Aviva Wind Turbine

Environmental Statement
Volume 2 - Main Text
February 2022

Prepared for Aviva plc by Purple Renewables

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FOREWORD

This document is Volume 2 of the Environmental Statement (ES) for the proposed Aviva Wind Turbine. The ES has been prepared by Purple Renewables to accompany an application for planning permission submitted to Perth and Kinross Council.

Inspection of the planning application, Environmental Statement and Supporting Documents

Copies of the Environmental Statement may be inspected free of charge at the following location:

Perth and Kinross Council
Pullar House
Kinnoull Street
Perth
PH1 5GD

Digital copies of the Non-Technical Summary are available free of charge from Perth and Kinross Councils Planning Portal or from www.aviva-renewables.co.uk

Further hard copies of the Environmental Statement are available at a cost of £400.

DVD copies are also available at a cost of £25.

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Contents

1. Introduction

1.1 Foreword

1.1.1 This Environmental Statement (ES) Main Text has been prepared to accompany the submission of a planning application under the Town and Country Planning (Scotland) Act 1997, as amended to Perth and Kinross Council for planning permission to construct a wind turbine at Aviva, Perth.

1.1.2 The purpose of this ES is to report the Environmental Impact Assessment (EIA) of the proposed development. The ES describes the proposed development, the current baseline conditions at the proposed development site and its surroundings and the likely environmental effects which may result from the proposed development. Mitigation measures to avoid, reduce or remedy significant effects are to be identified and incorporated into the proposal where appropriate.

1.1.3 The planning application is for a single wind turbine up to 77 metres (m) tip height with associated infrastructure such as a crane hardstanding, upgraded access track, and a temporary construction compound at Aviva Pitheavlis.

1.1.4 The proposed development site can be seen within its regional context in **Figure 1.1, Volume 3**. **Figure 1.2, Volume 3** shows the site in its local context.

1.1.5 The candidate turbine's capacity is up to 1 megawatt (MW). Full details of the proposed development are provided in Chapter 2 of this document. The proposed layout is presented in **Figure 1.3, Volume 3** of the ES.

1.1.6 The project would also involve the amendment of a grid connection, which will be subject to a separate application with Scottish and Southern Electricity (SSE).

1.2 The Applicant

1.2.1 Aviva plc is a British multinational insurance company, with over 15.5 million customers in the UK. Aviva is the largest general insurer and a leading life and pensions provider in the UK.

1.2.2 Aviva owns and currently operates from the former General Accident Headquarters in Perth. This site has approximately 1000 employees working across a range of departments in the company.

1.2.3 Aviva takes climate change very seriously, it's impact on air quality, weather events and flooding, and its impact on people. Aviva wants to do all they can to try to reduce global greenhouse gas emissions. Aviva began purchasing electricity from renewable sources for their UK estates in 2004 and they have reduced their worldwide carbon emissions by 53% since 2010. Aviva strongly believes that where it is feasible to produce green energy on

their own sites, they should be reinvesting to make the business as economically and environmentally sustainable as possible for the future.

1.2.4 In response to the international climate change emergency, Aviva aims to achieve operational net zero carbon status across their entire estate by 2030. As a site of some historic significance, Perth is considered to provide a significant opportunity to create an exemplar site for what can be achieved through positive action regarding climate change, for the Aviva Group worldwide.

1.3 Requirement for an EIA

1.3.1 Reference to the EIA Regulations and Circular 1/2017 (Scottish Government, 2017) indicates that the Proposed Development falls within Schedule 2, Paragraph 3(j) of the EIA Regulations, as it is an "installation for the harnessing of wind power for energy production (windfarm) where (ii) the hub height of any turbine or height of any other structure exceeds 15 metres."

1.3.2 A Schedule 2 development will require EIA if it is likely to have significant effects on the environment by virtue of factors such as its size, nature or location.

1.3.3 This EIA has been prepared to support a resubmission of the original 2018 planning application. A Screening and Scoping Opinion was received from Perth and Kinross Council for the original application. In advance of preparation of this EIA pre-application consultation was sought from Perth and Kinross Council. A copy of the Pre-Application Consultation is located within **Appendix 1.1, Volume 4**.

1.4 The Environmental Impact Assessment Regulations

1.4.1 Directive 97/11/EC is implemented by the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. The EIA Regulations set out the information which must be included in the ES.

Structure of the ES

1.4.2 The ES has been divided into four volumes and is described below:

Table 1.1 – ES Structure

Volume 1 - Non-Technical Summary	The non-technical summary contains, in non-technical language, a summary for the main text intended for review by the general public.
Volume 2 - Environmental Statement Main Text	The main text contains a detailed description of the proposal. It evaluates the existing environmental baseline, identifies and addresses the predicted environmental impacts that could occur as a result of the development. It provides detailed analysis of the design procedure and how mitigation measures have been incorporated into the design, where

	possible to prevent, reduce or offset any identified environmental impacts.
Volume 3 - Figure and Photomontages	The figures volume contains all the illustrative material referred to in the main text of the Environmental Statement.
Volume 4 - Technical Appendices	The appendices hold details of the assessment methodologies, assessment data, technical details and background information.

1.4.3 Volume 2 of the ES (this volume) is structured around the following chapter headings:

- Chapter 1 - Introduction
- Chapter 2 - The Proposed Development
- Chapter 3 - The Need for the Development
- Chapter 4 - Planning the Development
- Chapter 5 - Landscape and Visual Impact Assessment
- Chapter 6 - Cultural Heritage Assessment
- Chapter 7 - Ecology Assessment
- Chapter 8 - Ground and Water Assessment
- Chapter 9 - Shadow Flicker Assessment
- Chapter 10 - Noise Assessment
- Chapter 11 - Infrastructure Assessment
- Chapter 12 - Tourism, Recreation and Socio-economic Assessment
- Chapter 13 - Summary of Effects

1.4.4 The approach to this EIA has followed the requirements of the EIA Regulations. Schedule 4 of the Regulations sets out the information that must be included in the ES.

1.4.5 The reporting of the assessment of environmental effects in this ES is presented in Chapters 5 to 13 in a structured format with reference to guidelines and legislation in each topic area. There may be some inconsistency across topic areas when assessing the significance as it is recognised that a “one size fits all” approach to assessment would lead to compromise, which can sacrifice accuracy and ultimately affect the reliability of the EIA as a whole.

1.4.6 The EIA Regulations require the ES to include “a description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment”. Wherever reasonably practical, mitigation measures are proposed for each significant adverse impact predicted.

1.5 Additional Documents

Planning Application

1.5.1 The planning application will be submitted to PKC, this will consist of a completed planning application form, covering letter and associated figure which outlines the proposed development area and land ownership area.

Planning Policy Statement

1.5.2 A Planning Policy Statement is submitted with the application which assesses the Proposed Development in the context of adopted and emerging planning policies, setting out the arguments for and against the proposed development and concluding with recommendations about the overall acceptability of the proposals in relation to the planning context.

Design and Access Statement

1.5.3 A Design and Access Statement in addition to Chapter 4 of this ES, Planning the Development, has been submitted as part of this planning application. Where the design optimisation process is reported, a separate Design and Access Statement should be submitted to explain the design principles and concepts that have been applied to the development.

1.6 The EIA Team

1.6.1 The EIA team is led by Purple Renewables with assistance from independent specialist consultants listed in Table 1.2 below:

Table 1.2 – EIA Team

Landscape and Visual Assessment	Wood Group
Cultural Heritage Assessment	Hurd Rolland
Ecology Assessment	Avian Ecology
Construction, Ground and Water Assessment	Our Footprints
Shadow Flicker	350renewables
Noise Assessment	TNEI
All remaining chapters of the ES	Purple Renewables

1.6.2 Regulation 5(5) stipulates that to ensure the completeness and quality of the EIA report it must (a) be prepared by competent experts and (b) be accompanied by a statement from

the developer outlining the relevant expertise or qualifications of such experts. Specific details of each member of the EIA team are located within **Appendix 1.2, Volume 4**.

2. The Proposed Development

2.1 Introduction

2.1.1 This Chapter provides a description of the development location, the components of the proposed development and details of associated infrastructure. A summary of construction methods and overview of the operation and decommissioning of the proposed development.

2.2 Location

2.2.1 The proposed development is for a single wind turbine located at Aviva's commercial premises in Perth. The proposed development site is located on the south west fringe of Perth and is bounded by the M90 motorway running north-west / south-east, Craigie Hill golf club to the east and residential housing to the north west.

2.2.2 The proposed development site can be seen within its regional context in **Figure 1.1, Volume 3**. **Figure 1.2, Volume 3** shows the site in its local context and **Figure 1.3, Volume 3** provides further detailed plans of the proposed development.

2.3 Land Use

2.3.1 The Aviva site consists of a large commercial office building, a landscaped concourse, a number of smaller buildings including a former sports centre, an extensive car parking area and landscaped gardens.

2.3.2 The Aviva facility occupies an area of approximately 12.5 hectares and is primarily used as commercial office space.

2.3.3 In 2017 Aviva installed roof mounted photovoltaic panels which generate approximately 63,000 kWh a year.

2.3.4 In 2020 Aviva installed solar carports covering 342 car parking spaces and providing 50 electric vehicle charge points. In addition, a Tesla power pack battery was installed providing 1.8MWh of energy storage. This ambitious project currently supplies 27% of the site's electricity needs.

2.3.5 Following refusal of planning permission for a single wind turbine in 2020, Aviva are in advanced discussions with the land owner to secure land under a leasehold interest, which was previously unavailable for development. This additional land allows for the proposed wind turbine to be sited further away from the Aviva building but at an appropriate distance to allow for on-site grid connection.

2.3.6 The proposed wind turbine would take a significant step forward in meeting Aviva's on-site energy usage and desire to be carbon neutral at the Perth facility.

2.4 Pre-construction

2.4.1 Prior to the main construction contract commencing, a number of enabling works would be undertaken, including geotechnical investigations of the development site, sufficient to facilitate the development of detailed designs, and the production of a detailed Construction Method Statement.

2.5 Wind Turbine Components and Construction Works

2.5.1 The construction, operation and decommissioning of the proposed wind turbine is anticipated to be over a period of 27 years (25 operational years). It would contain the following components:

- One wind turbine;
- Turbine foundation;
- Crane hardstanding;
- Temporary construction compound;
- Underground cable network;
- Switchgear house (new or an extension to the existing);
- Electrical enclosure to house the wind turbine transformer (within or adjacent to the turbine).

2.5.2 **Figure 1.3, Volume 3** provides an illustration of the detailed site design. **Figures 2.1 to 2.8, Volume 3** illustrate the components of the site.

2.5.3 It is anticipated that the wind turbine project would take 4 to 6 months to construct.

2.5.4 Details of the site components and construction activities required are described below. The principal components of the construction activity would be as follows.

Wind Turbine

2.5.5 The exact model of wind turbine to be installed at the site would be decided following a future tendering process. It is however anticipated that a EWT61 turbine or similar would be used on site. The key technical parameters of this model are summarised below. **Figure 2.1, Volume 3** illustrates the dimensions of the turbine and a full specification is provided in **Appendix 2.1, Volume 4**.

Table 2.1 Candidate Turbine Models

	DW52	DW54	DW61
Rated Power	900kW	900kW	1000kW
Cut-in Speed	3.0m/s	3.0m/s	3.0m/s
Cut-out Speed	25.0m/s	25.0m/s	25.0m/s
Rotor Diameter	51.5m	54m	61m
Hub Height	50m	50m	46m
Tip Height	76m	77m	76.5m
IEC Wind Class	IIA	IIIA (* 54x version is IA)	IIIA

2.5.6 In the environmental assessments the candidate turbine DW61 has been used.

2.5.7 The nacelle and rotor of the turbine will rotate to face into the wind.

2.5.8 The turbine tower would be of tapered tubular steel construction and the blades of fibreglass with lightning protection, protecting the entire turbine. The finish of the turbine would be of a low-reflectivity, semi-matt white to mid-grey hue to reduce the contrast with the background sky and landscape. The turbine will contain no logos or advertising.

Turbine Foundation

2.5.9 A geotechnical investigation would be undertaken to establish the nature of the material underlying the foundation at the turbine location, upon which the most appropriate foundation detail would be applied. The turbine foundation would be either a gravity or piled foundation.

2.5.10 If a competent load bearing strata was located within 2 to 5 metres of the surface, then a gravity type foundation would be appropriate. The use of a gravity foundation would involve the excavation and removal of material down to the load bearing strata and backfilling with compacted engineering fill to a level approximately 2m below ground surface. A reinforced concrete foundation of approximately 18m diameter 2m depth would then be constructed on top of this engineering fill.

2.5.11 Alternatively, if no competent load bearing strata were located within 5 metres of the surface a piled foundation design would be required. This would involve the construction of a piling hardstanding over the proposed turbine location. An arrangement of evenly spaced bored or driven piles would be installed to a depth sufficient to engage a competent load bearing strata. These piles would be terminated below ground level upon

which a reinforced concrete foundation, of a similar size to the gravity foundation, would be constructed.

2.5.12 The construction of the reinforced concrete foundation would involve the placing of shuttering and steel reinforcement into the excavated area followed by the placement of concrete within the shuttering to form the foundation in situ. The upper surface of the foundation would finish approximately 1m below ground level with the central pedestal extending a minimum of 50cm above existing ground level to receive the bottom tower section. Suitable excavated material would be compacted in layers on top of the concrete foundation as turbine ballast. This will terminate a minimum of 50cm above the existing ground level to aid with the dispersal of surface water.

2.5.13 No concrete batching will be undertaken on site. Concrete for use in the turbine foundation would be brought in from a local commercial batching plant.

2.5.14 The applicants are mindful of waste arising therefore all excavated material will be stored on site, and used if suitable for foundation ballast and/or landscaped around the turbine or disposed of at landfill if not suitable.

2.5.15 An example of a typical gravity and piled foundation is illustrated in **Figure 2.2 and 2.3, Volume 3**.

Crane Hardstanding

2.5.16 A crane hardstanding would be required adjacent to the turbine for installation, maintenance and servicing. The location of the crane hardstanding area is provided in **Figure 3, Volume 3.**

2.5.17 The crane hardstanding will be constructed in accordance with the turbine manufacturers loading requirements. It will be formed using suitable imported graded stone. If the ground conditions require it, then geotextile and/or geogrid will be incorporated into the design. The surface will be topped off with a type 1 crusher run material to form a level running surface. Post construction plate loading tests will be undertaken at the crane outrigger locations to confirm that the requisite bearing capacity has been achieved.

2.5.18 The finished level of the crane hardstanding would be formed to ensure that any rain water runoff can discharge into a soakaway or the existing drainage system.

2.5.19 An example of a typical crane hardstanding is illustrated in **Figure 2.4, Volume 3**.

Temporary Construction Compound

2.5.20 During the construction period, a temporary construction compound and lay down area would be required. The construction compound would provide space for temporary porta cabins, parking for site vehicles, containers for tools and equipment storage and welfare facilities. The compound would be located adjacent to the crane hardstanding on the existing car parking area and is shown in **Figure 1.3, Volume 3**. The temporary

construction compound would comprise a hard standing area of approximately 25m x 25m. **Figure 2.5, Volume 3** illustrates a typical construction compound.

2.5.21 Within 3 months of the turbine becoming operational, all portacabins, machinery and equipment will be removed and the laydown area fully restored.

Electrical Enclosure

2.5.22 The electricity produced from the turbine would be transformed up to the appropriate voltage by a small transformer located within an electrical enclosure within the tower or adjacent to the turbine, and then conducted to the switchgear house via underground cables.

2.5.23 Should an external transformer be required, a single-story electrical enclosure, to house the wind turbine transformer, approximately 3.5m x 5m x with a height of 3.5m will be constructed on the site. A detailed drawing of a typical transformer kiosk is illustrated in **Figure 2.6, Volume 3**.

Switchgear House

2.5.24 It is currently envisaged that the wind turbine will be connected to Aviva's existing switchgear house, with the addition of upgraded equipment. However, the exact requirements may vary depending on the specific requirements of the Distribution Network Operator (DNO).

Grid Connection

2.5.25 It is envisaged that the electricity from the wind turbine will be connected to the existing DNO switchgear house on the Aviva site. No overhead lines will be required to connect the turbine with the site's electrical system. All cables between the turbine, the electrical enclosure, and the switchgear house would be buried below ground and materials extracted from the trench excavation used in the backfilling of the cables. **Figure 1.3, Volume 3** illustrates the cable route.

Earthing and Lightning Protection

2.5.26 Earthing and lightning protection will be installed within and around the turbine base and designed such that there will be no step and touch hazard.

Site Entrance

2.5.27 The proposed entrance to the development is an existing entrance from the B9112 Necessity Brae. No modifications are required on this entrance.

Internal Access Tracks

2.5.28 From the existing entrance, an existing road will be used to reach the position of the crane pad.

2.5.29 It will be necessary to use a temporary loading plate (Trackway or similar) to facilitate access of the abnormal indivisible load (AIL) vehicle for the turbine blades. This will be removed immediately post-delivery and any necessary reinstatements undertaken.

2.5.30 The layout has been designed to minimise any impact upon current operations and so that land take is kept to a minimum. The location of the internal access track is illustrated in **Figure 1.3, Volume 3**.

Micro-siting

2.5.31 It is normal practice to allow a small margin for adjustment of turbine, track and equipment positions to suit actual ground conditions. It is therefore requested that minor changes to the turbine location, tracks and equipment be permitted within 30m of the stated locations, in an easterly direction away from the Aviva building. In the unlikely event that a greater degree of adjustment is required Perth and Kinross Council would be consulted for approval. The red line planning boundary reflects these micro-siting allowances, and is shown on the planning drawings submitted as part of this planning application.

2.6 Access Route

2.6.1 Currently there are no wind turbine manufacturers (of this scale of turbine) based within the UK. Therefore, it is envisaged that the turbine components will be brought into the UK from mainland Europe via the ports of Dundee, Grangemouth or Portsmouth. These docks cater for the deep draft of vessels required for the transport of turbine components. From the port of entry abnormal loads are envisaged to reach the M90 with little hindrance via the UK's network of A-Roads and Motorways. The route from the M90 is as follows; M90 junction 12, A93, B9112 to the site entrance.

2.6.2 The proposed delivery route is shown on **Figure 2.7, Volume 3**.

2.6.3 An access survey has been undertaken by EWT to ensure that the turbine is able to be delivered to site. The report concluded that the recommended route is accessible with some minor alterations within the site, namely groundwork at two corners (ground to be reinforced with plates/Terrafirma) to allow heavy loads to cross. Trimming back of tree branches will also be required at one corner. The access report is provided in **Appendix 2.2, Volume 4.**

2.6.4 Consultation with Perth and Kinross Council and Transport Scotland has been undertaken.

Access Route Assessment

2.6.5 An initial assessment of the access route from suitable ports to the site was undertaken to ensure the local highway network could accommodate the large vehicles and vehicle movements associated with the delivery of the turbine components.

2.6.6 The assessment shows that the public roads are generally of a good standard and would be suitable, subject to localised minor highway improvements, to safely accommodate large loads associated with the delivery of the turbine components during the construction phase.

2.6.7 A walkover assessment was conducted to determine if junctions along the access route could accommodate the delivery of the turbine blades and towers which are the largest loads to be delivered to the site, and if any road improvements would be required.

2.6.8 The results from the analysis indicate that both the blades and tower transporters can be accommodated by the access route if selected minor highways improvements and minor works are conducted. This would include removal of the bollards in the central island on the junction of the A93/Necessity Brae, and some minor tree trimming works on the A93. Any of the improvements proposed along the access route would be undertaken in agreement with the relevant highway's authority.

2.7 Vehicle Types and Movement

Construction Stage

2.7.1 A number of different vehicle types would be needed during the construction stage of the wind turbine development. Of these the majority would be standard road vehicles of similar type to those using the roads on a daily basis. However, the delivery of the wind turbine components would require vehicles and transport configurations that are longer and/or wider and/or heavier than standard road vehicles.

2.7.2 The vehicles used to transport the turbine components are specialised articulated trailer lorries. Despite their large size and sometimes unusually heavy gross weights, they have multiple axles to ensure that axle loads fall within limits set out in 'The Road Vehicles (Authorisation of Special Types)(General) Order' commonly known as STGO. The turbine blades are the longest components to deliver, while the turbine tower is manufactured and delivered in smaller sections. Typical component delivery vehicles are illustrated in **Figure 2.8, Volume 3**.

