve a 'Good Ecological Potential' status by 2027. It subsequently flows into Kendoon Loch which converges with the Water of Ken (downstream of Kendoon) which has an overall SEPA classification of Bad. An unclassified stretch of the Water of Deugh issues from Kendoon Loch flowing west around Dundough Hill before converging with the Water of Ken 4 km south-west of the site's southern boundary. The Marbrack Burn converges with the Water of Deugh at NGR NX 59050 92270.
 - Poliferie Burn (ID:10560), which is located 110 m north-west of the Proposed Varied Development. It has also been classified as having an overall status of 'Poor' due to pressures from morphological alterations creating barriers to fish passage associated with culverting. Future objective is to achieve a 'Good' status by 2027.
- 13.6.21. A selection of field water quality measurements were undertaken on the tributaries downstream of the site. These are presented in **Table 13.7**.

Table 13.7 – Field Water Quality Measurements

ID	Location	pH	EC	TDS (ppm)	T (°C)	Colour	Observed Flow
WQ1	Black Burn	6.85	106	53	9.5	Clear – slightly yellow	Moderate flow

ID	Location	pH	EC	TDS (ppm)	T (°C)	Colour	Observed Flow
	NGR NX 63350, 93622						
WQ2	Craigengillan Burn NGR NX 63342, 93796	6.92	48	24	10.3	Mid yellow-brown	Moderate flow
WQ3	Dry Burn NX 62966 91596	6.83	53	27	10.1	Clear-mid yellow	Low-moderate flow

EC = Electrical conductivity ($\mu\text{S}/\text{cm}^3$), TDS = total dissolved solids (ppm), Colour observation and estimated flow observation.

Flooding

- 13.6.22. NPF4 was published by the Scottish Government on the 13th of February 2023. It is the national spatial strategy for Scotland, which sets out the spatial principles, regional priorities, national developments and national planning policy for Scotland. NPF4 supersedes NPF3 and Scottish Planning Policy.
- 13.6.23. NPF4 Policy has an emphasis on tackling the climate and nature crises (Policy 1). Climate mitigation and adaptation (Policy 2) is another important theme, with the intent of this policy being *“To encourage, promote and facilitate development that minimises emissions and adapts to the current and future impacts of climate change.”*
- 13.6.24. The following assessment has been undertaken to comply with the policies of NPF4 and outline the results of the assessment for determining flood risk.
- 13.6.25. The Flood Map (2024) produced by SEPA shows the areas of Scotland at 0.1%, 0.5% and 10% chance of flooding in a year.
- 13.6.26. No infrastructure of the Proposed Varied Development is located within SEPA river (fluvial) flood risk areas. These are limited to the areas immediately surrounding the watercourses, with the exception of the larger watercourses downstream, such as the Water of Ken.
- 13.6.27. Generally, only the lower reaches of watercourses downgradient of the site have associated SEPA river flood zones, with the exception of Poliferie Burn which runs along the northern boundary of the site which has flood zones in the higher reaches.
- 13.6.28. A review of OS mapping and aerial imagery in conjunction with the SEPA flood mapping indicated that Craigengillan Cottage and Craigengillan Castle are potentially at risk of fluvial flooding from the Poliferie Burn and the Smittons property is potentially at risk of flooding from the Water of Ken downstream of the site.

- 13.6.29. The SEPA surface water (pluvial) flood map indicates localised surface water flood risk zones within the site on the slopes of Marscalloch Hill and Craigengillan Hill, associated with existing forestry track drainage, watercourses, depressions and hollows within the surrounding topography. None of the proposed concrete turbine foundations are with a surface water flood risk area.
- 13.6.30. Flooding can also result from high groundwater levels if the water table rises above the surface level. Groundwater flooding can occur in a variety of geological settings, including river valleys with thick deposits of alluvium and river gravels. Groundwater flooding is often associated with the shallow unconsolidated sedimentary aquifers that overlie sediments with no / very low permeability. Such aquifers are susceptible to flooding as the storage capacity within these deposits is often low, which, combined with the high direct rainfall recharge, can subsequently increase the water levels within the groundwater. The Proposed Varied Development is not located within an area vulnerable to groundwater flooding

Hydrogeology

- 13.6.31. The geology on site comprises the Portpatrick Formation metamorphic greywacke bedrock overlain in places by glacial till and peat superficial deposits. The bedrock and superficial geology are further discussed in **Chapter 12** and shown on **Figure 12.3** and **12.4**.
- 13.6.32. Hydrogeological mapping shows the Portpatrick Formation and Glenwhargen Formation to be a low productivity aquifer comprising highly indurated greywackes with limited groundwater in the near surface weathered zone and secondary fractures.
- 13.6.33. Glacial till generally acts as an aquitard between groundwater and surface water and upland peat is generally oligotrophic or rainwater fed. Peaty deposits may act as a store of water and release rainwater for a considerable time after significant rainfall. However, no significantly saturated peaty areas were observed during the surveys and the areas are heavily drained by relatively dry or stagnant forestry grips.
- 13.6.34. The site is underlain by the Galloway Groundwater body, which is classified by SEPA, under the WFD, (ID: 150694) as having a 'Good' quantitative and qualitative status.
- 13.6.35. The site lies within the Solway Tweed groundwater Drinking Water Protection Area (DWPA), overall classified as Good. It should be noted that in Scotland all groundwater is a DWPA.
- 13.6.36. The BGS Geoindex records record a water well borehole for Craigengellan (reference NX69SW3, NGR NX 63607 94984, 79 m depth, no strata records, installed 2021 by High Water).

Groundwater Vulnerability

- 13.6.37. The SEPA and SNIFFER Groundwater Vulnerability Map indicates the Vulnerability Class of the site is variable from 4b to 5. The Vulnerability Map represents the strata overlying the aquifer ('vertical pathway').

- 13.6.38. Vulnerability classes range from 1 to 5, with 5 being most vulnerable. Class 4 is subdivided into 4a and 4b. It is the hydrogeological characteristics within the pathway rather than the 'importance' of a particular aquifer that results in the final vulnerability classification. The methodology behind the classification assumes that where contaminants move through unsaturated fractured bedrock, no attenuation of pollutants can take place. Large parts of Scotland show areas of Classes 4 and 5, reflecting the widespread occurrence of rocks dominated by fracture flow located exposed at the surface where the potential for attenuation of contaminants, from overlying strata, in the pathway is very limited.

