

**Hill of Fare Wind Farm  
Dunecht Estate PWSRA**



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# CONTROL SHEET

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# 1 INTRODUCTION

## 1.1 Terms of Reference

EnviroCentre Ltd has been commissioned by RES Ltd to carry out a Private Water Supply Risk Assessment (PWSRA) for the Dunecht Estate Private Water Supply (PWS) as part of the Hill of Fare Wind Farm Section 36 application (ECU00004592). This assessment seeks to address SEPAs objection due to lack of information in relation potential impacts of proposed track upgrades on the PWS source:

*The Dunecht Estate collection tanks identified in Appendix 10.3 and shown on Figure 10.7, however, are within 100m of construction activities <1m in depth. The source is stated as "near surface water" in Appendix 10.3, however based on the information provided in the SEPA CAR licence, the collection tanks are supplied by an un-named spring. As these collection tanks are groundwater fed and within the appropriate buffer zone, a bespoke risk assessment is required to ensure they are not impacted by the proposed development. We therefore object due to lack of information on this matter. We will consider removing this objection when a bespoke quantitative and qualitative risk assessment is submitted which demonstrates that the proposals will not have a significant impact on the groundwater flow and groundwater quality feeding the Dunecht Estate collection tanks through the proposed design, construction and operation of the infrastructure.*

## 1.2 Scope of Report

The following scope of works was carried out to assess the potential impacts on the PWS source:

- Review of information within Chapter 10 of the EIAR and the walkover survey (May 2023);
- Development of a conceptual model for the Dunecht Estate PWS;
- Assessment of risk posed by the proposed track upgrade on the PWS; and
- Identification of necessary mitigation measures.

## 1.3 Methodology

The Dunecht Estate PWS is fed by 'near surface water' considered to comprise surface water runoff and groundwater in varying proportions. As described in section 10.1.61 of Chapter 10 of the EIAR the underlying geology indicates that aquifers are generally of low productivity with limited near surface and fracture flow. This is generally associated with complex hydrogeological conditions (e.g. unknown fracture networks, varying weathered zone, flows and zones of contributions) which are extremely difficult to characterise and do not lend themselves to quantification. The risk assessment has therefore adopted a qualitative approach. In order to classify the risks a scale has been adopted based on criteria that incorporate probability of occurrence and magnitude of effect. The scale defines five levels of risk to both water quantity and water quality (together termed 'water supply'), as described below:

- None: No risk predicted, and no effect on water supply is anticipated;
- Very Low: Risks are unlikely, and no measurable change in water supply is predicted;
- Low: Risks are unlikely, with a slight change in water supply predicted over very short timescales and within the bounds of normal water supply variation;
- Medium: Risks are probable, and some impact on water supply is likely; and

- High: Risks are very probable and very likely to cause a significant impact on water supply.

## **1.4 Report Usage**

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## 2 DUNECHT ESTATE PWS

### 2.1 PWS Infrastructure

Dunecht Estate PWS is located within the headwaters of the Landerberry Burn between the slopes of Meikle Tap to the south and an unnamed hill to the north.

The PWS was visited during a site walkover during May 2023 and was noted to consist of a series of 10 collection chambers situated on adjacent slopes to the north and south of the headwaters of the Landerberry Burn.

Information was provided by the Dunecht Estate which detailed the location of the collection chambers, the nature of the supply infrastructure and the properties supplied. The PWS is a licenced abstraction under licence reference CAR/S/1012929. Details of the supply are outlined in Table 2.1. A photographic record is presented within Appendix A.

**Table 2.1: Private Water Supply Infrastructure Details**

Infrastructure	Location and Details
Collection Chambers	<ol style="list-style-type: none"> <li>1. NJ72084 03348</li> <li>2. NJ72196 03332</li> <li>3. NJ72319 03324</li> <li>4. NJ72428 03339</li> <li>5. NJ72692 03473</li> <li>6. NJ72863 03526</li> <li>7. NJ72912 03512</li> <li>8. NJ72187 03146</li> <li>9. NJ72444 03216</li> <li>10. NJ72753 03450</li> </ol>
Storage Tanks	<ul style="list-style-type: none"> <li>• Collection chamber at Fire Dam - located at NJ 75029 09179. Concrete tank with iron lid. 2640 litre capacity.</li> <li>• Cowiehillock storage Tank - Concrete tank with iron lid, capacity of 7000 litres. Located at NJ73442 04160. Fed via an Alkathene pipe from the 5 inch main from treatment plant room.</li> <li>• Hindhill Reservoir - Granite built with tar pitching to internal faces. Located at NJ74536 07479. Fed via a 5" iron pipe from Hillbrae treatment plant room.</li> <li>• Hillbrae treatment plant room - located at NJ73534 04093. PH correction treatment applied.</li> </ul>

