ACKRON WIND FARM

APPENDIX A12.1

PRIVATE WATER SUPPLY RISK ASSESSMENT

NOVEMBER 2020

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A12.1 INTRODUCTION

This appendix provides a risk assessment of private water supplies (PWS) identified within the hydrologically connected catchments of the Ackron Wind Farm ('the Development').

This Appendix supplements Chapter 12: Hydrology and Hydrogeology of the Ackron Wind Farm Environmental Impact Assessment ('the EIA Report'), and should be read in conjunction with Chapter 12 of the EIA Report, which outlines the assessment of potential effects of the Development on the hydrological environment, including private water supplies.

Chapter 4: Development Description of the EIA Report sets out the proposed new infrastructure as part of the Development. The location of the Development and the PWS Study Area is provided in Figure 12.1 in the EIA Report with outlines of the hydrological catchment provided in Figure 12.2 of the EIA Report.

The avoidance of effects on the water environment is built into the design of the Development by avoiding construction in particularly wet areas and in proximity (50 metre) to watercourses and by routing tracks to avoid the need for watercourse crossings.

A suite of measures to limit the potential for effects from the Development on the watercourse and groundwater has been built in to the Development construction and design, and is outlined in Chapter 12 of the EIA Report and in Appendix A4.1: Construction Environmental Management Plan (CEMP) which includes specific water measures in Appendix A: Water CEMP (WCEMP). The WCEMP has been developed in consultation with the Scottish Environment Protection Agency (SEPA), NatureScot, and the Environmental Health Office of Scottish Councils, and builds on good practice guidance. The mitigation measures outlined in the WCEMP are known to be effective in preventing effects on the quality and quantity of water in watercourses and groundwater, and the source waters and distribution systems (supply) of PWS.

This risk assessment will consider the potential risk to PWS following implementation of good practice construction mitigation measures outlined in the WCEMP.

This assessment also outlines any requirements for a private water supply monitoring programme, and suggested frequency of monitoring. Any implemented monitoring programme would be established in agreement with SEPA and the Local Authority prior to the construction phase of the Development. The monitoring programme will demonstrate the effectiveness of the mitigation and avoidance measures in eliminating effects on PWS and sources.

A12.2 METHODOLOGY

The Arcus methodology for PWS Risk Assessment (PWSRA) has been developed in conjunction with SEPA and reviewed by Scottish Councils. The Arcus methodology for PWSRA follows the approach outlined below:

- Identify PWS with potential to be affected by the Development;
- Identify the source of water feeding the water supply and its catchment;
- Identify infrastructure and activities in hydrological connectivity with water supply source, distribution infrastructure and supply;
- Identify the potential effect on the water supply i.e. whether construction of the Development has the potential to change the quality, quantity and / or continuity of water at the receptor; and

- Determine whether the private water supply is at risk and determine appropriate mitigation to minimise or avoid the risk.

The methodology for identifying and risk assessing PWS consists of the following six stages:

- Identification of PWS through consultation with the Highland Council within 2 km of the Core Study Area;
- Resident or property owner consultation via letter to those properties identified to be supplied by a PWS;
- Desk-based study and hydrological assessment;
- Site-based survey of the PWS, including discussion with resident (where possible and required);
- Risk assessment; and
- Review and approval by statutory consultees.

A12.2.1 Legislation and Guidance

The procedure for identifying and risk assessing PWS is based on the following legislation and guidance:

- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017 ('the Regulations')[1];
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017 - Guidance for Local Authorities (v4.0)[2];
- Water Environment (Controlled Activities) (Scotland) Regulations 2011[3]; and
- Scottish Environment protection Agency (SEPA) Land Use Planning System Guidance Note 31 2017 v3.0 (LUPS-GU31)[4].

The PWSRA will assess the risk for all PWS which are located within the following categories outlined by SEPA LUPS-GU31 guidance:

- Groundwater abstractions within 100 m radius of all excavations less than 1 m in depth; and
- Groundwater abstractions within 250 m of all excavations deeper than 1m.

A12.2.2 Survey Area

A PWS Study Area is defined as 2 km from the Site Boundary, with the aim of identifying all PWS within 2 km of the Development.

