Technical Appendix 10.5: Private Water Supply Risk Assessment

Windburn Wind Farm

Windburn Wind Farm Limited

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Revision Record

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1.0 Introduction

SLR Consulting Ltd (SLR) was commissioned by Windburn Wind Farm Limited to undertake a private water supply (PWS) risk assessment for the proposed Windburn Wind Farm (the proposed development).

This Technical Appendix considers the potential effects of the proposed development on the quality and quantity of water at private water supply (PWS) sources within the study area which comprises a buffer of 500m from the application boundary. To complete the assessment a conceptual site model is presented which uses a source-pathway-receptor linkage to assess the risk to each PWS. Where necessary mitigation, required to safeguard a water source, is proposed.

The location of the PWS sources is shown on **Figure 10.5.1** appended.

This Technical Appendix should be read in conjunction with **Chapter 10** of the EIA Report which contains a detailed description of the local hydrology and hydrogeology, flow mechanisms and hydraulic properties of the soils and geology, the embedded mitigation incorporated in the proposed development design, and an assessment of impacts on groundwater and surface water flows and quality.

As part of this assessment detailed consultation has been undertaken with Highland Spring Limited and their hydrogeological advisors. Details and the locations of their abstraction boreholes have been provided and been used to inform the design of the proposed wind farm. The details are the subject of a Non-Disclosure Agreement (NDA), and are not, therefore, reproduced herein. It is noted that Perth and Kinross Council (PKC) and the Scottish Environment Protection Agency (SEPA) have details of the abstractions and thus are able to complete an appraisal of this assessment.

1.1 Survey Approach

Following consultation with PKC and Clackmannanshire Council (CC) data was received for PWS sources within the study area. This data was then augmented with Ordnance Survey mapping and aerial photography.

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, enquiring about their water use and source, and mapping water abstraction locations. A standard reporting questionnaire was used to ensure consistency of data collected.

The location of water sources (boreholes, springs, surface abstractions) and holding tanks etc. were recorded using a handheld GPS, and where not subject to a NDA in the case of Highland Spring Limited. When residents were unavailable on the day that the survey was conducted, questionnaires were left at properties requesting details of their water source or PWS.

Details of Highland Spring Limited abstraction infrastructure was also obtained from Highland Spring Limited and a number of meetings held with the company and their hydrogeological advisors to gather details and characteristics of these abstractions. Tullibardine Distillery was also consulted about the water abstractions used in the distillery processes, which was confirmed as part of the field investigation.

The field investigation was completed in November 2023 by the author of this report and the assessment has been reviewed by Gordon Robb. (BSc, MSc, MBA, C.WEM, FCIWEM). He is a Technical Director (Hydrology and Hydrogeology) and has more than 30 years' experience assessing renewable energy and electrical infrastructure projects and specifically their potential effects on soils, geology and the water environment. He is based in Scotland and has worked throughout Scotland, including on sites in similar settings to the proposed

development. He has also prepared and given expert witness testimony for renewable and electrical infrastructure projects.

1.2 Assessment Methodology and Report Structure

As required by SEPA's guidance the assessment has been undertaken by suitably qualified and experienced specialists.

The assessment has been undertaken with reference to SEPA guidance[1] which sets outs their expectations for the assessment of impact of developments on groundwater abstractions, both public and private water supplies. This guidance applies to proposed infrastructure, both temporary and permanent and provided any temporary or permanent dewatering abstractions are unlikely to exceed 10 m^3/day.

SEPA recommends adopting a phased approach to the assessment of risks to groundwater abstractions, with greater detail being required for higher risk sites or activities, and identify the steps given in **Table 1-1**.

Table 1-1: SEPA Methodology - Assessment Steps

Step	Description
1	Identifying any Existing Groundwater Abstractions This covers both public and private water supply groundwater abstractions, both within and out with the site boundary. It is critical that it is the actual source of the abstraction, and not the property that it supplies, that is identified. The relevant buffer zones for groundwater abstractions for all proposed infrastructure, both temporary and permanent and provided expected dewatering rates do not exceed 10m3/day, are: a) 10m for all activities b) 100m radius of all subsurface activities less than 1m in depth; c) 250m of all subsurface activities deeper than 1m Details of each private water supply source will require confirmation, including a site walkover survey. If there are no groundwater abstractions within the buffer zones, SEPA will not provide comment on this topic in our planning response. **If there are no groundwater abstractions within the buffer zones there is no need to assess further and progress to Step 2.**
2	Qualitative Impact Assessment A conceptual site model (CSM) should be provided as part of the Environmental Statement. This should include interpretation of the hydrogeological setting, including the groundwater flow regime. This may be supported, as appropriate, by intrusive ground investigation, groundwater monitoring, or groundwater modelling. Qualitative assessment of the potential impacts to any groundwater abstractions identified within the relevant buffer zones is required. This should consider the expected extent, magnitude, likelihood, and duration, frequency, and reversibility of any potential impacts. The impact assessment should consider the impacts to each groundwater abstraction individually, including any potential cumulative effects if the groundwater abstraction is near multiple parts of the proposed development.

[1] SEPA (August 2024) Guidance on Assessing the Impacts of Development on Groundwater Abstractions

Step	Description
	If the potential impacts to groundwater abstractions are considered low or less then no further risk assessment (e.g. Step 3) is required.
3	Detailed Quantitative Risk Assessment This would include characterisation of the ground conditions at both the relevant infrastructure location(s) and the groundwater abstraction(s), plus the pathway(s) in between if appropriate. This will require ground investigation, including groundwater level and quality monitoring and quantify the potential change(s) in groundwater levels or flow regime.

Using this approach and developing this to include surface water abstractions and to consider the distribution pipework from ground and surface water abstractions the criteria given in **Table 1-2** have been used to assess potential risk to each PWS source.