Groundwater Dependent Terrestrial Ecosystems

- 13.6.39. SEPA's guidance (2024) on assessing the impacts of developments on GWDTE requires assessment of GWDTE located within 250 m of excavations greater than 1 m, within 100 m of excavations less than 1 m and within 10 m of all activities associated with construction
- 13.6.40. An extended Phase I habitat survey was carried out April 2018 and refreshed in November 2024. During the Phase 1 habitat surveys, plant communities were assigned to NVC categories based on the community types identified where appropriate. Results of the 2018 habitat surveys were used as a reference throughout the 2024 surveys. The extended Phase I habitat survey and NVC categories are presented within **Chapter 9: Ecology** and **Appendix 9.5**.
- 13.6.41. Of the habitats identified (coniferous forestry, marshy grassland and M17), marshy grassland has the potential to support groundwater dependent communities. This habitat was found mostly in forestry rides, along existing forestry track, and in close proximity to drains and watercourses as shown in **Figure 9.1**.
- 13.6.42. **Figure 13.4a-b** shows the potential GWDTEs with the superficial deposits. Note, this figure uses the peat survey data over the geological mapping as it is considered to be a higher resolution and more accurate.
- 13.6.43. Superficial deposits are absent across around half of the site and the bedrock aquifer is classified as low productivity as outlined in the Hydrogeology Section and therefore, is not likely to support groundwater dependent communities. Furthermore, much of the areas of marshy grassland are located on peat or glacial till which act as an aquitard between potential groundwater reaching the surface.
- 13.6.44. Turbines 1 and 10 encroach into areas of marshy grassland. The occurrence of marshy grassland within forestry rides and in close proximity to surface water suggests this habitat is surface water fed and not groundwater dependent. Therefore, GWDTEs have not been considered further.

Public Water Supplies

- 13.6.45. Scottish Water confirmed in a consultation response dated 11th August 2024, that a surface water DWPA is downstream of the site. The Carsfad Loch catchment, over 1 km downstream of the site, supplies Lochinvar Water Treatment Works (WTW). Carsfad Loch

is located on the Water of Ken 5.3 km south of the site. Raw water is pumped from Carsfad Loch to Lochinvar Loch which supplies Lochinvar Water Treatment Works (WTW).

- 13.6.46. Consultation with Scottish Water confirmed that with standard best practice in place, with the distance and dilution effect there is unlikely to be an effect on the Public Water Supply. The activity is a sufficient distance from the intake that it is likely to be low risk, however care should be taken and water quality protection measures must be implemented in accordance with Scottish Water's list of precautions for a range of activities, including that no PFAS should be present in any of the materials used for the Proposed Varied Development and a CEMP detailing the Water Quality Protection Measures will be required.
- 13.6.47. Scottish Water assets and infrastructure were observed on the approach road to the site including the Carsphairn WTWs at approximately NGR NX 56712 93206, potential services either side of the road at this junction section and some recent (2025) groundworks to the west of the WTWs, possibly underground storage reservoir. Further consultation was undertaken with Scottish Water in April 2026 to confirm if they have any concerns regarding these assets. At the time of writing no response had been received.

SEPA Registered Water Abstractions

- 13.6.48. The following SEPA registered water abstractions (2023) were recorded within 1 km of the Site:
- CAR/R/1198310 SEPA abstraction licence associated with the Craigengellan properties for sewage treatment approximately 350 m from the site and over 800 m from the nearest Proposed Varied Development infrastructure and therefore not considered to be hydrologically connected to the Proposed Varied Development.
 - CAR/R/1191055 & CAR/S/1191919 SEPA abstraction licenses at NGR NX 63744,95879, Authorised Activities are for the primary purpose of developing a laydown area. Located approximately 250 m distance from the site, over 900 m from the nearest Proposed Varied Development infrastructure and on the opposite side of the Poliferie Burn and therefore not considered to be hydrologically connected to the Proposed Varied Development.
- 13.6.49. No SEPA registered water abstractions are within 250 m of or considered to be hydrologically connected to the Proposed Varied Development's infrastructure have been identified and therefore are not assessed further.

Private Water Supplies

- 13.6.50. The Private Water Supplies (Scotland) Regulations 2006 and the Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017 define supplies as either:
- Type A - Supplies providing 10 m³ of water a day or serving 50 or more persons; and supplies to commercial or public activities irrespective of their size; or

- Type B - Supplies serving only domestic premises with less than 50 persons supplied.

- 13.6.51. Previous consultation with DGC as part of the previous 2018 EIA Report for the Consented Development identified 35 abstractions for PWSs within 2 km of the site boundary. Properties with potential hydrological connectivity were contacted for the 2018 EIA Report to ascertain the location of their PWS source and type. All but three abstractions were scoped out as they were not considered to be hydrologically connected to the site for the following reasons (refer to Table 13.6 of Chapter 13 of the Consented Development's EIA Report for further information):
- Located over 1 km from the Consented Development site (which remains the same as the Proposed Varied Development site);
 - Hydrologically separated from the site by watercourses or waterbodies e.g. Water of Ken or Kendoon Loch; and
 - Not located within the same hydrological catchment as the Proposed Varied Development.
- 13.6.52. The PWS discussed in the EIA Report for the Consented Development within the Poliferie Burn catchment are Craigengillan and Craigengillan Cottage. Smittons PWS is located on the Water of Ken with the nearest infrastructure being existing forestry track. The Black Burn, Craigengillan Burn and Hare Strand all flow into the Water of Ken upstream of Smittons.
- 13.6.53. As part of the assessment for the Proposed Varied Development, DGC was contacted again in 2024 to provide PWS information and a review of the Lorg OHL EIA Report and Private Water Supply Assessment (2025) was undertaken. Of the 35 DGC abstractions within 2 km of the site, seven were within 1 km of the Proposed Varied Development infrastructure.
- 13.6.54. Craigengillan and Craigengillan Cottage contain Proposed Varied Development infrastructure within their catchments, the Poliferie Burn. These PWS both have a groundwater source which is located 738 m and 860 m from the nearest Proposed Varied Development infrastructure.
- 13.6.55. The Black Burn, Craigengillan Burn and Hare Strand all flow into the Water of Ken upstream of the Smittons PWS, however the nearest infrastructure is existing forestry track located approximately 880 m distance away.
- 13.6.56.** PWSs are outwith the appropriate buffers of 250 m for groundwater and 500 m for surface water from the Proposed Varied Development infrastructure. No PWSs considered to be hydrologically connected to the Proposed Varied Development's infrastructure have been identified, and therefore are not assessed further than summarised in **Table 13.8**.

Table 13.8 – Private Water Supplies

ID	User	User Type	Source Supply	Infrastructure in Catchment	Distance from Infrastructure	Assessments / Comments
S1	Muirdrochwood Farm NGR NX 61818 91129	Type B Residential	Borehole (150 m depth)	No	~500 m	Within separate sub-catchment. All infrastructure downgradient. Not at risk.
S2	Muirdrochwood NGR NX 61823 91123	Type B Residential	Unknown, potentially same borehole as S1	No	~500 m	Within separate sub-catchment. All infrastructure downgradient. Not at risk.
S3	Bridgemark NGR NX 62484 90424	Type B Residential	Groundwater Spring	No	~745 m	Hydrologically separated by Water of Ken. Not at risk.
S4	Moorbrock NGR NX 62939 96654	Type B Residential	Surface water	No	~1,080 m	Within separate sub-catchment. Hydrologically separated by Poliferie Burn. Not at risk.
S5	Smittons NGR NX 63298 91700	Type B Residential	Unknown, assumed groundwater spring	Yes	~880 m	Abstraction type is unconfirmed. Anecdotal information from the Lorg EIA Report indicates it's a groundwater well situated on the south bank of the Water of Ken, 160 m east of the property. Nearest infrastructure is existing forestry track. Not at risk.

