



Chapter 8 – Hydrology, Geology and Hydrogeology

Dupplin Solar EIA Report

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Table of Contents

8. Hydrology, Geology and Hydrogeology	8-1
8.1 Executive Summary	8-1
8.2 Introduction	8-1
8.3 Legislation, Policy & Guidance	8-2
8.4 Consultation	8-4
8.5 Assessment Methods & Significance Criteria	8-5
8.6 Baseline	8-11
8.7 Scope of the Assessment.....	8-17
8.8 Good Practice and Embedded Mitigation	8-19
8.9 Assessment of Potential Effects	8-23
8.10 Mitigation.....	8-27
8.11 Assessment of Residual Effects	8-27
8.12 Assessment of Cumulative Effects	8-27
8.13 Summary.....	8-28
8.14 References.....	8-1

Tables

Table 8-1 Consultation Responses

Table 8-2 Criteria for Assessing the Sensitivity of Receptors

Table 8-3 Criteria for Assessing the Magnitude of Impact

Table 8-4 Significance of Effect

Table 8-5 Surface Water Classification Data (2024)

Table 8-6 Private Water Supply (PWS) Details and Risk Assessment

Table 8-7 Summary of Identified Receptor Sensitivity and Justification

Table 8-8 Summary Table

Supporting Figures (EIA Report Volume 3)

Figure 8.1: Local Hydrology

Figure 8.2: Soils

Figure 8.3: Superficial Geology

Figure 8.4: Peatland Classification

Figure 8.5: Bedrock Geology

Figure 8.6: Regional Hydrogeology

Figure 8.7: Aquifer Designations and Groundwater Vulnerability

Figure 8.8; Private Water Supply Locations



Acronyms and Abbreviations

BGS	British Geological Survey
CAR	Controlled Activities Regulations
CEMP	Construction Environmental Management Plan
CIRIA	the Construction Industry Research and Information Association
DIA	Drainage Impact Assessment
DWPA	Drinking Water Protected Area
EASR	Environmental Authorisations (Scotland) Regulations
ECoW	Ecological Clerk of Works
EnvCoW	Environmental Clerk of Works
EIA	Environmental Impact Assessment
EU	European Union
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment
GPP	Guidance for Pollution Prevention
GWDTE	Groundwater Dependent Terrestrial Ecosystem
LDP2	Local Development Plan 2
m AOD	Metres Above Ordnance Datum
NGR	National Grid Reference
NPF4	National Planning Framework 4
NVC	National Vegetation Classification
OS	Ordnance Survey
PAN	Planning Advice Notes
PKC	Perth and Kinross Council
PWS	Private Water Supply
SAC	Special Area of Conservation
SEPA	Scottish Environment Protection Agency
SPA	Special Protection Areas
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
WEWS	Water Environment and Water Services (Scotland)
WFD	The Water Framework Directive



8. Hydrology, Geology and Hydrogeology

8.1 Executive Summary

- 8.1.1 This Chapter considers the potential effects the Proposed Development could have on hydrology, geology and hydrogeology. It considers the construction, operational and decommissioning phases of the Proposed Development.
- 8.1.2 Information on the study area was compiled using baseline information from a desk study that was verified by field work prior to completion of the assessment. The assessment undertaken considered the sensitivity of receptors identified during the baseline study and mitigation measures incorporated in the development design. It has also considered potential future changes to baseline conditions.
- 8.1.3 It has been shown that the Proposed Development is not considered to be at risk of flooding and that surface water attenuation measures in accordance with sustainable drainage principles can be provided to control both the rate and quality of discharge from Proposed Development, so that flood risk to downstream land and property is not increased.
- 8.1.4 Subject to good practice measures and a site-specific Construction and Environmental Management Plan (CEMP), it has been shown that the Proposed Development would have no adverse effects on the water environment. The final CEMP would include good practice measures which will be adopted and would be agreed with Scottish Environment Protection Agency (SEPA) and Perth and Kinross Council (PKC) prior to construction.
- 8.1.5 Notwithstanding these safeguards, a programme of predevelopment, construction phase and post construction water quality monitoring is also proposed. Monitoring results would be used to confirm that the Proposed Development does not have a significant adverse effect on the water environment and would be used ensure the effectiveness of any good practice or remedial measures implemented.

8.2 Introduction

- 8.2.1 This Chapter considers the potential effects of the Proposed Development on hydrology, geology (including soils) and hydrogeology during construction, operation and decommissioning phases.
- 8.2.2 The chapter is supported by the following technical appendices and figures:
- Technical Appendix: Flood Risk Assessment (FRA) and Drainage Impact Assessment (DIA);
 - Technical Appendix: Schedule of Watercourse Crossings;
 - Figure 8.1: Local Hydrology;
 - Figure 8.2: Soils;
 - Figure 8.3: Superficial Geology;
 - Figure 8.4: Peatland Classification;
 - Figure 8.5: Bedrock Geology;
 - Figure 8.6: Regional Hydrogeology;
 - Figure 8.7: Aquifer Designation and Groundwater Vulnerability; and



- Figure 8.8: Private Water Supply Locations.

8.2.3 The assessment has been undertaken by SLR Consulting Limited and has been overseen by a Technical Director who has more than 20 years' experience assessing similar developments.

8.3 Legislation, Policy & Guidance

8.3.1 The water environment in Scotland is afforded significant protection through key statutes and the regulatory activities of SEPA and the local authorities. The assessment has been undertaken with respect to environmental legislation, planning policy and general guidance, including the following which are relevant to the water environment.

Legislation

8.3.2 Legislation relevant to this assessment includes:

- European Union (EU) Water Framework Directive (2000/60/EC);
- EU Drinking Water Directive (98/83/EC);
- The Environmental Act 1995;
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations (2017);
- Environmental Protection Act 1990;
- The Flood Risk Management (Scotland) Act 2009;
- Water Environment and Water Services (Scotland) Act 2003 (WEWS Act);
- Environmental Authorisations (Scotland) Regulations 2018 (EASR);
- The Water Supply (Water Quality) (Scotland) Regulations 2001;
- Private Water Supplies (Scotland) Regulations 2006; and
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017.

Planning Policy

8.3.3 The Planning Statement associated with this Section 36 application sets out the planning policy framework that is relevant to this Environmental Impact Assessment (EIA).

8.3.4 In summary, the National Planning Framework 4 (NPF4) provides planning guidance and policies regarding sustainable development, tackling climate change and achieving net zero. Policies relevant to this chapter includes:

- Policy 2 (Climate Mitigation and Adaptation);
- Policy 4 (Natural Places);
- Policy 5 (Soils);
- Policy 11 (Energy);
- Policy 20 (Blue and Green Infrastructure); and
- Policy 22 (Flood Risk and Water Management).



8.3.5 Additionally, Perth and Kinross Council (PKC) Local Development Plan 2 (LDP2) provides planning guidance on the type and location of development that can place in the region. The LDP2 presents the policies of which the following are relevant to this assessment:

- Policy 33: Renewable and Low-Carbon Energy;
- Policy 38: Environment and Conservation;
- Policy 51: Soils;
- Policy 52: New Development and Flooding; and
- Policy 53: Water Environment and Drainage.