Table 1-2: Private Water Supply Risk Assessment Criteria

PWS Risk	Criteria
PWS source considered potentially at risk from the proposed development	• PWS source is located within 10m of any element of the proposed development; • spring fed or groundwater source is located within 100m of excavations less than 1m deep (such as access tracks); • spring fed or groundwater source is located within 250m of excavations greater than 1m deep (such as borrow pits, turbine crane pads and other hardstanding areas); and / or • stream or surface water fed abstraction is located within the same surface water catchment and downstream of the proposed development.
PWS source is not considered at risk from the proposed development, but distribution pipework may be impacted	• PWS source is located at least 10m away from any element of the proposed development; • spring fed or groundwater source is not located within 100m of excavations less than 1m deep (such as access tracks); • spring fed or groundwater source is not located within 250m of excavations greater than 1m deep (such as borrow pits, turbine crane pads and other hardstanding areas); • stream abstraction is not located within the same surface water catchment and / or upstream of the proposed development; • the distribution pipework between the PWS source and property may be crossed by the proposed development.
PWS source or pipework not considered to be at risk from the proposed development	• PWS source is located at least 10m away from any element of the proposed development; • spring fed or groundwater source is not located within 100m of excavations less than 1m deep (such as access tracks); • spring fed or groundwater source is not located within 250m of excavations greater than 1m deep (such as borrow pits, turbine crane pads and other hardstanding areas); • stream abstraction is not located within the same surface water catchment and / or upstream of the proposed development; • the distribution pipework between the PWS source and property will not be crossed by the proposed development.

The results of the PWS survey and assessment are presented in Section 2 of this report in accordance with Step 1 of the SEPA guidance. If any PWS are considered to be at risk from the proposed development, a qualitive risk assessment has been completed and is presented within Section 3 of this report (Step 2 of the SEPA guidance).

Section 4 of this report gives detail of a potential water monitoring schedule and parameter list that could be used to monitor water quality at receptors that have a hydraulic linkage (e.g. flow pathway) to the proposed development. The monitoring frequency, parameter list and reporting programme would be subject to agreement with PKC and SEPA should consent be granted, and it is anticipated would be secured by an appropriately worded pre-commencement planning condition.

Further consultation during the detailed design stage would also be undertaken with Highland Spring Limited and Tullibardine Distillery to discuss the scope of proposed water monitoring in the Danny Burn and Burn of Ogilvie water catchments.

2.0 Private Water Supply Risk Assessment (Step 1)

Table 2-1 presents information collected from the PWS field survey, returned questionnaires, data collected during the desk study and following consultation with PKC and CC. If a source is assessed to be within the buffers specified in SEPA's guidance and have a hydraulic connection (e.g. there is a flow pathway) to the proposed development, a further qualitative risk assessment and necessary mitigation are given in Section 3.

It is noted that all the private water supplies within the study area are within the PKC administrative area.

The findings from **Table 2-1** are summarised as follows:

- three PWS source has been identified as potentially at risk from the proposed development (and is assessed further in Section 3);
- three PWS sources are not at risk from the proposed development; and
- one property is confirmed to be supplied by mains but the distribution pipework may be at risk.

Table 2-1: Private Water Supply Risk Assessment

PWS ID (Figure 10.5.1)	Property Name	Data Source and Source Type	Location of PWS Source and Distance from the proposed development	Details	PWS Risk Assessment (see Table 2)
PWS01	Highland Spring	Survey Business with PWS Boreholes	E 290175 / N 708974 (business location) Approximately 2km north east of the proposed access point off the A9.	Consultation with Highland Spring has confirmed that the business is supplied by groundwater sources that are located in the Danny Burn and Burn of Ogilvie surface water catchments, downstream of the proposed development. No development is proposed within 250m of the groundwater sources. The development will not cross any distribution pipework from the PWS source to the properties. Therefore, PWS source and distribution pipework is not considered to be at risk from the proposed development.	PWS source and pipework not considered to be at risk. Adopted mitigation and proposed monitoring plans are discussed in Section 3 and 4 respectively.
PWS02	Tullibardine Distillery	Survey Business with PWS	E 290175 / N 708974 (business location)	Consultation with Tullibardine Distillery confirms that the distillery is sourced by a stream abstraction which abstracts from the Danny Burn.	PWS source potentially at risk.

PWS ID (Figure 10.5.1)	Property Name	Data Source and Source Type	Location of PWS Source and Distance from the proposed development	Details	PWS Risk Assessment (see Table 2)
		Stream	Approximately 1.2km north east of the proposed access point off the A9.	The abstraction point is located downstream of the proposed development and is therefore potentially at risk from the proposed development.	Further assessment and mitigation required – see Section 3.
PWS03	Topfauld	Survey Borehole	E 287682 / N 708312 Approximately 450m west of the proposed access track near the A9.	Residents confirmed that the two properties at this location are supplied by a borehole located between 25m and 50m south east of the properties. No development is proposed within 250m or upgradient of the borehole. The development is also unlikely to cross any distribution pipework from the PWS source to the properties. Therefore, PWS source and distribution pipework 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 required.
PWS04	Drumcairn	Survey Stream	E 288362 / N 706195 Approximately 1.6km south east of the existing access track which is scheduled to be upgraded and 2.7km north of proposed turbine T13.	The property owner has confirmed that the property is served by a stream abstraction from the Danny Burn. The abstraction point is located approximately 1.6km south east of the property. The abstraction point is located downstream of the proposed development and is therefore potentially at risk from the proposed development.	PWS source potentially at risk. Further assessment and mitigation required – see Section 3.
PWS05	East Biggs	Survey Spring	E 286993 / N 705608 Approximately 880m south east of the existing access track which is scheduled to be upgraded.	The property owner has confirmed that the property is served by a spring approximately 1km south of the property. No development is proposed within 250m of the spring. The development is also unlikely to cross any distribution pipework from the PWS source to the property. Therefore, PWS source and	PWS source and pipework not considered to be at risk. No further assessment, monitoring or mitigation required.

PWS ID (Figure 10.5.1)	Property Name	Data Source and Source Type	Location of PWS Source and Distance from the proposed development	Details	PWS Risk Assessment (see Table 2)
				distribution pipework is not considered to be at risk from the proposed development.	
PWS06	Carim Lodge	Survey Stream	E 286190 / N 704477 Approximately 125m east of the proposed access track.	The property owner has confirmed that the property is served by a stream abstraction from an unnamed tributary of the Burn of Ogilvie. The abstraction is located approximately 790m south east of the property. The abstraction point is located downstream of the proposed development and is therefore potentially at risk from the proposed development.	PWS source potentially at risk. Further assessment and mitigation required – see Section 3.
M1	Buttergask	Survey Mains	N/A	Property confirmed to be supplied by mains. The owners confirmed that the distribution pipework will be crossed by the proposed access track near the A9 and therefore the Scottish Water assets in this area could be at risk from the proposed development.	Mains source is not considered at risk, but distribution pipework may be impacted. Further mitigation required – see Section 3.

3.0 Qualitative Impact Assessment (Step 2)

This Section of the report provides assessment of the PWS sources which have been identified as potentially at risk from the proposed development.