Infrastructure	Location and Details
Properties supplied.	<ul style="list-style-type: none"> <li>• Hillbrae Cottage</li> <li>• North Mains Farmhouse</li> <li>• South Lodge</li> <li>• Tillymannoch Farmhouse</li> <li>• Easter Echt Lodge</li> <li>• Denwell Cottage</li> <li>• Kennels Cottage</li> <li>• The Kennels Game Larder</li> <li>• Kennels Bothy</li> <li>• Dunecht House</li> <li>• Garage Flats No 1</li> <li>• Garage Flats No 2</li> <li>• Garage Flats No 3</li> <li>• Dunecht Golf Club room and toilets</li> <li>• Springhill Nurseries</li> <li>• Pony Club House – No treatment.</li> <li>• South Finnercy</li> <li>• Dairy shed, Dunecht (Village Joinery)</li> </ul>

Source: Dunecht Estate

## 2.2 PWS Catchment

The PWS Catchment is shown in Figure 2-1 below. The catchment is shown to comprise open moorland and forestry with existing estate tracks shown at the southern edge of forestry and the west of the catchment. Key catchment characteristics are presented in Table 2.2.

**Table 2.2 Key Catchment Characteristics**

Catchment Characteristics		Key Flow Estimates	
Catchment Area (km <sup>2</sup> )	1.24	Annual Natural Mean Flow (l/s)	21.1
Standard Annual Average Rainfall 1961 -1990 (mm)	865	Low Flow - Q <sub>95</sub> (l/s)	3.18
Base Flow Index – BFI (-)	0.347	Low Flow - Q <sub>95</sub> (l/d)	274,752
Mean Altitude (m)	283		
Forest Cover (%)	12.7		