Guidance

8.3.6 The following guidance and technical standards have informed this assessment:

- Planning Advice Notes (PAN):
 - PAN 61 Planning and Sustainable Urban Drainage Systems; and
 - Online Planning Advice on Flood Risk.
- SEPA Guidance for Pollution Prevention (GPP):
 - GPP01 Understanding your environmental responsibilities;
 - GPP02 Above Ground Oil Storage Tanks;
 - GPP03 Use and Design of Oil Separators in Surface Water Drainage Systems;
 - GPP05 Works and Maintenance in or near Water;
 - GPP06 Working at Construction and Demolition Sites;
 - GPP08 Safe Storage and Disposal of Used Oils;
 - GPP13 Vehicle Washing and Cleaning;
 - GPP18 Containing Major Spillages and Firewater at Industrial Sites;
 - GPP21 Pollution Incident Response Planning; and
 - GPP22 Dealing with Spills.
- Construction Industry Research and Information Association (CIRIA) Publications:
 - C532 Control of Water Pollution from Construction Sites (2001);
 - C624 Development and Flood Risk – Guidance for the Construction Industry (2004);
 - C741 Environmental Good Practice on Site (2015); and
 - C753 The SuDS Manual (2015).
- SEPA Publications:
 - Groundwater Protection Policy for Scotland, Version 3 (2009);
 - Technical Flood Risk Guidance for Stakeholders (2022);
 - Flood Risk and Land Use Vulnerability Guidance (2024);
 - Recommended Riparian Corridor Layer for use in Land Use Planning (2024);



- Climate Change Allowances for Flood Risk Assessment in Land Use Planning (2025); and
- Guidance on Assessing the Impact of Development on Groundwater Abstractions (2024).
- Other Guidance:
 - PKC Guidance on Flood Risk & Flood Risk Assessments (2021);
 - Scottish Water Sewers for Scotland (2018); and
 - British Standards Institution (2017), Assessing and Managing Flood Risk in Development – Code of Practice, Report BS-8533:2017.

8.4 Consultation

- 8.4.1 Data requests were issued to SEPA, Scottish Water and PKC to obtain information relating to water quality data; groundwater level and flow data; private water supplies; licenced water abstractions and discharges; and details on nearby Scottish Water assets and required standoffs.
- 8.4.2 Pre-application advice was also sought from PKC and SEPA. **Table 8.1** summarises the key points relevant to hydrology, geology and hydrogeology raised through consultation for the Proposed Development.

Table 8.1: Consultation Responses

Consultee	Consultation Response	Applicant Action
SEPA Pre-application advice 17 July 2025	Based on the information provided, it appears that this application falls below the thresholds for which SEPA provides site specific advice.	Noted.
PKC Floods Team Pre-application advice 17 July 2025	SEPA maps indicate a small/medium size watercourse running through the Northeast of the site. Localised flooding is shown along its extent.	Noted. A site-specific assessment on flooding has been undertaken and is presented as Technical Appendix: FRA and DIA
	The developer must provide a buffer strip (exclusion zone) of a minimum of 6m on each side of the watercourse. If the watercourse is deemed to be a ditch, the strip could be reduced to a minimum of 3m, depending on the requirements for access for maintenance.	In accordance with best practice and SEPA requirements, a 10m buffer has been applied to watercourses shown on 1:10,000 scale mapping, see Figure 8.1 . No development, except for watercourse crossings, is proposed within the 10m watercourse buffer.
	PKC discourages the culverting of watercourses unless absolutely necessary. The approach aligns with national guidance and environmental best practices, emphasising flood risk reduction, ecological protection, and sustainable development. Any proposal to culvert a watercourse must comply with the Flood Risk Management (Scotland) Act 2009.	Noted. The proposed watercourse crossings are shown on Figure 8.1 and discussed in Section 8.7 .



Consultee	Consultation Response	Applicant Action
	Drainage Strategy - It is recommended that the applicant produce a site Drainage Strategy that considers the existing drainage and site modifications. The Drainage Strategy shall outline how the development will manage surface water, including stormwater runoff, groundwater management, and flood prevention. The plan should involve developing and positioning drainage systems while implementing sustainable drainage techniques.	Noted. An outline drainage strategy is presented within Technical Appendix: FRA and DIA .
PKC Pre-application advice 17 July 2025	Submission should be supported by a Flood Risk Assessment.	Noted. A flood risk assessment is presented as Technical Appendix: FRA and DIA .

8.5 Assessment Methods & Significance Criteria

Study Area

- 8.5.1 The study area for this assessment is shown on **Figures 8.1 to 8.7**. The study area encompasses the areas over which all desk based, and field data were gathered to inform the assessment and includes a 500 m buffer from the application boundary. Beyond this distance, any potential effect is considered to be so diminished as to be undetectable and therefore not significant.
- 8.5.2 The assessment for potential cumulative effects (see **Section 8.13**) uses the hydrological and hydrogeological catchments within the study area, with a maximum distance of 5 km from the application boundary.

Desk Study

- 8.5.3 An initial desk study has been undertaken to determine and confirm the baseline characteristics by reviewing available information on soils, geology, hydrology and hydrogeology. The following sources of information have been consulted in order to characterise the baseline conditions of the study area:
- Ordnance Survey (OS) 1,10,000, 1:25,000 and 1:50,000 scale mapping¹;
 - 1 m LiDAR data from the Scottish Remote Sensing Portal²;
 - UK Centre for Ecology and Hydrology, Flood Estimation Handbook (FEH)³;
 - NatureScot SiteLink⁴;

¹ [OS Data Download and API Products \(Ordnance Survey\)](#)

² [Scottish Remote Sensing Portal \(Scottish Government\)](#)

³ [Flood Estimation Handbook \(FEH\) \(UK Centre for Ecology and Hydrology\)](#)

⁴ [SiteLink \(NatureScot\)](#)



- National Soil Map of Scotland (1:250,000 scale)⁵;
- National scale land capability for agriculture data⁶;
- Carbon and Peatland 2016 data⁷;
- British Geological Survey (BGS) Onshore GeoIndex⁸;
- BGS Hydrogeological maps of Scotland (1:100,000 scale aquifer productivity and groundwater vulnerability datasets)⁹; and
- SEPA rainfall data¹⁰, flood maps¹¹ and environmental data¹².

Site Visit

- 8.5.4 A hydrological walkover survey was carried out by SLR in October 2025 to allow an appreciation of the study area, verify the information that was collected during the desk study and review private water supplies in the study area. This information was used to inform the emerging project design and to complete this assessment.

Assessment of Significance

- 8.5.5 The significance of effects of the Proposed Development has been assessed by considering two factors: the sensitivity of receptors in the receiving environment and the potential magnitude of impact.
- 8.5.6 This approach provides a mechanism for identifying the areas where mitigation measures are required and for identifying mitigation measures appropriate to the significance of likely effects presented by the Proposed Development.
- 8.5.7 The assessment methodology has also been informed by experience of carrying out such assessments for a range of renewable developments, knowledge of the geology and water environment characteristics in Scotland and cognisance of good practice.
- 8.5.8 The criteria for determining the significance of effect are provided in **Table 8.2**, **Table 8.3** and **Table 8.4**.

Sensitivity of Receptor

- 8.5.9 The sensitivity of receptors in the receiving environment (i.e., the baseline quality of the receiving environment) is defined as its ability to absorb an effect without a detectable

⁵ [National Soil Map of Scotland \(Scotland's Soils\)](#)

⁶ [National Scale Land Capability for Agriculture Data \(Scotland's Soils\)](#)

⁷ [Carbon and Peatland 2016 Map \(NatureScot\)](#)

⁸ [GeoIndex Onshore \(British Geological Survey\)](#)

⁹ [Hydrogeological Maps of Scotland \(British Geological Survey\)](#)

¹⁰ [Rainfall Data for Scotland \(Scottish Environment Protection Agency\)](#)

¹¹ [SEPA Flood Maps \(Scottish Environment Protection Agency\)](#)

¹² [Environmental Data \(Scottish Environment Protection Agency\)](#)



change and can be considered through a combination of professional judgement and a set of pre-defined criteria which is set out in **Table 8.2**.

8.5.10 Receptors in the receiving environment only need to meet one of the defined criteria to be categorised at the associated level of sensitivity.

Table 8.2: Criteria for Assessing the Sensitivity of Receptor

Sensitivity	Definition
High	<ul style="list-style-type: none"> soil type and associated land use is highly sensitive (e.g. unmodified blanket bog or peatland); SEPA Water Framework Directive (WFD) water body classification: high-good or is close to the boundary of a classification: moderate to good or good to high; receptor is of high ecological importance or national or international value (e.g. Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), habitat for protected species) which may be dependent upon the hydrology of the Site; receptor is at risk from flooding in the future (2080s) and/or water body acts as an active floodplain or flood defence; receptor is used for public and/or private water supply (including Drinking Water Protected Areas); groundwater vulnerability is classified as high; and if a Groundwater Dependent Terrestrial Ecosystem (GWDTE) is present and identified as being of high sensitivity.
Medium	<ul style="list-style-type: none"> soil type and associated land use moderately sensitive (e.g. arable or commercial forestry); SEPA WFD water body classification: poor to moderate; and moderate classification of groundwater aquifer vulnerability.
Low	<ul style="list-style-type: none"> soil type and associated land use not sensitive to change in hydrological regime and associated land use (e.g. Intensive grazing of sheep and cattle); SEPA WFD water body classification: poor or bad; receptor is not at risk of flooding in the future (2080s) and receptor not used for water supplies (public or private).
Not sensitive	<ul style="list-style-type: none"> receptor would not be affected by the Proposed Development e.g. lies within a different and unconnected hydrological / hydrogeological catchment.