As discussed in **Table 2-1**, the following PWS sources and distribution pipework has been identified as potentially at risk from the proposed development:

- 3 stream abstractions from the Danny Burn and Burn of Oglivie catchments; and
- the distribution pipework for one property (Buttergask) which benefits from a mains water supply.

Further assessment of these sources, as required by SEPA's guidance, has therefore been undertaken and is presented in Section 3.2.

3.1 Committed Mitigation

Chapter 10 of the EIA Report details the mitigation measures that would be deployed and used to safeguard the water environment and abstractions. Of relevance to this report and assessment are the following:

- the production of a final Construction and Environmental Management Plan (CEMP) which would be agreed with statutory consultees prior to commencement of any works;
- the deployment of an Ecological or Environmental Clerk of Works (ECoW or EnvCoW) to oversee all works and with the authority to cease works should a risk to the water environment (e.g. change in water flow or quality) become apparent;
- a commitment to undertake preconstruction (baseline), construction and post construction water quality monitoring and reporting (see Section 4); and
- commitment to protect distribution pipework in accordance with good practice.

A stated in **Chapter 10** of the EIA Report, the location of the Scottish Water distribution pipework will be confirmed as part of the detailed design stage of the project. Necessary protection will be implemented to ensure that the integrity of the infrastructure is maintained, particularly with reference to the mains water supply which supplies Buttergask property (M1). A site investigation will be undertaken to review confirm the location of the pipework, review the condition of the pipework and provide any additional mitigation measures that would be required to safeguard the pipework. If required, additional protection to pipework will be placed for the duration of works / traffic movement as required. If damaged, distribution pipework would be repaired to the satisfaction of landowner.

3.2 Assessment of Works in the Danny Burn and Burn of Ogilvie Water Catchments

To enable the delivery of infrastructure for the proposed development it is necessary to widen the existing public highway from the A9 and construct a new bound access track to enable vehicles to climb the steep ground from Carim Lodge to the proposed turbine area to the south.

The widened public highway is located to the north east of the Burn of Ogilvie and the access track to the turbine area would pass through the upper catchments of Burn of Ogilvie and Danny Burn. As discussed in **Table 2-1**, three PWS surface water catchments, including a surface water abstraction for Tullibardine Distillery, are recorded within the Burn of Ogilvie and Danny Burn catchments.

Groundwater abstractions maintained by Highland Spring Limited are also noted downstream of the proposed access track, however is it noted that no development is proposed within 250m of the PWS sources maintained by Highland Spring Limited.

Given known presence of water abstractions in the Danny Burn and Burn of Ogilvie water catchments, the length of unbound and bound track in the headwaters of these catchment has been minimised as part of the project design.

Notwithstanding this, it is recognised that without appropriate controls the construction and use of the proposed track could pose a potential risk to the surface and groundwater resources in these catchments and a further assessment has been undertaken.

An outline concept for the potential drainage scheme to collect, attenuate and treat runoff from the access track as it passes through the upper Danny Burn and Burn of Ogilvie catchments is presented in Section 3.2.1. The drainage scheme has been developed with reference to local topography, knowledge of the hydrological and hydrogeological site setting and in accordance with the principles of The SUDS Manual (CIRIA C753) and Wind Farm Construction Good Practice. These principles apply equally to the required widening works to the existing public highway from the A9 to Carim Lodge.

It is noted that at the detailed design stage of the project, prior to the construction phase of the project (should it be permitted), these concept details would be developed further. As part of the detailed design stage, final construction method statements and a monitoring programme / arrangements would also be prepared.

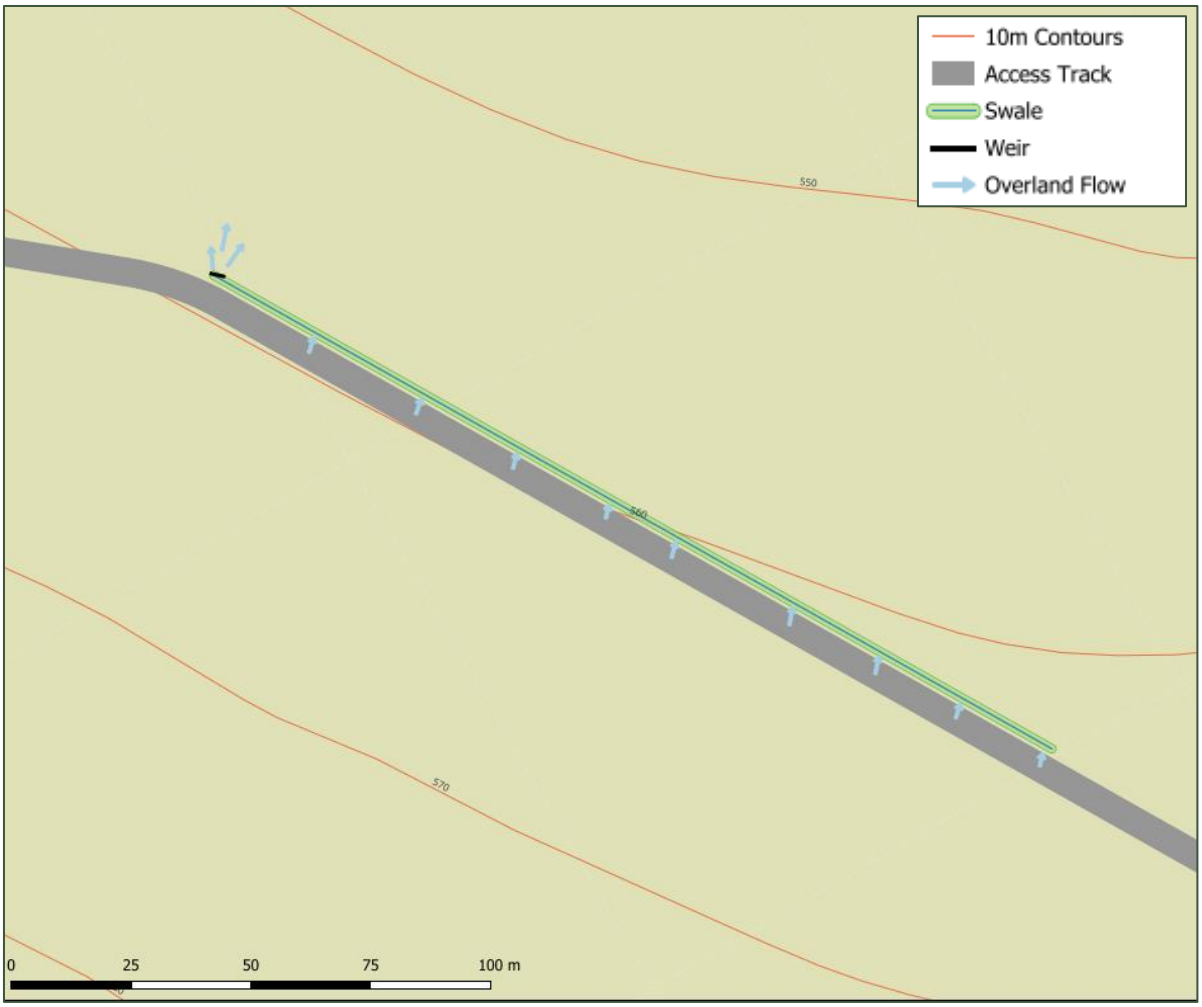
3.2.1 Outline Drainage Concept for the Proposed Access Track