ID	User	User Type	Source Supply	Infrastructure in Catchment	Distance from Infrastructure	Assessments / Comments
S6 & S7	Craigengillan Cottage NGR NX 63636 94932	Type A / Type B Residential	Well / borehole NX 63607,94984	Yes	~860 m borehole	Infrastructure is located outside of the 250 m buffer for groundwater sources. Not at risk.
	Craigengillan NGR NX 63696 94824		Groundwater Spring NX 63553,94953		~738 m groundwater spring	

- 13.6.57. The Consented Development also concluded that the risks to PWSs were not significant and did not require further assessment due to the distances from the infrastructure and SEPA as part of the planning consent raised no concerns over private water supplies, given that they are outwith the appropriate buffer distances from the proposed infrastructure.

Watercourse Crossings and Diversions

- 13.6.58. There are currently seven watercourse crossings required for the Proposed Varied Development: two existing watercourse crossing located on the existing forestry track and five new watercourse crossings as presented in **Table 13.9**. Note, one of these additional crossings is for the removal of an existing crossing and diverting a minor watercourse. These are discussed further in **Appendix 13.2**.

Table 13.9 – Watercourse Crossings

ID	Grid Reference	Watercourse Name	Infrastructure Location	Type of Crossing
WC1	NX62550,91183	Unnamed 1:50 K watercourse	Existing Access Road	Existing crossing to be removed
WC2	NX62568,91223	Unnamed 1:50K watercourse	Existing B729 Public Road	New Crossing for diversion and to replace WC1
WC3	NX62393,91782	Dry Burn Tributary 1:50K	Existing track	Existing culvert crossing
WC4	NX62523,92253	Dry Burn 1:50K	Existing track	Existing crossing
WC5	NX62207,94347	Craigengillan Burn tributary 1:25K	New access track	New crossing

ID	Grid Reference	Watercourse Name	Infrastructure Location	Type of Crossing
WC6	NX62119,94494	Craigengillan Burn tributary 1:25K	New access track	New crossing
WC7	NX62233,94497	Craigengillan Burn 1:50K	New access track	New crossing
WC8	NX62583,94874	Goat Strand 1:50K	Access track to Turbine 4 and Turbine 2	New crossing

- 13.6.59. A minor forestry drain (not shown on OS mapping and lineated) will require diverting for Turbine 3. This was a trade off in the design decision making to avoid disturbance of deeper peat and / or being close to the Marbrack Burn.
- 13.6.60. The Consented Development required nine watercourse crossings: four existing and five new. The AEI removed one crossing of the main stem of the Craigengillan Burn and added a new crossing upstream on a minor section of the Craigengillan Burn and a new crossing of the tributary of the Craigengillan Burn, resulting in the ten watercourse crossings four existing and six new.
- 13.6.61. The Proposed Varied Development has less watercourse crossings than the Consented Development post AEI. The Proposed Varied Development has removed the requirement to cross the Black Burn (the most sensitive watercourse on-site). All watercourse crossings are considered to be relatively minor watercourses or headwaters.
- 13.6.62. All engineering activities listed above are subject to EASR (2025), as discussed in **Appendix 13.2**), and subject to SEPA approval. Post-consent, detailed design information would be provided to support this process.
- 13.6.63. In relation to watercourse crossings, access tracks would be designed and constructed following good practice techniques including SEPA's guidance on Construction of River Crossings: Good Practice Guide. Existing crossings along access routes would be surveyed prior to construction and upgraded to conform with drainage standards, as required. The final crossing solution (circular culvert, box culvert, bottomless arch culvert, etc) would be subject to good practice design standards as informed by detailed design and would be confirmed post consent.
- 13.6.64. Further details of the Proposed Varied Development watercourse crossings and diversions are provided in **Appendix 13.2**.

Designated Sites

- 13.6.65. There are no statutory designated sites relating to watercourses within 10 km of the site, identified through the use of NatureScot, SEPA and MAGIC GIS and dataset searches.

13.6.66. The nearest designated sites are:

- Cleugh SSSI, ~4 km, south designated for lowland grassland;
- Hannahston Wood SSSI, ~8.5 km south-west, designated for lichen assemblages, lowland grassland and woodland; and
- Water of Ken Woods SSSI. ~9.5 km south-west, designated for upland oak woodland, lichen assemblages and lichen.

13.6.67. These are not considered to be hydrological designations and are considered to be hydrologically disconnected from the Proposed Varied Development as development is proposed in areas that are hydrologically down-gradient and /or are of sufficient distance to remain unaffected by the Proposed Varied Development.

Fish and Other Water Dependent Species

13.6.68. The Kendoon Loch downstream of the site is known to have trout and perch populations. A search of freely available datasets from the Biological Records Centre (Database for the Atlas of Freshwater Fish) held within the National Biodiversity Network (NBN) gateway was undertaken. There are existing records of rainbow trout in Kendoon Loch (downstream of the Site) and otter records for on and near the site.

13.6.69. The Galloway Fisheries Trust provides a description of the fishery potential in the rivers in this council area. These are split into three classifications: Good, Poor and Absent, with the following descriptions:

- A classification of Good suggests that population densities are relatively healthy. These rivers are likely to be close to the carrying capacity for the available habitat.
- A classification of Poor suggests that, in general, populations are lower than would be expected for the instream habitat present.
- A classification of Absent means that there are no individuals of this species present.

13.6.70. The Water of Deugh and Water of Ken are listed on this database as both being absent of salmon populations and having poor trout populations due to barriers, such as dams preventing fish passage.

13.6.71. Fisheries Surveys were carried out by Galloway Fisheries Trust (GFT) by Scottish Fisheries Co-ordination Centre (SFCC) qualified surveyors between the 22nd and 30th of August 2018. These surveys were carried out across nine Fisheries Survey Sites (FSS) on the Water of Ken and its associated tributaries, including one small tributary of the Water of Deugh.

13.6.72. Brown trout (*Salmon trutta*), European eel (*Anguilla anguilla*), stoneloach (*Barbatula barbatula*) common minnow (*Phoxinus phoxinus*), northern pike (*Esox lucius*), European perch (*Perca fluviatilis*) were recorded. Furthermore, the non-native invasive species North American signal crayfish was recorded at the Black Burn / Water of Ken Location.

- 13.6.73. Fish habitat was recorded to be good in the lower reaches of the Black Burn / Water of Ken location and in the lower reaches of the Water of Ken. No Atlantic Salmon were recorded.
- 13.6.74. The Kendoon Loch is actively used by Glenkens Fish Farming Ltd which has fish farms located within the loch. Fish and mammal surveys, which provide more detail on the potential impact the Proposed Varied Development may have are discussed in **Chapter 9**.
- 13.6.75. The watercourse crossings (existing and proposed) on site are mostly across minor watercourses in peaty soil substrate, which have existing forestry track culvert crossings and therefore unlikely to be currently suitable for fish migration.
- 13.6.76. Fisheries, fish and otter remain scoped out with regards potential effects as design and good practice mitigation measures will be included as standard to protect the aquatic environment. These ecological receptors were considered within the EIA process through the design of the Proposed Varied Development and through best practice construction methods, and therefore it is considered that there are no likely significant effects. The following good practice measures are proposed in **Chapter 9**:
- Pre-construction surveys of all watercourse crossings during the survey season immediately prior to construction to assess use of the locations by otter;
 - Pre-construction fish habitat surveys in the season prior, to micro-site the crossings away from potentially sensitive habitats wherever possible, and to confirm the habitat baseline within a buffer of up to 100 m upstream and downstream;
 - Monitoring of a range of ecological features by the ECoW throughout construction of the Proposed Varied Development; and
 - Post-construction fish habitat surveys and monitoring to ensure mitigation measures are effective, that crossings maintain fish passage, and that potentially sensitive habitats are retained, and to identify any requirement for improvements or remedial works.