2.7.3 It is envisaged that a maximum of 11 abnormal loads would be required to deliver the turbine to site. The vehicles likely to be involved in construction activities are summarised in Table 2.2 below:

Table 2.2: Summary of Transport Vehicles required for Construction

Activity	Comment	Vehicle Type
Plant Delivery	Vehicles will transport materials that include portacabins, compactors, fencing, generators, cabling, bulldozers, excavators etc	Low loaders / HGV's

Site Preparations	Stone for construction compound / crane hardstanding (if required)	20 tonne lorries
Foundation Work	Deliveries of steel, turbine bases and ancillary equipment	Low loaders / Flat beds / HGV's
	Concrete	Concrete mixers
Electrical Enclosure	Concrete	Concrete mixers
	Components and equipment	Low loaders / Flat beds
Electrical Installation	Sand for bedding	20/16 tonne waggons
	Cable and switchgear	Low loaders / Flat beds / HGV's
Fuel	1 delivery per week (if fuel is stored on site)	Fuel tanker
Turbine Components	Main components of the turbine will include 2 tower sections, 1 nacelle, 3 blades, 1 hub, 1 generator and a miscellaneous load including anchor and tools	Abnormal extendable low loaders (return journey as HGV).
Turbine erection plant	Including 2 mobile cranes, ballast carrier, lattice boom carrier (deliver and collect)	Low loaders, mobile crane units (return journey as HGV)
Construction personnel	Travel to and from the site	Cars/minibuses

Operational Stage

2.7.4 Once the turbine is in operation, minimal vehicle traffic would be required to access the site. Turbines are designed to be monitored remotely and require only routine maintenance visits.

2.7.5 Scheduled maintenance visits would be undertaken twice each year during the operational stage.

Decommissioning Stage

2.7.6 Decommissioning would be expected to take approximately 4 weeks. The turbine would be dismantled and removed from site using the construction route described above. Similar traffic movements as experienced during the delivery of the turbine components could be anticipated. However other vehicles volumes required to

decommission the remaining components would be minimal, and considerably lower than the volumes experienced during construction.

2.8 Turbine Installation

2.8.1 The components for the turbine would be brought to site separately. The overall installation process for the turbine would take approximately 1 - 3 days depending on weather conditions and would not start until weather conditions were suitable.

2.8.2 The method for construction would involve the use of a small auxiliary 100 tonne crane for vehicle off loading and preliminary assembly. A larger main lift crane, approximately 500 to 600 tonnes (depending on the requirement of the turbine manufacturer), and the auxiliary crane would together be utilised to erect the turbine once preliminary assembly has been completed.

2.8.3 The turbine blades would be attached using one of three methods, depending on the turbine type and weather conditions.

- The blades can be attached to the hub on the ground. The hub and the blades are then lifted as one. This is the quickest method and can be used in higher winds than the other methods. However, it requires a large lay down area in which light vehicles would need to manoeuvre
- The hub can be attached to the nacelle and two of the blades attached to the hub while the nacelle is on the ground, this is known as the bunny lift. The nacelle is then lifted into position and the third blade lifted into place separately. This requires manoeuvring of several components on the ground and usually the repositioning of the cranes.
- Lifting the nacelle and hub as one until, and then attaching the blades one at a time, rotating the hub between lifts. The blade lifting operations do not require the repositioning of the cranes.

2.9 Construction Methods

2.9.1 The proposed development would take approximately 4 to 6 months to construct on site from start to completion including the removal of any temporary works.

2.9.2 All construction works would comply with the requirement of a Construction Method Statement. The Construction Method Statement would contain details of the proposed and agreed working practises to be adopted on site for all construction activities.

2.9.3 Prior to the main construction contract commencing, a number of enabling works would be undertaken including geotechnical investigations and surveys to identify ground conditions.

Storage and Disposal of Materials

2.9.4 During the construction all topsoil would be moved and stored in accordance with the DEFRA Good Practice Guide for handling soil. Subsoil and topsoil would be retained for backfilling and as required by the landowner for site operations. Any excess would be removed off site adhering to appropriate granted waste licences.

2.9.5 If fuel were to be stored on site, it would be proprietary double skinned bunded tanks within the construction compound to ensure that in the event of any leakage, it would be contained.

2.9.6 All relevant Pollution Prevention Guidelines (PPG's) as published by SEPA would be adhered to during the construction, operation and decommissioning stages of the development.

Noise

2.9.7 It is considered that no specific measures, other than the use of modern machinery with the manufacturers standard noise control devices in place and in good repair, would be required in mitigating the effects of construction noise. Noise from construction activities and traffic would be similar in character to the existing noise sources in the area, given the proximity to the motorway and a number of large-scale housing developments in the surrounding area.

Site Traffic

2.9.8 The impacts of construction traffic would be mitigated through adoption of the following routing and control measures:

- Appropriate warning signs to be erected close to the site, to the specification of Transport Scotland and Perth and Kinross Council;
- All abnormal indivisible loads (AIL) to use an access route agreed with Transport Scotland and Perth and Kinross Council;
- All other non-AIL vehicles to use an access route agreed with Transport Scotland and Perth and Kinross Council;
- Excess subsoil, concrete, used oils and other chemicals to be disposed of off-site.

2.9.9 Coupled with existing levels of industrial traffic in the area and short duration of the construction schedule, additional construction traffic associated with this proposed development is likely to result in negligible impact.

Disruption of Soils and Drainage

2.9.10 A number of management actions will be implemented to manage surface drainage and exposed soil surfaces to ensure that erosion events do not occur. Such actions include the installation of filter drains and or the distribution of protective material over exposed areas if necessary.

2.10 Operation and Maintenance Requirements

2.10.1 Once the turbine is in operation, it would be monitored remotely and not staffed. Maintenance personnel would make routine visits by car and or van approximately once a month with intermediate visits as and when necessary.

2.10.2 Scheduled maintenance work would be undertaken approximately twice a year, involving one maintenance van on site for approximately one week.

2.11 Decommissioning

2.11.1 The Aviva wind turbine would have an operational life of approximately 25 years. After this time, the development would be decommissioned in order to return the land to its former use. It is anticipated that decommissioning of the wind turbine would take approximately 4 weeks to complete and the process would involve the following stages:

- The turbine would be dismantled and removed from site for scrap or re-sale.
- The foundation would be cut back to approximately 1.2m below ground level.
- Topsoil or blacktop would be reinstated, and the land returned to its former use as a car park.

2.11.2 The power cables would be underground and contain no harmful substances and they could be removed if economically attractive or left in the ground. Terminal connections would be cut back to below ground level.

2.11.3 All such decommissioning would be the responsibility of the wind turbine owner.

2.11.4 If at the end of the wind turbine's operational life (some 25 years) there remained an environmental or economic requirement for its operation a planning application to the Local authority for the refurbishment or replacement of the turbine would be considered.

3. The Need for the Development

3.1 Introduction

3.1.1 The need for the installation of the proposed wind turbine at Aviva, Perth is twofold:

- To create an exemplar for Aviva's global aspirations to achieve operational net zero carbon status across their entire estate, by 2030.
- To reduce the running costs of the building to future proof the viability of the present general configuration of the building.

3.1.2 Aviva is committed to 'act now on climate change' and significantly reduce their carbon footprint. As part of their work to deliver on this commitment they want to develop their own Aviva wind turbine, on land adjacent to their flagship Scottish property in Perth, which has one of the largest carbon footprints of buildings in the Aviva estate. The proposal is for a single wind turbine with a generation capacity of up to 1 megawatt (MW).

3.1.3 Aviva's commitment to the environment is a key strategic priority. As such, they have set the challenging target for their own operations and supply chain to be Net Zero by 2030. This includes all their occupied UK property.

3.1.4 The wind turbine will make the site an exemplar within the Aviva portfolio and can be used as a showcase by Perth and Kinross Council to help demonstrate the area's commitment to green energy. The wind turbine will build upon Aviva impressive solar and energy storage project which is seeing climate change tackled at a local level and supports the Scottish Government's Low Carbon Infrastructure Transition Programme (LCITP) nationally, reinforces Aviva's longstanding commitment to public-private collaboration and being a positive environmental and social influence. Investment in renewable energy technology represents an important milestone in the development of sustainable buildings and infrastructures in Scotland and the UK and it is hoped this will support PKC's ambition to be Europe's first net zero small city.

3.1.5 The current drive to increase the use of renewable energy sources is rooted in the recognition that the burning of fossil fuels is a major contributor to the emission of greenhouse gases, the primary cause of global climate change. As part of the response to climate change, the UK and Scottish Governments have entered into binding international agreements, committing to reducing greenhouse gas emissions.

3.1.6 Within the current policy framework, the generation of electricity from renewable energy sources is one of the principal ways in which the Government will meet its targets to reduce greenhouse gas emissions. Onshore wind energy is recognised as one of the most viable and economic renewable energy technologies available at the present time with Scotland having some of the best wind resources in Europe.

3.1.7 This section of the Environmental Report outlines the need for the Development based on an assessment of the need to implement legally binding national climate change targets by encouraging appropriate renewable energy development throughout Scotland. In addition, it details the needs and benefits of on-site generation projected benefits this development would have on Aviva's operation of their business in Perth. By encouraging renewable energy developments, the Scottish Government is seeking to move towards a low carbon economy, with companies such as Aviva leading the way to reduce their carbon footprint and demonstrate an exemplar site.

3.2 The Imperative

3.2.1 The imperative for the installation of the proposed wind turbine at Aviva, Perth is twofold:

- To create an exemplar for Aviva's global aspirations to achieve operational net zero carbon status across their entire estate, by 2030.
- To reduce the running costs of the building to future proof the viability of the present general configuration of the building.

3.2.2 In response to the international climate change emergency, Aviva aims to achieve operational net zero carbon status across their entire estate, by 2030. As a site of some historic significance, Perth is considered to provide a significant opportunity to create an exemplar site for what can be achieved through positive action regarding climate change, for the Aviva Group worldwide.

3.2.3 In this respect, Aviva aspires to make Perth 100% supplied by on-site renewable energy generation. The installation of solar roof panels above the car parking to the south of the main building (supported through Scottish Government Grants) achieved 27% of the target requirement. The wind turbine is forecasted to supply over 75%, bringing the site to Net Zero in terms of current electricity demand.

3.3 Climate Change

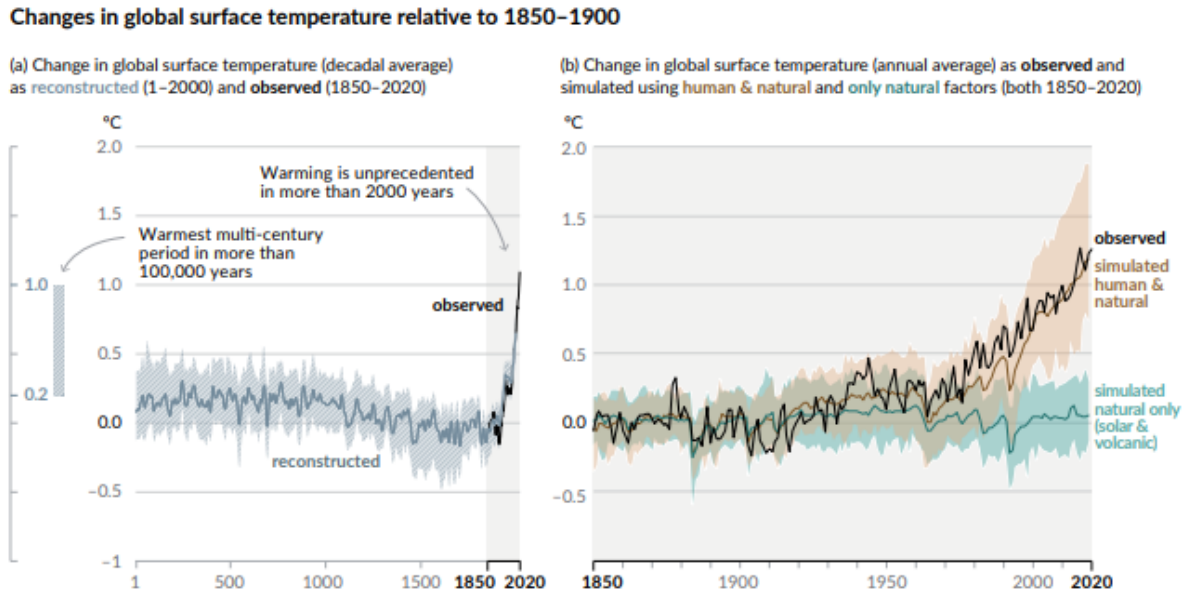
3.3.1 The likelihood and consequence of global climate change has been the subject of extensive research over decades. As the work has progressed, models have improved and with them the understanding of the processes which bring about global climate change and its likely consequences.

3.3.2 A report published over a decade ago in February 2007 by the United National Intergovernmental Panel on Climate Change (IPCC), entitled 'The Physical Science Basis of Climate Change' concluded that there is now indisputable evidence that human activities since 1750 have warmed the climate. The IPCCs most recent report entitled 'Climate Change 2021 – the Physical Science Basis' continues to state that It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. Since 2011, concentrations have continued to increase in the atmosphere, reaching annual averages

of 410 parts per million (ppm) for carbon dioxide (CO_2), 1866 parts per billion (ppb) for methane (CH_4), and 332 ppb for nitrous oxide (N_2O) in 2019.[1]

3.3.3 Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years. The graphs below show the rapid rate of change since 1850.

Plate 3.1 – History of global temperature change and causes of recent warming[2]



3.3.4 Global surface temperature will continue to increase until at least mid-century under all emissions scenarios considered. Global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO_2 and other greenhouse gas emissions occur in the coming decades.

3.3.5 Many changes in the climate system become larger in direct relation to increasing global warming. They include increases in the frequency and intensity of hot extremes, marine heatwaves, heavy precipitation, and, in some regions, agricultural and ecological droughts;

3.3.6 Many changes due to past and future greenhouse gas emissions are irreversible for centuries to millennia, especially changes in the ocean, ice sheets and global sea level.

3.3.7 From a physical science perspective, limiting human-induced global warming to a specific level requires limiting cumulative CO_2 emissions, reaching at least net zero CO_2 emissions, along with strong reductions in other greenhouse gas emissions. Strong, rapid and sustained reductions in CH_4 emissions would also limit the warming effect resulting from declining aerosol pollution and would improve air quality

[1] https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report.pdf
[2] https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report.pdf

3.3.8 This IPCC Report reaffirms with high confidence that there is a near-linear relationship between cumulative anthropogenic CO_2 emissions and the global warming they cause. Every tonne of CO_2 emissions adds to global warming.

3.3.9 On the 28th February 2022 IPCC AR6 working group two was released. The report was produced by more than 1,000 physical and social scientists and unanimously approved by the governments of 195 nations. The IPCC sets out in the strongest terms to date that the climate crisis is inseparable from the biodiversity crisis and the poverty and inequality suffered by billions of people.

3.3.10 Amongst a very damming climate report, it is noted that the global trend of urbanisation also offers a critical opportunity in the near term, to advance climate resilient development. Integrated, inclusive planning and investment in everyday decision-making about urban infrastructure, including societal, ecological and grey/physical infrastructure, can significantly increase the adaptive capacity of urban and rural settlements.[3]

3.3.11 The IPCC Report identifies that opportunity for action will only last for the rest of this decade, less than 8 years, "The cumulative scientific evidence is unequivocal: Climate change is a threat to human well-being and planetary health. Any further delay in concerted anticipatory global action on adaptation and mitigation will miss a brief and rapidly closing window of opportunity to secure a liveable and sustainable future for all."[4]

International Policy Context

3.3.12 The United Nations 'Earth Summit' held in Rio de Janeiro in 1992 first established the need to control greenhouse gas emissions and other emissions in the light of rising levels of global warming.

3.3.13 At the Kyoto climate change conference in 1997, the 174 parties to the convention considered what should be the next steps. In a historic agreement a new protocol was established, aiming to reduce developed countries emissions to 5.2% below the 1990 levels over the period 2008 - 2012. The Kyoto Agreement became legally binding in February 2005 shortly after the formal ratification of the protocol by parties including the UK.

3.3.14 The Kyoto Protocol has had a number of significant policy consequences for most developed countries. In particular it has led to the widespread adoption of measures to encourage the generation of energy from renewable resources.

3.3.15 The Paris Agreement was negotiated in December 2015 at the 21st Conference of the Parties of the UNFCCC, and as of May 2018 195 UNFCCC members have signed the agreement. The Agreement has the long-term goal of keeping the increase in global average temperature to well below 2°C above pre-industrial levels; and to aim to limit the

[3] https://report.ipcc.ch/ar6wg2/pdf/IPCC_AR6_WGII_SummaryForPolicymakers.pdf
[4] https://report.ipcc.ch/ar6wg2/pdf/IPCC_AR6_WGII_FinalDraft_FullReport.pdf

increase to 1.5°C, since this would significantly reduce the risks and impacts of climate change.

3.3.16 In 2018 the IPCC produced a special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways.

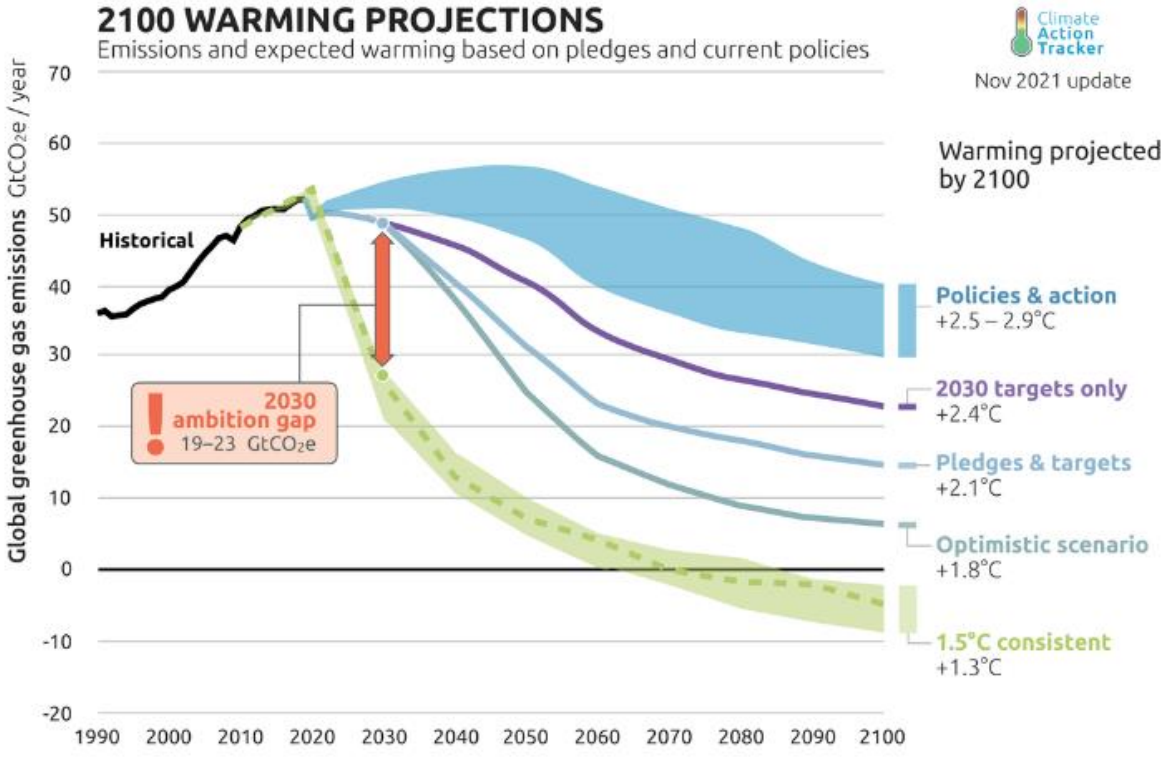
3.3.17 The report concluded that pathways limiting global warming to 1.5°C with no or limited overshoot would require rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings), and industrial systems. These system transitions are unprecedented in terms of scale, but not necessarily in terms of speed, and imply deep emissions reductions in all sectors, a wide portfolio of mitigation options and a significant upscaling of investments in those options.

3.3.18 Estimates of the global emissions outcome of current nationally stated mitigation ambitions as submitted under the Paris Agreement would lead to global greenhouse gas emissions in 2030 of 52–58 $GtCO_2eq\ yr^{-1}$. Pathways reflecting these ambitions would not limit global warming to 1.5°C, even if supplemented by very challenging increases in the scale and ambition of emissions reductions after 2030. Avoiding overshoot and reliance on future large-scale deployment of carbon dioxide removal can only be achieved if global CO_2 emissions start to decline well before 2030.

3.3.19 According to the Climate Action Tracker current policies presently in place around the world are projected to result in about 2.7°C warming above pre-industrial levels.[5]

[5] https://climateactiontracker.org/global/temperatures/ (2.7°C is the median of the low and high ends of current policy projections (2.0 to 3.6°C).)