3.2.1.1 Concept Design

For the majority of the access track, it is proposed to drain surface water runoff from the track surface to a swale running adjacent to the track. The swale would slow the rate of runoff and treat it prior to discharge. To promote a dispersed discharge rather than at a single point, it is recommended that the track is drained in sections of no more than 200m longitudinal sections, with an adjacent swale to collect, convey and treat the runoff. At the end of each section of swale, a launder board or similar structure would allow surface water to disperse to ground, as shown in **Plate 1**.

The benefit of using a launder board is it allows discharge to be stopped if needed.

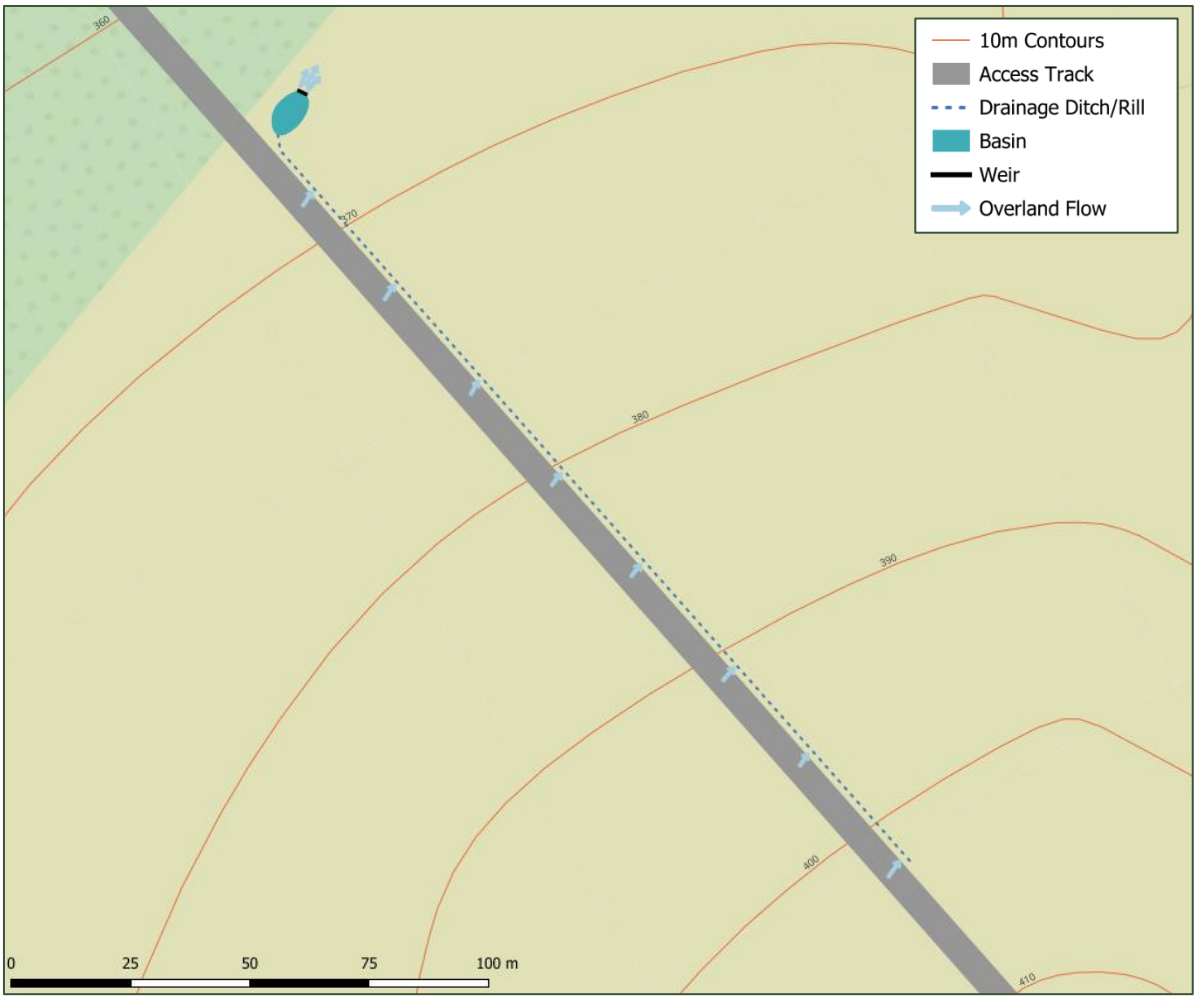
Plate 1: Concept Swale Design for Access Track Sections <1V:3H



Where the track gradient is particularly steep (i.e. greater than 1 in 33 (>1V:3H)), it is proposed to drain surface water runoff from the track surface to an adjacent drain which would convey flows to a small open water basin, as shown on **Plate 2**.

As above, the track would require splitting into sections, with sections of up to 200m of track length draining to a dedicated basin. Also as above, each basin would have a launder board (or similar) overflow to allow surface water to disperse to ground following attenuation and treatment in the basin. For this steeper section of drain it may be necessary to provide erosion protection if the drain is constructed in non-cohesive soils. The nature of the soils and required erosion protection would be confirmed at the detailed design stage of the project but might include specification of a geo-grid or similar.

Plate 2: Concept Basin Design for Access Track Sections >1V:3H



No direct discharge of surface water from the swales or basins would be made to a watercourse.

It is recommended that gravel or cobble check dams be incorporated to avoid high velocity flows and prevent potential scour. An example of gravel check dams within a swale is shown below in **Plate 3**.

Plate 3: Typical Gravel Check Dams within a Swale

3.2.1.2 Concept Sizing of Drainage Features

Both the typical swale and typical basin features have been modelled using the industry standard Causeway Flow drainage design software package to confirm they have sufficient capacity to collect and covey storm water flows. The drainage calculations are presented in **Annex A**.