General Site Conceptualisation

- 13.6.77. The site is characterised by low permeability superficial deposits (extensive areas of peat and glacial till) over low permeability bedrock. The low permeability of both the superficial deposits and the low permeability of the bedrock will allow limited infiltration of rainfall and relatively high runoff rates. Groundwater movement within the superficial deposits is therefore also low.
- 13.6.78. Based on the assessment criteria defined in **Table 13.4**, a summary of the site sensitivities is presented in **Table 13.10**.

Table 13.10 – Sensitive Receptors

Sensitive Receptors		Sensitivity	Rationale / Designations
Groundwater	Shallow groundwater	Low	Limited resource and no users
	Deep groundwater	Low	Limited resource and no users
Surface watercourses and waterbodies on site	Lower Reaches of Black Burn	High	Otter and fish habitat
	Lower reaches of Craigengillan Burn	Medium	Upstream of otter and fish
	Minor watercourses (Dry Burn, Dare Stand, Goat Strand, Marbrack Burn), unnamed tributaries and those upstream of existing forestry track watercourse crossings	Low	Unsuitable habitat for fish habitat
Surface watercourses and waterbodies downstream off site	Loch Kendoon	High	Otter and Fish Fishery
	Water of Ken	High	Otter and Fish
	Loch Carsfad	Very High	Public Drinking Water Protection Area

Note: Receptors not potentially connected to the Proposed Varied Development have been scoped out and therefore are not included in this table.

13.6.79. On the basis of the baseline information and professional judgement, the key sensitive receptors identified for the site and carried through to detailed assessment are:

- Surface watercourses, particularly those with fish habitat and suitable for fish migration downstream of the site.

Impacts Scoped Out of Assessment

13.6.80. The below receptors are scoped out of the assessment for the following reasons:

- GWDTEs – None of the potential GWDTEs identified from the Phase I Habitat Survey are considered to be groundwater dependent based on the hydrogeological regime;

- PWSs – No PWSs are considered to be hydrologically connected to the Proposed Varied Development; and
- Public Water Supplies – Scottish Water has agreed with standard best practice, a CEMP detailing the Water Quality Protection Measures there are unlikely to be any significant effects to the Public Water Supply abstraction from Carsfad Loch downstream.

Implications of Climate Change

13.6.81. The summary of the relevant climate change projections using the UK Climate Change Projections 2018 (UKCP18) are:

- temperatures are projected to increase, particularly in summer;
- winter rainfall is projected to increase and summer rainfall is most likely to decrease;
- heavy rain days (rainfall greater than 25 mm) are projected to increase, particularly in winter;
- near surface wind speeds are expected to increase in the second half of the 21st century with winter months experiencing more significant effects of winds; however, the increase in wind speeds is projected to be modest; and
- an increase in frequency of winter storms over the UK.

13.6.82. Climate change projections in the west of Scotland for the 2060s highlight that summer and winter temperatures are likely to be greater than the current baseline (greater for summer), with winter rainfall increasing and summer rainfall decreasing.

13.6.83. The projected climate change scenario is likely to affect the baseline conditions in relations to the water environment in the following ways:

- Habitat loss for wetlands: Drier conditions in summer may in the long-term result in the loss of these habitats.
- Increase in flooding in winter: Increased winter rainfall is likely to increase peak flows and therefore flooding extents.
- Higher potential erosion and therefore sediment transfer to watercourses due to increased winter rainfall.
- Water resources: Less snow on the ground in winter and drier summers will lead to a reduction in groundwater recharge for groundwater water supplies and reduction in water quantity and quality in summer months for surface water resources.
- Higher intensity rainfall events will increase runoff and potentially reduce water quality as water will have less time to filtrate through vegetation and shallow soils.
- Climate change will affect the water quantity and quality of water resources used for PWS and Scottish Water public drinking water supplies. Evidence of this was

observed generally in parts of Scotland in summer 2021 and 2022 where river levels were very low with algal blooms present, and shallow springs used for generations experienced drought.

Future Baseline in the Absence of the Proposed Varied Development

13.6.84. The predicted environmental conditions and potential changes which may occur in the absence of the Proposed Varied Development are outlined below. This includes natural changes, including climate change (see above), land use practices and future developments:

- Continuation of rough grazing in open moorland areas increasing erosion, drying and ground poaching.
- Continued impediment of natural water flows and fish migration by the use of culverted watercourse crossings within the catchments.
- Continuation of commercial forestry activities and new commercial forestry activities including tracking, borrow pits, drainage alteration, watercourse crossings, felling, ground disturbance and risks for sediment release and acidification of watercourses.

13.7. Standard Mitigation

13.7.1. A number of embedded design mitigation measures have already been applied as part of the iterative design process (see below and **Chapter 3**), to avoid the higher value areas of waterbodies and watercourses.

Embedded Design Considerations

13.7.2. Where possible, the following principles have been adhered to in the design of the Proposed Varied Development:

- All infrastructure has been sited with an objective to maintain at least a 50 m 'buffer zone' from natural watercourses and water bodies shown on 1:50,000 scale and 1:25,000 scale Ordnance Survey mapping. Where possible, infrastructure is located outside of flood zones, with the exception of watercourse crossings.
- The Proposed Varied Development's infrastructure has been designed to minimise the number of new watercourse crossings, and existing access tracks have been utilised where possible.
- During the detailed design and construction phase, sections of track will be surveyed and micro-sited to optimise the distance from water bodies.
- No PFAS will be present in any of the material used for this Proposed Varied Development.
- Concrete will be processed in a concrete batching plant located on-site within or adjoining the construction compound. Concrete batching on-site will require a water

supply from a water body on site or imported in tankers and stored at the batching site. Each turbine foundation requires approximately 150 m³ of water for concrete production, including washdown, with a pour likely to occur every three days. A water supply of 50 m³ per day or 0.6 litres per second would therefore be required for the operation of the batching plant. If this supply is sourced from within the Site a licence for abstraction will be obtained from SEPA post-consent.

Good Practice Measures

- 13.7.3. **Appendix 13.1** details the good practice techniques that will be employed during construction and operation. These techniques are assumed to be in place for the purposes of the assessment, thus they are not considered as mitigation but as an inherent part of the construction process. The list in **Appendix 13.1** is not exhaustive, and the latest guidance and good practice literature will be used when construction commences. Where required, additional mitigation measures will be identified which are specific to the source-pathway-receptor at risk to address likely significant effects.
- 13.7.4. To ensure all reasonable precautions are taken to avoid negative effects on habitats, protected species and aquatic interests, a suitably qualified ECoW will be appointed prior to the commencement of construction, and they will advise the Applicant and the Principal Contractor on all ecological and hydrological matters. A Drainage Management Plan (DMP), Pollution Prevention Plan (PPP) and Water Quality Management Plan (WQMP) will also be implemented as part of the CEMP to minimise effects to the water environment.