Source: FEH web service and LowFlows2



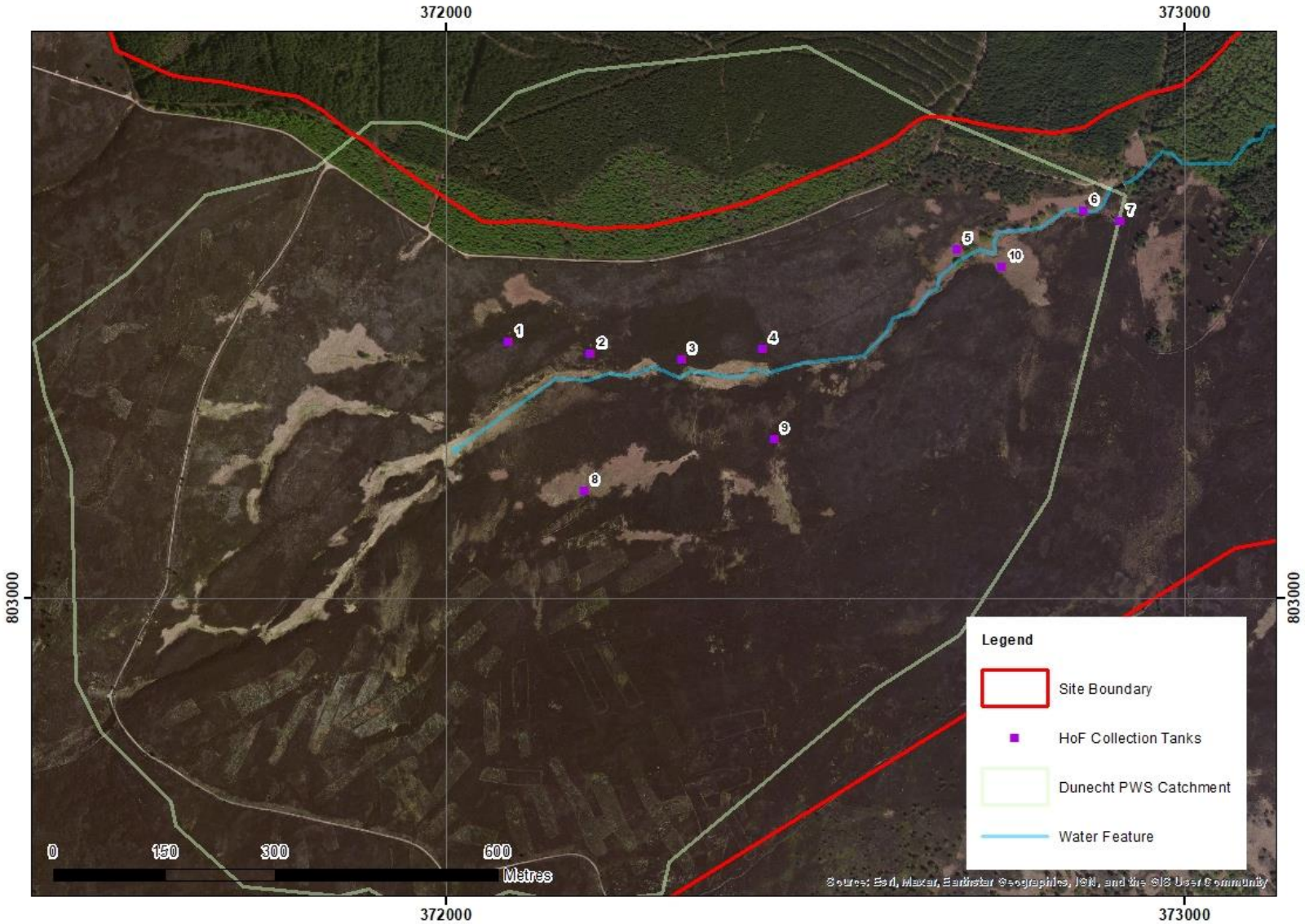


Figure 2-1: PWS Catchment



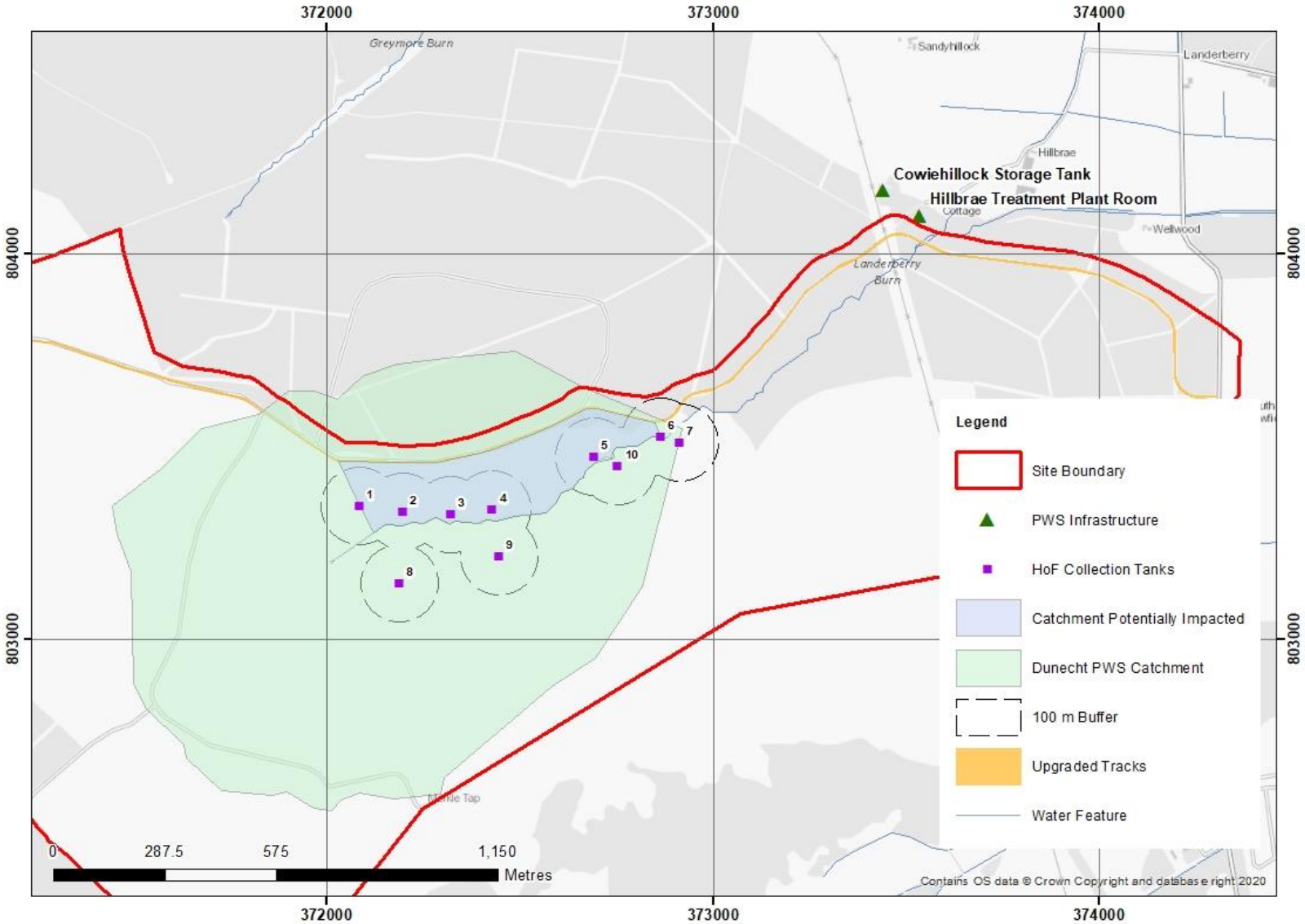


Figure 2-2: PWS Infrastructure Layout

## 2.2.1 Hydrogeological Conditions & Conceptual Model

A hydrogeological conceptual model and a summary of the hydrogeological conditions is provided in Table 2.3 below.

**Table 2.3 Hydrogeological Conditions**

Characteristic	Description
Soils	<ul style="list-style-type: none"> <li>Peaty gleyed podzols in the upper catchment associated with hill and valley sides with gentle and steep slopes and humus-iron podzols associated with undulating lowlands and hills with gentle and strong slopes.</li> </ul>
Drift Deposits	<ul style="list-style-type: none"> <li>Till belonging to the Banchory Till formation on lower slopes of the catchment, no mapped superficial deposits are present on the upper slopes . Area of peat mapped within centre of the catchment.</li> </ul>
Bedrock Geology	<ul style="list-style-type: none"> <li>Hill of Fare intrusion Leucogranite.</li> <li>No fault lines or similar features recorded in BGS map.</li> </ul>
Bedrock Aquifer	<ul style="list-style-type: none"> <li>Low productivity aquifer with fracture flow, typically with small amounts of groundwater in the near surface weathered zone and secondary fractures.</li> </ul>
Source Contribution Mechanisms	<ul style="list-style-type: none"> <li>Spring associated with bedrock aquifer from weathered zone, and possibly fracture networks, surface water runoff.</li> </ul>
Zone of Contribution	<ul style="list-style-type: none"> <li>Weathered zone: ~1.22km<sup>2</sup> (based on topography) and direct surface water runoff; headwaters of the Landerberry Burn, forestry and open moorland.</li> <li>Other fractures: Unknown.</li> </ul>

## 2.2.2 Proposed Track Upgrade

It is proposed that a section of existing track is upgraded as part of the wind farm proposals, typical track details are shown in Figure 2-3. Detailed proposals for the relevant section of track which falls within the 100m buffer of a PWS source have not yet been developed however it is anticipated that these will likely consist of widening of the track where required and associated verge creation and drainage installation. No excavation below 1m in depth is proposed.