In both instances, an impermeable area of 0.12ha has been modelled as a contributing area, representing a 200m long by 6m wide section of the access track. The results of the modelling (see **Annex A**) confirm the proposed swales, drains/rills and basins have sufficient capacity to collect and convey storm events up to the 200-year event plus current recommended climate change uplifts.

Designing for the 200-year event ensures that there is redundancy (or capacity) for more frequent storm events and minimises the potential for the drainage system becoming overwhelmed.

The trackside swale would be approximately 500mm in depth and approximately 2 to 2.5m wide (top width). This would ensure that the swale has sufficient capacity to accommodate flows. The weir used to retain surface water in the swale and allow gradual discharge of runoff would be set to a height of 300mm above the base of the swale.

The basins would be approximately 500mm in depth, with a base area of approximately 20m^2 and surface area of approximately 50m^2 when accounting for 1V in 3H side gradients. A launder board with a height of 150mm would ensure that surface water disperses to ground and maintains a minimum freeboard within each basin of 300mm. The trackside drains/rills receiving surface water runoff from the steeper sections of track would convey runoff water to each basin would be a minimum of 200mm deep and 200mm wide and would require cobble check dams or gabions to reduce higher velocity flows and minimise potential scour.

3.2.1.3 Water Treatment and Quality

No element of the proposed surface water management concept would be buried which would allow easy and rapid inspection of the drainage measures. The measures also allow the quality of runoff to be assessed at point locations as there is no dispersed discharge over the length of the proposed track.

In common with best practice, it is recommended that the drainage measures are constructed well in advance of the wider site construction. This would provide an opportunity for soils disturbed during construction to stabilise and vegetate and for the drainage system to be in place and manage incident rainfall during constriction and use of the access track.

The swales and basins would be utilised to remove potential pollutants from surface water runoff before discharge. In order to determine whether the proposed SuDS features would be sufficient in the removal of pollutants from surface water runoff, The SUDS Manual (CIRIA C753) Simple Index Approach has been applied. The Simple Index Approach provides a way of quantifying pollution hazard levels based upon the type of contributing hardstanding surface as well as the levels of mitigation based upon type of SuDS components being used.

Table 3-1 below details the pollution hazard indices associated with the access track, as extracted from the SuDS Manual (CIRIA C753).

Table 3-1: Pollution Hazard Indices for Different Land Use Classifications

Land Use	Pollution Hazard Level	Pollution Hazard Indices		
		Total Suspended Solids (TSS)	Metals	Hydrocarbons
Low Traffic Tracks	Low	0.5	0.4	0.4

Table 3-2 provides the mitigation indices for the relevant SuDS components being proposed, from The SUDS Manual.

Table 3-2: SuDS Mitigation Indices for Discharges to Surface Waters

Type of SuDS Component	Mitigation Indices		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Swale	0.5	0.6	0.6
Detention Basin	0.5	0.5	0.6

Based upon the above, drainage directly to a swale or directly to a detention basin would sufficiently surface water runoff from the access track and in accordance with guidance given in The SuDS Manual. In reality, however, surface water runoff would receive further treatment benefits from the inclusion of check dams and from a release onto the surrounding natural ground, which would effectively act as a filter strip, before draining to either Danny Burn or Burn of Ogilvie.

Further, the use of launder boards allows the discharge from a drainage swale or basin to be stopped should the quality of water have potential to cause pollution. For example, in the unlikely event of an accident on the track, which gave rise to a spill of a hydrocarbons, the height of the launder boards can be increased at the drainage and pollution contained before removal from site.

3.3 Qualitative Risk Assessment of PWS sources

With reference to **Chapter 10** of the EIA and Section 3.2 of this Technical Appendix, it has been confirmed:

- no permanent dewatering is required of groundwater in either the Burn of Ogilvie or Danny Burn water catchments;
- measures have been proposed to maintain existing surface water flow paths and catchment areas which will ensure there is no loss or reduction of water flow in the Burn of Ogilvie and Danny Burn water catchments;
- a commitment has been made to deploy industry good practice measures to mitigate pollution risk, erosion and sedimentation in order to protect ground and surface water resources;
- during the construction phase an ECoW or EnvCoW will be present on site and their duties will be specified in the agreed final CEMP and they will have the authority to stop works should the need arise; and
- the final CEMP will also include a Pollution Incident Response Plan and routine monitoring plan.

Details of these plans, reporting procedures and monitoring locations and suites would be agreed with statutory consultees and other relevant parties as part of the detailed design stage of the project post any grant of planning permission. The location of spill kits will be agreed as part of these plans, and it is expected the agreed monitoring programme will include the provision of continuous water level / quality loggers with pre-prescribed trigger levels and alarms which would provide secondary surveillance of water quality.

While the potential for pollution during the operational phase is much less that the construction phase, the plans, controls and monitoring locations used during construction remain applicable and would be relied upon when maintenance activities are undertaken at site.

Thus, in summary the controls which would be adopted during construction and operation of the proposed development, which are in accordance with best practice and will be agreed in the final CEMP, will safeguard surface water and groundwater which sustains the PWS sources identified as potentially at risk from the proposed development. The likelihood and magnitude of impact on the PWS sources is therefore assessed as negligible, and the resultant significance of effect is assessed as negligible and not significant.

4.0 Example Monitoring and Contingency Plan

Monitoring of the surface water catchments that drain from the site and PWS sources potentially at risk from the proposed development has been recommended to confirm that the embedded mitigation included in the site design and committed to in the EIA Report are effective and that there is no impairment of the water environment and water sources.

Pre-development monitoring data can be used to establish baseline water levels and quality and assessment or trigger values to which routine monitoring data collected during construction can be compared against.

A separate water monitoring and reporting plan would be developed during the detailed project design phase. The monitoring programme would be secured by a pre-development planning condition to be agreed statutory consultees. Further consultation during the detailed design stage would also be undertaken with Highland Spring Limited and Tullibardine Distillery to discuss the scope of proposed water monitoring in the Danny Burn and Burn of Ogilvie water catchments.

It is expected that the water monitoring plan would contain the following:

- in accordance with SEPA guidance monthly baseline monitoring for a period of at east 12 months, fortnightly monitoring at PWS sources and monthly at other locations, and post construction monitoring at a frequency of not less than monthly;
- location of proposed monitoring locations (NGR and plan);
- proposals for baseline, construction and post construction monitoring and reporting;
- commitment to prepare and adhere to a pollution incident response plan;
- a commitment to maintain wholesome water supplies at all private water supply sources.