Micrositing

- 13.7.5. Micrositing of infrastructure up to 100 m may be required to take account of local conditions. In the event that this is required, consideration will be given to the potential effects on hydrology and hydrogeology, including proximity to watercourses and water features.
- 13.7.6. Where micrositing is required, where possible, this will not decrease the distance to the sensitive hydrological and hydrogeological features identified.
- 13.7.7. A suitably qualified ECoW will be present on-site during the construction period to provide initial on-site advice for micrositing.

13.8. Potential Effects

- 13.8.1. The assessment of effects is based on the Proposed Varied Development as outlined in detail in **Chapter 4**. Unless otherwise stated, potential effects are considered to be adverse.
- 13.8.2. The following section describes the potential effects of the Proposed Varied Development during the construction phase in relation to the sensitive receptors of the site as highlighted in **Table 13.10**, prior to additional mitigation and management, but assuming that all embedded mitigation and good practice methods are employed. The purpose of

this assessment is to identify areas of the Proposed Varied Development infrastructure where specific mitigation and management measures are required to mitigate any significant (Major or Moderate) effects. The assessment of effect significance has been undertaken based on the assessment of baseline conditions across the site and with reference to the significance criteria in **Table 13.5**.

- 13.8.3. Where the significance of effect is assessed as being moderate (significant) or above with good practice and standard mitigation applied, further site-specific (additional) mitigation is required. Where applicable, the additional mitigation and the residual significance of effects are summarised and discussed below.
- 13.8.4. The assessment concentrates on the effects of construction and operation of the Proposed Varied Development upon those receptors identified during the review of desk-based information and field surveys for which a significant effect could occur. Effects upon the following features are assessed:
- Direct effects during construction on the recharge and flow within shallow and deep groundwater systems;
 - Direct effects during construction to surface or groundwater quality due to oil and fuel spills or leaks, other chemicals stored onsite and sediment release;
 - Direct effects of sedimentation on surface water quality as a result of forestry felling to enable construction;
 - Indirect effects during construction on the water environment including watercourses through drainage management, watercourse crossings, the alteration of flow rates, geomorphology, sediment loading and pollution; and
 - Cumulative effects on geology, hydrogeology, and hydrology as a result of other developments (either at the planning application stage, consented or under construction) that share the same catchments as the Proposed Varied Development.

Construction

- 13.8.5. Possible hydrological, hydrogeological and geological effects resulting from the construction of the Proposed Varied Development are related to five main factors as detailed below:
- Erosion and Sedimentation Effects;
 - Alteration of Flow, Natural Drainage Patterns/Runoff Volumes and Rates;
 - Increase in the Magnitude or Frequency of Flooding Events; and
 - Potential Pollution events affecting Groundwater and Surface Water Quality.

Erosion and Sedimentation Effects

- 13.8.6. Unmanaged erosion/sediment deposition and suspended solids generated from ground disturbance and new infrastructure, could be transported to receptors directly by surface

run-off or could cause modification to stream channel morphology. This can result in smothering of habitats and effects on both terrestrial and aquatic flora and fauna, especially fish. Potential effects may occur from the following:

- Construction of access tracks (approximately 5.4 km of new tracks will be excavated, approximately 1.8 km of existing track will be widened and approximately 0.2 km of tracks will be floated). The majority of new and upgraded site tracks will be constructed using a standard cut and fill method which will involve stripping and stockpiling of material to expose underlying soils or bedrock, potentially increasing runoff and the potential for transportation of sediment. Floating tracks will involve building the track on the existing surface vegetation mat with geotextile layers, minimising excavation of peat, however side slopes will be required.
- Construction of five new watercourse crossings, use of three existing crossings (as present, upgraded or replaced) and the removal of one watercourse crossing to be diverted and a new crossing made under the B729 road instead (refer to the Watercourse Crossing Schedule in **Appendix 13.2** for further information).
- Increasing the potential for increased run-off of silt and debris and erosion.
- Removal and stockpiling of material for each turbine foundation base and crane hardstanding, which could result in increased silt run-off.
- Dewatering of shallow groundwater and direct rainfall into excavations (potentially containing silt and other debris), which may result in transportation of fine sediments into watercourses. This would be compounded by increased movement over and around these disturbed environments.
- Extreme rainfall events which could result in the overflowing of existing on-site drainage and resulting erosion and sediment transport, as well as the potential failure of pollution prevention measures to operate under high run-off flow conditions.
 - Vehicle movements around the site transporting silt off-site.
 - Rock, topsoil, peat storage and reuse.
 - Forest felling run-off.
 - Peat slides of material into watercourses.

13.8.7. Effects on specific receptors are discussed and assessed in the relevant sections below.

Alteration of Flow, Natural Drainage Patterns / Runoff Volumes and Rates

13.8.8. The development of tracks and cable trenches has the potential to alter natural drainage on the site by the creation of altered preferential flow pathways. If constructed against the topographic gradient, roads could act as barriers to run-off resulting in the ponding of water. If constructed in line with the gradient, the development of preferential flow down the roadway could occur. This has been considered in the design, where possible with other constraints.

13.8.9. Changes to the natural drainage and run-off rates could affect sensitive water dependent habitats, such as bog habitats, as well as fish and protected species habitats (e.g. otter) or increase erosional rates.

13.8.10. Effects on specific receptors are discussed and assessed in the relevant section below.

Increase in the Magnitude or Frequency of Flood Events

13.8.11. Impermeable areas of the Proposed Varied Development could increase the run-off rates from the Site and drainage management is required to attenuate run-off.

13.8.12. The track network and turbine layout have been designed to avoid, as far as is practicable, areas that have been identified as at risk of flooding, with the exception of watercourse crossings. Therefore, flood hazard has been assessed to be low sensitivity for the majority of the site.

13.8.13. The majority of the proposed infrastructure is located within the catchments of Black Burn Craigengillan Burn and Dry Burn, with approximately 6.15%, 5.41% and 4.26% of the catchment area being infrastructure footprint. The proposed infrastructure would cover 0.1% of the Marbrack Burn catchment. Note, that these are worst-case scenarios as much of the access track is existing forestry tracks and includes earthworks, temporary infrastructure and clearance areas would be potentially reinstated. Furthermore, footprint other than the turbine foundations would be either reinstated or have gravel hardcore and therefore would semi-permeable footprint rather than impermeable.

13.8.14. Much of the Proposed Varied Development footprint will temporary and where permanent will be of semi permeable gravel construction except for the turbine foundations which will be impermeable concrete. The overall proportion of land take in each catchment is low and therefore with appropriate embedded mitigation the rates of run-off are unlikely to significantly increase.

13.8.15. Given the limited area of flood risk zones on-site and their localisation within topographical, forestry drainage and hydrological features, flood risk is not considered to be a significant risk factor and can be largely mitigated through micro-siting of infrastructure and appropriate watercourse crossing design. With the good practice methods employed for flow attenuation and SUDs along with the infrastructure having semi permeable surfaces, the magnitude of effect on run-off rates and flooding is assessed as Low and therefore the significance of effect will be **Minor, not significant**.