Magnitude of Impact

8.5.11 The potential magnitude of impact would depend upon whether the potential effect would cause a fundamental, material or detectable change. In addition, the timing, scale, size and



duration of the potential change resulting from the Proposed Development are also determining factors.

8.5.12 The criteria that have been used to assess the magnitude of impact are defined in **Table 8.3**. The characteristics of the impacts are described as direct / indirect, temporary (reversible) or permanent (irreversible), together with timescales (short, medium and long term).

Table 8.3: Criteria for Assessing the Magnitude of Impact

Magnitude	Criteria	Definition
High	Results in a loss of attribute	<p>Long term or permanent changes to the baseline geology, hydrology, hydrogeology and water quality such as;</p> <ul style="list-style-type: none"> • permanent degradation and total loss of soils, peatland habitat or protected geological features; • loss of important geological structure / features; • wholesale changes to watercourse channel, route, hydrology or hydrodynamics; • changes to the baseline environment resulting in an increase in runoff with flood potential and also significant changes to erosion and sedimentation patterns; • major changes to the water chemistry; and • major changes to groundwater levels, flow regime and risk of groundwater flooding.
Medium	Results in impact on integrity of attribute or loss of part of attribute	<p>Material but non-fundamental and short to medium term changes to the baseline geology, hydrology, hydrogeology and water quality such as;</p> <ul style="list-style-type: none"> • loss of extensive areas of soils or peat habitat, damage to important geological structures / features; • some fundamental changes to watercourses, hydrology or hydrodynamics; • changes to baseline environment resulting in an increase in runoff within system capacity; • moderate changes to erosion and sedimentation patterns; • moderate changes to the water chemistry of surface runoff and groundwater; and • moderate changes to groundwater levels, flow regime and risk of groundwater flooding.
Low	Results in minor impact on attribute	<p>Detectable but non-material and transitory changes to the baseline geology, hydrology, hydrogeology and water quality such as;</p> <ul style="list-style-type: none"> • minor or slight loss of soils, peatland or slight damage to geological structures / features; • minor or slight changes to the watercourse, hydrology or hydrodynamics; • changes to baseline environment resulting in slight increase in runoff well within the drainage system capacity; • minor changes to erosion and sedimentation patterns; • minor changes to the water chemistry of surface runoff and groundwater; and



Magnitude	Criteria	Definition
		<ul style="list-style-type: none"> minor changes to groundwater levels, flow regime and risk of groundwater flooding.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect the use / integrity	<p>No perceptible changes to the baseline geology, hydrology, hydrogeology and water quality such as:</p> <ul style="list-style-type: none"> no impact or alteration to existing important soils, peatland or geological environs; no alteration or very minor changes with no impact to watercourses, hydrology, hydrodynamics, erosion and sedimentation patterns; no pollution or change in water chemistry to either groundwater or surface water; and no alteration to groundwater recharge or flow mechanisms.

Significance of Effect

8.5.13 The sensitivity of a receptor together with the magnitude of impact determines the significance of the effect, which can be categorised into level of significance as identified in **Table 8.4** and which provides a guide to assist in decision making. In some cases, the potential sensitivity of the receiving environment or the magnitude of potential impact cannot be quantified with certainty and, therefore, professional judgement remains the most robust method for identifying the predicted significance of a potential effect.

Table 8.4: Significance of Effect

Magnitude of Impact	Sensitivity of Receptor			
	High	Medium	Low	Not sensitive
High	Major	Major	Moderate	Negligible
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Potential Cumulative Effects

8.5.14 The assessment also considers potential cumulative effects associated with other developments within 5 km of the application boundary and in the same surface water catchments as the Proposed Development. A cumulative effect is considered to be the effect on a hydrological, hydrogeological or geological receptor arising from the Site in combination with other developments which are likely to affect soils or geology, surface water and groundwater.

Approach to Mitigation

8.5.15 Potential effects of the Proposed Development on hydrology, geology and hydrogeology identified by the assessment have been addressed and mitigated by the design (embedded mitigation) and the application of good practice guidance to be implemented as standard to prevent, reduce or offset effects where possible. As such a number of measures would form



an integral part of the Proposed Development and these have been taken into account prior to assessing the potential effects of the Proposed Development.

- 8.5.16 Good practice measures would be applied in relation to pollution risk, sediment management, and management of flood risk and surface runoff rates and volumes. These would form part of the final Construction and Environmental Management Plan (CEMP) to be implemented for the Proposed Development which would be prepared during detailed design and is expected would be secured by a planning condition prior to construction commencing. An outline CEMP is provided as a Technical Appendix in **Volume 4 of the EIA Report**.
- 8.5.17 The final CEMP would also include details and responsibilities for environmental management onsite for environmental aspects and would outline the necessary surface water management, oil and chemical delivery and storage requirements, waste management, traffic and transport management and would specify monitoring requirements for wastewater, water supply and all appropriate method statements and risk assessments for the construction of the Proposed Development.
- 8.5.18 Where appropriate, tailored mitigation measures have been identified prior to determining the likely significance of residual effects.

Identification of Residual Effects

- 8.5.19 A statement of residual effects, following consideration of any further specific mitigation measures where identified, is then given.

Statement of Significance

- 8.5.20 A statement of significance is provided in the assessment. Effects of ‘major’ and ‘moderate’ significance, as outlined in **Table 8.4**, are considered to be ‘significant’ in terms of the EIA Regulations.

Limitations to Assessment

- 8.5.21 The assessment uses site investigation, survey data and publicly available data sources, including but not limited to SEPA, PKC, Scottish Water, and commercial data supply companies, as well as additional information supplied from stakeholders during consultation.
- 8.5.22 It is therefore considered that the data and information used to complete this assessment is robust and that there are no significant data gaps or limitations.



8.6 Baseline

Current Baseline

- 8.6.1 This section outlines the baseline hydrology, geology (including soils and peat), and hydrogeology conditions within the study area.

Site Setting

- 8.6.2 The Proposed Development is located within Dupplin Estate, north of the A9, in Tibbermore, Perth and is centred at National Grid Reference (NGR) NO 04810 21645. The Site currently comprises arable farmland.
- 8.6.3 Ground elevations generally slope down from south west to the north east, with a high point of approximately 149 m above Ordnance Datum (AOD) in the south western extent of the Site, and a low of approximately 101 m AOD along the northern boundary of the Site, near Newbigging.
- 8.6.4 SEPA precipitation data for Perth Norwich Union rain gauge (station ID: 341345), located approximately 4 km north east of the Site, recorded an annual precipitation total of 779.6 mm in 2024.

Designated Sites

- 8.6.5 A review of NatureScot SiteLink webpage confirms that there are no statutory geological or water dependent designated sites within the Site, as shown on **Figure 8.1**.
- 8.6.6 The Dupplin Lakes Site of Special Scientific Interest (SSSI) site is located adjacent to and south west of the Site and has been designated for breeding and non-breeding bird assemblage. The SSSI outside of the study area has also been designated as part of the South Tayside Goose Roosts Special Protection Area (SPA) and RAMSAR sites which have also been designated for breeding and non-breeding bird assemblage. The designated features are not considered sensitive to changes in the water environment and are therefore not considered further in this assessment. The potential effects as a consequence of the Proposed Development on the SSSI, SPA and RAMSAR sites are considered further in **Chapter 6: Ecology and Biodiversity**, and within the standalone **Habitats Regulations Appraisal – Appropriate Assessment**
- 8.6.7 The East Pow watercourse located approximately 2.3 km north of the Site, has been designated as part of the River Tay Special Area of Conservation (SAC). The SAC has been designated for otter, freshwater habitats and several fish, features which are known to be sensitive to changes in water quality. The northern extent of the Proposed Development drains to the East Pow, however, given the distance between the Proposed Development and the SAC it is considered that there is sufficient dilution that any potential effect from the



development would be discernible. Potential effects to the River Tay SAC are therefore not considered further in this assessment.