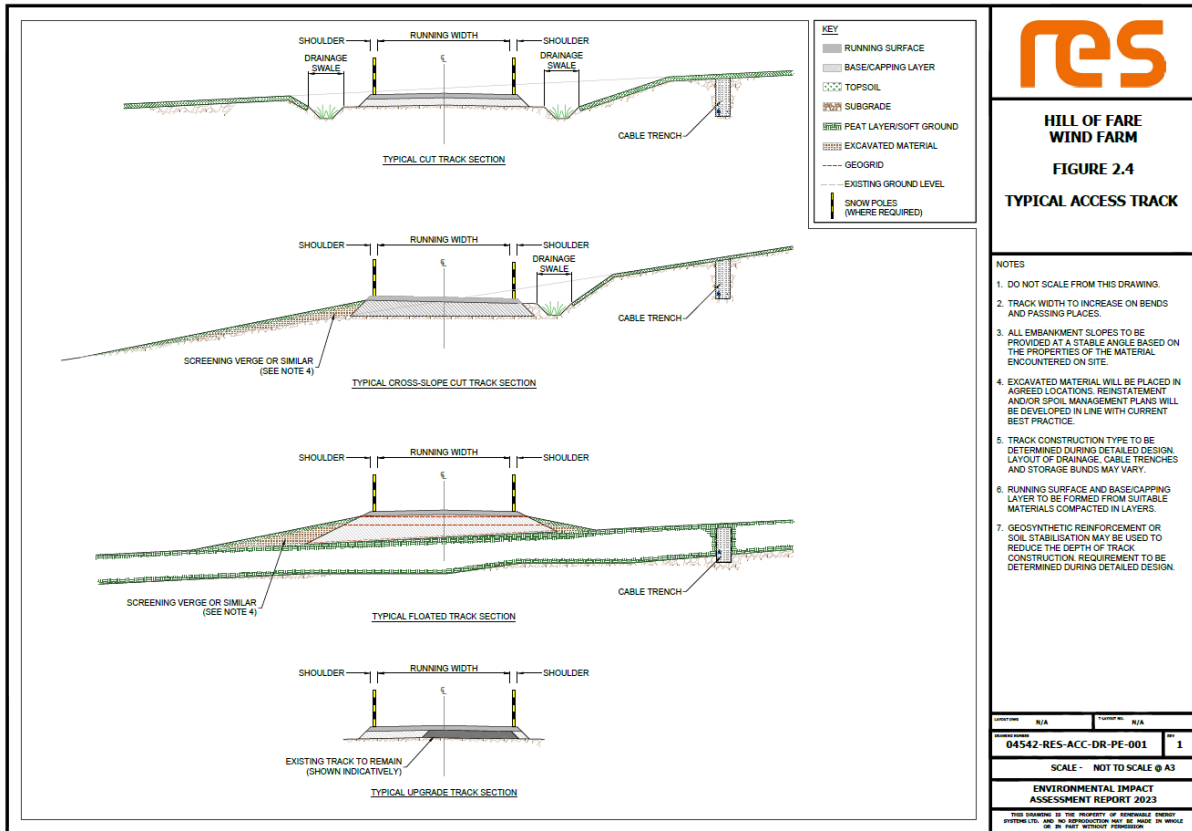


Figure 2-3: Typical Access Track Details.

### 2.2.3 Risk Assessment

The table below summarises the risk assessment undertaken for the Dunecht Estate PWS. The risk evaluation was undertaken for activities before specific mitigation measures are put in place.

Table 2.4 Risk Assessment

Source of Risk	Potential Impact	Risk Assessment
Track upgrade ~35m (at closest point) north and up-gradient of PWS intake.	<ul style="list-style-type: none"> <li>Alteration of water levels/flows from track upgrades.</li> </ul>	<ul style="list-style-type: none"> <li><b>Low</b> – Track located at 35m up-gradient from collection chamber 6 at NJ 72863 03526, unlikely to significantly interfere with flow to PWS intake. Upgrade of existing track to potentially involve widening if required with the track to be formed of permeable material and no dewatering required. Only easternmost (6 and 7) two collection chambers are within the assessment buffer. Chamber number 7 is on the opposite side of the Landerberry Burn from the proposed works and as such is considered to be hydrologically disconnected as shown in Figure 2-2.</li> <li>The track upgrades have the potential to impact only 10% of the overall catchment as shown in Figure 2-2.</li> </ul>

Source of Risk	Potential Impact	Risk Assessment
	<ul style="list-style-type: none"> <li>Increased sedimentation resulting from track upgrade activities</li> </ul>	<ul style="list-style-type: none"> <li><b>Moderate</b> – Increased sediment loading could result from construction works particularly during heavy rainfall given the proximity to the proposed track upgrades at the easternmost collection chambers.</li> </ul>
	<ul style="list-style-type: none"> <li>Hydrocarbons, concrete or other chemical spillages reaching the PWS.</li> </ul>	<ul style="list-style-type: none"> <li><b>Low</b> – No storage or refuelling with hydrocarbons is proposed within the catchment of the PWS.</li> </ul>
	<ul style="list-style-type: none"> <li>Damage to PWS infrastructure by excavation or heavy traffic.</li> </ul>	<ul style="list-style-type: none"> <li><b>Low</b> – Track upgrades are proposed within the footprint and immediate vicinity of the existing track.</li> </ul>