Table 4-1 shows an example protocol which could be used as a basis to agree a water monitoring protocol with relevant consultees and other interested parties.

The Applicant has already held detailed consultation with Highland Spring Limited regarding the protection of their water sources and is committed to maintaining this consultation to ensure appropriate monitoring of their water catchments and sources is undertaken. If it is determined necessary or appropriate with their hydrogeological advisors, groundwater monitoring will also be undertaken from either existing observations boreholes or new boreholes located between the proposed development and the nearest Highland Spring groundwater abstractions. Flow accretion monitoring may also be undertaken in the Danny Burn and Burn of Ogilvie watercourses. This monitoring will occur for a period of at least 12 months prior to any construction commencing in order to collect a robust baseline monitoring record that accounts for seasonal variation.

Table 4-1: Example Monitoring Protocol*

Location	Frequency	Determinand Suite
• PWS01 (locations to be consulted with Highland Spring) • PWS02 (distillery offtake from the Danny Burn in consultation with Tullibardine Distillery) • PWS04 (Drumcairn)	Continuous – 15 minute logging interval. Deployed for a minimum of 12 months prior to, during construction, and for at least 12 months post construction	Water quality loggers to be installed in headwater of River Devon DWPA, Danny Burn and Burn of Ogilvie immediately downstream of proposed construction areas. Sondes to include telemetry and alarms and following probes: • pH • Electrical conductivity

Location	Frequency	Determinand Suite
• PWS06 (Carim Lodge) • Surface water catchments that drain the site including Burn of Oglivie and Danny Burn upstream of PWS source locations and River Devon upstream of the Upper Glendevon Reservoir.		• Dissolved Oxygen • Redox • Temperature • Water Level
	Monthly for minimum of 12 months prior to, during construction, and for at least 12 months post construction.	Field Sampling • pH • Electrical conductivity • Dissolved Oxygen • Redox • Temperature • Water Level and/or flow Extractive Samples • Chloride • Alkalinity • Sulphate • Sodium • Potassium • Calcium • Magnesium • Ammoniacal Nitrogen • Nitrate • Nitrite • Orthophosphate • Biological Oxygen Demand • Chemical Oxygen Demand • Iron (total and dissolved) • Manganese (total and dissolved) • Total suspended solids • Dissolved organic carbon • Colour • Turbidity

* Monitoring locations, suite and frequency to be agreed with statutory consultees

4.1 Monitoring and Reporting Personnel

The monitoring and reporting would be undertaken by appropriately experienced and trained staff.

4.2 Monitoring Methodology

Water samples would be collected following guidance within SEPA, July 2003, Guidance on Monitoring of Landfill Leachate, Groundwater and Surface Water, v2 (specifically Section 9 thereof).

Prevailing weather conditions, qualitative flow conditions as well as other visual indicators would be recorded in order to aid the sample reporting.

The water samples would be placed directly into appropriate sterile bottles, which would be labelled and dispatched to a UKAS accredited laboratory under chilled conditions and accompanied by the relevant chain of custody documentation.

4.3 Example Intervention Strategy

In the unlikely event that the routine monitoring data recorded potential pollution at a private water supply an investigation would be undertaken and intervention strategy would be implemented. The details of this would be agreed prior to any construction and secured by an appropriately worded pre-commencement planning condition.

4.3.1 Alerting Potentially Affected Properties

Contact details (land and mobile numbers / email addresses) for private water supply users would be maintained by site management at all times.

In the event that monitoring data collected at any private water supply is above the baseline monitoring record and above prescribed regulatory standards then property owners would be advised and repeat water sampling undertaken (if agreed with the property owners). Property owners would be advised within 24 hours of receipt of monitoring results. Repeat water sampling would be undertaken as soon as reasonably practicable and within 72 hours.

Details of any affected property would be reported to PKC within the timeframe as agreed with PKC when the monitoring programme was agreed and finalised.

4.4 Provision of Alternative Water Supplies

The Applicant commits to maintaining the yield and wholesomeness of water supplies.

The following measures may be deployed in the unlikely event a private water supply is impaired by the works:

- at a property, provision of bottled potable water in the event of a short or transient derogation of a water supply (bottled water would be retained on site ready for quick dispatch to any affected property); and
- provision of an alternative water source (e.g. spring, borehole, alternative surface water abstraction location) in the event of a permanent derogation of a water supply.

In the event of an alternative water source being implemented PKC would be advised as soon as is practical.

Figures

Technical Appendix 10.5: Private Water Supply Risk Assessment

Windburn Wind Farm

Windburn Wind Farm Limited
SLR Project No.: 428.V12959.00001

2 June 2025

284000 286000 288000 290000 292000

708000 706000 704000 702000

12959.00001.0260.1 PWSRA

Figure 10.5.1b
Figure 10.5.1c
Figure 10.5.1d
Figure 10.5.1e

TCC1 TCC2 TCC3
BP1 BP2
T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13

LEGEND

- Application Boundary
- Study Area (Application Boundary 500 m Buffer)
- Proposed Turbine Location
- Proposed Crane Pad
- Proposed Substation Compound
- Proposed Temporary Construction Compound (TCC)
- Proposed Borrow Pit
- Proposed Access Track
- Proposed Turning Head
- Existing Road (To Be Upgraded)

Private Water Supply (PWS) Source Type

- Borehole
- Business with PWS
- Mains
- Property with PWS
- Stream
- Spring

0 1 2 Kilometres

WINDBURN WIND FARM LTD

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PWSRA

PRIVATE WATER SUPPLY RISK ASSESSMENT (PWSRA)

FIGURE 10.5.1a

Scale 1:35,000 @ A3

Date MAY 2025

286000

288000

708000

N

Mclaren Cottage

Buttergask

M1

PWS03

PWS03

PWS03

Topfauld

Blueton Farm

Burn

Tarneybackle

Drumcairn

PWS04

Buttergask Burn

Knowehead

East Biggs

PWS05

TCC1

Burn of Ogilvie

PWS04

0 250 500

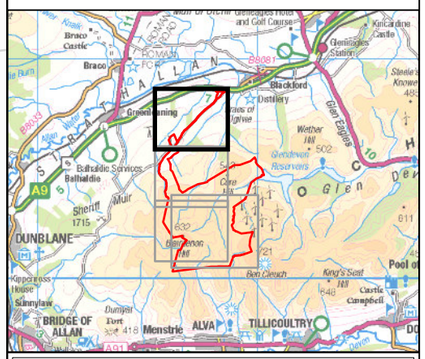
Metres

LEGEND

- Application Boundary
- Study Area (Application Boundary 500 m Buffer)
- Proposed Substation Compound
- Proposed Temporary Construction Compound (TCC)
- Proposed Access Track
- Existing Road (To Be Upgraded)