Soils and Geology

Soils

- 8.6.8 An extract of the 1:250,000 Soil Map of Scotland is presented as **Figure 8.2** which indicates that the Site is entirely underlain by brown earth soils.
- 8.6.9 The Site has been classified as Class 3.1 agricultural land which is considered as land capable of producing consistently high yields of narrow range of crops and / or moderate yields of a wider range. Class 3.1 is considered prime agricultural land. Refer to **Technical Appendix: Land Capability for Agriculture** within **Volume 4** of the EIA Report.

Peat and Superficial Deposits

- 8.6.10 An extract of BGS superficial deposit mapping (see **Figure 8.3**) shows that the majority of the Site is underlain by glacial till superficial geology. Small isolated areas of the western and central extent of the Site are shown to be absent of any superficial deposits. No peat deposits are recorded.
- 8.6.11 Published priority peatland mapping (see **Figure 8.4**) shows that the Site is underlain by mineral soils (Class 0) which are not considered to represent peatland habitats.

Bedrock Geology

- 8.6.12 An extract of BGS bedrock and linear features geology mapping is presented as **Figure 8.5** and shows that the Site is underlain by sandstones of the Scone Sandstone Formation. The north eastern extent of the Site is shown to be underlain by igneous intrusion of the Central Scotland Late Carboniferous Tholeiitic Dyke Swarm comprising quartz-microgabbros.

Hydrogeology

Aquifer Characteristics and Groundwater Vulnerability

- 8.6.13 An extract of the BGS 1:625,000 scale Hydrogeological Map of Scotland and 1:100,000 scale Aquifer Productivity and Groundwater Vulnerability datasets are presented as **Figure 8.6** and **Figure 8.7** respectively.
- 8.6.14 Review of **Figure 8.6** confirms that the bedrock has been classified as a moderately productivity aquifer which locally, can yield moderate amounts of groundwater.
- 8.6.15 The Aquifer Productivity and Groundwater Vulnerability datasets classify the underlying aquifer (superficial and bedrock) according to the predominant groundwater flow mechanism (fracture or intergranular) and the estimated groundwater productivity and the estimated



groundwater productivity. Groundwater vulnerability is divided into five classes (1 to 5) with 1 being least vulnerable and 5 being most vulnerable.

8.6.16 Review of **Figure 8.7** indicates that the superficial deposits within the study area are not classified as a significant aquifer. The bedrock aquifer is confirmed to be a high productivity aquifer with intergranular flow and flow through fractures and other discontinuities.

8.6.17 The potential groundwater vulnerability in the uppermost aquifer within the Site has been ascribed a vulnerability of Class 4a, with some smaller isolated areas of Class 5 close to the western and south western Site boundary.

Groundwater Levels and Flow

8.6.18 SEPA have confirmed that they have no groundwater level monitoring locations within the study area.

8.6.19 In the absence of published information or data held by SEPA, it is anticipated that groundwater will be present within the sedimentary bedrock deposits, however, the glacial till superficial deposits will inhibit groundwater recharge and flow due to their generally low bulk permeability.

Groundwater Quality

8.6.20 All of Scotland's groundwater bodies have been designated as Drinking Water Protected Areas (DWPA) under the Water Environment (Drinking Water Protected Area) (Scotland) Order 2013 and require protection for their current use or future potential as drinking water resources.

8.6.21 SEPA has identified that the Site is located within two groundwater bodies:

- the north western extent of the Site is located within the Bankfoot groundwater body (ID: 150657)
- the south eastern extent of the Site is located within the Crieff groundwater body (ID: 150668)

8.6.22 Both groundwater bodies have been designated in 2024 (the latest reporting cycle) with an overall classification of Good with no pressures identified.

Groundwater Dependent Terrestrial Ecosystem (GWDTE)

8.6.23 Due to the agricultural nature of the Site, no National Vegetation Classification (NVC) survey has been undertaken. Given the sites current agricultural use and underlying low



permeability superficial geology, no GWDTE are expected to be present at the Site. No evidence of GWDTEs were recorded as part of the hydrological walkover.

Hydrology

Local Hydrology

- 8.6.24 The local hydrology is shown on **Figure 8.1**.
- 8.6.25 The northern and western extents of the Site are located within the East Pow surface water catchment, which is part of the wider River Tay catchment, whilst the southern and eastern extent of the Proposed Development is located within River Earn surface water catchment.
- 8.6.26 The East Pow flows generally north eastward approximately 2.3 km north of the Proposed Development before discharging into the River Almond approximately 4 km north east of the Site. Two drainage ditches, which are tributaries of the East Pow, are located within the western and northern extent of the Site and flow northwards towards the East Pow. Approximately 65% of the Site is located within the East Pow catchment.
- 8.6.27 The River Earn flows generally eastwards approximately 2.2 km south east of the Site. The Cotton Burn, a tributary of the River Earn, rises within the eastern extent of the Site and flows eastwards within the Site before discharging into the River Earn approximately 3.6 km south east of the Site. Approximately 35% of the Site is located within the River Earn catchment.
- 8.6.28 The entire River Earn catchment has been designated as a DWPA.

Surface Water Quality

- 8.6.29 The larger watercourses within the study area or hydraulically connected to the study area are monitored by SEPA as part of its responsibility under the WFD. A summary of the SEPA classification for the latest reporting cycle (2024) is shown in **Table 8.5**. Smaller watercourses and drains within the study area are not monitored or classified by SEPA.

Table 8.5: Surface Water Classification Data (2024)

Watercourse (SEPA ID)	Overall Status	Overall Ecology	Physio-Chemical	Hydro-morphology	Water Quality	Pressures
East Pow (d/s of Methven to River Almond confluence) (ID: 6510)	Moderate ecology potential	Bad	Poor	Bad	Moderate	The water body has been designated as a heavily modified water body on account of physical alterations that cannot be addressed without a significant impact on the drainage of agricultural land.
River Earn (ID: 6800)	Good ecological potential	Bad	High	Bad	Good	

Flood Risk

- 8.6.30 A site-specific FRA is included as a Technical Appendix in **Volume 4** (see **Technical Appendix: FRA and DIA**), which assesses the risk of flooding to the Proposed Development. The FRA confirms that the Proposed Development is not at risk of flooding for the NPF4 design event of 1 in 200-year plus an allowance for climate change except for



some small areas of shallow surface water flooding (<0.3 m deep). It is understood that flood-free access/egress is afforded to and from the Site via the A9 for the design event.

Watercourse Crossings

8.6.31 A review of the 1:10,000 scale OS mapping indicates that the Proposed Development will require two new permanent watercourse crossings. The locations of these crossings are shown on **Figure 8.1** and a schedule of these crossing points, which includes photographs and dimensions of each crossing is shown in **Technical Appendix: Schedule of Watercourse Crossings (Volume 4)**.

Private Water Supplies

8.6.32 As part of this assessment, details of Private Water Supply (PWS) sources within the study area were obtained from PKC. Additional properties, and potential water users, were also identified following a programme of site-specific field investigation that involved visiting the properties within the study area. The location of the PWS sources assessed are shown on **Figure 8.8**.

8.6.33 The risk the Proposed Development poses to PWS sources has been considered in accordance with SEPA guidance for assessing the impact on developments on groundwater abstractions and is presented in **Table 8.6**.