A12.2.3 Consultation

Consultation with the Council was originally conducted in April 2019 to obtain details on the location of registered PWS within the PWS Study Area. Further consultation was conducted on 18th September 2019 as part of an updated scoping exercise with the extension to the site boundary. The Development of the Site boundary is discussed further in Chapter 4: Development Description of the EIA Report. No further PWS were identified as part of the updated scoping exercise.

[1] UK Government (2017) The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017. Available at: http://www.legislation.gov.uk/ssi/2017/282/contents/made Accessed on: 02/03/2020
[2] DWQR (2019) The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017: Guidance for Local Authorities Ver 4.0. Available at: https://dwqr.scot/media/42030/the-water-intended-for-human-consumption-private-supplies-scotland-regulations-2017-guidance-v4-feb-2019-as-issued.pdf Accessed on: 17/06/2020
[3] UK Government (2011) The Water Environment (Controlled Activities) (Scotland) Regulations 2011. Available at: http://www.legislation.gov.uk/ssi/2011/209/contents/made Accessed on: 17/06/2020
[4] SEPA (2017) Land Use Planning System (LUPS) SEPA Guidance Note 31 v3.0. Available at: https://www.sepa.org.uk/library/content-search/?q=LUPS-GU31&LibGo=Search&page=1 Accessed on: 17/06/2020

Consultation with residents and landowners of properties with PWS was contacted 29th July 2019. The consultation process involves providing a questionnaire to residents to obtain further information on the PWS supplying their property. The questionnaire and reasoning for each of the questions are outlined in Table 0.1.

Table 0.1: Resident Consultation Questionnaire and Reasoning

Question	Reasoning
Type of supply (with list of options)	Allows for identification of the likely PWS source water and provide an understanding of its potential connectivity to the Development, and developing a source-pathway-receptor model. This allows for an initial level of sensitivity to be applied to the PWS source as part of the final risk assessment.
Use of supply	Aids in developing the source-pathway-receptor model and conceptual site model. Also to attribute sensitivity for the final risk assessment. Also provides information on the likely volumes of water abstracted at the PWS.
Type of water treatment	Understanding of the baseline vulnerability of the source and existing protection measures in place.
Number of people supplied	Provides information on the likely volumes of water abstracted at the PWS. Also helps to attribute sensitivity for the final risk assessment. It is acknowledged that this number can vary, particularly if the PWS supplies a commercial property.
Number of livestock supplied	Provides information on the likely volumes of water abstracted at the PWS. Also to attribute sensitivity for the final risk assessment. It is acknowledged that this number can vary seasonally.
Volume of water abstracted (m^3)	Allows for initial assessment on the catchment or 'zone of influence' of the water supply. This is the likely area the supply is draining water from. This informs an understanding of the PWS potential connectivity to the Development. For example, a large groundwater abstraction further from the Development may be hydrologically connected due to its larger zone of influence. A smaller abstraction, closer to the Development, may not be hydrologically connected because it has a very small zone of influence. It is acknowledged that this is often unknown or estimated by residents.
Any comment of the condition of your water supply	This informs an understanding of the existing level of vulnerability of the PWS and potential need for additional protection measures. For example, PWS that have previously been influenced by quantity reductions during drought periods may be more vulnerable than those who have not experienced this. Any information regarding previous water quality issues or quantity issues can inform an understanding of where the water is likely to be sourced from and the pathway it takes to get to the property.

Consultation letters and questionnaires were sent to five properties and responses received from two. Further details of which are provided in Section A12.3.

A12.2.4Site Visit

A hydrological site walkover was conducted on 23rd October 2019 including a PWS survey, further information is provided in Section A12.3.

A12.2.5 Assessment of Risk

The level of risk is attributed to each of the PWS based on the sensitivity level of the receptor (source water, distribution infrastructure and point of supply), combined with the level of magnitude of impact. The resultant level of risk is based on the risk matrix outlined in Table 0.2.

Table 0.2: Risk Matrix

Magnitude of Effect	Sensitivity of Resource or Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

A12.3 RISK ASSESSMENT

A12.3.1 Identification of PWS

A total of five PWS have been identified within the PWS Study Area, identified through consultation with the Council. The location of the identified PWS are shown in Figure 12.3 of the EIA Report.

The details of the identified PWS and their hydrological connectivity to the Development are outlined Table 0.3 below. This incorporates details provided through consultation with residents of properties and questionnaire responses.