13.8.16. The extent of forest being felled for the Proposed Varied Development in each catchment has the potential to increase run-off rates and drainage management is required to attenuate run-off. When forestry is felled, the roots will be left in situ, forestry drainage ditches blocked and forest to bog restoration will be undertaken to assist attenuating run-off (refer to **Appendix 9.8** for further information on the forest to bog enhancement proposals). The magnitude of effect on flooding from forest felling is assessed as Low and therefore the significance of effect will be **Minor, not significant**.

Potential Pollution events affecting Groundwater and Surface Water Quality

13.8.17. Pollution of watercourses could potentially occur through the following pathways:

- Oil and chemical spills from:
 - Oil leakages during vehicle movements or when on standby;
 - Refuelling areas such as the compound; and/or
 - Chemical/fuel storage areas.

13.8.18. Leakage of cement powder or liquid concrete during batching, transportation or pouring. Concrete is highly alkaline (high pH) and changes in the pH balance could affect the water quality and the species that depend on baseline conditions.

- Plant washing and vehicle wheel wash areas.
- Improper management of on-site waste.
- Poor sanitary plumbing.
- Poor water storage.
- Sedimentation and erosion (as previously discussed).

13.8.19. The construction compound will be constructed with an impermeable membrane and any surface water run-off along with any pollutants will be routed through an oil/water separator as part of good practice procedures.

13.8.20. The concrete batching plant will also be located on an impermeable membrane within or adjoining to the construction compound, both for the area where batching occurs and the washout area.

13.8.21. Even taking into account the application of good practice there is still a small risk of potential fuel spillage on-site due to the number of vehicles, and the potential for leaks or accidents. The magnitude of effect of potential pollution from the above pathways is Low and the effects on specific receptors are discussed and assessed in the section below.

Effect on Specific Receptors

Infrastructure within 50 m of Watercourses and Water Features

13.8.22. Where possible, infrastructure and site access routes have been located at least 50 m distance away from watercourses and waterbodies (shown on 1:50,000 scale and 1:25,000 scale OS mapping), with the exception of where the main existing forestry track is used and tracks approach watercourse crossings at the locations presented in **Appendix 13.2**.

- 13.8.23. The sensitivities of the watercourses and waterbodies within the catchments on the Site are Low to High. Those downstream of the site where protected fish may be present are High.
- 13.8.24. There is no Infrastructure adjacent or within 50 m of Very High, High or Medium sensitivity watercourses or waterbody receptors.
- 13.8.25. Where existing or new infrastructure encroaches the 50 m buffer of a watercourse (see **Figure 13.2a-b**, and **Appendix 13.2**). The infrastructure that encroaches on a section of the 50 m watercourse buffer has been identified and numbered I1 to I4, these areas are labelled on **Figure 13.2a-b** and are discussed within **Table 2** in **Appendix 13.2**. All of the areas are considered to be of Low sensitivity. Sections of new infrastructure within 50 m of watercourses include:
- Existing track (111 m length, I1) within 50 m (12 m at closest location) of 1:50,000 scale watercourse, un-named tributary of Water of Ken. Observed to be a small drain altered by existing track and forestry drainage.
 - Existing track (385 m length, I2) within 50 m (10 m at closest location) of 1:50,000 scale watercourse, un-named tributary of Water of Ken. Observed to be a small drain altered by existing track and forestry drainage.
 - Access track south of T9 (50 m I3) within 50 m (44 m closest location) of the Dry Burn 1:50,000K scale watercourse. Observed to be a small watercourse.
 - Earthworks of T5 (16 m², I4) within 50 m (48 m closest location) of the un-named tributary of Craigengillan Burn 1:50,000K scale watercourse. Observed to be a small drain altered by forestry drainage.
 - Existing access track bellmouth requires widening for turbine delivery and maintenance. The existing forestry track minor watercourse crossing will be removed, diverted and replaced with a new watercourse crossing under the B729 public road in order to avoid the requirement for a long, culverted section of the watercourse under the widened bellmouth. The diversion and new short crossing of the minor watercourse was considered beneficial to allow a short, single span or bottomless arch crossing under the road which will allow more natural conditions and otter passage.
- 13.8.26. It is noted that most of the infrastructure located within watercourse buffers is associated with upgrades to the existing site access track and these will be undertaken on the side of the track further away from the watercourse using embedded water management and monitoring, as outlined in **Appendix 13.1**.
- 13.8.27. Any short-term impact from sediment or peaty debris entering the Water of Ken from one of the hill tributaries would have negligible impacts on the poor condition of the Water of Ken.
- 13.8.28. Infrastructure within 50 m of watercourses of Low sensitivity will result in **Minor (not significant)** effect based on a Low magnitude of change.

Summary of Significance of Effects during Construction Phase

- 13.8.29. The infrastructure, and associated construction activities, will result in an overall significance of effect that is **Minor (not significant)** for erosion/sedimentation of watercourses, for alteration of natural drainage patterns, run-off volumes and rates and pollution.

Operation

- 13.8.30. Effects during the operational period for all disciplines, with the exception of drainage management and watercourse crossing management have been scoped out of the operational effects, as although it is recognised that effects will occur, these will be substantially less than during the construction period which represents a worst-case scenario.
- 13.8.31. Possible hydrological and hydrogeological effects resulting from the operation of the Proposed Varied Development are related to two main factors as detailed below:
- Alteration of Flow, Natural Drainage Patterns/ Runoff Volumes and Rates, including flooding and geomorphology; and.
 - Potential Pollution events affecting Groundwater and Surface Water Quality.
- 13.8.32. Erosion and sedimentation effects and potential pollution events affecting groundwater and surface water quality are considered to be **Minor (not significant)** as a result of careful design and construction. Any potential effects will be less than the construction period Minor with the implementation of best practice techniques.

Decommissioning

- 13.8.33. The potential effects on hydrology and hydrogeology during decommissioning are anticipated to be similar to, or lesser than, the construction phase effects and therefore are considered as **Minor (not significant)**.

13.9. Additional Mitigation and Enhancement

- 13.9.1. No additional mitigation is required as there are no significant adverse effects with the implementation of best practice techniques.
- 13.9.2. The existing forestry tracks will not be widened or infrastructure microsituated further into the 50 m watercourse buffers.
- 13.9.3. The new, extended or replaced watercourse crossings and the diversion of the watercourse at the entrance of the site will be subject to approval from SEPA under SEPA's Environmental Authorisation (Scotland) Regulations 2018 (EASR) (that came into effect 1st November 2025, replacing the CAR Regulations). Where possible, any replacement of existing crossing will improve conditions.

- 13.9.4. Enhancement of riparian corridors through additional bankside planting, and management of vegetation, following SEPA's good practice guidance will be implemented as part of the Outline Habitat Enhancement and Management Plan included as **Appendix 9.8**.