Table 8.6: PWS Details and Risk Assessment

PWS ID (Figure 8.1)	Property Name	Location of PWS (NGR)	Details	PWS Risk Assessment (Step 1 of the SEPA Guidance)
PWS01	11 properties along Old Gallows Road and Newbigging	NO 03680 21697	Properties have been confirmed to be supplied by a borehole which is located approximately 380m south east of the West Cultmalundie Farm Cottages. No development is proposed within 100 m of the borehole and the only development within 250 m of the borehole includes security fencing, part of the proposed access tracks and a transformer station. The Proposed Development will also not cross any distribution pipework from the PWS source to the properties. Excavations required to establish the elements of the Proposed Development within 250m will be <1 m deep and no dewatering is required to facilitate the construction of these elements. The access tracks will also be constructed with permeable materials. Therefore no change to groundwater flow or direction is expected as a result of the Proposed Development and the borehole is not considered to be at risk from the Proposed Development.	PWS source and pipework not considered to be at risk. No further assessment, monitoring or mitigation is required.
PWS02	Highdrum Cottage	NO 06208 21243	Properties have been confirmed to be supplied by a spring fed supply which is located 485 m north east of the Windyedge	PWS source and pipework not



PWS ID (Figure 8.1)	Property Name	Location of PWS (NGR)	Details	PWS Risk Assessment (Step 1 of the SEPA Guidance)
	and Crossgates		property. No development is proposed within 250 m of the PWS or upgradient of the spring fed source. The Proposed Development will also not cross any distribution pipework from the PWS source to the properties.	considered to be at risk. No further assessment, monitoring or mitigation is required.
M1	Windyedge and Windyedge Cottages	N/A	Properties have been confirmed to be supplied by mains.	N/A

Scottish Water Assets

8.6.34 Scottish Water Asset Plans have been reviewed with regard to any drainage or water distribution assets that may be located within the Site. A 15-inch trunk water supply main, 450 mm trunk main, and a 9-inch public water distribution pipe were noted along the southern boundary of the Site, generally following the A9.

Licensed Sites (Abstractions, Discharges and Waste)

8.6.35 SEPA has provided details of Controlled Activity Regulations (CAR) authorisations within the study area which shows that there are nine CAR authorisations within the study area which all represent private sewage discharges.

8.6.36 No licensed abstractions have been recorded within the study area.

Summary of Sensitive Receptors

8.6.37 **Table 8.7** outlines the receptors identified as part of the baseline studies, and their sensitivity based upon previously detailed criteria contained in **Table 8.2**. These receptors form the basis of the assessment, and as per the methodology, are used in conjunction with a magnitude of impact to determine significance.

Table 8.7: Summary of Identified Receptor Sensitivity and Justification

Receptor	Sensitivity	Reason for Sensitivity
Geological and water dependent statutory designated sites	Not sensitive	Dupplin Lakes SSSI is located within the study area however the designated features are not considered sensitive to changes in water quality or quantity. No other designated features are located within the study area.
Peat and carbon-rich soils	Not sensitive	The Site is underlain by mineral soils (Class 0) and no superficial peat or carbon-rich soils are recorded within the Site.
Superficial deposits and bedrock geology	Not sensitive	The superficial and bedrock geology is common regionally and has no specific rarity value. No designated geological sites are also recorded within the study area.



Receptor	Sensitivity	Reason for Sensitivity
Groundwater	High	Groundwater beneath the Site has been classified as Good and vulnerability is classified as 4a to 5.
GWDTEs	Not sensitive	No GWDTEs are recorded within the Site.
Surface water	High	Watercourses downstream of the Proposed Development have been classified with Good to Moderate Ecological Potential. The East Pow watercourse, downstream of the Site, has also been designated as part of the River Tay SAC.
DWPAs	High	The River Earn surface water catchment has been designated as a DWPAs.
Flood risk receptors downstream of the Proposed Development	Medium	Limited areas of flood risk (limited to discrete areas of surface water flooding) have been identified onsite. The Proposed Development, however, has the potential to alter surface water flow paths which could increase flood risk downstream of the Site.
PWSs	Not sensitive	PWSs have been recorded within or immediately adjacent to the study area, however, no PWSs are considered to be at risk from the Proposed Development.
Licenced Abstractions	Not sensitive	No licenced abstractions have been recorded within the study area.

Future Baseline

- 8.6.38 Climate change studies predict a decrease in summer precipitation and an increase in winter precipitation alongside slightly higher average temperatures. This suggests that there is likely to be greater pressures on water supplies and water levels in summer months in the future. Additionally, summer storms are predicted to be of greater intensity.
- 8.6.39 Peak fluvial flows associated with extreme storm events may also increase in volume and velocity. Whilst not relevant to this Site, further sea rise is also anticipated.
- 8.6.40 These potential changes are considered in the assessment of effects. Whilst there is uncertainty surrounding the future baseline environment, there are no other anticipated changes on the hydrological, geological or hydrogeological environment throughout the anticipated lifetime of development besides climate change.

8.7 Scope of the Assessment

Effects Scoped In

- 8.7.1 The following potential impacts have been assessed in full as part of the impact assessment.

Construction Effects

- 8.7.2 The following impacts have been scoped in for the construction phase:
- generation of pollution from fuel, oil, concrete or other hazardous substances, including potential impacts on surface water and groundwater quality and the River Earn DWPA;



- increased erosion and sedimentation, which could give rise to potential impacts on surface water and groundwater quality and the River Earn DWPA;
- increased flood risk to downstream receptors during construction; and
- potential impacts on surface water and groundwater levels and flow including potential impacts on the River Earn DWPA.

Operation

8.7.3 The following impacts have been scoped in for the operational phase:

- pollution risk from fuel, oil, concrete or other hazardous substances, including potential impacts on surface water and groundwater quality and River Earn DWPA;
- increased erosion and sedimentation, which could give rise to potential impacts on surface water and groundwater quality and the River Earn DWPA;
- increased flood risk to downstream receptors as a result of the introduction of new permanent hardstanding areas associated with the Proposed Development; and
- potential impacts on surface water and groundwater levels and flow including potential impacts to the River Earn DWPA.

Decommissioning

8.7.4 Potential decommissioning effects are expected to be similar to and less than potential construction effects.

Effects Scoped Out

8.7.5 The following effects have been scoped out of the impact assessment:

- Disturbance and loss of carbon rich soils and peat deposits as the baseline assessment has confirmed that no peat or carbon-rich soils are recorded within the Site.
- Potential impacts on superficial deposits and bedrock geology during construction, operation and decommissioning of the Proposed Development. There are no protected geological features within the Site or study area. The nature of the activities during construction, operation and decommissioning of the Proposed Development would not alter regional superficial or bedrock geology.
- Potential impacts on GWDTEs as the baseline assessment has confirmed that no evidence of GWDTEs have been recorded within the Site.
- Potential impacts on statutory designated sites including Dupplin Lakes SSSI, South Tayside Goose Roosts SPA and RAMSAR and River Tay SAC. The designated features for the Dupplin Lakes SSSI and South Tayside Goose Roosts SPA and RAMSAR sites are not considered sensitive to changes in water quality or water quantity and therefore no further assessment in this chapter is required. The River Tay SAC is located outside of the study area and therefore any potential effects as a result of the Proposed Development are considered to be not discernible due to significant dilution effects. Potential effects on surface water quality and quantity within the Site have been assessed in full and mitigation is provided to ensure that there are no impacts to the watercourses which drain to the SAC.
- Potential impacts on PWSs and licenced abstractions. The baseline assessment (see **Table 8.6**) has confirmed that two PWSs have been assessed however neither of the



PWSs are considered to be at risk from the Proposed Development. The baseline assessment has also confirmed that there are no licenced abstractions within the study area.

8.8 Good Practice and Embedded Mitigation

Environmental Measures Embedded into the Development Proposals

- 8.8.1 Generally, a 50 m buffer has been applied around watercourses and waterbodies, as shown on the 1:10,000 scale mapping, has been applied and in accordance with SEPA's riparian corridor guidance a minimum 10 m buffer has also been applied. It is confirmed that no development is proposed within 10 m of any of the mapped watercourses, apart from two proposed watercourse crossings and the only development located within the 50 m buffer are solar panels (which are considered water compatible), part of the proposed access track and security fencing.
- 8.8.2 In addition, a 100 m and 250 m buffer has been applied to PWS01 which is located within study area (see **Figure 8.8**) and it is confirmed that no development or construction activities are proposed within 100m of the PWS sources and the only development within 250m of the PWS source includes the security fencing, part of the proposed access track and a transformer station, which will not require excavations >1m deep.
- 8.8.3 Areas of surface water flooding, as shown by SEPA flood maps, were also considered as a design constraint. The development has been designed to avoid deep areas of surface water flooding (>0.3m deep) as shown on SEPA flood maps for up to and including the 1 in 200-year flood event plus an allowance for climate change - to ensure that solar panels remain flood free and sufficient freeboard can be maintained during flood events.