Plate 3.2 – Global warming projections based on policy scenarios



3.3.20 The UN Climate Change Conference (COP26), the latest round of climate talks that took place in Glasgow was a defining moment. Renewing targets for 2030 that align with limiting warming to 1.5 degrees Celsius and an agreement on accelerating the phase-out of coal were not realised.

3.3.21 "Climate change is no longer a future problem. It is a now problem," said Inger Andersen, Executive Director of the United Nations Environmental Programme (UNEP). "To stand a chance of limiting global warming to 1.5°C, we have eight years to almost halve greenhouse gas emissions: eight years to make the plans, put in place the policies, implement them and ultimately deliver the cuts. The clock is ticking loudly."[6]

3.3.22 In response to the latest IPCC climate change report on the 28th February 2022, the sixth assessment from working group 2, Madeleine Diouf Sarr, the chair of the Least Developed Countries at the UN climate talks, said: "I read this report with a great deal of fear and sadness, but not surprise. It's very clear to us that no amount of adaptation can compensate for failing to limit warming to 1.5C."

3.3.23 Former Executive Secretary of the UN Framework on Climate Change Christiana Figueres: "IPCC reports are like alarm bells for the climate crisis. This latest report is a sobering reminder that our global failure to cut emissions is leading to devastating health,

[6] https://www.unep.org/news-and-stories/press-release/updated-climate-commitments-ahead-cop26-summit-fall-far-short-net

economic, and social impacts around the world. But the report is also a reminder that we have the power to change this. We can prevent and protect ourselves from extreme weather events, famines, health problems and more by cutting emissions and investing in adaptation strategies. The science and the solutions are clear. It's up to us how we shape the future."

3.3.24 WWF Scotland's climate and energy policy manager Fabrice Leveque: "There is no sugar coating the fact that this report is a difficult read, but it's vital we use it as a rallying cry, as preventing every fraction of a degree of warming really matters. The recent storms that have battered Scotland, and the rest of the UK, are a warning of what may be in store if we fail to play our part in limiting global temperature rises to 1.5C.

The UK Policy Context

3.3.25 In order to achieve its commitments, the UK Government has included renewable energy within its policy framework and has put in place certain market mechanisms to encourage growth of electricity generated from renewable sources.

3.3.26 The UK Climate Change Programme in 2006 set out the policies and priorities for action in the UK and internationally and was designed to deliver the UK's Kyoto Protocol target of reducing emissions. The Programme set a target of a 60% reduction in CO_2 emissions by 2050. The Climate Change Act in 2008 increased the target to 80% by 2050, and by at least 34% in the period of 2018 to 2022. The Climate Change Act made the UK the first country in the world to adopt a long-term legal framework for reducing emissions.

3.3.27 In 2019 the Government amended the Climate Change Act to commit the UK to achieving net zero by 2050.

3.3.28 Following the Ten Point Plan for a green industrial revolution published in November 2020 the government has also published additional sector strategies that have set out to deliver on our ambition. The Energy White Paper, Transport Decarbonisation Plan, Hydrogen Strategy[7], and Industrial Decarbonisation Strategy. The UK government's Net Zero Strategy published in October 2021, presents an economy-wide perspective on the route to net zero. This strategy states that by 2035 the UK will be powered entirely by clean electricity, subject to security of supply, moving to a fully decarbonised power system whilst meeting a 40-60% increase in demand.

3.3.29 The government has introduced some policy initiatives to meet net zero, but the Climate Change Committee has said the UK is currently not on track to meet its carbon budget targets in 2025 and 2030. The 6th Carbon Budget[8] published in December 2020, requires a

[7] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1033990/net-zero-strategy-beis.pdf

[8] https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf

78% reduction in UK territorial emissions between 1990 and 2035. In effect, bringing forward the UK's previous 80% target by nearly 15 years.

Scottish Policy Context

3.3.30 In direct response to the UN Paris Agreement, Scotland's landmark Climate Change (Scotland) Act 2009 set the standard for the most ambitious legislative framework in the world.

3.3.31 The Climate Change (Scotland) Act 2009 was amended by the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 increasing the ambition of emission reduction targets, to net zero by 2045 including revising interim and annual emission reduction targets.

3.3.32 The Scottish Government has produced an Update to the Climate Change Plan published in December 2020. Entitled "Securing a green recovery on a path to net zero: climate change plan 2018–2032," which sets new ambitious targets to end Scotland's contribution to climate change by 2045. The Scottish Government has committed to reduce emissions by 75% by 2030 (compared with 1990) and to net zero by 2045.

3.3.33 Scotland continues to lead the way and is determined to play its part in the global effort to tackle harmful climate change.

Local Policy Context

3.3.34 The Net Zero Perth and Kinross Interim Climate Emergency Action plan was released in December 2019[9]. Within this document it highlights that the need to address climate change is already embedded in many Council plans and strategies. Our main strategic documents, the Community Plan, the Corporate Plan and our Local Development Plan all set out our aspirations to address climate change by reducing our emissions and by making our area more resilient towards the impacts of climate change.

3.3.35 Across Perth and Kinross, there is a continued reduction in both total CO_2 emissions and per capita (per person) CO_2 emissions. This follows a trend across Scotland, although per capita emissions in Perth and Kinross remain consistently higher than the average across Scotland.

3.3.36 The Council is working with agencies and industry to develop flagship projects to support clean growth and achieve net zero carbon emissions. We envision Aviva's transition to net zero on the Perth site being an exemplar for the region.

3.3.37 The Perth City Leadership Forum, supported by Perth and Kinross Council and Perthshire Chamber of Commerce are currently exploring what it would take to make Perth the most sustainable small city in Europe.

[9] https://data.climateemergency.uk/media/data/plans/perth-and-kinross-council-03b448d.pdf

3.3.38 A virtual conference held in November and December 2021 brought together leading examples across Europe to inspire and inform Perth Leader vision. Major employers, local businesses, community groups, local organisations and our Local Authority were joined by international guests and national partners to develop practical solutions to realise the area's ambition to see Perth become the most sustainable small city in Europe as we work towards the implementation of the Perth City Plan.

3.3.39 As a leading major employer in Perth, Aviva supports the Perth City Leadership Forum and would like to see the wind turbine development play a key part of Perth's transition to the most sustainable small city in Europe.

3.4 How the Proposed Development Contributes to Meeting the Need

3.4.1 Aviva is committed to 'act now on climate change' and significantly reduce their carbon footprint. As part of their work to deliver on this commitment they want to develop their own Aviva wind turbine, on land adjacent to their flagship Scottish property in Perth, which has one of the largest carbon footprints of buildings in the Aviva estate.

3.4.2 Aviva's commitment to our environment is a key strategic priority. As such, they have set the challenging target for their own operations and supply chain to be Net Zero by 2030. This includes all their occupied UK property.

3.4.3 Significant investment has already been made at their Perth site to reduce electricity consumption through several energy conservation projects including:

- Converting all (100%) lighting systems to LED;
- Retrofitting VSDs (Variable Speed Drives) to all motors, pumps, and fans;
- A comprehensive Smart building optimisation programme;
- A 1.1MW solar carport, 1.8MW energy storage battery, 50 electric vehicle parking spaces;
- 0.1 MW solar panels on the roof of the building.

3.4.4 Despite their ambitious solar developments only 27% of the site's electricity load is provided by renewable generation through the above projects.

3.4.5 Without significant technology advancements, additional energy efficiency measures will only make small contributions to overall energy conservation savings.

3.4.6 The installation of a 1MW wind turbine will supply over 75% of the site's electricity load. Combined with the existing solar development and on-site energy conservation measures it will bring the site to Net Zero, in terms of current electricity demand.

3.4.7 Aviva's journey to Net Zero on the Perth site, is illustrated further in **Appendix 3.1, Volume 4.**

Energy Efficiency of the Aviva Perth Listed Building

3.4.8 Although Aviva are incredibly proud of their listed building, the evolution of smart working following the Covid pandemic has resulted in 50% of the open plan office space at Perth being vacated. The present disproportionally high running costs makes returning the building to full occupancy, in its present general configuration, problematic.

3.4.9 Perth is currently one of Aviva's highest energy consuming offices globally and one of the most inefficient in terms of energy intensity (kWh/Sqm) rating. In this context it is a costly and challenging building. However, as a site of some historic significance, Perth is considered to provide a significant opportunity to create an exemplar site for what can be achieved through positive action regarding climate change, for the Aviva Group worldwide.

Table 3.1: Aviva Building Energy Use Comparison

		Available Industry Benchmarks		
Site Name	**Gas & Elec Energy Use Intensity (kWh/m2/time)**	**REEB Benchmark (kWh/m2/time)**	**CIBSE Benchmark (kWh/m2/time)**	**GBC NetZero guide Benchmark (kWh/m2/time)**
Site 1	183	326	215	70
Site 2	186	326	215	70
Site 3	188	326	215	70
Site 4	207	326	215	70
Site 5	216	326	215	70
Perth 2023 Forecast with onsite renewables	223	326	215	70
Site 6	226	326	215	70
Site 7	283	326	215	70
Site 8	285	326	215	70
Site 9	337	326	215	70
Site 10	360	326	215	70
Perth	**450**	**326**	**215**	**70**
Site 11	466	326	215	70
Perth 2017 (pre LED, Smart building optimisation)	543	326	215	70

3.4.10 Whilst significant improvement has been made with the introduction of solar panels at the Perth site, the site still has an energy intensity use 45% greater than any other building in the estate which clearly shows the challenge Aviva face with operation of this building. This effectively means that the energy costs Aviva incur in Perth, are 45% more per sqm than other buildings in their estate. Whilst Aviva are proud of their listed building,

the design features for which it is celebrated, such as high ceilings and terraced garden/soil rooftops do lead to heat loss and create inefficiencies.

3.4.11 Over the next few years, Aviva are seeking to refocus their operational property portfolio to align with their ESG agenda and buildings which cannot meet that criterion have questionable longevity. The current energy usage at Perth, presents an operational challenge for Aviva from a cost perspective, particularly considering current global instability and fluctuation in energy prices. The turbine will future proof running costs by stabilising energy prices. The turbine will also enable Aviva's staff and visitors to use cost effective and green supply EV charge points and allows investment in removing gas from the site.

3.4.12 A wind turbine is the only renewable energy technology that can deliver the amount of electricity required, on the land available, for Aviva to reach 100% on-site generated renewable electricity in the Pitheavlis office. In this respect the addition of a wind turbine would change the Perth site from being the worst performing building in terms of energy use intensity by a long way to one of the better performing buildings in the estate, substantially improving the prospects for the long-term future use of the building in its current configuration and will help to encourage new businesses to locate their offices in Perth.

3.4.13 The proposed conversion to 100% self-generated renewable energy will future proof the viability of the present general layout of the building and from a built heritage standpoint, this will substantially reduce the risk of commercial pressure forcing major alterations to the existing floorplates.

3.4.14 Aviva cannot continue to operate the Perth building at 50% occupation therefore they are keen to attract new like-minded occupiers to lease out vacated space. For Aviva to be successful in attracting new businesses to Perth they will need to demonstrate that the Perth site is a low carbon and a cost-effective location.

3.4.15 Conversion of the Perth site to 100% self-generated renewable energy will substantially improve the prospects for the long-term future use of the building in its current configuration and encourage new businesses to locate their offices in Perth. The building is now 50% vacant and onsite energy generation will improve attractiveness to new tenants to share the space available. The ESG agenda is a significant focus for potential occupiers. Current enquiries for the vacant space at Pitheavlis are on the whole from organisations who recognise what has already been achieved on the site and the potential for further diversification via a wind turbine to be erected in the future.

3.4.16 The wind turbine will make the site an exemplar within the Aviva portfolio and can be used as a showcase by Perth and Kinross Council to help demonstrate the area's commitment to green energy. This will support PKC's ambition to be Europe's first net zero small city.

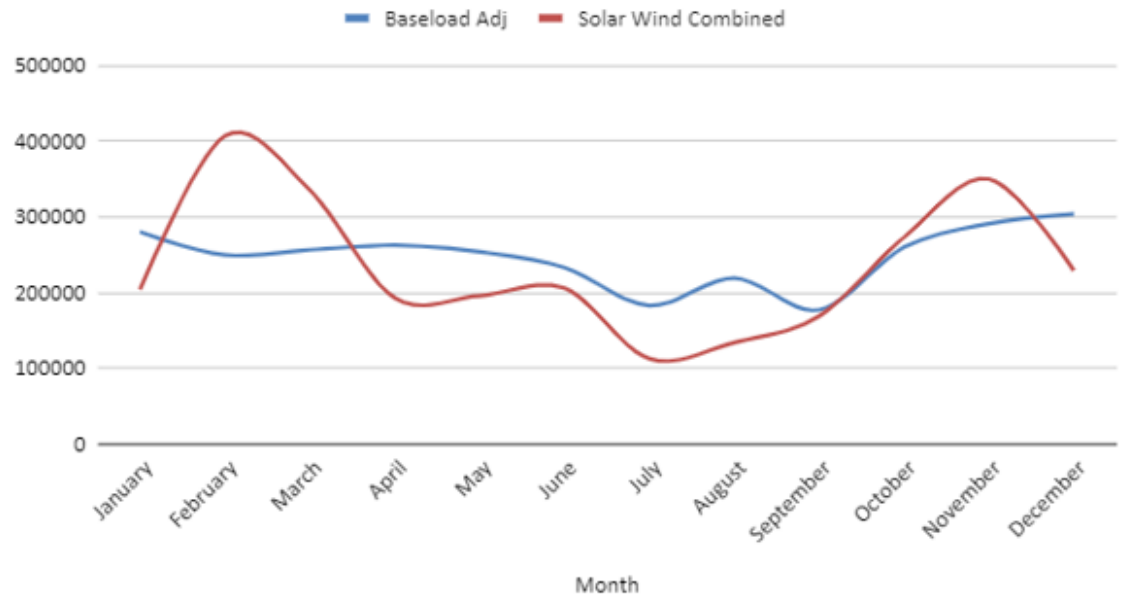
Electricity Production

3.4.17 Installation of the proposed wind turbine would provide up to an additional 1MW of installed renewable capacity into the country depending on the model of wind turbine selected. Assuming the turbine would be running at a "capacity factor" of 0.266, the proposed Aviva turbine would generate circa 2330 MWh per year.

3.4.18 Wind turbines do not generate at a constant rate as they are dependent on weather conditions therefore there will naturally be a greater generation in the winter months. The predicted energy supply has been modelled based on MERRA2 and actual wind data for 2021.

3.4.19 The 2021 baseload figures for the Perth site showed an annual electricity usage of approximately 2 million kilowatt hours. This is however an atypical usage pattern due to the covid pandemic. During 2021 a significant number of staff were encouraged to work from home, therefore reducing the electricity demand placed on the site. It is therefore expected that there will be an increase in baseload back to pre-covid levels as people return to work. This figure is expected to be circa 3 million kilowatt hours, 50% higher than the 2021 baseload figures, however less than actual figures for 2019 due to energy efficiency improvements. The Aviva Perth site baseload and combines wind and solar generation for 2021 is shown graphically below.

Plate 3.3: Aviva Perth Energy Generation and Demand (2021)



3.4.20 In 2021, 50 EV Chargers were installed as part of the solar carport development. Due to the covid pandemic and encouragement of staff to work from home these charge points are currently not in constant use. It is anticipated that from 2023 there will be a significant

increase in the use of these EV charge points placing greater demand on the site's electricity baseload.

3.4.21 The Aviva site uses a significant amount of gas, circa 6.4 million kilowatt hours per annum. Aviva are currently investing heavily in the upgrade of the heating system, replacing the large inefficient boilers with electric heat pumps and smaller higher efficiency boilers. This is a major step forward in the decarbonisation of the Perth site, however will place a greater demand on the electricity system. Further details on Economic Energy Benchmarking can be found in **Appendix 3.2, Volume 4.**

3.4.22 The proposed turbine alone would offset 589 tonnes of additional atmospheric carbon dioxide, 3.2 tonnes of nitrous oxide and 1.6 tonnes of methane each year and it would generate as much electricity as is used by approximately 600 local homes. The equations used to calculate the number of households supplied and the amount of greenhouse gas emissions reduced is detailed in **Appendix 3.3, Volume 4.**

3.4.23 It is estimated that carbon dioxide emissions from power stations accounted for a quarter of the UK's total carbon dioxide emissions as of the end of 2016[10]. For a given level of national electricity demand, every kilowatt hour produced from a non-polluting source, such as a wind turbine, replaces one produced by a fossil fuel power station.

3.4.24 Wind energy has been recognised as being the most technologically advanced, cost effective, direct and readily available means of cutting down on such emissions.

Carbon Footprint

3.4.25 A 'carbon footprint' is the total amount of CO_2 and other greenhouse gases, emitted over the full lifecycle of a process or product.

3.4.26 Although electricity generated from wind does not require fossil fuel combustion, wind turbines and their associated connections still require significant quantities of steel, copper, aluminium, and other rarer metals, in addition to concrete for wind turbine foundations and fibreglass and resins for the blades. Processing and manufacturing these materials require energy, which contributes to greenhouse gas emissions, not to mention the requirement to physically extract the necessary mineral resources used in the manufacture of these component materials. Although its material requirements are significant, wind power is still one of the best-performing energy technologies from an environmental perspective, with lifetime greenhouse gas emissions just 5–10% of those from fossil fuels. Further information on Life Cycle Assessment of wind turbines can be found in **Appendix 3.3, Volume 4.**

10 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/679334/2016_Final_Emissions_Statistics_one_page_summary.pdf

Energy Balance

3.4.27 The energy balance is an assessment of the relationship between the energy consumption of the product and the energy production throughout the lifetime. It is calculated that the energy input required to manufacture and erect a wind turbine would be recovered from its output in between approximately 6.8 to 9 months for a modern multi-MW class wind turbine[11]. Modern, larger turbines (>1 MW) typically employed in wind farms today will 'pay back' the energy invested in less than a year, in some cases in less than six months. Over the remainder of its 20 to 25-year lifespan, the wind turbine will continue to return useful surplus energy in the form of electricity back to society.[12]

Reduction of Transmission Losses

3.4.28 Electricity generated by the proposed wind turbine will be integrated into the Aviva electricity infrastructure and any surplus electricity fed into the local electricity distribution network. As a result, the electricity would primarily be consumed closer to where it is generated rather than being transmitted long distances within the national grid.

3.4.29 As a local provider of electricity, a wind turbine of the scale proposed at Aviva will make a significant contribution to reducing losses associated with transmitting and distributing electricity across the country from large centralised power generation plants.

3.4.30 In 2016 Digest of Energy Statistics, it states that losses as a proportion of electricity demand in 2016 were at 7.4 percent and that transmission losses from the high voltage transmission system account for about 28% of the losses. Embedded generators such as this proposal generally avoid the high voltage transmission losses associated with traditional generation.

Security of Supply

3.4.31 Security of supply requires that sufficient fuel and infrastructure capacity is available to avoid socially unacceptable levels of interruption to physical supply and excessive costs to the economy from unexpectedly high or volatile prices.

3.4.32 The UK is becoming increasingly dependent on imported fuels to meet demand as our own fossil fuel reserves decline. The UK became a net importer of gas in 2004, a net importer of oil in 2005 and a net importer of petroleum in 2013. Recently there have been declines in gas demand for electricity generation, industry and services as large parts of the economy shutdown in line with government Covid restrictions. Net imports fell 12 per cent in 2019, in line with reduced demand. Despite this, a growing Liquefied Natural Gas (LNG) market saw another record year for LNG imports, which reached the highest level since the peak in 2011. Global liquefaction capacity has increased consecutively for the last six years, and

[11] Vestas 2005
[12] https://www.cse.org.uk/downloads/reports-and-publications/planning/renewables/common_concerns_about_wind_power.pdf

notably UK imports from the US were up by more than 70 per cent compared to 2019 as the US shale revolution continues to take hold.[13]

3.4.33 Whilst imports are not in themselves a threat to security of supply, our reliance on fossil fuels and higher levels of import dependence will bring new associated risks, as the UK will face greater exposure to developments in the global energy system. Global oil and gas reserves are concentrated in relatively few locations around the world. Often in less politically stable areas. Our dependence on these resources may be taken advantage of by unstable fossil fuel rich nations, threatening global security and prosperity.

3.4.34 Wind energy development is required to play a key role in achieving energy security within the UK. Wind power is a safe, carbon neutral, indigenous energy resource that is well placed to fill the electricity gap as we move to a low carbon economy. Increasing levels of renewable generation will remove the need to replace existing plants like for like, such as coal fired generation capacity and reduce the dependency on imported energy sources.

Socio-economic Benefits

3.4.35 Aviva pride themselves in being an important part of the community in which they operate and take responsibilities towards that community very seriously. The company also considers itself an important part of the economic wellbeing of the area, both as a major employer, directly employing around 1200 staff, and through local sourcing of goods and services through the supply chain.