13.10. Existing Planning Conditions

- 13.10.1. The Shepherds' Rig Wind Farm (the Consented Development) Decision Letter outlines:
- SEPA raised no concerns over private water supplies, given that they are outwith the appropriate buffer distances from the proposed infrastructure.*
 - Marine Scotland has no objection to the proposed Development. It recommends an integrated robust water quality monitoring programme takes place at selected sites potentially impacted by the proposal and at control sites (where an impact from the present proposal is unlikely). Also the Ecological Clerk of Works should carry out regular visual inspections of all watercourses.*
 - Scottish Water had no objection to the proposed development.*
 - Third parties objecting to the development raised their concerns with regards to private water supplies.*
- 13.10.2. Annex 2 of the Shepherds' Rig Wind Farm (the Consented Development) Decision Letter outlines the Conditions attached to the Deemed Planning Permission.
- 13.10.3. The following conditions relate to hydrology and hydrogeology and all remain applicable to the Proposed Varied Development:
- 13.10.4. Condition 14: Ecological Clerk of Works
- (1) There shall be no Commencement of Development unless the terms of appointment of an independent and suitably qualified Ecological Clerk of Works (ECoW) by the Company have been submitted to, and approved in writing by the Planning Authority, in consultation with NatureScot and SEPA.*
- (2) The terms of appointment shall:*
- impose a duty on the ECoW to monitor compliance with the ecological, ornithological and hydrological commitments provided in the EIA Report, AEI and AEI II lodged in support of the application and the Construction Environmental Management Plan, Peat Management Plan, Biodiversity Plan, Species Protection Plan(s), Breeding Bird Protection Plan, Water Construction Environmental Management Plan, Biosecurity Plan and other plans approved in terms of the conditions of this permission (the ECoW Works);*
 - advise on micro-siting proposals issued pursuant to condition 15;*
 - require the ECoW to report to the nominated construction project manager any incidences of non-compliance with the ECoW Works at the earliest practical opportunity and stop the job where any breach has been identified until the time that it has been reviewed by the construction project manager; and d) require the ECoW to report to the*

Planning Authority any incidences of non-compliance with the ECoW Works at the earliest practical opportunity.

(3) The ECoW shall be appointed on the approved terms during the establishment of the Habitat Management Plan and throughout the period from Commencement of Development to completion of post construction restoration works and aftercare phase of the Development.

(4) No later than 18 months prior to decommissioning of the Development or the expiry of the section 36 consent (whichever is the earlier), details of the terms of appointment of an ECoW by the Company throughout the decommissioning, restoration and aftercare phases of the Development shall be submitted for the written approval of the Planning Authority.

(5) The ECoW shall be appointed on the approved terms throughout the decommissioning, restoration and aftercare phases of the Development. Reason: To secure effective monitoring of and compliance with the environmental mitigation and management measures associated with the Development during the decommissioning, restoration and aftercare phases.

13.10.5. Condition 18: Construction Environmental Management Plan

There shall be no Commencement of Development unless a Construction and Environment Management Plan (CEMP) has been submitted to and approved in writing by the Planning Authority, in consultation with NatureScot, HES, SEPA, the roads authority and the council's Environmental Health Officer (EHO). The CEMP shall integrate best practice methods for the Scottish / UK wind farm industry with the mitigation measures identified in the EIA and AEI reports:

- b) a sustainable drainage system (SUDS) design concept including run-off and sediment control measures and flood risk management;*
- c) details of foul drainage arrangements;*
- e) a pollution prevention plan (PPP);*
- f) an environmental management plan (EMP);*
- r) a water construction environmental plan, including a water quality monitoring programme;*
- q) a groundwater dependant terrestrial ecosystem protection plan.*

(3) Thereafter, the construction of the Development shall be implemented in complete accordance with the approved CEMP, unless otherwise agreed in writing with the Planning Authority.

13.10.6. Condition 28 relates to hydrology and hydrogeology, as follows:

(1) There shall be no Commencement of Development unless full details of all surface water drainage provision within the application site (which should accord with the principles of Sustainable Urban Drainage Systems (SUDS) and be designed to the standards outlined in Sewers for Scotland Third Edition, or any superseding guidance

prevailing at the time) have been submitted to, and approved in writing by, the Planning Authority.

(2) Thereafter, only the approved details shall be implemented and all surface water drainage provision shall be completed prior to the date of first commissioning.

13.11. Summary of Residual Effects

- 13.11.1. The residual effects represent the likely significant effects of the Proposed Varied Development on the environment taking account of the applied embedded mitigation and good practice measures as referred to above.
- 13.11.2. There are no significant residual construction effects on the water environment.
- 13.11.3. The Proposed Varied Development will result in no change in the magnitude of effects on the hydrological and hydrogeological receptors overall. The assessment of significance of effects remains unchanged from that detailed within the 2018 EIA Report and 2019 AEI Report, which concluded that there will be no significant effects in terms of the EIA Regulations.

13.12. Cumulative Assessment

- 13.12.1. The EIA regulations require the cumulative effects of the Proposed Varied Development with other relevant projects or plans to be assessed.
- 13.12.2. Cumulative effects are most likely to occur on those receptors for which a significant residual effect is predicted, particularly if the core range of these receptors includes other planned, consented or built development. This assessment considers that cumulative effects can result from effects that were individually assessed as non-significant, but in combination with effects or actions taking place over time, or across a wider spatial range (such as catchment) non-significant effects may cumulatively be considered significant.
- 13.12.3. Consideration of combined effects in a cumulative context would not sufficiently increase the scale of impacts to allow any potential effect to be considered cumulatively significant. All identified residual impacts of the Proposed Varied Development on geological and peat features are predicted to be Minor, and therefore not significant. In addition, the nature of these impacts is considered to be spatially or temporally limited.
- 13.12.4. The application of a hydrological catchment methodology enables a logical evaluation of the potential for cumulative effects on the hydrological environment. A cumulative impact is the impact on a hydrological or hydrogeological arising from the Proposed Varied Development in combination with other developments which are likely to affect the same surface water or groundwater receptor/s through sharing the same catchment. Proposed developments (consented and in planning) within the same catchment as the Proposed Varied Development and within a distance of 5 km from the Proposed Varied Development have been considered. Although a distance of 2 km is more realistic, as at distances greater than 2 km within upland catchments, it is considered that schemes are unlikely to contribute to a hydrological impact, in terms of chemical or sedimentation

impacts, due to dilution over distance of potentially polluting chemicals, unless a direct pathway exists, such as a watercourse.

- 13.12.5. The following developments are located within 5 km of the site. Further details on these developments are presented in **Chapter 2: Site Description**.

Table 13.11 – Developments within 5 km of Site for Cumulative Effects

Site	Status	Distance from Site (km)*	Significance of Effects
Lorg Overhead Line (OHL) Grid Connection	In planning	On-site	No significant impact predicted. No significant residual effects. Concluded following the application of mitigation measures to protect water supplies, including measures to be implemented through embedded design, good practice mitigation methods, micro-siting and a CEMP, no significant effects are predicted during construction of the OHL, and operation effects were excluded from the assessment on the basis no adverse impacts on the existing water and soil environment were expected.
Quantans Hill 15 turbines	In planning	0.75 km west	No significant impact predicted. No significant effects from the Proposed Development on the hydrological, hydrogeological and geological environment
Windy Rig 12 turbines	Operational	3.3 km north	No significant impact predicted.
Manquhill 8 turbines	Consented	4.1 km east	No significant impact predicted. The site hydrological, hydrogeological and geological conditions were assessed not significant under the terms of The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 New application for same number of turbines with increased tip height to 220 m submitted September 2025.
Cornharrow 7 turbines	Consented and in planning (revised scheme)	4.1 km east	No significant impact predicted.