Good Practice Measures

- 8.8.4 The Proposed Development will be undertaken in accordance with industry good practice guidance including those detailed in **Section 8.3**. As a principal, preventing the release of any pollution or sediment is preferable to dealing with the consequence of any release.

Construction Environmental Management Plan

- 8.8.5 A contractual management requirement of the successful Principal Contractor would be the development and implementation of a comprehensive and site-specific Construction Environmental Management Plan (CEMP). This document would detail how the works would be managed in accordance with the commitments and mitigation detailed in the Environmental Appraisal, statutory consents and authorisations, and industry good practice and guidance. An outline CEMP has been provided as a Technical Appendix in **Volume 4** of the EIA Report.
- 8.8.6 The outline CEMP includes measures to ensure that the works minimise the risk to the water environment and would ensure the works are undertaken in accordance with good practice guidance. These include:
- during construction there would be heavy plant and machinery required and as a result it is appropriate to adopt best working practices and measures to protect the water environment, including those set out in GPPs (GPP01);



- in accordance with GPP02 any above ground onsite fuel and chemical storage would be bunded;
- emergency spill response kits would be maintained during the construction works (GPP21);
- a vehicle management system would be put in place wherever possible to reduce the potential conflicts between vehicles and thereby reduce the risk of collision (GPP21);
- suitable access routes would be chosen which minimise the potential requirement for either new temporary access tracks or for tracking across open land which could contribute to the generation of suspended solids;
- a speed limit would be used to reduce the likelihood and significance of any collisions;
- plant nappies would be placed under stationary vehicles which could potentially leak fuel / oils;
- any temporary construction / storage compounds required would be located remote from any sensitive surface water receptors and will be constructed to manage surface water run-off in accordance with good practice;
- any water contaminated with silt or chemicals would not be discharged directly or indirectly to a watercourse without prior treatment; and
- water for temporary site welfare facilities would either be brought to Site, or a local surface water or groundwater abstraction would be identified. Any water abstraction would be made in accordance with General Binding Rules or an authorisation would be obtained from SEPA in accordance with the EASR;
- foul water would either be collected in a tank and collected for offsite disposal at an appropriately licensed facility or discharge will be to a septic tank or soakaway in accordance with the EASR; and
- a wet weather protocol would be developed which would detail the procedures to be adopted by all staff during periods of heavy rainfall.

Environmental or Ecological Clerk of Works (EnvCoW or ECoW)

- 8.8.7 To ensure all reasonable precautions are taken to avoid negative effects on the water environment, a suitably qualified Environmental Clerk of Works (EnvCoW) or Ecological Clerk of Works (ECoW) will be appointed prior to the commencement of construction to advise the Applicant and the Principal Contractor on all hydrological matters.
- 8.8.8 The EnvCoW/ECoW will be required to be present onsite during the construction phase and will carry out monitoring of works and briefings with regards to any hydrological sensitivities at the Site to the relevant staff of the Principal Contractor and subcontractors.
- 8.8.9 With respect to the water environment, the EnvCoW/ECoW will also have responsibility for advising on the maintenance of surface water flow paths and ensuring the quality of surface water and shallow groundwater is maintained.

Pollution Risk

- 8.8.10 Good practice measures in relation to pollution prevention would include the following:
- refuelling would take place at least 50 m from watercourses;
 - foul water generated on-site would be managed in accordance with GPP4;



- areas would be designated for production of concrete or washout of vehicles which are a minimum distance of 50 m from a watercourse;
- washout water would also be stored in a washout area before being treated and disposed of, or re-used in concrete production;
- if any water is contaminated with silt or chemicals, runoff would not enter a watercourse directly or indirectly prior to treatment;
- water would be prevented as far as possible, from entering excavations such as trenches and foundations;
- procedures would be adhered to for storage of fuels and other potentially contaminative materials in line with the EASR, to minimise the potential for accidental spillage; and
- a plan for dealing with spillage incidents would be designed prior to construction, and this would be adhered to should any incident occur, reducing the effect as far as practicable. This would be included in the final CEMP for the Proposed Development.

8.8.11 Site investigation (e.g., trial pitting and/or boreholes) will be undertaken at the detailed design stage, prior to any construction works, where excavation will be required to construct the Proposed Development. The site investigation will inform detailed design and construction methods of the Proposed Development to ensure pollution risk is further considered and minimised prior to construction. A commitment has been made to ensure that no site investigation works will be undertaken within the 100m buffer to any PWS sources, in accordance with SEPA guidance.

Erosion and Sedimentation

8.8.12 Good practice measures for the management of erosion and sedimentation would include the following:

- all stockpiled materials would be located out with a 50 m buffer from watercourses;
- water would be prevented as far as possible, from entering excavations such as trenches and foundations through the use of appropriate cut-off drainage;
- where the above is not possible, water would pass through silt/sediment traps to remove silt prior to discharge into the surrounding drainage system;
- clean and dirty water on-site would be separated, and dirty water would be filtered before entering the water environment;
- silt fences would be deployed as required to reduce sediment transport;
- the amount of ground exposed, and time period during which it is exposed, would be kept to a minimum;
- silt/sediment traps, single size aggregate, geotextiles or straw bales would be used to filter any coarse material and prevent increased levels of sediment. Further to this, activities involving the movement or use of fine sediment would avoid periods of heavy rainfall where possible; and
- the EnvCoW/ECoW and the Principal Contractor would carry out regular visual inspections of watercourses to check for suspended solids in watercourses downstream of work areas.



Flood Risk

- 8.8.13 It is typically assumed that solar panels would intercept precipitation and shed this onto the ground along the lower edge of each array (the 'dripline'). Runoff from each solar panel would continue to infiltrate into the underlying soils locally, in much the same way as existing conditions. It is therefore considered that solar panels will generally not impact floodplain storage or increase peak runoff rates and volumes. Underlying meadow grassland will function as dripline planting and will be useful in managing surface water runoff from the solar arrays, preventing channelisation, and mimicking the natural rainfall-runoff regime.
- 8.8.14 As detailed in **Technical Appendix: FRA and DIA**, it is proposed to adopt SuDS to manage surface water runoff from the proposed construction compound. The DIA outlines a concept drainage design to show how surface water runoff from compound can be managed in accordance with current best practice. The concept design presented in the Technical Appendix will be developed further as part of the detailed design stage of the project and would be agreed with PKC and SEPA prior to construction. It is anticipated that this will be secured by a planning condition.

Concrete Pouring

- 8.8.15 In relation to works involving concrete batching, transport and pouring, the following mitigation would be adopted:
- where concrete transfers are required, measures would be adopted at the point of concrete transfer to prevent accidental spillage of liquid concrete and no transfers would be undertaken in proximity to watercourses or areas of standing water; and
 - washout water would also be stored in a washout area before being treated and disposed of or re-used in concrete production.
- 8.8.16 As part of the proposed investigation works, the ground conditions will be assessed to inform the concrete design which will be used to facilitate the Proposed Development in accordance with best practice. The design of the concrete will ensure that the concrete specification used is appropriate for the environment to minimise degradation and leaching into the surrounding soil and water environment. If necessary, the excavations would incorporate an adequate barrier to prevent the movement of any onsite pollutants to the underlying soils, groundwater and surface water environment. These methods will be specified in the CEMP and agreed with PKC and SEPA prior to construction.

Water Quality Monitoring

- 8.8.17 Water quality monitoring before, during construction and post construction will be undertaken at the watercourses which drain the Site, including watercourses that drain to the River Tay SAC and River Earn DWPA, to allow a rapid response to any pollution incident as well as assess the impact of good practice or remedial measures. Monitoring frequency would increase during the construction phase if remedial measures to improve water quality were implemented. The performance of the good practice measures would be kept under constant



review by the water monitoring schedule, based on a comparison of data taken during construction with a baseline data set, sampled prior to the construction period.