Private Water Supply (PWS) Source Type

- Borehole
- Mains
- Property with PWS
- Stream



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PRIVATE WATER SUPPLY RISK ASSESSMENT (PWSRA)

FIGURE 10.5.1b

Scale 1:10,000 @ A3

Date MAY 2025

12959.00001.0260.1 PWSRA

286000

288000

706000

704000

12959.00001.0260.1 PWSRA

PWS05

PWS06
Carim Cottage

PWS06

Carim Burn

Danny Burn

Glen Amy

Tambeth

Ogilvie

T13

BP2

0 250 500
Metres

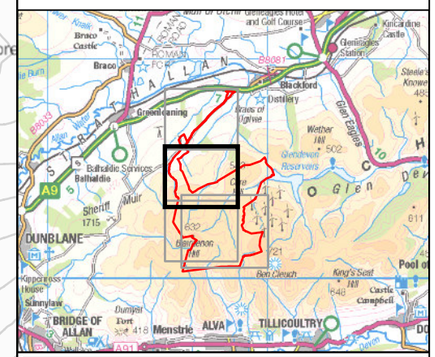
N

LEGEND

- Application Boundary
- Study Area (Application Boundary 500 m Buffer)
- Proposed Turbine Location
- Proposed Crane Pad
- Proposed Borrow Pit
- Proposed Access Track
- Proposed Turning Head
- Existing Road (To Be Upgraded)

Private Water Supply (PWS) Source Type

- Property with PWS
- Stream
- Spring



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PWSRA

PRIVATE WATER SUPPLY RISK ASSESSMENT (PWSRA)

FIGURE 10.5.1c

Scale 1:10,000 @ A3

Date MAY 2025

286000

288000

702000

12959.00001.0260.1 PWSRA

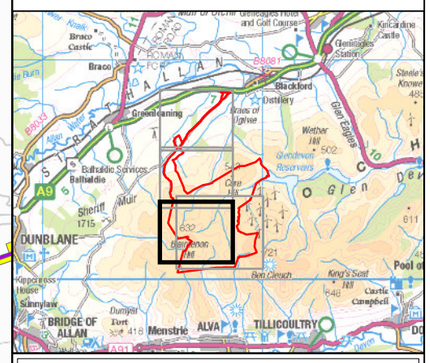
N

T13
BP2
T12
T10
T9
T8
T7
T6
TCC2
TCC3
BP1
T4
T3
T2
T1

Sauchanwood Hill
Mickle Corum
Greenforet Hill
Blairdenon Hill
Kidlaw Hill
Finglen Burn
Alva Moss
Burken Glen

LEGEND

- Application Boundary
- Study Area (Application Boundary 500 m Buffer)
- Proposed Turbine Location
- Proposed Crane Pad
- Proposed Temporary Construction Compound (TCC)
- Proposed Borrow Pit
- Proposed Access Track
- Proposed Turning Head



0 250 500

Metres

WINDBURN WIND FARM LTD

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WINDBURN WIND FARM

PWSRA

PRIVATE WATER SUPPLY RISK ASSESSMENT (PWSRA)

FIGURE 10.5.1d

Scale 1:10,000 @ A3

Date MAY 2025

288000

290000

702000

12959.00001.0260.1 PWSRA

N

LEGEND

- Application Boundary
- Study Area (Application Boundary 500 m Buffer)
- Proposed Turbine Location
- Proposed Crane Pad
- Proposed Temporary Construction Compound (TCC)
- Proposed Borrow Pit
- Proposed Access Track
- Proposed Turning Head

T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13

BP1 BP2

TCC2 TCC3

Sauchanwood Hill

Blairdenon Hill

Greenforet Hill

Menstrie Moss

Alva Moss

Finglen Burn

Medrat Burn

Greenhorn Burn

Ben Buck

0 250 500

Metres

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WINDBURN WIND FARM

PWSRA

PRIVATE WATER SUPPLY RISK ASSESSMENT (PWSRA)

FIGURE 10.5.1e

Scale 1:12,000 @ A3

Date MAY 2025

Annex A: Causeway Flow Drainage Calculations

Technical Appendix 10.5: Private Water Supply Risk Assessment

Windburn Wind Farm

Windburn Wind Farm Limited
SLR Project No.: 428.V12959.00001

2 June 2025

1:3 Swale Link Type

Shape	Trapezoidal	Auto Increment (mm)	100	ks (mm) / n	0.035
Barrels	1	Follow Ground	x		
Side Slope (1:X)	3.0	Velocity	Manning		

Available Diameters (mm)

100 | 300 | 500

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
1		1.00	560.000	-12.414	76.607	0.500
2			555.000	-19.862	84.773	0.500
Depth/Area 1	0.120	1.00	370.000	-35.197	88.699	0.350

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	200.000	0.035	559.500	554.500	5.000	40.0	500	2.75	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.901	1901.4	16.3	0.000	0.000	0.120	0.0	48	0.517

Node 2 Offline Weir Control

Flap Valve	x	Design Depth (m)	0.300	Discharge Coefficient	0.590
Loop to Node		Design Flow (l/s)			
Invert Level (m)	554.700	Width (m)	1.000		

Node Depth/Area 1 Offline Weir Control

Flap Valve	x	Design Depth (m)	0.200	Discharge Coefficient	0.590
Loop to Node		Design Flow (l/s)			
Invert Level (m)	369.650	Width (m)	1.000		

Node Depth/Area 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	369.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	8

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	20.0	0.0	0.500	50.8	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 93.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	559.500	0.000	0.0	0.0000	0.0000	OK
15 minute winter	1.000:50%	10	557.033	0.033	12.0	0.0000	0.0000	OK
360 minute summer	2	200	554.714	0.214	3.6	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	9	369.682	0.032	15.2	1.1854	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	1.000:50%	0.0	0.000	0.000	0.9795	
15 minute summer	1	1.000	2	8.0	0.424	0.004	4.1959	
360 minute summer	2	Weir		3.2				12.0
15 minute summer	Depth/Area 1	Weir		10.7				3.9