3.4.36 The continuing strength of the company relies upon its ability to adapt to market demands, develop new products and improve operating efficiency. Its credentials as a forward looking green and socially responsible company have helped it to maintain market share as more consumers become environmentally aware, and factor this into their decision-making process. It is essential that Aviva continues to lead the way in this area in the face of increasing competition.

3.4.37 Aviva takes climate change very seriously, it's impact on air quality, weather events and flooding, and its impact on people. Aviva wants to do all they can to try to reduce global greenhouse gas emissions. Aviva began purchasing electricity from renewable sources for their UK estates in 2004 and they have reduced their worldwide carbon emissions by 53% since 2010. Aviva strongly believes that where it is feasible to produce green energy on their own site, they should be reinvesting to make the business as economically and environmentally sustainable as possible for the future.

13

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1006628/DUKES_2021_Chapter_4_Natural_gas.pdf

3.4.38 The reduction and stabilisation of Aviva's energy spend in Perth will not only directly benefit Aviva but will also benefit the local community through the ongoing support and investment Aviva are able to provide.

3.4.39 Aviva has already established a community fund which allows people to vote to fund projects which can make a difference in local communities. Organisations and charities in the Perth and Kinross Area have already benefited from this fund. In line with Aviva's existing commitment, they proposed to extend/create an additional community fund which is linked to the operation of the wind turbine. This community fund will equate to a minimum of £5,000 per annum for the lifetime of the proposed development.

3.5 Summary and Conclusions

3.5.1 The imperative for the installation of the proposed wind turbine at Aviva, Perth is twofold:

- To create an exemplar for Aviva's global aspirations to achieve operational net zero carbon status across their entire estate, by 2030.
- To reduce the running costs of the building to future proof the viability of the present general configuration of the building.

3.5.2 Perth is currently one of Aviva's highest energy consuming offices globally and one of the most inefficient in terms of energy intensity (kWh/Sqm) rating. In this context it is a costly and challenging building. However, as a site of some historic significance, Perth is considered to provide a significant opportunity to create an exemplar site for what can be achieved through positive action regarding climate change, for the Aviva Group worldwide.

3.5.3 Aviva's commitment to the environment is a key strategic priority. As such, they have set the challenging target for their own operations and supply chain to be Net Zero by 2030. This includes all their occupied UK property.

3.5.4 The installation of a 1MW wind turbine will supply over 75% of the site's electricity load. Combined with the existing solar development and on-site energy conservation measures it will bring the site to Net Zero, in terms of current electricity demand.

3.5.5 The wind turbine will make the site an exemplar within the Aviva portfolio and can be used as a showcase by Perth and Kinross Council, to help demonstrate the area's commitment to green energy. This will support Perth and Kinross Councils ambition to be Europe's first net zero small city.

4. Planning the Development

4.1 Introduction

4.1.1 The selection and design of a wind energy site is an important component of a renewable energy development. Purple Renewables applies a stringent site selection process involving reference to national and regional/local development plan policy provisions as well as a range of environmental and technical considerations.

4.2 Site Selection

4.2.1 Aviva approached Purple Renewables in 2016 to assess the feasibility of wind turbines on their UK owned sites to provide electricity directly to their facilities. On the basis of a feasibility report, Aviva decided to proceed with developing a wind turbine at their Perth site.

4.2.2 The original feasibility assessment and selection of Perth as a suitable site which formed the basis of the 2018 planning submission has considered the following aspects, which remain appropriate for the revised planning submission:

- Suitable separation distances from international designations (Ramsar sites, Special Protection Areas, Special Areas of Conservation);
- Suitable separation distances from national designations (Sites of special Scientific Interest, National Parks, National Scenic Areas);
- Suitable separation distances from important tourist destinations and Scheduled Monuments.
- Suitable separation distances from World Heritage sites.
- Suitable separation distances from residential properties
- Suitable separation distances from aviation interests (Civil and Military)
- Ability to integrate into the existing electrical grid network
- Availability of wind resources.

4.2.3 The original 2018 planning submission was restricted by Aviva's land availability. Aviva is in advanced discussions with the land owner to secure the land under a leasehold interest, increasing the land assessment area, see section 4.6 Design Evolution for further information. Alternative locations suitable for wind energy development outside the land holding has been undertaken, however restricted to within 500m of the site to allow for a direct grid connection.

4.2.4 Aviva is committed to 'act now on climate change' and significantly reduce their carbon footprint. Aviva's commitment to our environment is a key strategic priority. As such

Aviva has set the challenging target for all their own operations and supply chain to be Net Zero by 2030. This includes all occupied UK property.

4.2.5 Significant investment has already been made at the Perth site to reduce electricity consumption through several energy conservation projects including:

- Converting all (100%) lighting systems to LED
- Retrofitting VSDs (Variable Speed Drives) to all motors, pumps and fans
- A comprehensive Smart building optimisation programme

4.2.6 Aviva will continue to implement energy saving technology when appropriate and available however without large advances in technology development, energy saving gains will be minor compared with the overall site energy baseload.

4.2.7 Significant investment has been made at the Perth site to produce electricity from renewable energy technologies including:

- 0.1MW solar panels on the roof of the building
- 1.1MW solar carport which has a 1.8MWh energy storage battery

4.2.8 Despite these impressive energy reduction and generation projects currently only 27% of Aviva's electricity demand is met from renewable sources.

4.2.9 To generate 100% of Aviva's electricity demand a number of renewable technologies were considered. Taking into account the required electricity output to meet the need, the available space, characteristics of the site i.e., wind/solar resource and several other technical and commercial considerations, on-site wind energy was deemed to be the most suitable renewable technology to meet the need of achieving Net Zero on this site. **Appendix 4.1, Volume 4** provides details of alternative technologies considered.

4.2.10 It is considered that buying renewable electricity via the grid will not ensure that the site is supplied by renewable energy. It is not technically possible to supply renewable energy to the site unless you have a direct connection from a renewable energy generator. With electricity delivered from the grid it is not possible to direct "renewable electrons" to some businesses and "non-renewable electrons" to others. There is a higher demand for renewable energy on the network than there is a supply leading to incidents of purchasing surplus renewable energy generation certificates (REGOs) and greenwashing. Where it is technically and environmentally possible to develop renewable generation for on-site consumption there is responsibility to do this, otherwise the transition to Net Zero nationally will never be achieved.

4.2.11 The installation of a single 1MW wind turbine could potentially provide enough electricity to power over 75% of Aviva's current electricity demand with wind, taking the site to Net Zero in combination with existing solar and battery storage. Wind energy is the only technology that can provide the level of renewable energy generation required to reach net zero on the Perth site. For further information on Aviva Perth's Zero Carbon Journey

please see **Figure 3.1, Volume 3** and **Appendix 3.1, Volume 4** - Making Aviva Perth an Energy Independent and Zero Carbon Location.

4.3 Site Design

4.3.1 The individual turbine location was informed by technical and environmental requirements. In accordance with EIA regulations the main design alternatives have to be studied with key reasoning, taking into account the potential environmental effects. The proposed development at Aviva has been considered a suitable site for wind energy development because it has met the following criteria:

Technical requirements

4.3.2 Technical requirements which influence wind turbine siting are as follows;

4.3.3 **Land Availability** - the turbine should be placed as not to over-sail adjacent land holdings.

4.3.4 **Site Access** - should utilise existing roads where possible in order to minimise the need to build new roads.

4.3.5 **Wind Resource** – the site should have a high annual wind speed across the proposed development site.

4.3.6 **Grid Connection** – the site should have an available grid connection in close proximity to the development site.

Environmental Requirements

4.3.7 In addition to the technical parameters of wind turbine development, the following environmental requirements influence directly on the site design, these were identified and considered during the development of the project;

4.3.8 **Separation from Dwellings** - the turbine should be located so that no dwelling could experience noise nuisance. Noise considerations are discussed in further detail in Chapter 10 which follows the methodology outlined in ETSU-R-97. The turbine should also be a sufficient distance away from dwellings to prevent them being visually overbearing, this is discussed in Chapter 5.

4.3.9 **Archaeology and Heritage** - the turbine should not significantly impact any sites of archaeology or heritage significance, nor significantly affect the setting of such sites. Where it is practicably possible Historic Environment Scotland's methodology of avoid, reduce and offset is followed. The cultural heritage assessment for this project is contained within Chapter 6 of this volume.

4.3.10 **Ecology** - the turbine should be located so that it does not significantly impact upon species or habitats that may occur in close proximity to the site or further afield for species

such as birds or bats. The ecological assessment for the project is contained within Chapter 7 of this volume.

4.3.11 **Infrastructure** - the turbine layout should be such that it does not interfere with the operation of aviation organisations and regulators such as the Ministry of Defence (MoD), National Air Traffic Service (NATS) and regional or local airports. Careful consideration needs to be given regarding interference with telecommunication links and television reception. Infrastructure issues are discussed in Chapter 11 of this volume.

4.3.12 Further information relating to the detailed assessment of these aspects is considered in each of the technical assessments within this Environmental Statement.

4.4 Stakeholder Consultation

4.4.1 Following a number of initial feasibility studies, a full consultation exercise was undertaken to identify any remaining key issues of potential concern. The following statutory and non-statutory consultees were approached for information and guidance regarding the proposal:

- Perth and Kinross Council
- Arqiva
- Atkins
- British Telecom (BT)
- Ericsson
- Historic Environment Scotland (HES)
- Joint Radio Company (JRC)
- Ministry of Defence (MoD)
- National Air Traffic Services (NATS) En Route
- NatureScot
- Police Scotland
- Scottish and Southern Electricity (SSE)
- Scottish Environmental Protection Agency (SEPA)
- Scottish Gas Networks (SGN)
- Scottish Water
- Telefonica / Virgin Media
- Transport Scotland
- Vodafone

4.4.2 Further details on the content of the responses are included in each of the subsequent technical assessments.

4.4.3 It should be noted, that in some cases, consultees are unable to provide any guidance, until a formal planning application has been submitted.

4.5 Public Consultation

Introduction

4.5.1 The approach to public consultation for this development has been guided by planning officers at Perth and Kinross Council and the current operational covid environment. Although this development is below the 20MW limit for formal pre-application consultation Purple Renewables and Aviva have exceeded the minimum consultation requirements set out for considerably larger scale developments.

4.5.2 Scottish Government Covid-19 Guidance: planning guidance on pre-application consultation for public events identifies that it is not currently possible to hold public meetings without unacceptably posing a significant risk to public health. Alternative to public events is encouraged to enable an exchange of views[14].

Public Consultation Website

4.5.3 The www.aviva-renewables.co.uk website was launched in July 2018 to provide a source of information about the proposed development. This website has been maintained through the course of the project and updated periodically to reflect current progress.

4.5.4 The website provides information about the proposed development, Aviva and the developer Purple Renewables. There are sections which provide information on the facts and figures, such as turbine height and number etc along with information about the benefits of wind energy in general and specifically for this proposed development.

4.5.5 There is a section which explains Aviva Perth's energy journey and highlights the motivations for the project. There is a section which shows the location of the proposed turbine and predicted photomontages from around the local area.

4.5.6 The Have Your Say section is an area where we are able to provide information on questions raised by members of the public. The website provided a "contact us" form should anybody viewing the website wish to ask further questions.

4.5.7 Extracts from the Aviva Renewables website are displayed in **Appendix 4.2, Volume 4**.

4.5.8 Over a month period from 16th January to 14th February 2022 there were 534 unique visitors to the Aviva Renewables website. The peak activity was the week before the virtual exhibition 25th to the 31st January with website traffic peaking on the day of the

[14] https://www.gov.scot/publications/coronavirus-covid-19-planning-guidance-on-pre-application-consultations-for-public-events/

virtual exhibition the 31st January 2022. Website statistics can be found in **Appendix 4.6, Volume 4.**

Media Coverage

4.5.9 An article was placed in the Perth Courier on Monday the 24th January 2022 inviting people to visit the Open Day and or the Aviva Renewables Website. A copy of the press advert is included in **Appendix 4.3, Volume 4**.

4.5.10 The developer Purple Renewables created an event for the Open Day on the social media platform Facebook. Two Facebook campaigns were undertaken reaching over 8549 and 8606 respectively, targeted to people in the Perth area. The event generated 253 and 170 clicks and was shared and commented on by a number of people. A copy of the Facebook Event is included in **Appendix 4.3, Volume** 4 and statistics can be found in **Appendix 4.6, Volume 4.**

Aviva Wind Turbine Virtual Event

4.5.11 A live online virtual exhibition introducing the proposed development for a wind turbine at Aviva was held on the 31st January from 3pm until 7pm online, hosted by the Hopin platform. The virtual exhibition allowed members of the public and staff at the Aviva site to view plans and predicted photomontage views of the proposed development. Staff from both Purple Renewables and Aviva were available to answer any questions regarding the proposed development via live chat. Attendees were encouraged to fill out a survey recording their views about the proposed development. A copy of the material from the virtual event is included in **Appendix 4.4 and 4.5, Volume 4**.

4.5.12 25 external guests were registered to have visited the virtual event, peaking at 40 users. We had a 92% turnout rate which is 15% above the industry average for a Hopin event of this type. Statistics for the Hopin event are detailed in **Appendix 4.6, Volume 4**.

4.5.13 The results showed overwhelmingly that Aviva is well known with the Perth Community, with 100% respondents having prior knowledge of Aviva before the Virtual Exhibition. Of the persons that returned a survey 92% noted that they had prior knowledge of the proposal via a local press advert, social media or word of mouth.

4.5.14 The majority of people, 54% that responded to the survey, believe that onshore wind energy should play an important part of the fuel energy mix. 15% were undecided and 30% felt onshore wind should not play a significant part in helping reach the Scottish government's target of 100% of the country's energy from renewable sources. Feedback that people gave from the survey results are:

"Sufficient offshore power is available to be exploited"- Strongly Opposed

"I think it should play a localised contribution alongside solar. I think offshore wind and tidal should be the significant energy sources. I think local generation is an important part of local energy grids." – Strongly Supportive

4.5.15 8 people surveyed were either strongly or reasonably supportive of the proposals. For people who are supportive of the proposal, clean energy for future generations was sighted as the main benefit, identified 7 times. Supporting the low carbon growth of a local business was also sighted as a key benefit to the proposed development. The 5 people surveyed that registered as being somewhat opposed or strongly opposed cited visual impact and noise as their main concerns.

4.5.16 Help to reduce environmental problems in Perth and Help reduce fuel poverty in Perth were both popular options for the community trust fund. People who were strongly supportive of the proposal tended to support an environmental based trust fund whereas people who were opposed to the proposal tended to support measures to reduce fuel poverty.

4.5.17 The survey responses showed that social media was the most popular method of communicating the event, followed by the local press advert and word of mouth.

4.5.18 There were fewer survey results collected than the previous application primarily due to the location of the event being online only. It is believed that the information reached a wider audience given the social media, Hopin and website statistics, however very few people (13) chose to fill out a survey questionnaire.

4.6 Design Evolution

4.6.1 All of the above factors, environmental and technical requirements of the wind turbine along with feedback received from consultees and the public consultation exercise, were analysed in relation to each element of the proposed wind turbine development. This led to a process of design development.

4.6.2 Aviva's commitment to our environment is a key strategic priority. As such, they have set the challenging target for their own operations and supply chain to be Net Zero by 2030. The site is currently supplied by 27% renewable on-site generation from solar installations. Aviva would like to make their Perth site the exemplar site for the group worldwide.

4.6.3 **Design 1** represents the original technically based desktop design for the site. The initial design consisted of one wind turbine up to 80 m in height. The height was limited due to the proximity of the M90 motorway and nearby residential dwellings.

4.6.4 **Design 2** resulted in a slight relocation of the turbine position, to place the turbine away from the centre of the road into an area currently used for car parking. There was a slight

reduction in height of the turbine due to the size of the candidate turbines currently available. This design was submitted to Perth and Kinross Council for Planning in September 2018.

4.6.5 Following planning refusal of Design 2, predominantly due to the proximity to the listed building a search of neighbouring land was undertaken for suitability of wind energy development.

4.6.6 **Design 3** is located on land south east of the Aviva building beyond the sports centre complex within a disused field. The revised turbine location introduces a 200m separation buffer from the listed building mitigating setting issue raised by HES in the previous planning submission. The location of the turbine allows for a simple grid connection to the site's existing services and continues to be close enough to be viewed as within the Aviva site.

4.6.7 The design evolution of the site is illustrated in, **Figure 4.1, Volume 3**.

4.6.8 It should be noted that the constraints limit the available developable area of this land holding to a small section of field adjacent to the overflow car park. It is therefore suggested that a micro-siting allowance of 30m is appropriate in this instance in a south easterly direction only (i.e., away from the building).

4.6.9 The final design is considered by Purple Renewables to be an appropriate and responsible wind turbine design where the scale and design of the proposed development effectively balance the need to utilise the wind resource to provide renewable electricity to Aviva, whilst not unduly impacting on the surrounding environment or community.

4.7 Summary and Conclusions

4.7.1 Aviva approached Purple Renewables in 2016 to assess the feasibility of wind turbines on their UK owned sites to provide electricity directly to their facilities. Planning permission was sought in 2018 for a single 77m high wind turbine within the car park adjacent to the building. Planning was refused in 2020 primarily due to the impact on the setting of the listed building. Since planning was refused in 2020, Aviva has been able to acquire rights over adjacent land, increasing the land assessment area providing a suitable buffer distance of over 200m from the building.

4.7.2 Aviva is committed to 'act now on climate change' and significantly reduce their carbon footprint. Aviva's commitment to our environment is a key strategic priority. As such Aviva has set the challenging target for all their own operations and supply chain to be Net Zero by 2030. This includes all occupied UK property.

4.7.3 Significant investment has already been made at the Perth site to reduce electricity consumption through several energy conservation projects and to produce electricity from renewable energy technologies including a 1.1MW solar development

4.7.4 Despite these impressive energy reduction and generation projects currently only 27% of Aviva's electricity demand is met from renewable sources.

4.7.5 The installation of a single 1MW wind turbine could potentially provide enough electricity to power over 75% of Aviva's current electricity demand, taking the site to Net Zero. Wind energy is the only technology that can provide the level of renewable energy generation required to reach Net Zero on this Perth site.

4.7.6 All information and consultation responses were analysed in relation to the technical, environmental and operational safety requirements of each element of the wind turbine development. This led to a process of detailed design development as the relevant factors were taken fully into account, as detailed knowledge of the site and feedback from the public was obtained.

4.7.7 The development has been designed to minimise the impact on the local environment and is considered by Purple Renewables to be an appropriate and responsible wind turbine design.

4.7.8 The final design presented in **Figure 1.3, Volume 3** has been submitted with the planning application and is assessed within this Environmental Statement.

5. Landscape and Visual Impact Assessment

5.1 Introduction

Background

5.1.1 This Chapter of the Environmental Statement (ES) has been prepared by Wood Plc and presents a Landscape and Visual Impact Assessment (LVIA)of the proposed development described at Chapter 2 of the ES.

5.1.2 The purpose of the LVIA is to evaluate the landscape and visual impacts associatedwith the proposed development, to determine the likely effects to the landscape character and visual amenity of the area.

5.1.3 The LVIA was carried out by a Chartered Landscape Architect with more than 20 years' experience of landscape and visual impact assessment including many wind turbine and wind farm projects across Scotland, England and Wales.

5.1.4 In addition to the Figures, Photoviews and Photomontages associated with this chapter, the assessment should be read in conjunction with the methodology at **Appendix 5.1, Volume 4**.

Technical Difficulties

5.1.5 There have been no overriding issues, difficulties or limitations which compromise the overall integrity of the assessment undertaken.

5.2 Methodology

5.2.1 The full methodology is contained at **Appendix 5.1**, **Volume 4.**

5.2.2 In summary, the LVIA is comprised of two separate but inter-linked components:

- Landscape character – which is the physical make up and condition of the landscape itself. Landscape character arises from a distinct, recognisable and consistent pattern of physical and social elements, aesthetic factors and perceptual aspects; and
- Visual amenity – which is the way in which the Site is seen and appreciated; viewsto and from the Site, their direction, character and sensitivity to change.

5.2.3 This chapter assesses the potential of the Proposed Development to result in Significant landscape and visual effects. It is based on a desk study and field visits to identify the key landscape and visual receptors.