- 8.8.18 The monitoring programme would be secured by a pre-development planning condition to be agreed with PKC.

Watercourse Crossings

- 8.8.19 Review of 1:10,000 scale OS mapping confirms that two new permanent watercourse crossings are required to establish the Proposed Development, as detailed in **Technical Appendix: Schedule of Watercourse Crossings**.
- 8.8.20 The new crossings will be designed to pass the 1 in 200-year flood event, including an allowance for climate change, and their design and construction details will be agreed with SEPA as part of the final CEMP and will be constructed in accordance with EASR.

8.9 Assessment of Potential Effects

Construction Effects

Pollution Risk

- 8.9.1 During the construction phase, without safeguards, there is potential for a pollution event to affect surface water catchments and groundwater bodies, impacting their quality. This would have an adverse impact on these receptors, potentially leading to adverse effects on any aquatic life and River Earn DWPA.
- 8.9.2 Pollution may occur from excavated and stockpiled materials during site preparation. Contamination of surface water runoff from oils or leaks from machinery, spills of chemicals and the construction of access tracks and the construction compound hardstanding also have the potential to affect surface and groundwater bodies.
- 8.9.3 The baseline assessment has shown that the watercourses within the study area and groundwater beneath the Proposed Development are considered high sensitivity receptors. The River Earn DWPA is also considered to be a high sensitivity receptor.
- 8.9.4 The risk of a pollution incident occurring will be managed using industry standard good practice measures. Many of these practices are concerned with undertaking construction activities away from watercourses and identifying safe areas for stockpiling or storage of materials that could otherwise lead to the pollution. The good practice measures described in this chapter, which will also be set out in the final CEMP, will minimise the risk of a pollution event occurring. These measures will also include an emergency response plan which will be triggered in the case of an accident occurring to minimise pollution risk. No additional mitigation is expected to be required, over and above good practice measures.
- 8.9.5 The magnitude of impact associated with a pollution event on all identified receptors is therefore considered negligible and thus the significance of effect is negligible and therefore **Not Significant**.

Erosion and Sedimentation

- 8.9.6 Site traffic during the construction phase has the potential to cause erosion and increase sediment loads in receiving watercourses. This has the potential to adversely impact water quality, increase turbidity levels, reduce light and oxygen levels and impair aquatic ecology



including fish populations. Construction of access tracks, the construction compound and watercourse crossings are the key sources of erosion and sedimentation generation.

- 8.9.7 Adherence to good practice measures will minimise the risk that any material generated is not transported into nearby watercourses or to groundwater. Location specific good practice measures will form part of the final CEMP, particularly in areas where development is proposed within the 50 m watercourse buffer, and will be used to minimise the potential for erosion and sedimentation. No additional mitigation is expected to be required, over and above the good practice measures.
- 8.9.8 After consideration of good practice measures, the magnitude of impact associated with erosion and sedimentation is assessed as negligible. Groundwater and surface water and River Earn DWPA are considered high sensitivity receptors. The significance of effect is therefore assessed as negligible and **Not Significant**.

Flood Risk

- 8.9.9 It has been shown (see **Technical Appendix: FRA and DIA**) that the Proposed Development is not considered to be at risk of flooding.
- 8.9.10 It is proposed that any rainwater and groundwater ingress which collects in the excavations during construction would be stored and attenuated prior to controlled discharge to ground or the adjacent water network. Attenuation of runoff generated by any excavations will allow settlement of suspended solids within the runoff prior to discharge in accordance with 'Site control' component of the SuDS 'management train'.
- 8.9.11 The magnitude of the increase in the impermeable area is not sufficient to have a measurable effect on groundwater levels, as the extent of the impermeable area is insignificant compared to the extent of the underlying geology and groundwater. Therefore magnitude of impact is therefore considered negligible.
- 8.9.12 The significance of effect on flood risk receptors downstream of the Proposed Development, which are considered to have a medium sensitivity, is therefore assessed as negligible and **Not Significant**.

Surface Water and Groundwater Level and Flow

- 8.9.13 Excavations associated with construction works can result in local lowering of the water table. Dewatering associated with construction is temporary and will not be required post construction. The proposed solar panels would be secured to the ground with steel piles, minimising the need for significant excavations.
- 8.9.14 The design of the Proposed Development has avoided watercourses (excluding necessary watercourse crossings) and groundwater dependent PWSs. Furthermore, the superficial deposits have little groundwater and therefore limited or little dewatering is likely to be required. No significant deep or expansive earthworks are proposed when compared to the groundwater catchments so there will be no catchment scale impact on groundwater levels and flows.
- 8.9.15 Location-specific good practice measures will form part of the final CEMP and will be used to minimise the potential for drainage and dewatering effects. The EnvCow/ECow will also ensure that existing surface water flow paths are identified and preserved during construction. Measures such as permeable access tracks and regular cross track drains



would be adopted to safeguard existing surface water flow paths and maintain existing water quality.

- 8.9.16 The sensitivity of the receptors (surface water, groundwater and River Earn DWPA) are considered high sensitivity receptors. With these safeguards, the potential impact on ground and surface water flows is assessed as negligible and thus the resultant significance of effect is negligible (**Not Significant**).

Operational Effects

- 8.9.17 During the operational phase of the Proposed Development, it is anticipated that routine maintenance of infrastructure and tracks would be occasionally required, during which there is potential to result in the following impacts without appropriate controls or mitigation. It is noted that potential impacts will be similar to potential construction impacts but likely to be on a much smaller more localised scale.
- 8.9.18 Should any maintenance be required onsite during the operational life of the Proposed Development which would involve construction type activities, mitigation measures similar to those adopted in the final CEMP will be employed to mitigate potential significant effects. This would be adopted through a longer-term operational management plan.

Pollution Risk

- 8.9.19 The risk of contamination from the Proposed Development is considered to be very low, as there would be no requirement for the storage of any potentially hazardous substances and runoff from the Site would typically comprise of clean rainwater runoff from areas of hardstanding. Storage and handling of potential pollutants, if required, will be handled in accordance with good practice and regulated in accordance with the EASR.
- 8.9.20 The solar panels will be cleaned infrequently and when they are cleaned it would be with clean water only. This will be confirmed and stipulated in an adopted via a longer-term operational management plan which will be agreed with PKC via a planning condition, should the development be consented.
- 8.9.21 The magnitude of impact of a pollution event during the operational phase of the Proposed Development is assessed as negligible, as no detectable change will likely occur. Therefore, the significance of effect for a pollution event during the operational phase of the Proposed Development is predicted to be Negligible for all receptors and **Not Significant**.

Erosion and Sedimentation

- 8.9.22 During the operation of the Proposed Development, it is not anticipated that there will be any significant excavation or stockpiling of material beyond the clearing of SuDS features to maintain their efficiency, reducing the potential for erosion and sedimentation effects.
- 8.9.23 Should any non-routine maintenance be required at the sections of track crossing wet areas (defined visually onsite by a contractor or operational personnel) there would be potential for erosion and sedimentation effects to occur due to the existence of disturbed material. Should this type of activity be required, then the good practice measures as detailed for the construction phase will be required on a case-by-case basis. Extensive work at watercourse



crossings or adjacent to the water environment may require approval from SEPA under the EASR (depending upon the nature of the activity).

- 8.9.24 The likelihood, magnitude and duration of a potential erosion and sedimentation event occurring during operational phase would be negligible following adherence to good practice measures. The magnitude of impact is therefore considered negligible and thus the significance of effect on identified receptors (which are all considered as high sensitivity receptors) is negligible and **Not Significant**.