Table 0.3 also outlines the PWS for which a risk assessment is required. PWS which are deemed to be hydrologically disconnected from the Development following desk-based assessment of hydrological and hydrogeological catchment boundaries, or PWS which are located upstream of the Development, are scoped out of the risk assessment.

As a result, the following PWS are risk assessed for impacts from the Development:

- PWS Ackron Farm.

Table 0.3: Identified PWS within PWS Study Area

Property	Type of PWS	Source Water	Location of source and supply	Distance from Development	Catchment	Hydrologically Connected to the Development	Risk Assessment Required
Ackron Farm	Domestic & Livestock	Near- surface water and surface water run-off.	Supply: NC 90002 62547 Source: NC 90464 62898	Within Site Boundary Adjacent to access track upgrades.	Akran Burn	Yes	Yes
Golval	Scottish Water Main	-	-	20 m west of Site Boundary.	-	-	No
Kirkton Farm	Domestic & Livestock	Spring (near-surface water); Stream (surface water)	Supply: NC 88975 62067 Source: Lochan Coulbackie (NC 87301 61389) Spring at approx. NC 88933 62001	910 m west of Site Boundary.	Allt na h-Eaglaise	No – hydrologically disconnected by surface water catchment boundary and Halladale River.	No
Kirkton Cottage	Same supply as Kirkton Farm.						No
Melvich	Unknown	Unknown	Supply: NC 88420 64382	1.8 km north-west of Site Boundary.		No – hydrologically disconnected by the River Halladale.	No

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A12.3.2Assessment

The potential risks to the hydrologically connected PWS as a result of construction and operation of the Development are detailed in Error! Not a valid bookmark self-reference. below. As detailed in Section A12.1, the risk is assessed with consideration of the good practice measures outlined in the WCEMP in Appendix 4.1 further details of the mitigation measures are outlined in Section A12.4 of this assessment.

Further discussion on the sensitivity of each of the PWS receptors to the Development is provided in the following sections.

Ackron Farm PWS

Ackron Farm PWS supplies one property of the same name, located within the Site Boundary. A consultation letter and questionnaire response was not received from Ackron Farm. The property was visited and consultation with residents was undertaken on 23rd October 2019 and a follow up telephone consultation conducted on 21st May 2020.

The Ackron Farm PWS is sourced from near-surface flows and surface water run-off in an area of existing forestry plantation to the north of Ackron Farm and existing farm access tracks at approximately NC 90692 62896. The source water drains and collects in existing trackside drainage ditches and is collected in a shallow underground pipe at approximately NC 90692 62896, and is transferred to the Ackron Farm property in a pipe network, which follows the existing access track.

The shallow pipes are considered to be at risk from construction works associated with the Development, including construction of upgraded access tracks and substation.

The PWS is located within 100 m of excavation of less than 1 m depth.

Works associated with the Development are not considered to impact the source of the supply and are only considered to have potential effects on the water supply distribution infrastructure during the construction period, and beyond.

In the absence of good practice measures or mitigation the potential magnitude effects on a High sensitivity receptor are considered to be Medium, having a residual significance of Moderate.

The PWS infrastructure will be protected during construction works and where this is not possible, alternative potable supply will be provided during construction works. The PWS infrastructure will be reinstated following construction period relating to upgrading of access tracks. Following implementation of mitigation measures detailed in Section A12.4, the overall level of risk attributed to the Ackron Farm PWS is considered Negligible.

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Table 0.4: Risk Assessment

Private Water Supply and Property	Supply Type and Source Water	SEPA LUPS-GU31 Guidance		Sensitivity Level	Potential Impacts from Development	Risk	Mitigation	Residual Risk
		Excavations < 1 m within 100 m	Excavations > 1 m within 250 m					
Ackron Farm	Near- surface water and surface water run-off collect.	Yes	No	High	Chemical pollution from works associated with access track upgrades and vehicle use on access tracks and Turbine 8 construction. Sediment pollution and impediments to flow as a result of works associated with access track upgrades and Turbine 8 construction. Partial of complete loss of supply infrastructure as a result of construction works associated with access track upgrades.	Medium – a temporary or revisable change or loss of private water supply.	Mitigation and good practice measures outlined in Section A12.4 and Appendix A12.1: WCEMP to protect source water. Provision of temporary or permanent alternative supply. If temporary alternative supply provided, the following mitigation would be employed: • disconnection of the current supply during construction phase; • provision of temporary alternative potable supply e.g. bowser; • watching brief employed for pipe intake infrastructure to minimise impact; and • water quality monitoring programme to ensure water quality reinstated to baseline quality.	Negligible