5.2.4 The LVIA is conducted with regard to the principles set out in the following bestpractice guidance:

- *'Guidelines for Landscape and Visual Impact Assessment'* (GLVIA, 3rd edition) published by the Landscape Institute in 2013;
- *'Visual Representation of Wind Farms'* (Version 2.2) published by Scottish Natural Heritage (now NatureScot) in 2017;
- 'Assessing the impact of small-scale wind energy proposals on the natural heritage' (Version 3) – published by Scottish Natural Heritage (now NatureScot) in March 2016; and
- *'Siting and Designing Wind Farms in the Landscape'* (version 3a) published by Scottish Natural Heritage (now NatureScot) in August 2017.

5.2.5 The intent of the GLVIA is to present a general overview of a 'non-prescriptive' methodology for undertaking assessments or appraisals of developments*: 'It is always the primary responsibility of any landscape professional carrying out an assessment to ensure that the approach and methodology adopted are appropriateto the particular circumstances'* (GLVIA, paragraph 1.20).

5.2.6 This LVIA focuses on the landscape and visual effects that have the potential to be Significant. Paragraph 1.17 of the GLVIA states: *'judgement needs to be exercised at all stages in terms of the scale of the investigation that is appropriate and proportional'*.

5.2.7 The nature of LVIA requires both objective analysis and subjective professional judgement. Accordingly, the LVIA is prepared in accordance with the principles ofthe best practice guidance listed above, information and data analysis techniquesand subjective professional judgement where necessary and is based on clearly defined terms in line with best practice guidelines.

5.2.8 The key stages in the assessment process are summarised below.

- Identification of the aspects of the Proposed Development likely to give rise to potentially significant effects during the different stages in the life of the project (construction and operation);
- Identification of components/receptors that have the potential to be significantly affected by the development at different stages in the life of the Proposed Development;
- Description of the interaction of the receptors with aspects of the development(this will vary during the different stages in the life of the project);
- Assessment of the sensitivity of the landscape and visual receptors in relation to the identified aspects of the development;
- Assessment of the magnitude of change upon the landscape and visualreceptors, in light of the mitigation measures adopted; and
- Assessment of the significance of landscape and visual effects following construction.

5.2.9 The assessment is supported by the following figures:

- Figure 5.1 ZTV – Bare earth (25km radius)
- Figure 5.2 ZTV – Bare earth (5km radius)
- Figure 5.3 ZTV – Visual barriers (5km radius)
- Figure 5.4 Designations
- Figure 5.5 Landscape Character
- Figure 5.6 Landform
- Figure 5.7 Cumulative Location Plan
- Figures 5.8 to 5.25 Photomontage visualisations: Viewpoints 1-10, 12-17, 1A and 5A

5.3 Data Sources

5.3.1 The published Landscape Character Assessment was reviewed covering the Site and Study Area. Planning Policy was reviewed covering Scottish Planning Policy, the Local Development Plan and associated SPD.

5.3.2 A ZTV of the wider study area extends 25km from the proposed turbine (see **Figure 5.1, Volume 3**). A more focussed detailed study area extends 5km in all directions from the proposed turbine, as beyond this distance it is predicted that there would be no potential for any potentially Significant landscape and visual effects (see **Figures 5.2 and 5.3, Volume 3**). The decision on the extent of the detailed study area was tested by assessment of a range of additional visual receptors requested by consultees, including those that are more than 5km distant from the proposed turbine.

5.3.3 A broad area of search for potential viewpoint locations was carried out using specialist digital terrain modelling and analysis software which was used to calculate a Zone of Theoretical Visibility (ZTV) of the Development, based on the current landform of the Site and including the main blocks of woodland and settlements asvisual barriers.

5.4 Consultation

5.4.1 A scoping report was submitted to Perth and Kinross Council in June 2018, for the nearby wind turbine application that was refused. This report included a section covering landscape and visual issues. The section was structured under the headings of:

- Key Landscape and Visual Issues;
- Viewpoint Selection;
- Cumulative Effects;
- Potential Significant Effects;
- Issues to be Scoped Out; and
- Effects Evaluation.

5.4.2 Computer Zone of Theoretical Visibility (ZTV) plans were included in the scoping report.

5.4.3 SNH (now NatureScot) made comments on landscape and visual issues in response to the scoping request and as a result of some of their comments, the following locations were reviewed in the field and photomontages produced.

'Our advice is that at least the following VPs are also included to be more representative of views of the turbine from Perth and surrounding area;

- A94 in Scone from where the turbine would be seen on the opposite edge of the bowl in views across the city; [no views from the A94 could be found due to local tree cover, however a view from the nearby settlement edge was included as **Viewpoint 10**]
- From M90 east of Balmanno Hill where views open out above the carse to the Sidlaws and the apparently undeveloped outer bowl of Perth; [see **Viewpoint 11**], and from A90 above the Tay to the east of Friarton [no views could be found due to local tree cover, however a view near the M90 at Tarsappie was included as **Viewpoint 9**].'

We appreciate the difficulty of getting good photographs from Motorways and busy roads but in this case where the M90 and A90 offer important views into and across the city it will be essential to attempt to provide some visuals.' [as described above we have included as photomontages – **Viewpoints 9 and 10, Volume 3**. **Viewpoint 11** has been excluded from the current application as was the case for the refused application there would be no visibility of the proposed wind turbine]

- Additional feedback was received in late August 2018 from Persephone Beer of Perth and Kinross Council covering the scope of the proposed landscape and visual assessment. **Table 5.1** below sets out the key comments made and the response from Aviva.

Table 5.1: Perth and Kinross scoping response

Perth and Kinross Council comments	**Aviva response**
The design strategy for the development should explain thedesign principles and rationale for the development through a Design Statement	The LVIA Chapter covers design considerations; however there is a separate Design Statement covering why the turbine is located where it is due to a series of constraints. The rationale behind the overall size of the turbine and design considerations are covered.

SNH (now NatureScot) detailed comments andinformation on scoping landscape issues is given in Appendix 1.	This appendix has been reviewed and the additional views suggested included in this ES chapter. As stated inthis chapter, SNH rely on desktop assessment including an out of date google earth image of the site which may have influenced their opinion on the landscape setting. Asite visit including to all the representative viewpoint locations should be encouraged by all consultees involved in commenting on the ES chapter.
Visual information should be presented in a way which communicates as realistically as possible the actual visual impact of the proposal.	The visualisations and ZTV comply with the latest SNH technical guidance.
Additional viewpoints will be required. These should not berestricted to sites within 5km. (see response from SNH). Viewpoints to include A94 in Scone, M90 east of Balmanno Hill and A90 abovethe Tay to the east of Friarton.	These viewpoints have been covered in the ES.
...Also, Moredun Hill…	Not included as a visualisation but it has been assessed -noting similar range and distance to **Viewpoint 8**.
…and consideration of impacton Earn Valley – Aberdalgie, Dupplin Estate, Forteviot area…	These areas have been scoped out of detailed consideration as they lie outside the ZTV. Review of ZTV (**Figure 5.3, Volume 3**) indicates no potential for visibility, other than very limited blade only visibility from a few isolated areas of private farmland however even from these locations, a review of up-to-date aerial photography indicates that these views are likely to be fully restricted by hedgerows and local tree cover not included in the ZTV. Given that visual amenity from public receptors and would be unaffected no visualisations are justified, however should the Council still require additional viewpoints the precise locations should be clearly identified with a cross on **Figure 5.3, Volume 3**.

…Further viewpoints from within the built-up area of Perth should be included so that the full visual effects onthe city of Perth can be assessed, particularly from higher areas around the Western Edge/Oakbank, Letham/Perth College areas.	The ZTV at **Figure 5.3, Volume 3** identifies limited locations where the turbine would be available, noting that review in the field indicates that in the areas of theoretical visibility identified by the ZTV that urban tree cover frequently prevents clear views. A representative viewpoint (**Viewpoint 5**) was taken from the Cherrybank estate and illustrates clear views of the turbine. More distant views from the urban area have been assessed in the ES, however it is not clear how further, more distant visualisations, from the urban area will assist the identification of Significant effects, which is the purpose of the LVIA (as stated in best practice guidance GLVIA 3rd Edition). Should the Council still require additional viewpoints the precise locations should be clearly identified with a cross on Figure 5.3.

5.4.4 Pre-application consultation with both NatureScot and Perth and Kinross Council on the scope of the landscape and visual assessment connected to the current application occurred during December 2021 and January 2022. Within Section 5.5 Baseline conditions below, **Table 5.2** outlines the selected viewpoints that were informed by the consultation process and **Table 5.3** indicates the viewpoints that were rejected with a rationale for exclusion.

5.5 Baseline Condition

Planning Policy

5.5.1 Full details of the relevant Local Development Plan policies are set out in the Planning Statement, with the Local Development Plan Policies that are most relevant to landscape and visual matters, summarised below.

National Policy

5.5.2 Scottish Planning Policy (2014) states at paragraph 161 that 'Planning authorities should set out in the development plan a spatial framework identifying those areas that are likely to be most appropriate for onshore wind farms as a guide for developers and communities, following the approach set out below in Table 1'

5.5.3 Within Table 1, the proposed development falls into Group 2: Areas of significant protection and the description for Group 2 states:

'Recognising the need for significant protection, in these areas wind farms may be appropriate in some circumstances. Further consideration will be required to demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation'

5.5.4 Under community separation for consideration of visual impact it states:

'an area not exceeding 2km around cities, towns and villages identified on the local development plan with an identified settlement envelope or edge. The extent of the area will be determined by the planning authority based on landform and other features which restrict views out from the settlement.'

Regional Policy

5.5.5 The Tayplan Strategic Development Plan 2016-2026 was approved in October 2017. Policy 7 covering energy, waste and resources states that *'Local Development Plans should identify areas that are suitable for different forms of energy…and the policy to support this'*. The Spatial Framework for On-shore Wind Energy Proposals (Map 3b) identifies Perth as one of the settlements requiring the application of a '2km visual buffer', however the site is located on Map 7b within a Group 3 area which is described *as 'Areas with potential for wind farm development subject to consideration against detailed policy criteria including local landscape capacity studies'. Local Landscape capacity studies have been prepared as part of the adopted and emerging Wind Energy SPD which are discussed in more detail below.*

Local Policy

5.5.6 The Perth and Kinross Local Development Plan 2 was adopted in November 2019. Policy E33A covering new proposals for renewable generation states that the proposal will be supported subject to a range of factors (a to j). In relation to landscape and visual matters for this proposal criterion (a) is relevant, which states that the following factors need to be considered:

'The individual or cumulative effects on...landscape character, Local Landscape Areas, Wild Land Areas and National Scenic Areas, visual amenity...and the residential amenity of the surrounding area.'

5.5.7 Policy 39 covers Landscape and states that development proposals will be supported where they do not conflict with the aim of maintaining and enhancing the landscape qualities of Perth and Kinross and will need to demonstrate:

a) *they do not erode local distinctiveness, diversity and quality of Perth and Kinross's landscape character areas, the historic and cultural dimension of the area's landscapes, visual and scenic qualities of the landscape, or the quality of landscape experience;*
b) *they safeguard views, viewpoints and landmarks from development that would detract from their visual integrity, identity or scenic quality*
c) *they safeguard the tranquil qualities of the area's landscapes*
d) *they safeguard the relative wildness of the area's landscapes*
e) *they provide high quality standards in landscape design, including landscape enhancement and mitigation schemes when there is an associated impact on a landscape's qualities*

f) they incorporate measures for protecting and enhancing the ecological, geological, geomorphological, archaeological, historic, cultural and visual amenity elements of the landscape…

Supplementary Planning Documents

5.5.8 The Landscape Supplementary Guidance was adopted by the Council in 2020. The document provides a contextual background to landscape character and both national and local landscape designations. The SPD includes guidelines for the Local Landscape Area non-statutory designations that cover around 27% of Perth and Kinross and fall within the study area. Further details on these non-statutory designations are included below.

Draft Supplementary Planning Documents

5.5.9 The Renewable and Low Carbon Energy Draft Supplementary Guidance 2019 represents the emerging policy. The Spatial Framework for Wind Energy at page 9 identifies the proposed turbine as lying within a community separation for consideration of visual impact (2km viewshed). SPP Table 1 at page 8 states that 'the extent of the area will be determined by the planning authority based on landform and other features which restrict views out from the settlement.' It is clear from preliminary review that the viewshed calculation has not accounted for built development within the settlement and areas of permanent coniferous woodland and other planting belts that would substantially restrict visibility of wind turbines on the edge of Perth, in the vicinity of the Site.

Other Publications

5.5.10 The Landscape Study to Inform Planning for Wind Energy (Final Report) was prepared by David Tyldesley Associates and issued in November 2010. This document is not formally adopted as Supplementary Planning Guidance but is referred to in The Renewable and Low Carbon Energy Draft Supplementary Guidance 2019. The Site does not fall within a landscape character area (because it is within the urban area of Perth). The Study does not refer to latest best practice guidance published by NatureScot and the Landscape Institute and consequently is considered to have limited weight in the decision-making process.

Statutory Landscape Designations

5.5.11 No part of the Site or Study Area lies within a statutorily designated landscape (e.g. National Park or National Scenic Area).

5.5.12 The River Tay National Scenic Area is located circa 20km north of the proposed turbine. Whilst the ZTV at **Figure 5.1, Volume 3** indicates the potential for theoretical intervisibility from some limited higher ground within the designation e.g. Newtyle Hill, extensive intervening forestry indicates that no intervisibility is predicted and in any event even if visibility was possible at this range, the turbine would be barely discernible and consequently any effects upon landscape character and visual amenity Minor and Not Significant.

Non-Statutory Landscape Designations

5.5.13 No part of the Site lies within a non-statutorily designated landscape. Within the detailed Study Area there are two Special Landscape Areas (SLA) which are illustrated on **Figure 5.4, Volume 3.**

5.5.14 The Ochil Hills SLA lies approximately 4km to the south of the Site at the closest point and is predominantly located out-with the ZTV, apart from theoretical blade tip visibility from isolated tracts of land to the south and southwest of Forgandenny (**see Figure 5.3, Volume 3**). Review in the field indicates that hedgerows and tree cover along the ridgeline to the south and southeast of Woodhead Farm would restrict any visibility of the turbine blades from the locations indicated by the ZTV within the Ochil Hills SLA. With clearly no potential for any adverse effects upon the designations key qualities or overall integrity. Detailed assessment of the effects of the proposed development upon the designation would be Neutral and consequently have been scoped out of further consideration.

5.5.15 The Sidlaw Hills SLA lies 2.7km east of the Site at the closest point. Theoretical intervisibility covers land around Tarsappie and extends north, including Kinnoull Hill and parts of the rural landscape between the edge of Perth and Scone (see **Figure 5.3, Volume 3**). A detailed assessment of the effect of the proposed development upon the designation is therefore required.

Green Belt

5.5.16 The site does not lie within the Green Belt. In the immediate vicinity of the Site, the designation covers much of the surrounding landscape including the golf course and undeveloped land between the urban edge of Perth and the River Earn to the south.

Tree Preservation Orders

5.5.17 It is understood that the Site and adjoining land is not subject to any Tree Preservation Orders (TPO).

Other Designations contributing to Landscape Character

5.5.18 The desktop survey comprising review of the Local Development Plan and other database sources has identified a range of ecological and cultural heritage designations within the wider study area that contribute to an assessment of landscape value (see **Figure 5.4, Volume 3**). The following paragraphs describe the landscape context of these designations, with more detail provided within Chapters 6 and 7 of the ES.

5.5.19 The closest listed building to the Site is the Aviva office building. Further afield the Listed Pitheavlis Cottages are situated off the B9112 screened by a belt of woodland planting along the B9112. Listed buildings are scattered across the urban area of Perth but are most concentrated within the central Conservation Area that lies out-with the ZTV.

5.5.20 There are no Scheduled Monuments in close proximity to the Site. Two main clusters of Scheduled Monuments occur within the Lowland River Corridor LCT, around Huntingtower Castle, approximately 3km northwest of the Site and outwith the ZTV. There is a scattered distribution of Scheduled Monuments on elevated land east of Perth, including the hillfort at Moredun Top lying within the Lowlands Hill LCT and SLA designation. North of the River Tay within the Igneous Hills LCA and SLA designation there are a couple of Scheduled Monuments.

5.5.21 Ecological designations are limited within the study area and are covered in full detail at Chapter 7 of this ES. The River Tay, located within the Firth Lowland LCT and urban area of Perth, is situated approximately 1.8km east of the Site and is a Special Area of Conservation. Kinnoul Hill SSSI is designated for floristic and geological interest.

National Landscape Character Area

5.5.22 The landscape of Scotland has been subject to a nationwide landscape character assessment in the 1990's overseen by Scottish Natural Heritage. The Tayside Landscape Character Assessment prepared by Land Use Consultants was published in 1999. Minor refinement on the assessment was undertaken by David Tydesley Associates in 2010 and more recently by LUC as part of the Local Landscape Designations Review now incorporated in the 2020 Landscape SPG. **Figure 5.5, Volume 3** illustrates the character types within the 5km Study Area that are based on the 1999 study with the precise boundaries adopted from the 2015 review with the Landscape Units from both the 2015 and 2010 studies identified in the legend. In order to avoid unnecessary duplication and confusion, this assessment covers the impact of the proposed development on landscape character within the main landscape types, with cross reference to the landscape units in the 2020 Landscape SPG.

5.5.23 The Site is located within the Urban Area and close to the boundary with the Lowland Hills. An extract of the full description of the character area is contained at **Appendix 5.2, Volume 4.** The published key characteristics from the NCA are set out below.

- 'low ridges and hills separating lowland straths and adjoining the nearby uplands,
- Composed of soft, red sandstones,
- Transitional character with pastures on lower slopes, giving way to rough grazing and even open moorland,
- Evidence of several phases of historic settlement,
- Extensive woodland, including forestry plantations, and
- Influence of modern development.

5.5.24 At paragraph 5.6.5 the signs of modern development are described which are stated to include the '…busy A9 corridor where it climbs over the Gask Ridge to the west of Perth, the lines of pylons which fan out from the highland glens carrying power to the lowlands,

and a number of telecommunications masts (e.g. on Kirton Hill near Perth) exploiting the hills proximity to settled lowland…'

5.5.25 In relation to wind energy development, the assessment states at paragraph 5.6.15 that '…the insensitive development of wind turbines in this area could conflict with the small-scale, historic and deeply rural character of the landscape. It would also weaken and confuse the area's role of providing a transition from the unsettled uplands to the fertile and settled lowland.'

5.5.26 The remainder of the character types where there is the potential for Significant effects i.e. areas that are located within 5km and the ZTV have been reviewed. The Landscape Character Areas are illustrated on **Figure 5.5, Volume 3** and are:

- Firth Lowlands LCT (minimal theoretical intervisibility, >2km from Moncreiffe Island and River Tay)
- Igneous Hills LCT (some theoretical intervisibility >2.7km distance between Perth and Scone);
- Broad Valley Lowlands LCT (some theoretical intervisibility, >3.7km, mainly near Scone); and
- Lowland River Corridors LCT (some theoretical intervisibility, >2.3km, north and northwest of Perth).

5.5.27 The key characteristics and full descriptions of the above areas are contained **at Appendix 5.2, Volume 4** and have been used to determine the landscape value, as set out in the assessment section of this chapter.

Immediate Landscape Character Context

5.5.28 A Chartered Landscape Architect assessed the Site and surrounding landscape character during a visit in January 2022 in dry and clear weather.

5.5.29 The individual characteristics and condition of the landscape were noted. Differences in the composition and the character of the Site's physical components were recorded as well as their sensitivity to and ability to accommodate change (see Methodology at **Appendix 5.1, Volume 4**)

5.5.30 The site is located within the Aviva commercial area and comprises an area of semi-improved grassland between the main Aviva site and the Craigie Hill Golf Course and lies at around 90m AOD. The land parcel that contains the Site is bordered by mature woodland and tree cover. A full description of the vegetation within and surrounding the Site is contained in the Ecology Chapter of this ES.

5.5.31 The landform in the wider locality is illustrated on **Figure 5.4, Volume 3**, which identifies the site as being located on a slope of the River Tay Valley with land falling away to the north and west but rising to the south. Within the Aviva grounds there is a circa 40m fall in levels, noting that along the B9112 land rises to the north within the urban area of Perth

including the Cherrybank estate. Further afield and beyond the city, land to the south and southeast of the site gently rises initially and then more steeply to an east-west ridgeline. High points include Mailer Hill at 182m AOD and approximately 1.1km south and further to the southeast Moncreiffe Hill at 223m AOD, approximately 4.1km from the site. Northeast of the Site, beyond the urban area of Perth the land rises steeply above the River Tay to Kinnoull Hill at 220m AOD.

5.5.32 The closest built development to the proposed turbine is a redundant Sports Hall approximately 90m to the north-west of the proposed turbine, comprising a modern brick building with steel cladding. The listed Pitheavlis Building (Aviva Building) constructed in the early 1980's comprises flexible concrete modules, stepped into the slope with landscaped roof terraces. The building is located circa 200m north-west of the proposed turbine (details on the Pitheavlis listing and impact assessment is covered in the cultural heritage chapter of this ES).