## **3 MITIGATION AND GOOD PRACTICE**

### **3.1.1 Construction Environmental Management Plan**

- A Construction Environmental Management Plan (CEMP) including surface water management, pollution prevention measures and construction method statements would be in place during the proposed works. The CEMP would remain a live document and would be updated as work progresses. All of the general and site-specific mitigation measures outlined in this risk assessment document will be incorporated into the CEMP.
- A pollution incident response plan will be set out in the CEMP relating to the construction of the wind farm, statutory requirements and identification of areas of highest sensitivity. This will provide site spill response procedures, emergency contact details and equipment inventories and their location. All staff will be made aware of this document and its content during site induction. A copy will be available in the site office at all times.
- An Environmental Clerk of Works (EnvCoW) or suitably experienced Ecological Clerk of Works (ECoW) will supervise the construction works to ensure that the CEMP and associated mitigation measures are being implemented effectively.

### **3.1.2 Monitoring Programme**

The following elements specific to the Dunecht Estate PWS would be included within the monitoring programme proposed within section 10.1.125 of Chapter 10 of the EIAR:

- Regular visual inspection of surface water management features such as silt traps, settlement ponds, swales, culverts etc. to check for appropriate performance, blockages and to establish whether there are increased levels of suspended sediment, erosion or deposition.
- Regular visual inspection of active areas, particularly where vegetation has been stripped and soil storage areas to establish whether there are increased levels of erosion.
- Water Quality Monitoring of Dunecht Estate PWS prior to (baseline monitoring) and during (construction monitoring) construction activities with samples tested at an accredited laboratory.
- Monitoring following any pollution incidents.
- On-going liaison with SEPA as required during construction and decommissioning.

### **3.1.3 PWS Infrastructure**

- Vigilance should be maintained during construction works for any buried pipe work that may be associated with the PWS infrastructure.

### **3.1.4 Surface Water Management**

- Surface water drainage arrangements for construction elements will be in line with the principles of sustainable drainage systems (SuDS), incorporating appropriate attenuation and treatment prior to discharge to the water environment in accordance with GBR10 and GBR11. It is proposed to replicate natural drainage around construction areas and to use source control to deal with rainwater in proximity to where it hits the ground. This approach is in line with the Guidance on Applying the SuDS Manual (C753) published by CIRIA and relevant SEPA guidance.

- Swales will be used to hold water temporarily and to encourage infiltration/discharge into the ground local to where the rain falls.
- Check dams and silt traps will be placed along the swales or ditches to settle out fine sediment and reduce flow velocities along with subsequent erosion potential.
- Silt fencing will be used for erosion protection and silt attenuation, and protection of the water environment, where required.
- Exposed soils will be restored as soon as possible using vegetated turves (from construction areas), hydro-seeding/seeding (with suitable seed mixes) and other erosion protection measures such as bio-matting, as required.
- Track construction will include the installation and maintenance of existing drainage paths with suitable cross drains installed where necessary to prevent the collection of surface water. These will be regularly inspected and maintained to ensure optimal performance. Sediment control measures will be incorporated into all site drainage systems.

### **3.1.5 Fuel and Oils**

- No fuel or oils are to be stored within the PWS catchment area, no refuelling will take place within the PWS catchment area.
- All vehicles and plant to be well maintained and carry spill kits.



## **4 CONCLUSIONS**

An assessment has been undertaken to determine the potential effects that would result from the upgrade of an existing access track on the Dunecht Estate PWS.

Desk studies and field surveys have been undertaken to inform this assessment. Mitigation has been detailed and should be adopted when undertaking works in the vicinity of the PWS. Following the implementation of mitigation measures all potential impacts are considered to be of low risk, meaning risks are unlikely, with a slight change in water supply predicted over very short timescales and within the bounds of normal water supply variation.

# APPENDICES

# A SITE PHOTOGRAPHS




Photo ID	Photograph	Comment
1		Catchment looking northeast with fenced off collection tank visible.
2		Existing track located at the edge of existing forestry.

Photo ID	Photograph	Comment
3		Catchment looking southwest.
4	 <p data-bbox="354 1361 368 1391">3</p>	Collection chamber (1 of 10).

Photo ID	Photograph	Comment
5	 A photograph showing the interior of a collection tank. The tank is constructed from reddish-brown metal. In the center, there is a dark, rectangular object, likely a filter or a piece of equipment, with a pipe extending from it. The floor of the tank is covered with a layer of white, crystalline or fibrous material, possibly a byproduct of the collection process. The walls of the tank show signs of wear and some debris.	Internal view of collection tank with visible flow through pipework.