Results for 2 year Critical Storm Duration. Lowest mass balance: 93.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	559.500	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1.000:50%	9	557.043	0.043	22.5	0.0000	0.0000	OK
240 minute summer	2	132	554.718	0.218	5.7	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	9	369.693	0.043	22.5	1.5923	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	1.000:50%	0.0	0.000	0.000	1.3482	
15 minute summer	1	1.000	2	12.7	0.482	0.007	6.3478	
240 minute summer	2	Weir		4.6				12.6
15 minute summer	Depth/Area 1	Weir		16.5				5.7

Results for 30 year Critical Storm Duration. Lowest mass balance: 93.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	559.500	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1.000:50%	9	557.078	0.077	58.7	0.0000	0.0000	OK
60 minute summer	2	36	554.745	0.245	25.2	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	9	369.734	0.084	58.7	3.2430	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	1.000:50%	0.0	0.000	0.000	2.8375	
15 minute summer	1	1.000	2	38.1	0.595	0.020	14.1723	
60 minute summer	2	Weir		17.9				17.7
15 minute summer	Depth/Area 1	Weir		45.4				14.9

Results for 30 year +39% CC Critical Storm Duration. Lowest mass balance: 93.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	559.500	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1.000:50%	9	557.094	0.094	81.6	0.0000	0.0000	OK
30 minute winter	2	20	554.765	0.265	40.9	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	9	369.755	0.105	81.6	4.1327	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	1.000:50%	0.0	0.000	0.000	3.6672	
15 minute summer	1	1.000	2	54.7	0.603	0.029	16.9841	
30 minute winter	2	Weir		30.9				22.6
15 minute summer	Depth/Area 1	Weir		63.7				20.7

Results for 100 year Critical Storm Duration. Lowest mass balance: 93.29%

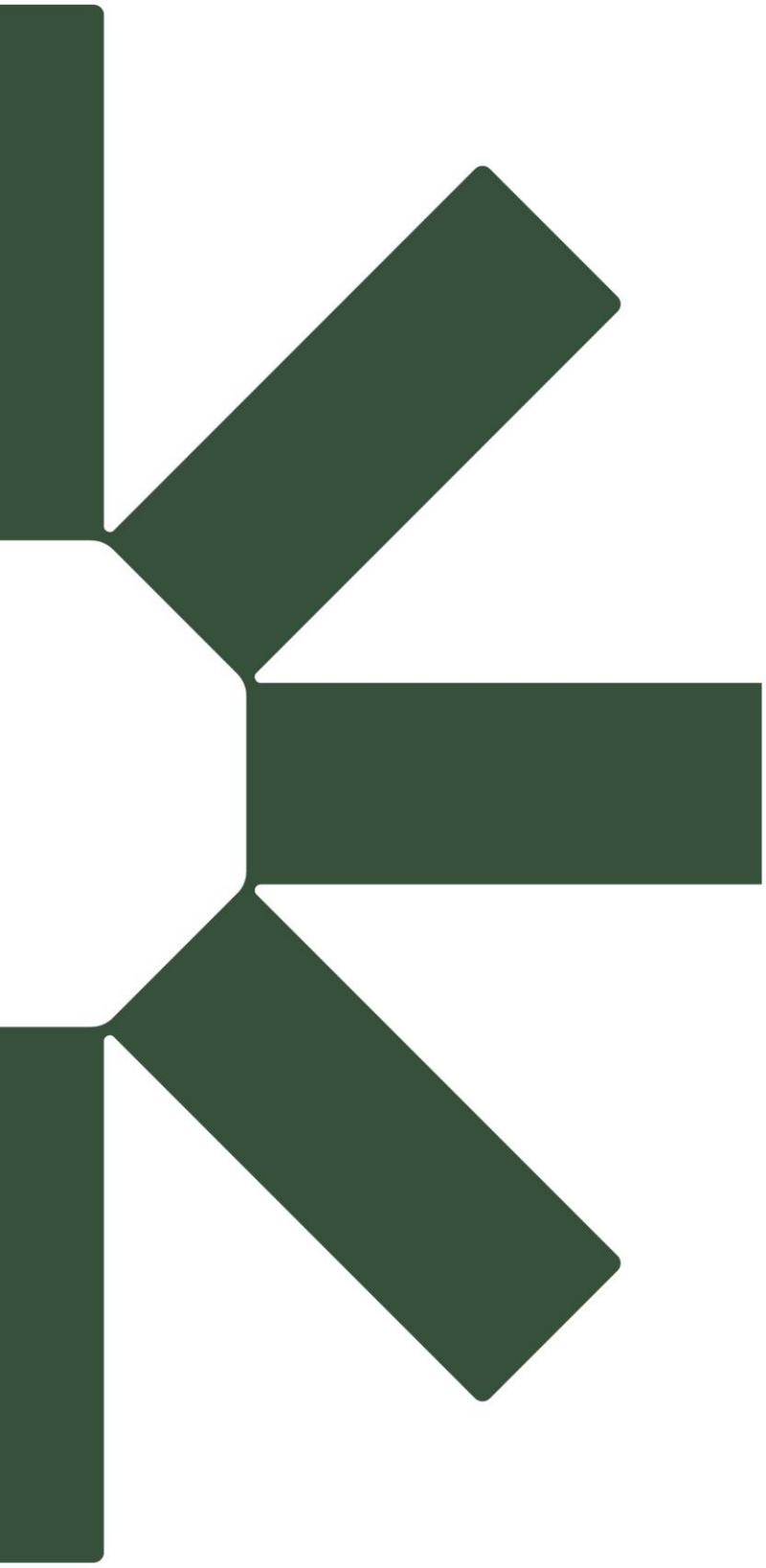
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	559.500	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1.000:50%	9	557.090	0.090	75.3	0.0000	0.0000	OK
30 minute winter	2	21	554.761	0.261	37.8	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	9	369.750	0.100	75.3	3.8975	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	1.000:50%	0.0	0.000	0.000	3.4459	
15 minute summer	1	1.000	2	50.1	0.601	0.026	16.1866	
30 minute winter	2	Weir		27.6				20.2
15 minute summer	Depth/Area 1	Weir		58.7				19.1

Results for 200 year +39% CC Critical Storm Duration. Lowest mass balance: 93.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	559.500	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1.000:50%	9	557.116	0.116	118.8	0.0000	0.0000	OK
30 minute winter	2	19	554.792	0.292	60.7	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	9	369.786	0.136	118.8	5.4601	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	1.000:50%	0.0	0.000	0.000	4.9245	
15 minute summer	1	1.000	2	82.6	0.621	0.043	21.4695	
30 minute winter	2	Weir		51.8				37.6
15 minute summer	Depth/Area 1	Weir		93.4				30.1



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