5.5.33 The nearest residential dwelling is located approximately 500m from the proposed turbine, within a recently constructed housing estate on Bell Gardens, off the B9112. Due to the orientation of the dwellings relative to the proposals, no direct view of the turbine from these dwellings would be available, noting that nearby properties including the listed Pitheavlis Cottages are separated from the proposed turbine by landform along the boundary of the Aviva grounds and mature coniferous tree planting.

5.5.34 The road network in close proximity to the Site include the M90 motorway corridor to the south, with the Aviva buildings and car parking, including the Site screened from the road corridor by a coniferous tree belt. The B9112, Necessity Brae, provides access to the Aviva site and after passing under the motorway follows the north western boundary of the Aviva grounds where low level mounding and/or coniferous tree planting encloses the site along the majority of the route apart from a short section near the access roads into the Site (see **Viewpoint 1, Volume 3**).

5.5.35 The edge of Perth in this location comprises a range of man-made development and a range of building styles and ages, dominated by modern post-war housing (typically 1-2 storey) and occasional larger buildings including flats, offices and the motorway service station.

5.5.36 Vertical infrastructure in the rural landscape to the south of the M90 includes pylons that lie approximately 1.2km southwest of the proposed turbine at the closest point and the telecommunication masts on Mailer Hill and St. Magdalene's Hill that lie approximately 1.1km to the southeast. The presence of these existing vertical features has been considered in the assessment section of this chapter, noting that opportunities for cumulative visibility are limited and clear separation between the proposed turbine and other vertical infrastructure is apparent from the photomontage views.

Visual Baseline

5.5.37 The Zone of Theoretical Visibility (ZTV) of the proposed turbine at ground level, hub level and blade tip are illustrated on **Figures 5.2 and Figure 5.3, Volume 3** respectively. The ZTVs should be interpreted as indicative of a maximum-effect scenario, since they cover tracts of the surrounding landscape where the Proposed Development would in reality be filtered or screened by other intervening elements (e.g. hedgerows, individual trees and scattered buildings). In addition, areas of farmland where there is no public access is of no importance in the assessment of the impact upon visual receptors. The density and thickness of the hedgerows and trees in the surrounding landscape would also prevent or filter views over the winter months to varying degrees, i.e. the degree of screening afforded would be dependent on season.

5.5.38 The ZTV of the proposed development at **Figure 5.3, Volume 3** illustrates the theoretical visibility of the hub and blade tip of the proposed turbine. The ZTV does not include any mitigation planting and therefore in conjunction with existing features which restrict visibility including hedgerows, individual trees and tree belts, presents a pattern of visibility that is exaggerated from reality.

5.5.39 Theoretical visibility of the proposed turbine within the 5km detailed study area is substantially restricted from the majority of the study area by a combination of landform and in places, commercial forestry. Views to the immediate north include parts of the urban area of Perth including the suburb of Cherrybank on a local ridgeline, noting only very infrequent visibility is predicted further north beyond this ridgeline. Views are predicted along the M90 corridor and farmland to the south and west within 2km including higher land at Kirkton/Mailer Hill where telecommunication masts are located. Further south, west and northwest, the majority of the study area lies out-with the ZTV and only very infrequent visibility is predicted, largely confined to blade tip. Views to the immediate east are predicted to include parts of the Craigie Hill Golf course noting views from the adjacent urban area are typically restricted by forestry on higher ground and built form of the settlement itself. Views further to the east include above the M90 motorway near Tarsappie and local high points at Kinnoul Hill and Moncreiffe Hill. Views to the northwest between Perth and Scone include the parks of North Inch and South Inch near the River Tay and theoretical views from predominantly agricultural land between the urban areas of Perth and Scone.

5.5.40 Following review of the ZTV and online resources, a number of representative viewpoints from public locations were identified and the locations micro-sited in the field to maximise the visibility of the turbine and minimise any foreground elements that could be deemed distracting. Additional views requested by NatureScot and Perth and Kinross Council were included as set out in Table 5.2. Some of the views suggested by the Council were not included, because there was no potential for significant effects. In all cases the reasons why some suggested viewpoints were excluded is provided in Table 5.3 below.

5.5.41 The photography was undertaken with a high quality Digital SLR camera with a full frame sensor and fixed 50mm lens. Computer generated verified photomontages of the proposed turbine were prepared in accordance with latest NatureScot Guidance, noting that for single turbines wireframes have little or no value in assessment terms.

Table 5.2: Selected Viewpoints

Ref	Viewpoint	Distance/ direction from proposed turbine	Receptors	Selection Rationale
Original Viewpoints selected for the refused application and still relevant to the current application				
1	B9112 near edge of new housing estate	482m	Road users and nearby residents (no direct views)	Oblique view of turbine between perimeter planting
2	Core Path south of M90	235m	Walkers and nearby road users	Approaching the Site from the northwest
3	Core Path south of Craigie Hill golf course	415m	Walkers and Golfers	Views from Core Path with similar views from nearby golf course
4	Core Path near B9112	771m	Walkers	Views towards proposed turbine across M90
5	Oakbank Crescent near junction with Fraser Terrace	854m	Residents, road usersand pedestrians	Elevated view from urban area
6	Kirkton Hill	1.09km	Walkers	Elevated view of turbine in context of urban edge of Perth
7	Bridge over M90 near Broxden services	1.38km	Walkers on core path (road users below)	Approaching the Site from the northwest
8	Kinnoull Hill	3.72km	Walkers within the Special Landscape Area (SLA)	Popular summit and promoted panoramic

				viewpoint
Additional viewpoints advised by NatureScot (SNH) in the scoping response to the original refused application				
9	Tarsappie near M90	2.83km	Road users and nearby residents within the SLA	VP 9 and 11 taken at safest close locations to M90. VP 11 excluded as there would be no visibility of the proposed turbine due to intervening tree cover.
10	Edge of Scone	5.11km	Walkers and road users within the SLA	
11	M90	8.9km	Road users	
Additional viewpoints suggested by NatureScot in the pre-application consultation to the current application				
12	South Inch Park	2.01km	Recreational users of the park	Viewpoints micro-sited where foreground and middle ground trees in the parks would not restrict views of the proposed turbine.
13	North Inch Park	2.93km	Recreational users of the park	
Additional Viewpoints suggested by Perth and Kinross Council in the pre-application consultation to the current application				
14	Bertha Park	4.85km	Users of Core Path	Viewpoints micro-sited where foreground and middle ground vegetation and potentially other clutter would restrict or distract from views towards the proposed turbine.
15	Mains of Tippermallo	7.75km	Users of Core Path	
16	Dunning	10.50km	Road users of B934 and nearby residents	
17	Moncrieff Hill	4.10km	Walkers	
Additional Viewpoints illustrating the refused turbine requested by Historic Scotland in the pre-application consultation to the current application				
1A	B9112 near edge of new housing estate	343m to refused turbine	Road users and nearby residents (no direct views)	Oblique view of turbine between perimeter planting. Location of photography had to be slightly adjusted to avoid screening of turbine from intervening planting
5A	Oakbank Crescent near junction with Fraser Terrace	789m to refused turbine	Residents, road usersand pedestrians	Elevated view from urban area.

Table 5.3: Viewpoints suggested by Perth and Kinross Council in January 2022 that were rejected

Potential Viewpoint	Approximate distance/ direction from proposed turbine	Potential receptors and likely sensitivity	Rejection rationale
Perth Playing Field/Viewlands Road	1.1km north	Residents (high sensitivity) and school children (low sensitivity)	This location is already represented by Viewpoint 5 that is closer to the proposed turbine, noting curtilage of the school in the far right of the view.
Cedar Drive	1.3km northwest	Residents (high sensitivity)	Local tree cover is not included in the ZTV and from analysis of aerial photo would prevent any clear views of the proposed wind turbine from the open space to rear of Cedar Drive.
Birnam Hill	18km northwest	Hill walkers (high sensitivity)	No potential for significant effects to be possible for a single turbine of this scale at this distance.
A9/area around Redgorton	6.6km north	Road users (medium sensitivity)	A9 area directly adjacent to Redgorton is outside the bare-earth ZTV - i.e. landform prevents any views. Review in the field indicates mature tree planting along the A9 that would prevent any views further south towards the proposed turbine.
From Scone Palace	3.8km north (southern end of parkland)	Users of Park (high sensitivity)	As identified in the original LVIA this area was reviewed in the field (and on aerial photography) and no clear line of site was identified due to extensive mature tree cover, noting this type of planting is not included in the ZTV (only woodland). Nonetheless an assessment from Scone Palace is contained in the LVIA.
A94 between Perth Airport and Scone	6.9km northeast	Road users (medium sensitivity)	The route is located on the edge of the ZTV and field review demonstrates that roadside planting will screen views. Nonetheless an assessment of the route is contained within the LVIA.
Dunsinane Hill	15.2km northeast	Hill walkers (high sensitivity)	Not in the ZTV and therefore no views of the proposed turbine would be possible.
Aberargie/A912	8.6km southeast	Road users (medium sensitivity)	Viewpoint 11 near Aberargie was requested by NatureScot (SNH) for the refused application. Whilst located in the ZTV intervening planting along the road corridor would prevent any views of the turbine, hence omission.

5.5.42 Following the desktop review of the ZTV, assessment in the field and identification of selected viewpoints, the key receptors where potential effects upon visual amenity may be experienced have been identified in Table 5.4 below. It is important to note that all of the key receptors, in addition to the representative photomontages, were visited in the field to establish the potential for intervisibility and this assessment is reflected in the detailed assessment.

5.5.43 Paragraph 1.17 of GLVIA 3 states:

'The Directive is clear that emphasis is on the identification of likely significant environmental effects…Identifying significant effects stresses the need for an approach that is in proportion to the scale of the project that is being assessed and the nature of its likely effects. Judgement needs to be exercised at all stages in terms of the scale of the investigation that is appropriate and proportional…'

5.5.44 In order to meet the proportionate requirements of best practice guidance described above, viewpoint locations were not proposed where intervening planting or buildings would screen views of the proposed turbine. As made clear by current best practice guidance, there is no requirement to prepare an unnecessarily long assessment where every potential landscape and visual effect is catalogued when it is clear that the potential for Significant effects from some receptors outside the ZTV and/or at greater separation distances from the turbine could not arise.

Table 5.4: Key Visual Receptors

Receptor	Viewpoint References
Community Receptors	
Pitheavlis, Perth	1
Cherrybank, Perth	5
Woodlands/Burghmuir, Perth	Assessed with reference to ZTV's and field observations
Letham/Hillyland, Perth	
Tulloch/Muirton, Perth	
Bertha Park, Perth	15
City centre, Perth	12
North Inch, Perth	13
Bridgend/Barnhill, Perth	Assessed with reference to ZTV's and field observations
Moncreiffe/Upper Craigie, Perth	
Craigie, Perth	12
Scone	10
Tarsappie	9
Transport Receptors	
M90	2 , 7, and 9
B9112	1
A9	Assessed with reference to ZTV's and field observations
A93	
A94	
Railway	
Recreational Receptors	
Core paths including key hill summits	2, 3, 4, 6, 7, 8, 14, 15 and 17
Craigie Hill Golf Course	3
Scone Park	Assessed with reference to ZTV's and field observations

Note: Viewpoint 16 was scoped out of the assessment as the photomontage demonstrates there us bi potential for significant effects.

5.6 Significant Environmental Effects of the Proposal

5.6.1 The construction period is programmed to last 4-6 months and would be subject to a Construction Management Plan that would minimise the landscape and visual effects of the construction. Other environmental impacts that can influence landscape character including tranquillity (noise), dust and external lighting would also be controlled.

Landscape and Visual Effects during the Construction Phase

5.6.2 The Site for the Proposed Development has a simple landscape fabric and construction-related impacts on the fabric of the Site would be mostly limited to the loss of a small area of neutral semi-improved grassland covering the footprint of the turbine. The access

would follow the existing internal road network and there would be a small area of tree planting within the Aviva site, where cutting back of branches will be required to accommodate delivery of the turbine blades. In terms of off-site alterations, existing shrubs around the roundabout junction between the A93 and B9112 to the north of the Aviva Site would require trimming back where planting currently overhangs the highway verge.

5.6.3 The construction activities and temporary features with the potential to cause an effect on landscape and visual resources include:

- Abnormal vehicle load movements;
- Construction of crane hard-standings;
- Excavations and construction of turbine foundations;
- Excavations for underground cables;
- Temporary site compound;
- HGV deliveries to site and movement of vehicles on site;
- Erection of turbine - with external transformer if required;
- Formation of grid connection; and
- Reinstatement works.

5.6.4 The location and management of the above aspects have been carefully considered, and various mitigation measures have been incorporated into the construction programme to limit the transitory effects of the construction phase, as described below.

5.6.5 Ground disturbance would be limited to the excavation for turbine base, hardstanding, the external transformer (if required) and underground cable routes, as well as the areas occupied by temporary features such as the construction compound. All ground areas disturbed by construction would be reinstated following the construction phase.

5.6.6 Hardstanding is proposed adjacent to the turbine to facilitate turbine construction and erection as illustrated on **Figure 3, Volume 3** and would consist of compacted aggregate. The cable to the substation would be laid underground in a trench approximately 1m wide. This will limit the extent of ground disturbance arising from the works thus limiting effects on the fabric of the landscape.

5.6.7 As shown in planning application **Figure 3, Volume 3**, a temporary construction compound would be located close to the location of the proposed turbine.

5.6.8 During the construction period, vehicle movements would consist primarily of construction plant, aggregates and turbine components.

5.6.9 The turbine would be erected by the use of a crane and this would take approximately 1 week, depending on weather conditions. Appearance of the crane at the Site in views would therefore be of a very short duration.

5.6.10 The construction works would individually and cumulatively give rise to landscape and visual effects. These effects would be temporary and would mainly arise through vehicle movements, construction of access tracks and erection of the turbine. The effects arising from other operations, including the excavation of turbine foundations, cable runs and the construction compound would be localised, with attention being drawn to the area through vehicle movements and plant rather than the physical changes arising. Construction operations would take place over a period of approximately 4-6 months.

5.6.11 During the construction of the wind turbine, the main construction activities would take place primarily within the Site boundary. There would be disturbance to landscape fabric in the form of localised vegetation and soil/ground removal, excavation, trenching for cable runs and placement of aggregate for hard surfaces. Disturbance would also occur around the turbine base and crane pad which, individually, would consist of localised operations of limited spread.

5.6.12 The fabric of the local landscape comprising semi-improved grassland is considered to be of Medium sensitivity to the construction activities within the context of the overall landscaped context of the wider Aviva site. The loss of grassland during the construction stage would be limited in extent, which in the context of the quantity of similar land in the local area would represent a low magnitude of change, resulting in a Slight adverse effect that is not Significant.

5.6.13 The effects on the character of the landscape during the construction phase would result initially from the activity and movement of large construction vehicles, plant machinery and cranes at the Site and along a limited section of road in the surrounding areas between the A93 from the junction of the M90 at Broxden Services to the existing Site entrance including the northern end of the B9112. These activities would not be out of character with the movement of existing HGV's and would be perceived in the context of the nearby busy transport corridors. With reference to Chapter 2 of this ES, the increase in movement frequency and volume of traffic would be modest.

5.6.14 The erection of the turbine would constitute the most noticeable aspect of the construction phase as perceived from the wider landscape. Concerning the erection of the turbine, given that the Proposed Development would appear to rise from the ground and be seen over a wider area, the effects would be 'emergent' and increasingly visible until the effects merged into those associated with the operational phase, described below.

5.6.15 The erection of the turbine tower and the placement of the nacelle and blades would involve the use of high lifting gear and would confirm the presence of the construction site in the wider area; most notably within those areas from which the lower-level elements

would not be visible. This would reinforce the local changes in character although the duration of the effect would be temporary and short-term.

5.6.16 The electrical connection between the substation and the local electricity distribution network would be the subject of a separate application by the distribution network operator.

5.6.17 The landscape character of the Site and its immediate surroundings is considered to be of Medium sensitivity (Medium value and susceptibility) to temporary construction works and traffic of the nature associated with the Proposed Development. The erection of the turbine, which is considered to represent a Medium magnitude of change in a local landscape. Resulting effects would be Moderate and Not Significant, noting that construction works would be temporary, of short duration and limited in extent.

5.6.18 The visual effects of the various aspects of the construction phase would be temporary and intermittent and will be minimised by good site management and a relatively short construction programme. Vehicle movements to and from the Site would be visible at the start of the construction process when materials and concrete are delivered and would give rise to an increased perception of activity; however following the initial delivery, the majority of vehicle movements would take place within the Site, screened from view from the wider study area by coniferous trees along the M90 and in other directions restricted by buildings and retained coniferous trees within the Aviva grounds

5.6.19 Later in the construction process visual effects would change as the excavation of turbine foundations, installation of underground cables and the grid connection would have localised effects and would only be visible from locations very close to the Site and within the Aviva grounds i.e. not from public locations or from public dwellings within the wider landscape. During the final phase of the construction process, a crane would be built to undertake the erection of the turbine and the visual effects would move towards those experienced during the operational phase.

Operational Effects

5.6.20 The only operational element of the scheme with the potential to affect the landscape and visual amenity of the study area is the wind turbine itself. The turbine would be three bladed with a tubular tower and the candidate turbine selected is the EWT61 (76.5m tip, 46m hub, 30.5m blades).

5.6.21 Turbine appearance is also influenced by its colour and level of reflectance of their surfaces. In identifying a suitable colour, it is necessary to consider the character of the landscape that would accommodate the turbines, likely weather conditions and whether or not the turbines are likely to be seen against land or sky. Given the topography of the area, the turbine where significant visual effects are possible, would be predominantly seen against a backdrop of sky, as shown in the photomontage visualisations. It is

considered that light grey colour would be most appropriate with a semi-matt surface that minimises surface reflectance.

Landscape Fabric

5.6.22 No landscape mitigation is considered to be required to compensate for the minimal loss of a small area of semi-improved neutral grassland.

5.6.23 It is not considered essential to mitigate the close-range visual effects of the proposed development from a short section of the B9112 corridor near the Site entrance (**Viewpoint 1** photomontage). However, it is anticipated that the Local Planning Authority may consider it appropriate to provide screening in this location set behind the visibility splay and secured by a planning condition. In order to substantially restrict views of the turbine at **Viewpoint 1** at Year 1 following construction, a semi-mature conifer trees screen, circa 6m high, are proposed to be planted and these would be in character with nearby conifers within Aviva's grounds.

Landscape Character

5.6.24 The assessment of effects resulting from the Proposed Development upon the Landscape Character Types and Units has been undertaken with reference to **Figures 5.3, 5.5, Volume 3, Appendix 5.2, Volume 4** and assessment in the field. **Appendix 5.3, Volume 4** sets out the detailed assessment of Landscape Character Sensitivity and the effects are summarised in Table 5.4 below.

Table 5.4: Landscape Character Effects within the 5km Study Area

Landscape CharacterType	Value	Susceptibility	Sensitivity	Magnitude	Effect and Significance
Urban	Medium	Medium to High	Medium	Medium	Moderate and Not Significant
Lowland Hills	Medium	Medium	Medium	Medium	Moderate and Not Significant
Lowland River Corridors	Medium	Medium	Medium	Very Low	Minor and NotSignificant
Firth Lowlands	Medium	Medium	Medium	Very Low	Minor and Not Significant
Igneous Hills	Medium to High	Medium to High	High	Very Low	Moderate/Minor and Not Significant
Broad Valley Lowlands	Medium	Medium	Medium	Very Low	Minor and Not Significant

Landscape Designations

5.6.25 An assessment of the impact of the proposed turbine on the key qualities and overall integrity of the Sidlaw Hills Special Landscape Area designation is contained at **Appendix 5.3, Volume 4** and this assessment is informed by the structured assessment carried out for the component Landscape Character Types. In summary it is assessed that there would be No Significant effects upon the Sidlaw Hills and Ochil Hills SLAs and the overall integrity of the designations would remain intact.

Visual Amenity

5.6.26 The key receptors in Table 5.2 have been assessed with reference to the ZTV plans at **Figure 5.1 to 5.3, Volume 3**, the relevant representative photomontages and an assessment of actual intervisibility carried out in the field. All assessment has been undertaken in accordance with the methodology at **Appendix 5.1, Volume 4** and effects are assumed to be adverse unless otherwise stated.