Flood Risk

- 8.9.25 The Proposed Development has the potential to increase surface water runoff due to the addition of increased hardstanding area associated with the proposed construction compound. A surface water drainage strategy has been developed and is included in **Technical Appendix: FRA and DIA**. The drainage strategy outlines how surface water runoff can be managed, utilising SuDS, to manage the quality and rate of surface water discharged from the hardstanding area. The concept design presented in the Technical Appendix will be developed further as part of the detailed design stage of the project, and would be agreed with PKC and SEPA prior to construction.
- 8.9.26 The risk of an adverse effect on flood risk receptors during operation also arises as a result of a potential restriction of flow at a permanent watercourse crossing following intense rainfall. In accordance with good practice, routine inspection and clearing of watercourse crossings at the Proposed Development will be undertaken, reducing the likelihood of a blockage occurring. All new watercourse crossings will be sized to pass the 200-year flood with an allowance for predicted climate change uplifts. The design of the watercourses will also be agreed with SEPA prior to construction and will be cognisant of industry good practice.
- 8.9.27 The magnitude of impact to flood risk receptors during operation is therefore assessed as negligible on a receptor with medium sensitivity. The significance of effect is assessed as negligible and **Not Significant**.

Surface Water and Groundwater Level and Flow

- 8.9.28 Operation of the Proposed Development will require limited or no activity that has the potential to impair surface water or groundwater levels and flows compared to the construction phase. No permanent groundwater dewatering is required during the operation phase of the Proposed Development.
- 8.9.29 The magnitude of a potential impact is limited by the small scale of the Proposed Development compared to the surface water and groundwater catchments in which it is located.
- 8.9.30 The magnitude of impact is therefore assessed as negligible, and thus the significance of effect is assessed as negligible and **Not Significant**.

Decommissioning Effects

- 8.9.31 Potential decommissioning effects are expected to be similar to potential construction effects. Decommissioning the Proposed Development will be carried out in accordance with an approved decommissioning plan which will be expected to include the same safeguards as those provided during the construction stage of the project. Methods for



decommissioning and mitigation measures to be employed at decommissioning stage will follow best practice measures and guidance at that time.

- 8.9.32 The magnitude of impact for decommissioning the Proposed Development is therefore considered negligible and the significance of effect on identified receptors is negligible and **Not Significant**.

8.10 Mitigation

- 8.10.1 As all the predicted effects are assessed to be negligible and therefore not significant in the context of the EIA Regulations, no additional mitigation during construction, operation or decommissioning is required other than the embedded mitigation and good practice measures that the Applicant will implement as standard (see **Section 8.8**). The good practice measures will be adopted through the final CEMP and a longer-term operational management plan.
- 8.10.2 It has been recognised in this assessment that a programme of water monitoring would be required prior to any construction activity, during construction and immediately post construction of the Proposed Development. The monitoring programme would be agreed with statutory consultees and is expected to include monitoring of the watercourses which drain from the Site, including watercourses that drain to the River Tay SAC and River Earn DWPA, to ensure that there are no impacts to the SAC, DWPA and local water environment.
- 8.10.3 The concept drainage design presented in **Technical Appendix: FRA and DIA** will be developed further as part of the detailed design stage of the project and would be agreed with PKC and SEPA prior to construction.

8.11 Assessment of Residual Effects

- 8.11.1 Subject to adoption of best practice construction techniques, no significant residual effects are predicted during the construction, operation and decommissioning of the Proposed Development.

8.12 Assessment of Cumulative Effects

- 8.12.1 The assessment also considers potential cumulative effects associated with other developments within 5 km of the Site and in the same surface water catchments as the Proposed Development. A cumulative effect is considered to be the effect on a hydrological, hydrogeological or geological receptor arising from the Site in combination with other developments which are likely to affect soils or geology, surface water and groundwater.
- 8.12.2 The following development is located within 5 km and in the same surface water catchments as the Proposed Development:
- Kinnon Park Farm Solar Array (application), which is located within the East Pow surface water catchment.
- 8.12.3 This development, should it be consented, would be constructed and maintained in accordance with good practice, industry standards and relevant legislation, planning policy and guidance regulated by statutory consultees. These standards, with respect to geology,



hydrology and hydrogeology, require that potential impacts are mitigated and controlled at source.

- 8.12.4 The magnitude of cumulative impact is therefore considered negligible and the potential effect on identified receptors is negligible and **Not Significant**.

8.13 Summary

- 8.13.1 An assessment of the potential effects of the Proposed Development on hydrology, geology and hydrogeology within a defined study area (comprising land within 500 m of the application boundary) has been undertaken. The assessment has considered the construction, operation and decommissioning phases of the Proposed Development.
- 8.13.2 The site design has been informed by a hydrological site walkover that has been used to verify the findings of a comprehensive desk study and identify key receptors.
- 8.13.3 Embedded mitigation and good practice measures have been identified that afford protection to the water environment. In addition, a site-specific CEMP has been committed.
- 8.13.4 It has been shown, as a consequence of the Site design and with the adoption of industry standard good practice, delivered through a skilled team of competent workers, with mitigation and compliance monitored in collaboration with SEPA, PKC and other engaged stakeholders, the significance of effects on all identified receptors is considered to be negligible and are not defined as significant in the context of the EIA Regulations.
- 8.13.5 A summary of the assessed receptors and identified mitigation measures required to reduce the potential effects to acceptable levels is identified in **Table 8.8**.



Table 8.8: Summary Table

Description of Effect	Mitigation Measures	Residual Effect (with mitigation)
Construction		
Generation of pollution impairing surface water and groundwater receptors, including River Earn DWPA.	<ul style="list-style-type: none"> • Mitigation by design, including 10 m watercourse buffer and adherence to good practice measures. • Final CEMP to be submitted for the written approval of PKC. • Confirmatory water quality monitoring, the scope and frequency of which will be agreed with PKC prior to construction commencing. 	Not significant.
Increased erosion and sedimentation impairing surface water and groundwater receptors including River Earn DWPA.	<ul style="list-style-type: none"> • Mitigation by design, including 10 m watercourse buffer and adherence to good practice measures. • Final CEMP to be submitted for the written approval of PKC. • Confirmatory water quality monitoring, the scope and frequency of which will be agreed with PKC prior to construction commencing. 	Not significant.
Increased flood risk to downstream receptors during construction.	<ul style="list-style-type: none"> • Mitigation by design, including avoiding deep (>0.3m deep) areas of surface water flooding and adherence to good practice measures. • Commitment to deploy SuDS during construction which will form part of the final CEMP. • Commitment to ensure all watercourse crossings are designed in accordance with good practice and construction detailed will be agreed with SEPA prior to construction. 	Not significant.
Potential impacts on surface water and groundwater levels and flow which may impact water contribution to River Earn DWPA.	<ul style="list-style-type: none"> • Adherence to good practice measures. • Final CEMP to be submitted for the written approval of PKC. • Confirmatory water quality monitoring, the scope and frequency of which will be agreed with PKC prior to construction commencing. 	Not significant.
Operation		
Generation of pollution impairing surface water and groundwater receptors, including River Earn DWPA.	<ul style="list-style-type: none"> • Adherence to good practice measures adopted through a longer-term operational management plan, including appropriate storage and handling of potential 	Not significant.



Description of Effect	Mitigation Measures	Residual Effect (with mitigation)
	pollutants, if required, in accordance with EASR and an operational management plan which will be agreed with PKC prior to construction commencing.	
Increased erosion and sedimentation impairing surface water and groundwater receptors including River Earn DWPA.	<ul style="list-style-type: none"> Adherence to good practice measures adopted through a longer-term operational management plan. 	Not significant.
Increased flood risk to downstream receptors during construction.	<ul style="list-style-type: none"> Adherence to good practice measures adopted through a longer-term operational management plan, including development of the concept drainage design (see Technical Appendix: FRA and DIA), which will be agreed with PKC prior to construction. Commitment to complete regular inspection of SuDS and watercourse crossings to ensure systems remain as designed. 	Not significant.
Potential impacts on surface water and groundwater levels and flow which may impact water contribution to River Earn DWPA.	<ul style="list-style-type: none"> Adherence to good practice measures adopted through a longer-term operational management plan. 	Not significant.
Decommissioning		
Similar to potential construction effects.	Methods for decommissioning and mitigation measures to be employed at decommissioning stage will follow good practice measures and guidance at that time, set out within a decommissioning plan.	Not significant.
Cumulative		
No cumulative effects are anticipated as a result of the Proposed Development.		



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