*Measurements taken from nearest infrastructure elements.

- 13.12.6. The majority of the Lorg Wind Farm Grid Connection Overhead Line (OHL) is within the Craigengillan Burn catchment and its main stem valley. There are sections of the OHL that will be within 50 m buffer of the Craigengillan Burn and a temporary watercourse crossing of the Craigengillan Burn is required for the OHL.
- 13.12.7. It is recommended that wind farm development construction earthworks and large-scale forest felling activities in the same hydrological catchments avoid being undertaken at the same time to minimise potential cumulative effects of acidification and sediment laden runoff.
- 13.12.8. It is also recommended that further investigation and micro-siting of infrastructure is undertaken in context of both developments to identify if construction compound footprints and other infrastructure could be shared or re-used to further reduce adverse effects.
- 13.12.9. The cumulative effects identified within the 2018 EIA Report and 2019 AEI Report (which presented a cumulative assessment with Lorg Grid Connection OHL) would remain unchanged. The predicted in-isolation effects of the Proposed Varied Development are considered to be so small that it is unlikely to make any meaningful contribution to cumulative effects on the hydrology and hydrogeology. It is therefore expected that there would be Minor cumulative impacts on the water environment and therefore the cumulative assessment from the EIA and AEI Reports for the Consented Development remains unchanged which identified cumulative effects as not significant.

13.13. Summary

- 13.13.1. An assessment has been made of the potential for significant effects of the Proposed Varied Development on the hydrology and hydrogeology. In line with the 2018 EIA findings, this assessment did not identify potential significant residual effects (in terms of the EIA Regulations) on any receptors during the construction, operation and decommissioning of the Proposed Varied Development.
- 13.13.2. By applying effective embedded mitigation measures, mainly through the design and following best practice guidelines during construction, the magnitude of residual effects of the Proposed Varied Development both alone and in combination with other schemes are assessed as non-significant in terms of the EIA Regulations.
- 13.13.3. The revisions to the Consented Development will result in no change to the magnitude of effects on the water environment overall, including cumulative effects. The assessment of significance of effects remains unchanged from that outlined within the 2018 EIA Report and 2019 AEI Report.
- 13.13.4. The Proposed Varied Development requires less watercourse crossings than the Consented Development post AEI by removing the requirement for the crossing of the Black Burn, the most sensitive watercourse on site.
- 13.13.5. Effects on the water environment associated with the Proposed Varied Development are considered to be not significant. This represents no change to the conclusions outlined in the 2018 EIA Report and the 2019 and 2021 AEI Reports

Table 13.12 – Summary of Effects

Description of Effect	Significance of Potential Effect		Mitigation and/or Enhancement Measure	Significance of Residual Effect		Change to Consented Development Conclusion
	Significance	Beneficial/ Adverse		Significance	Beneficial/ Adverse	
Construction						
Alteration of flow, natural drainage patterns/ runoff volumes and rates, including flooding and geomorphology	Minor	Adverse	None, assuming embedded best practice such as adherence to guidance, being outwith 50 m watercourse buffer and CEMP.	Minor	Adverse	None
Potential pollution events affecting groundwater and surface water quality	Minor	Adverse	None, assuming embedded best practice such as adherence to guidance and CEMP. No micro-siting or widening of existing track further into 50 m buffers around waterbodies.	Minor	Adverse	None
Operation						
Alteration of flow, natural drainage	Minor	Adverse	None, assuming embedded best practice	Minor	Adverse	None

patterns/ runoff volumes and rates, including flooding and geomorphology			such as adherence to guidance, being outwith 50 m watercourse buffer and CEMP.			
Potential pollution events affecting groundwater and surface water quality	Minor	Adverse	None, assuming embedded best practice such as adherence to guidance, being outwith 50 m watercourse buffer and CEMP.	Minor	Adverse	None
Decommissioning						
Alteration of flow, natural drainage patterns/ runoff volumes and rates, including flooding and geomorphology	Minor	Adverse	None, assuming embedded best practice.	Minor	Adverse	None
Potential pollution events affecting groundwater and surface water quality	Minor	Adverse	None, assuming embedded best practice.	Minor	Adverse	None

Table 13.13 – Summary of Cumulative Effects

Receptor	Effect	Cumulative Developments	Significance of Cumulative Effect	
			Significance	Beneficial/Adverse
No cumulative effects anticipated, assuming embedded best practice.				

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Abbreviations

Abbreviations	Definition
<i>AOD</i>	<i>Above Ordnance Datum</i>
<i>BAP</i>	<i>Biodiversity Action Plan</i>
<i>BAT</i>	<i>Best Available Techniques</i>
<i>BGS</i>	<i>British Geological Society</i>
<i>CAR</i>	<i>SEPA's Controlled Water Regulations (Revoked)</i>
<i>CEMP</i>	<i>Construction Environmental Management Plan</i>
<i>CMS</i>	<i>Construction Method Statements</i>
<i>DGC</i>	<i>Dumfries and Galloway Council</i>
<i>DMP</i>	<i>Drainage Management Plan</i>
<i>DWPA</i>	<i>Drinking Water Protection Area</i>
<i>GWDTE</i>	<i>Groundwater Dependent Terrestrial Ecosystem</i>
<i>EASR</i>	<i>SEPA's Environmental Authorisation (Scotland) Regulations 2018 (EASR) (that came into effect 1st November 2025)</i>
<i>ECow</i>	<i>Environmental Clerk of Works</i>
<i>EIA</i>	<i>Environmental Impact Assessment</i>
<i>FCS</i>	<i>Forestry Commission Scotland</i>
<i>GCR</i>	<i>Geological Conservation Review Area</i>
<i>GPP</i>	<i>Guidelines on Pollution Prevention</i>

<i>LDP</i>	<i>Local Development Plan</i>
<i>LNCS</i>	<i>Local Nature Conservation Sites</i>
<i>NNR</i>	<i>National Nature Reserves</i>
<i>NPF</i>	<i>National Planning Framework</i>
<i>PAN</i>	<i>Planning Advisory Note</i>
<i>PWS</i>	<i>Private Water Supply</i>
<i>OHL</i>	<i>Overhead Line</i>
<i>OHEMP</i>	<i>Outline Habitat Enhancement and Management Plan</i>
<i>OPMP</i>	<i>Outline Peat Management Plan</i>
<i>OS</i>	<i>Ordnance Survey</i>
<i>SAC</i>	<i>Special Areas of Conservation</i>
<i>SEPA</i>	<i>Scottish Environment Protection Agency</i>
<i>SNH</i>	<i>Scottish Natural Heritage (Now NatureScot)</i>
<i>SSSI</i>	<i>Site of Special Scientific Interest</i>
<i>WFD</i>	<i>Water Framework Directive</i>
<i>WTW</i>	<i>Water Treatment Works</i>