5.6.27 The assessment of magnitude for a visual receptor considers the geographical extent of visibility. In the case of roads, core paths and other linear routes, the assessment is carried out in the field and cross references to photomontage views, where appropriate. The assessment of magnitude is typically not confined to single viewpoint locations, especially if the view selected to be a photomontage represents a limited glimpse of the proposed development e.g. through a gap in a tree belt. The methodology at **Appendix 5.1, Volume 4** and paragraphs 6.38 to 6.41 of GLVIA 3 sets out the criteria to be considered in the assessment of magnitude, where the geographical extent, duration and reversibility of effects are factors to consider in addition to the scale of change from a specific viewpoint location. This approach contrasts with now superseded best practice guidance which simply assessed the scale of change upon isolated 'viewpoints' rather than assessing the overall magnitude that would be experienced by users along the full length of a route.

Urban Area of Perth

5.6.28 Analysis of theoretical visibility across the urban area of Perth was undertaken by measuring the urban area that is covered by the blade tip and hub ZTV of the proposed turbine in **Figure 5.3, Volume 4**.

Tip ZTV: 16.7% ZTV coverage of the total urban area of Perth; and

Hub ZTV: 10.6% ZTV coverage of the total urban area of Perth.

5.6.29 In reality, views of the turbine would be further reduced to an even smaller area of the city by numerous urban elements not included in the ZTV including fences, walls, hedges and street trees. Consequently because of the localised geographical visibility of the proposed turbine from the urban area of Perth it is not accurate to conclude the turbine would become a *'major orientating feature in the area'* as stated by SNH (NatureScot) in relation to the refused turbine. Additional photomontage views within the urban area requested by NatureScot and the Council also indicate there is no potential for the proposed turbine

(that is subject to this application) to *become 'a new, large-scale element in important views towards and across the city'* as previously concluded by NatureScot in relation to the refused turbine.

5.6.30 It is not feasible, or necessary to assess the views from every single property that may have a view towards the proposed turbine. It is however recognised that with reference to the ZTV at **Figure 5.3, Volume 4** and selected photomontages, assessment reporting arranged by the principal suburbs of the urban area of Perth will assist decision makers and the public. Provision of wireline visualisations from further locations in addition to the extra photomontages from the urban area of Perth included in this LVIA would not further inform the assessment. This is because the majority of views are restricted by intervening buildings, street trees and other infrastructure that would not be illustrated on these wirelines.

5.6.31 Key changes to the LVIA methodology at **Appendix 5.1, Volume 4** since the refused application reflect emerging best practice guidance, including the acknowledgment that residential receptors should typically be assessed as being of high sensitivity to changes resulting from development proposals, regardless of location e.g. views across a major highway in a busy urban setting are considered no less sensitive than views from an isolated dwelling in a remote rural setting. In addition, the relocation of the proposed turbine and change in turbine design has resulted in changes to the magnitude of change and level of effect that would be experienced by some receptors e.g. increased magnitude of change experienced by users of the Craigie Hill golf course.

5.6.32 GLVIA 3 best practice guidance acknowledges at paragraph 2.25 that 'even with qualified and experienced professionals there can be differences in the judgements made. This may result from using different approaches or different criteria, or from variation in judgements based on the same approach and criteria...'

5.6.33 Notwithstanding the change in assessment approach and acknowledgement of some localised significant visual effects, it is instructive to compare key views of the proposed turbine and refused turbine from the urban area. The photomontage of the proposed turbine from Viewpoint 1 (**Figure 5.8a-c, Volume 3**) compared with the refused turbine from Viewpoint 1A (**Figure 5.24 a-c, Volume 3**) demonstrate that the revised scheme, whilst resulting in significant visual effects, would represent a reduction in visual impact as experienced by the community on the edge of Pitheavlis, resulting from the set back of the turbine from the northern boundary of the Aviva Site. A similar improvement would occur from the suburb of Cherrybank with reference to the photomontage of the proposed turbine from Viewpoint 5 (**Figure 5.12a-c, Volume 3**) compared with the refused turbine from Viewpoint 5A (**Figure 5.25 a-c, Volume 3**).

Pitheavlis, Perth

5.6.34 The ZTV at **Figure 5.3, Volume 3** indicates that intermittent public views would be available from minor roads including localised parts of the residential cul-de-sacs of Bell

Gardens and Kimmond Drive and a limited section of the footway along Necessity Brae (B9112). Mature tree planting including evergreen pine and other conifers are located along the majority of the northern boundary of the Aviva grounds, which would screen views of the turbine, even in winter, however a break in the planting near the northern Aviva access road would facilitate clear views of the turbine from a short section of Necessity Bray (**Viewpoint 1**) and limited stretches of Bell Gardens and Kimmond Drive. Private views from residential properties have been estimated from nearby publicly accessible locations but would typically be limited by planting along the perimeter of the Aviva grounds. The main elevations of properties in close proximity to Viewpoint 1, off Bell Gardens and Kimmond Drive are orientated away from the proposed turbine, such that direct views of the turbine from within the dwellings would typically be avoided.

5.6.35 The value and susceptibility of public views is assessed as High with an overall High sensitivity. The changes to visual amenity would comprise very localised views of the proposed turbine at and very close to **Viewpoint 1**, comprising the majority of the turbine seen above woodland and against the sky. The magnitude of the change is assessed as ranging from None to High. The overall effect upon visual amenity would range from No View to Major and Significant, however this effect would be very localised and the turbine would be fully screened from the majority of the suburb of Pitheavlis.

5.6.36 Whilst mitigation planting is not assessed to be required, in order to respond to the original SNH (NatureScot) scoping opinion, it is proposed to plant semi-mature trees within the Aviva grounds and near the Site boundary to substantially restrict views of the proposed turbine from the short section of the B9112 corridor near the site entrance and to minimise any views from public and semi-private external areas of Bell Gardens and Kinnoull Drive. Should the evergreen screen planting be implemented, the magnitude would reduce to Low at Year 1 resulting in a Moderate effect that is Not Significant.

5.6.37 The new housing area recently constructed between the B9112 and the A90 is situated on sloping ground and is flanked by mature tree cover including dense conifer planting along an embankment raised above the B9112 within the Aviva grounds. In combination these local landform features and planting are predicted to prevent any views of the proposed turbine, noting that the southwestern edge of the housing estate closest to the turbine is outside the ZTV and further built development set further into the site and at a lower elevation would have views towards the turbine restricted by surrounding built development.

Cherrybank, Perth

5.6.38 The value of views and susceptibility of viewers is assessed to be High, resulting in an overall High sensitivity.

5.6.39 The ZTV at **Figure 5.3, Volume 3** indicates the greatest level of theoretical visibility from minor roads on rising ground within the Cherrybank Estate and also the footways along the A93 Glasgow Road (impacts upon road users is assessed separately). **Viewpoint 5** from

Oakbank Crescent was selected at a location where intervening dwellings or trees would not screen views of the proposed turbine. The viewpoint would be similar to the private views that would be experienced from the rear of No. 22 Murray Place. Views from other properties nearby including residents of Oakbank Crescent, Fraser Terrace, Braeside Gardens, Viewlands Terrace and Oakbank Road would vary according to the specific orientation of individual dwellings relative to the proposed turbine and the proximity of nearby dwellings which have the potential to restrict views. The predicted effect upon private visual amenity is covered in a separate section below.

5.6.40 The changes to visual amenity would comprise intermittent views of the proposed turbine, with the maximum magnitude of change illustrated at **Viewpoint 5**, where the majority of the turbine would be seen above the Aviva buildings and against the sky. The magnitude of the change would range from None to Medium, considering that visibility from many locations would be restricted by intervening buildings. The overall effect upon visual amenity would range from No View to Major/Moderate and Significant.

Woodland and Burghmuir, Perth

5.6.41 With reference to the ZTV at **Figure 5.3, Volume 3**, the visibility from minor roads within the Woodlands/Burghmuir estate is typically reduced compared with the Cherrybank Estate, due to intervening tree cover. The value of views and susceptibility of viewers is assessed to be High, resulting in an overall High sensitivity. The orientation and density of built development along the roads would combine with the local tree cover to restrict views of the turbine from most locations. There would typically be occasional partial glimpses of the turbine for people in vehicles or passing along the network of footways. The magnitude of the change is assessed as None to Low. The overall effect upon visual amenity would range from No view to Moderate and Not Significant.

Bertha Park, Perth

5.6.42 The ZTV at **Figure 5.3, Volume 3** indicates theoretical visibility from localised parts of the urban area on the northern edge of Perth including the recent housing development at Bertha Park (**Viewpoint 14**). Review in the field indicates that local tree cover and hedgerows in many locations would limit intervisibility and glimpses of the turbine would be typically fleeting in nature as people pass along the core path and public highways near the southern edge of the built-up area. The value of views would be Medium to High and susceptibility of viewers is assessed to be High, resulting in an overall High sensitivity. The magnitude of change would range from None to Very Low and the overall effect upon visual amenity would range from No View to Moderate/Minor and Not Significant.

City Centre, Perth

5.6.43 The ZTV at **Figure 5.3, Volume 3** indicates that a combination of built development, landform and intervening distance would prevent views of the proposed turbine from the city centre within the A989 ring road. Views however are predicted to be available from South Inch urban park (**Viewpoint 12**), particularly from the central and northern end of

the park where views of the turbine on the skyline would be available above the woodland surrounding the Site, set above the intervening urban area. The value of views and susceptibility of viewers within this urban green-space is assessed to be High, resulting in an overall High sensitivity. The magnitude of change is assessed as None to Low and the overall effect would be No view to Moderate and Not Significant.

North Inch, Perth

5.6.44 The ZTV at **Figure 5.3, Volume 3** indicates that a combination of built development, landform and intervening distance would prevent views of the proposed turbine from the majority of the residential suburbs to the north of the city centre and west of the urban park at North Inch. The least restricted views of the proposed turbine are predicted to be available from the central part of the North Inch urban park (**Viewpoint 13**), noting views from the south would be prevented by intervening built development and views from the golf course at the northern end of the course are more restricted by local tree planting. Where uninterrupted views are available the proposed turbine would be visible on the skyline above the woodland surrounding the Site, set above the intervening urban area, noting telecommunication masts on Mailer Hill are currently visible on the horizon and mature trees around the perimeter of the open space would partially restrict views, particularly when in leaf. The value of views and susceptibility of viewers within this urban green-space is assessed to be High, resulting in an overall High sensitivity. The magnitude of change is assessed as None to Low and the overall effect would range from No View to Moderate and Not Significant.

Bridgend/Barnhill, Perth

5.6.45 The ZTV at **Figure 5.3, Volume 3** indicates that views from these suburbs, east of the River Tay would be partially restricted by a combination of built development, landform and intervening distance. Where the ZTV indicates views, review in the field indicates these would be typically prevented by frequent mature street trees and other garden vegetation. The value of views and susceptibility of viewers are assessed to be High, resulting in an overall High sensitivity. The magnitude of change is assessed as None to Low and the overall effect would range from No View to Moderate and Not Significant.

Moncreiffe/Upper Craigie, Perth

5.6.46 The ZTV at **Figure 5.3, Volume 3** indicates that views from these suburbs, west of the River Tay would be partially restricted by a combination of built development and landform with woodland on higher ground along the perimeter of the Craigie hill golf course restricting views of the proposed turbine. Where the ZTV indicates blade tip views, review in the field indicates these would be typically restricted by mature street trees and vegetation within incidental open space and along the railway corridor. The value of views and susceptibility of viewers are assessed to be High, resulting in an overall High sensitivity. The magnitude of change is assessed as None to Low and the overall effect would range from No View to Moderate and Not Significant.

Craigie, Perth

5.6.47 The ZTV at **Figure 5.3, Volume 3** indicates very limited theoretical partial visibility of the proposed turbine blades and hub from parts of the suburb of Craigie, most clearly from Park Place, although even at this location where oblique views of the turbine would be available, views would be typically restricted by surrounding built form. The value of views and susceptibility of viewers is assessed to be High, resulting in an overall High sensitivity. The magnitude of the change for the suburb of Craigie is assessed as None to Low and the overall effect upon visual amenity would range from No View to Moderate and Not Significant.

Scone

5.6.48 The ZTV indicates potential views from the southern edge of Scone, circa 5km from the proposed turbine. **Viewpoint 10** was taken from Mayfield Road and illustrates that the turbine would be visible as a small element in the view, back clothed by landscape and the upper tower and rotor is seen above the horizon against the sky. Other man-made vertical structures in the view include the pylons on the horizon and telecommunication masts on hill tops. Elsewhere on the edge of Scone, blocks of woodland or mature tree cover limit visibility of the proposed turbine and within the settlement of Scone a combination of tree cover and built form restricts visibility.

5.6.49 The value of views and susceptibility of viewers is assessed to be High, resulting in an overall High sensitivity. The magnitude of change upon Scone is assessed as Low and the overall effect upon visual amenity would be Moderate and Not Significant.

Tarsappie

5.6.50 The ZTV indicates potential views from Tarsappie, a hamlet east of the M90 and just over 3km from the proposed turbine. **Viewpoint 9** was taken from Rhynd Road and was located as close to the M90 as possible.

5.6.51 Views would be experienced from Rhynd Road and the adjacent footway with any private views from the bungalows flanking the road predominantly very oblique in nature due to the orientation of the main elevations of the dwellings relative to the proposed turbine. Closer to the bridge crossing the motorway, tree planting that flanks the route would restrict views of the turbine from Rhynd Road and it is noted that parts of Wester Tarsappie are located out-with the ZTV with landform preventing any intervisibility. Viewpoint 9 therefore represents a location where the maximum magnitude of change would be experienced from Tarsappie.

5.6.52 The value of views is Medium to High and susceptibility of viewers is assessed to be High, resulting in an overall High sensitivity. The magnitude of change is assessed as Low and the overall effect upon visual amenity would be Moderate and Not Significant.

M90 Motorway

5.6.53 The detailed assessment focuses on potentially significant effects upon visual amenity within the refined 5km study area. The bare-earth ZTV that extends to a 25km radius from the turbine (see **Figure 5.1, Volume 3**) identifies blade only theoretical visibility from a limited section of the route north of junction 9 and east of Balmanno Hill. NatureScot (SNH) in their consultation response for the refused turbine requested an additional viewpoint from the motorway east of Balmanno Hill, however intervening woodland would prevent any views of the turbine. Theoretical views of the proposed turbine, north of junction 9 were reviewed in the field and it was established that tree planting flanking the route would prevent any theoretical blade tip visibility, noting the turbine would be approximately 9km distant.

5.6.54 Travelling north along the M90, the motorway passes the Bridge of Earn settlement and the route lies outwith the ZTV until Tarsappie. Review in the field indicates that oblique views from the motorway in both directions including the bridge crossing the River Tay would be available (**Viewpoint 9**). The turbine would be visible approximately 3km distant in the context of the urban area of Perth and other vertical structures on the horizon including the pylons and telecommunications mast on St. Magdalene's Hill. The value of views and susceptibility of viewers is assessed to be Low and Medium respectively, resulting in an overall Medium sensitivity. The magnitude of change upon the aforementioned route section is assessed as Low and the overall effect upon visual amenity would be Moderate/Minor and Not Significant.

5.6.55 Travelling northwest from junction 10, the ZTV indicates that landform and woodland would fully screen views of the turbine until passing the telecommunications mast on St. Magdalene's Hill. Views of the upper levels of the turbine approximately 1.1km distant would be available, seen above the distant carriageway and partially back-clothed by landform with the uppermost parts of the rotor seen against the sky. As people in vehicles get closer to the site, the turbine would become an increasingly prominent element in the view, with the lower levels screened by tree planting along the northern edge of the carriageway. **Viewpoint 2** was taken from a core path close to the Motorway and views from the road itself, whilst closer to the turbine, would be restricted to a greater extent by the coniferous tree planting along the motorway embankment.

5.6.56 Travelling in the opposite direction from the start of the motorway at the roundabout junction with the A9, the turbine would be screened from view from the slip road by dense tree cover along the motorway embankment. On the approach to the bridge over the motorway, the turbine would become visible above the carriageway and the upper tower and full rotor would be seen against the sky (see **Viewpoint 7**). As people in vehicles get closer to the site, the turbine would become an increasingly prominent element in the view, with the lower levels screened by tree planting along the northern edge of the carriageway.

5.6.57 The value of views and susceptibility of viewers is assessed to be Low to Medium, resulting in an overall Medium sensitivity. The magnitude of change is assessed as High and the overall effect upon visual amenity would be Major/Moderate and Significant.

B9112

5.6.58 Travelling northeast towards Perth, the ZTV indicates theoretical visibility in the vicinity of plantation woodland passing the farmstead of Coldwells, c.2km from the proposed turbine. Tree planting along the road corridor and intervening field boundaries including conifers would restrict views towards the turbine, although occasional fleeting and heavily filtered glimpses may occur, particularly in winter. After passing Gallowspark Wood, the route is located in cut and flanked by tree cover and consequently no views of the proposed turbine are predicted. After passing under the M90, the road corridor is flanked by earth mounding and tree and shrub planting along the boundary of the Aviva grounds which due to a significant evergreen component are predicted to prevent views of the proposed turbine, even in winter. Passing the northern entrance to the Aviva site, the turbine would be behind the direction of travel and the assessment of effects is described when travelling in the opposite direction below. The value of views and susceptibility of viewers is assessed to be Medium, resulting in an overall Medium sensitivity. The magnitude of change upon the aforementioned route section is assessed as Very Low and the overall effect upon visual amenity would be Minor and Not Significant.

5.6.59 Travelling south from the junction with the A93, road users would initially experience glimpses of the turbine blades seen against the sky, with the majority of the wind turbine screened by intervening coniferous tree planting. The screening effects of the planting would increase until road users pass a gap in the planting where oblique and fleeting views of the turbine would be available similar to **Viewpoint 1**. After the gap in the planting a coniferous screen of trees would prevent visibility of the turbine until passing the junction to the northern access road to the Aviva Grounds where oblique views of the turbine through a gap in the perimeter planting would be available for circa 50m length of the route (see **Viewpoint 1**) and thereafter views of the turbine would be screened by planting along the boundary of the Aviva grounds.

5.6.60 The value of views is assessed to be Medium as the narrow slot views of the listed Aviva buildings have cultural heritage associations; however the view is fleeting in nature and the buildings are largely screened by intervening tree cover and the Susceptibility is Medium, with an overall Medium Sensitivity. The magnitude of change upon the aforementioned route section is assessed as High and the overall effect upon visual amenity from the localised section would be Major/Moderate and Significant.

A9

5.6.61 Travelling northeast from the edge of the 5km study area towards Perth, the route lies outwith the ZTV. After passing the disused quarry there would be oblique views of the upper levels of the turbine, approximately 2.5km distant, above intervening shelterbelts.

On the approach to the roundabout junction with the M90, views of the turbine would become restricted by local tree cover.

5.6.62 The value of views and susceptibility of viewers is assessed to be Medium, resulting in an overall Medium sensitivity. The magnitude of change upon the aforementioned route section is assessed as Low and the overall effect upon visual amenity would be Moderate/Minor and Not Significant.

A93

5.6.63 Travelling eastwards from the junction with the M90, the ZTV indicates that there would initially be no views of the proposed turbine. Passing the services, the route drops in elevation however the route is flanked by planting and a low-level bund that would restrict theoretical views of the proposed wind turbine. Approaching the new housing estate, there is the potential for glimpses of the upper parts of the turbine blades, that would be seen in the context of foreground lamp posts and as the viewers approach the housing these buildings would increasingly screen the proposed turbine rotor from view. It should be noted that the recently constructed buildings are not included as visual barriers in the ZTV and it therefore exaggerates the potential visibility. As road users approach the roundabout junction with the B9112, the ZTV indicates that intervening buildings would fully screen any views of the wind turbine and thereafter the turbine would be behind the direction of travel.

5.6.64 Travelling westwards on the A93 from the centre of the city, approximately 2km from the Site, the ZTV indicates potential intervisibility crossing the railway, however review in the field indicates that a belt of tree planting along the river and taller buildings than assumed as visual barriers in the ZTV (e.g. the Dewar's Centre) would restrict any views of the turbine. The route then turns south and theoretical visibility of the turbine is indicated by the ZTV most frequently between approximately 1.5km and 0.9km from the turbine. However, review in the field indicates that in reality, views towards the proposed turbine would be predominantly fully screened by intervening buildings and street trees, with occasional glimpses of the upper rotor of the turbine.

5.6.65 The value of views and susceptibility of viewers is assessed to be Medium, resulting in an overall Medium sensitivity. The magnitude of change upon the aforementioned route section is assessed as None to Low and the overall effect upon visual amenity would be No View to Moderate/Minor and Not Significant.

A94

5.6.66 The route joins the A93 within the urban area of Perth, to the east of the River Tay and connects to Scone on the edge of the Study area. The ZTV indicates that views would be screened by built development from much of the route, with the section south of Scone indicating theoretical visibility. Review in the field indicates that initially the roadside hedgerow and field boundary trees would largely restrict visibility.