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A12.4 MITIGATION

A12.4.1 Good Practice Measures

The following good practice mitigation measures will be implemented during the construction of the upgraded access track:

- Silt traps to be installed on the down-slope side of tracks to ensure sediment is not transferred towards the settling tank or into the wider hydrological system;
- Infiltration trenches to be placed down-slope of overburden and rock stockpiles and will be designed to treat run-off before discharging back into the drainage network;
- Settlement lagoons to be installed to facilitate the settlement of sediment-laden run-off from turbine foundation excavations by allowing suspended solids to settle out of the water before it is discharged to ground or a watercourse;
- Check dams and silt traps to be installed on the down-slope side of tracks up-gradient of the PWS to ensure sediment is not transferred towards the source;
- Overburden and rock stockpiles and will not be located up-gradient of the PWS;
- Permanent swales and drainage ditches adjacent to access tracks will have outlets at specified intervals to reduce the volume of water collected in a single channel;
- Outfall pipes will drain into a bunded section of the drainage ditch to allow suspended solids to settle. Further measures could include the use of flocculent to further facilitate the settlement of suspended solids, if required. This would only be carried out under following consultation with the local Environmental Health Officer;
- A watching brief should be undertaken during the access track upgrade to mark out and protect pipe work serving the PWS; and
- Private Water Supply Monitoring Programme, as outlined below.

A12.4.2 Private Water Supply Monitoring Programme

A programme of water supply monitoring will ensure that the private water supply is reinstated to baseline water quality and quantity conditions following construction phase. It is considered the private water supply will be taken offline during construction phase and reinstated with the intake pipe upgradient of the substation compound and access track.

The following sampling frequency is proposed:

- Once per month for 12 months prior to the construction phase at the source water, intake pipe and point of supply;
- Once per month during the construction phase at the source water (it is considered the supply will be taken offline during construction phase); and
- Once per month for a period of six months following construction at the source water, new intake pipe, and point of supply.

The following water constituents will be monitored:

- pH;
- Total Petroleum Hydrocarbons (TPH);
- Suspended solids;
- Electrical conductivity;
- Heavy metals; and
- Microbiological parameters (e.coli, total coliforms and enterococci).

If required, the occupants of Ackron Farm will be provided with an emergency contact sheet with the following details:

- A contact name and number of an appropriate person related to the Development; and
- A contact name and number at the environmental health department of the Council.

A12.4.3Additional Mitigation

Watching brief

Where reinstatement of the existing private water supply following construction phase, a 'watching brief' will be conducted during works in proximity to the pipe infrastructure. A 'watching brief' should be used to clearly mark any pipes which serve the property and aim to minimise impact on the pipe infrastructure.

Alternative Potable Supply

12.4.3.1.1 Temporary Alternative Supply

A temporary alternative potable source (in the form of a water bowser) can be provided during the construction of the access track up-gradient of the PWS, if required. As the occupants of the supply are financially involved with the Development, agreement to this measure will be sought prior to the determination of the Development.

12.4.3.1.2 Permanent Alternative Supply

A permanent alternative potable source and supply infrastructure can be provided prior to construction. The source of this supply would not be at risk from the Development and quality standards would be comparable or better to that currently provided by the existing supply. An alternative potable supply may be a groundwater borehole, an alternative surface water/ spring source and pipe infrastructure, or connection to Scottish Water Mains.

A12.5 SUMMARY

The following private water supplies are identified as having the potential to be at risk from chemical pollution and sediment pollution as a result of the Development:

- Ackron Farm PWS

The level of risk to the supply is considered Medium as a result of a temporary change or loss of supply as a result of the construction phase of the Development.

Mitigation measures include provision of an alternative permanent or temporary (construction phase) supply. If a temporary alternative supply is provided, the existing supply would be reinstated following the construction phase with the pipe intake located upgradient of the substation compound.

Following implementation of mitigation measures and provision of an alternative means of supply, the residual risk during the operational phase is considered Negligible. A water quality and quantity monitoring programme should be employed to ensure the water supply is reinstated to baseline conditions.