5.6.67 The value of views and susceptibility of viewers is assessed to be Medium, resulting in an overall Medium sensitivity. The magnitude of change upon the A94 would be None to Very Low and the overall effect upon visual amenity would be No View to Minor and Not Significant.

Railway

5.6.68 Within the study area the railway passes through Bridge of Earn and through a tunnel before emerging within the City of Perth. Theoretical glimpses of the turbine blades only are indicated from intermittent sections of the route to the west and northwest of Moncreiffe Island. Tree planting along the route would restrict the majority of views and there is some potential for fleeting glimpses of the blades to be seen above the varied urban skyline, dominated by close-range built development. North of the station intermittent theoretical views would be screened by tree planting alongside the track until the trains pass through Muirton, where partially filtered views, particularly in winter may be available for a very limited stretch of the track where the trains pass an industrial estate.

5.6.69 The value of views and susceptibility of viewers is assessed to be Medium, resulting in an overall Medium sensitivity. The magnitude of change upon the aforementioned route section is assessed as Very Low and the overall effect upon visual amenity would be No View to Minor and Not Significant.

Core Paths within the ZTV and 1.5km of proposed turbine

5.6.70 There is a network of core paths within the woodland to the north of the proposed turbine, with public access separated from the Aviva Site by tall, mesh fencing (Core Path references CTYS/1/3, CTSYS/3/4 and CTYS/100/1). The routes were walked in winter when deciduous trees were not in leaf and intervisibility with the proposed turbine would be largely fully restricted by tree cover including conifers and shrub/ivy understorey although where the route passes to within ~50m of the proposed turbine, in winter it is predicted that core path users would be aware of the rotor movements through intervening mature woodland. The value of views and susceptibility of viewers is assessed to be Medium, resulting in an overall Medium sensitivity. The magnitude of change upon the aforementioned route section is assessed as None to High. The overall effect upon visual amenity would be No View to Major/Moderate and Significant.

5.6.71 A core path (Ref EARN/21/1) connects the B9112 with the core path along the southern edge of the Golf course and passes under the M90 Motorway. Fleeting views close to the motorway are available (**Viewpoint 2**) and unrestricted views of the turbine would also be available from the full length of the path up to the junction with the B9112 (**Viewpoint 4**). At both locations the lower levels of the turbine tower would be screened by intervening coniferous trees along the motorway. The rotor and upper tower would be seen against the sky close to the motorway and partially back-clothed by landform closer to the B9112. The value of views and susceptibility of viewers is assessed to be Medium, resulting in an overall Medium sensitivity. The overall magnitude of change is assessed as High and the

overall effect upon visual amenity from the route would be Major/Moderate, and Significant.

5.6.72 A core path (EARN/108/2) connects the footpath network at the top of Mailer Hill with the B9112. At the summit and close to the telecommunication towers, the motorway corridor and associated movement of traffic create a sharp transition between the city and surrounding rural landscape (**Viewpoint 6**). The turbine would be clearly visible and back-clothed by built development, with the maximum vertical extent of the rotor passing below the landform on the distant horizon. As walkers progress north along the route, the path follows a minor road at a lower elevation and views are filtered on places by an intermittent hedgerow along the route and partially restricted by a tree belt along an intervening field boundary. The value of views and susceptibility of viewers is assessed to be Medium, resulting in an overall Medium sensitivity. The overall magnitude of change is assessed as High with a Major/Moderate effect that is Significant.

5.6.73 A core path (CTYS/20/2) passes along the southern boundary of the Golf course and connects the suburb of Moncreiffe with the core path network that passes through woodland to the east of the Aviva grounds. **Viewpoint 3** was taken from a field gate just off the core path route to ensure that the existing planting did not restrict visibility of the upper tower and rotor of the turbine in the photomontage. Walkers from Moncrieffe for the first circa 400m of the route would have no visibility of the turbine due to a combination of landform and intervening woodland. Where the route changes direction parallel to the M90 motorway, the turbine would be clearly visible above intervening woodland (see **Viewpoint 3**). The value of views and susceptibility of viewers is assessed to be Medium, resulting in an overall Medium sensitivity. The magnitude of change is assessed as High and the overall effect Major/Moderate and Significant.

Core Paths within the ZTV and between 1.5km and 5km of proposed turbine

5.6.74 **Figure 5.3, Volume 3** illustrates the range of Core Paths in the study area located between 1.5km and 5km from the proposed turbine. It is noted that the majority of routes lie outwith the ZTV and have been scoped out of consideration. The assessment of Core Paths within the ZTV has been undertaken with reference to field observations and **Viewpoint 10**. Receptors using core paths at popular hill summits (**Viewpoints 8 and 17**) and urban areas including parks (**Viewpoints 12, 13 and 14**) have a higher sensitivity and have been assessed separately, so they are omitted in this section to avoid duplication and double counting.

5.6.75 A network of core paths is located around Kinnoull Hill and the lower slopes within the suburb of Barnhill. Review in the field indicates that dense tree and shrub planting within the urban area and other features including tall stone walls in places typically restricts visibility out towards the Site. Kinnoull Hill itself is densely wooded and no clear views of the Site in winter were found from the core paths or the majority of the area of permissive access around the summit. Apart from the summit views, assessed separately, the value of views and susceptibility of viewers is assessed to be Medium where routes are within the

settlement. The magnitude of change is assessed as None to Low. The effect upon visual amenity from the Core Path network near Kinnoull Hill within the suburb of Barnhill would be No View to Moderate/Minor and Not Significant.

5.6.76 A network of core paths is located between the urban edge of Perth and Scone (**Viewpoint 10**). The magnitude of change would range from None to Low . The sensitivity of users of the Core Path would be Medium (Susceptibility and Value are Medium). The overall effect upon visual amenity would be No View to Moderate/Minor and Not Significant.

Popular Hill Summits: Kinnoull Hill and Moncreiff Hill

5.6.77 Views from Kinnoull Hill are represented by the photomontage from **Viewpoint 8** and views from the summit of Moncreiff Hill are illustrated in the photomontage from **Viewpoint 17**. The sensitivity of hill walkers at both popular hill-top destinations is High (High susceptibility and Value). Both views are part of wider 360-degree panorama that includes clear visibility of the wider urban area of Perth and in places the M90 motorway and other vertical infrastructure including telecommunications masts on local hill-tops. At both locations the proposed turbine would occupy a limited horizontal extent in these wider views. Visibility of the proposed turbine from Kinnoull Hill would be frequently restricted by woodland cover on the upper slopes, close to the summit.

5.6.78 The magnitude of change is assessed as ranging between No View and Low from Kinnoull Hill and Low from Moncreiff Hill. The overall effect upon visual amenity of hillwalkers would range from No View to Moderate and Not Significant from Kinnoull Hill summit and Moderate and Not Significant from Moncrieiffe Hill summit.

Craigie Hill Golf Course

5.6.79 Visibility of the turbine from the northern part of the golf course would be partly restricted by intervening woodland cover and further restricted by belts of tree planting along the fairways. At the southern more elevated parts of the course clear views of the turbine would be frequently available, particularly near the southern boundary (see **Viewpoint 3** from adjacent Core Path). The value of views and susceptibility of viewers is assessed to be Medium, resulting in an overall Medium sensitivity. The magnitude of change is assessed as ranging between No View and High. The overall effect upon visual amenity of golfers playing on the course would range from No View to Major/Moderate and Significant.

Scone Park

5.6.80 Scone Park is located approximately 4-5km north of the proposed turbine. The value of views and susceptibility of viewers is assessed to be High, resulting in an overall High sensitivity. The ZTV indicates theoretical visibility, however review in the field indicates that frequent layers of parkland tree cover, including coniferous species, limits visibility towards the Site, even in winter. Whilst no views are indicated near Scone Palace, there is the potential for limited and heavily restricted glimpses in winter from some peripheral areas of the park. The magnitude of change would range from None to Very Low. The

overall effect upon visual amenity from the park, would be No View to Moderate/Minor and Not Significant.

5.6.81 Table 5.6 below provides a summary of the key visual amenity effects within the study area.

Table 5.6: Summary of Key Visual Amenity Effects within the 5km Study Area

Key Visual Receptor	Value of views	Susceptibility of viewers	Sensitivity	Magnitude	Overall Effect and Significance
Settlement					
Pitheavlis, Perth (Viewpoint 1)	Medium to High	High	High	None to High	No View to **Major** and **Significan**t
Cherrybank, Perth (Viewpoint 5)	Medium to High	High	High	None to Medium	No View to **Major/Moderate** and **Significant**
Woodland and Burghmuir, Perth	Medium to High	High	High	None to Low	No View to Moderate and Not Significant
Bertha Park (Viewpoint 14)	Medium to High	High	High	None to Very Low	No View to Moderate/Minor and Not Significant
City Centre, Perth (Viewpoint 12)	Medium to High	High	High	None to Low	No View to Moderate and Not Significant
North Inch, Perth (Viewpoint 13)	Medium to High	High	High	None to Low	No View to Moderate and Not Significant
Bridgend/Barnhill, Perth	Medium to High	High	High	None to Low	No View to Moderate and Not Significant
Moncreiffe/Upper Craigie, Perth	Medium to High	High	High	None to Very Low	No View to Moderate/Minor and Not Significant
Craigie, Perth	Medium to High	High	High	None to Low	No View to Moderate and Not Significant
Scone (Viewpoint 10)	High	High	High	None to Low	No View to Moderate and Not Significant
Tarsappie (Viewpoint 9)	Medium to High	High	High	None to Low	No View to Moderate and Not Significant

Main transport routes					
M90 (Viewpoints 2, 7 and 9)	Low to Medium	Medium	Medium	None to High	No View to **Major/Moderate** and **Significant**
B9112 (Viewpoint 1)	Medium	Medium	Medium	None to High	No View to **Major/Moderate** and **Significant**

A9	Medium	Medium	Medium	None to Low	No View to Moderate/Minor and Not Significant
A93	Medium	Medium	Medium	None to Low	No View to Moderate/Minor and Not Significant
A93	Medium	Medium	Medium	None to Very Low	No View to Minor and not Significant
A94	Medium	Medium	Medium	None to Very Low	No View to Minor and not Significant
Railway	Medium	Medium	Medium	None to Very Low	No View to Minor and not Significant
Recreational routes and locations					
Core paths within ZTV and 1.5km of proposed turbine (Viewpoints 2, 3, 4, 6 & 7)	Medium	Medium	Medium	None to High	No View to **Major/Moderate** and **Significant**
Core Paths within the ZTV and between 1.5km and 5km of proposed turbine (Viewpoint 10)	Medium	Medium	Medium	None to Very Low	No View to Moderate/Minor and Not Significant
Kinnoull Hill Summit (Viewpoint 8)	High	High	High	None to Low	No View to Moderate and Not Significant
Moncreiffe Hill Summit (Viewpoint 17)	High	High	High	Low	Moderate and Not Significant
Craigie Hill Golf Course (Viewpoint 3)	Medium	Medium	Medium	None to High	No View to **Major/Moderate** and **Significant**
Scone Park	High	High	High	None to Very Low	No View to Moderate/Minor and Not Significant

Private views from residential properties

5.6.82 It is an established planning principle that there is no right to a private view, however where developments by virtue of scale and proximity have the potential to result in overbearing effects upon living conditions then this is a material planning consideration.

5.6.83 There are many operational wind energy schemes in the U.K where residents would be located in close proximity to commercial scale wind turbines. An example is the operational 100m tall turbine at FMC which is located approximately 300m from the nearest housing on the edge of Dunfermline. The Little Raith windfarm comprising 9 turbines at 125m to tip is located approximately 800m distant from the edge of Cowdenbeath at the closest point.

5.6.84 Scottish Planning Policy sets out the Spatial Frameworks for onshore wind turbine development in Table 1 under paragraph 161. For the community separation for consideration of visual impact it states it should be *'an area not exceeding 2km around cities, towns and villages identified on the local development plan with an identified settlement envelope or edge. The extent of the area will be determined by the planning authority based on landform and other features which restrict views out from the settlement'*

5.6.85 The Scottish government commissioned a report to examine the evidence and rationale for separation distances for wind farms and the final report was published in September 2013 (see **Appendix 5.4**). The report concluded that in the review of separation distances in over 15 countries found that most separation distances have in fact been set based on noise, shadow flicker or health considerations, with none specifically relating to visual impacts. In these cases, no reference is made to turbine heights. The report goes on to state that the origin of the 2km separation criterion could not be traced to any specific study and no supporting data could be found to justify this distance.

5.6.86 The field assessment from public roads within the urban area, combined with reference to the ZTV and photomontages, indicate that the likelihood of significant effects arising from the proposed wind turbine would be localised in extent. Intervisibility from dwellings along the B9112 and the nearby recently constructed housing estates would be limited by a combination of property orientation and the intervening coniferous tree planting along the boundary of the Site. Further afield, visibility from dwellings within the Cherrybank estate would be available (**Viewpoint 5**) but views from properties would be frequently fully or partially restricted by intervening planting and buildings. Where direct views do occur, in particular from ground floor windows typically comprising main living space used in daylight hours and also gardens, it is predicted that the turbine would typically have an overall Major/Moderate adverse effect upon visual amenity that is Significant. Given the separation distance in excess of 500m from dwellings and the fact the single turbine would be perceived against the sky and set beyond forestry, the resulting effects are not considered to be overbearing.

5.7 Proposed Mitigation

5.7.1 Mitigation measures associated with the Proposed Development have been embedded in the design, resulting in a number of 'inbuilt' mitigation measures such as turbine design and colour. Additional landscape screening proposals, whilst not essential, are proposed to minimise the close-range visual effects upon a localised part of the urban area of Perth to the north of the Site along the B9112 corridor.

5.7.2 The mitigation planting would comprise a belt of semi-mature conifer planting to infill an approximate 20m long gap near the main access to the site. Trees planted would be conifers up to 6m high and selected from species already present near the road corridor within the Aviva grounds to ensure that they respect the character of existing planting.

5.8 Cumulative Effects

5.8.1 Cumulative landscape and visual effects can arise in three reasonably distinct ways:

- Firstly, the effect of an extension of an existing development or the positioning of a new development such that it would give rise to an extended and/or intensified impression of the original wind farm or turbine in the landscape as seen from fixed locations;
- Secondly, cumulative effects can arise through an increase in the perceptions of wind turbine development as seen from fixed points from which more than one wind turbine would now be seen in different parts of the landscape; and
- Thirdly, an increase in the incidence of sequential perceptions of different turbines can occur through the recurrence of images and impressions arising from developments which are located at various points in the landscape and which are encountered when moving through it.

5.8.2 The assessment has drawn on information of other wind energy developments from the Perth and Kinross Council website and summarised on Figure 5.7, Volume 3. The schemes that are approved i.e. either operational or consented are illustrated on the map.

5.8.3 SNH guidance regarding Cumulative Landscape and Visual Assessment (SNH 2012) states at paragraph 33 that:

'The key principle for all cumulative impact assessments is to focus on the likely significant effects and in particular those which are likely to influence the outcome of the consenting process'

5.8.4 The SNH Guidance goes on to state at paragraph 45 that the cumulative impact of windfarm development on landscape and visual amenity is a product of:

- the distance between individual windfarms (or turbines);
- the distance over which they are visible;
- the overall character of the landscape and its sensitivity to windfarms;

- the siting and design of the windfarms themselves; and
- the way in which the landscape is experienced.

5.8.5 It is then stated at paragraph 46 of the Guidance that the combination of single turbines (i.e. The Proposed Development) and small clusters of turbines can raise the same issues as for larger windfarms. SNH guidance is that where the cumulative effects of these are Significant, they require assessment.

5.8.6 Within 5km of the turbine there are several micro turbines and a single small turbine closely associated with large buildings of a similar or larger scale e.g. Tesco Stores, Scottish and Southern Energy along the A9 corridor. These structures have no potential for any significant cumulative effects with the proposed development from the A9 or any other visual receptors in the locality.

5.8.7 The closest larger scale wind turbines are the 12 No. 91m to tip turbines that form part of the operational Lochelbank Glenfarg Windfarm. The potential for cumulative effects with the proposed development lies in theoretical sequential visual effects from the M90, however review in the field indicates that the operational windfarm is not visible from the motorway due to intervening landform.

5.8.8 In conclusion it is clear from careful review in the field and analysis of the consented schemes illustrated on **Figure 5.7, Volume 3**, that there is no potential for any significant cumulative landscape or visual effects with the proposed development. In this context the preparation of further technical work including cumulative ZTVs or cumulative wireframes would not be a proportionate assessment requirement as advocated by best practice guidance.

5.9 Residual Effects

5.9.1 Residual effects are summarised in Table 5.5 and Table 5.6 above.

5.10 Conclusions

5.10.1 The landscape and visual impact assessment process combines objective methodology and elements of subjective professional judgement. The assessment has been carried out by a suitably qualified and experienced Chartered Landscape Architect.

5.10.2 In accordance with current best practice guidance, the assessment focuses on the landscape and visual effects that have the potential to be Significant. Judgement needs to be exercised at all stages in terms of the scale of the investigation that is appropriate and proportional. The decision on the extent of the detailed study area was tested by assessment of a range of additional visual receptors requested by NatureScot and Perth and Kinross Council.

5.10.3 The context of National, Regional and Local Planning Policy with respect to landscape and visual issues has been reviewed and includes the adopted Development Plan and draft Supplementary Planning Guidance.

5.10.4 No part of the Site or Study Area lies within a statutorily designated landscape (e.g. National Park or National Scenic Area). The River Tay National Scenic Area is located approximately 20km north of the proposed turbine and no intervisibility is predicted. Two non-statutory landscape designations lie within 5km of the proposed turbine and comprise the Ochil Hills Special Landscape Area (SLA), located 4km to the south of the Site and The Sidlaw Hills SLA, located 2.7km east of the Site at the closest point.

5.10.5 The Site does not lie within Green Belt and it is understood that no Tree Preservation Orders cover the Site or adjoining land. Chapter 6 and 7 provide full details on the Cultural Heritage and Ecological Designations and these have been reviewed to inform the overall assessment of landscape value.

5.10.6 The Tayside Landscape Character Assessment prepared by Land Use Consultants was published in 1999. Minor refinement on the assessment was undertaken by David Tydesley Associates in 2010 and more recently by LUC as part of the Local Landscape Designations Review and 2020 Adopted Landscape SPG. The Site is located within the Urban Area and close to the boundary with the Lowland Hills Landscape Character Type (LCT). Other landscape character types located within the study area and ZTV where there is the potential for indirect effects are the Firth Lowlands, Igneous Hills, Broad Valley Lowlands and Lowland River Corridors LCT.

5.10.7 The site is located within the Aviva commercial area and comprises an area of semi-improved grassland between the main Aviva site and the Craigie Hill Golf Course and lies at around 90m AOD. The land parcel that contains the Site is bordered by mature woodland and tree cover.

5.10.8 The landform in the wider locality identifies the site as being located on a slope of the River Tay Valley with land falling away to the north and west but rising to the south. Within the Aviva grounds there is a circa 40m fall in levels, noting that along the B9112 the land rises to the north within the urban area of Perth and views are available from the Cherrybank estate. Further afield and beyond the city, land to the south and southeast of the site gently rises initially and then more steeply to an east-west ridgeline. High points include Mailer Hill to the south and further to the southeast Moncreiffe Hill. Northeast of the Site, beyond the urban area of Perth the land rises steeply above the River Tay to Kinnoull Hill.

5.10.9 The closest built development to the proposed turbine is a redundant Sport's Hall circa 90m to the north-west of the proposed turbine, comprising a modern brick building with steel cladding. The listed Pitheavlis Building (Aviva Building) constructed in the early 1980's comprises flexible concrete modules, stepped into the slope with landscaped roof terraces. The building is located circa 200m north-west of the proposed turbine.

5.10.10 The nearest residential dwelling is located approximately 500m from the proposed turbine, within a recently constructed housing estate on Bell Gardens, off the B9112. Due to the orientation of the dwellings relative to the proposals, no direct view of the turbine would be available, noting that nearby properties including the listed Pitheavlis Cottages are separated from the proposed turbine by mounding along the boundary of the Aviva grounds and mature coniferous tree planting.

5.10.11 The road network in close proximity to the Site include the M90 motorway corridor to the south, with the Aviva buildings and car parking, including the Site screened from the road corridor by a coniferous tree belt. The B9112 (Necessity Brae), provides access to the Site.

5.10.12 The edge of Perth in this location comprises a range of man-made development and a range of building styles and ages, dominated by modern post-war housing (typically 1-2 storey) and occasional larger buildings including flats, offices and the motorway service station.

5.10.13 Vertical infrastructure in the rural landscape to the south of the M90 includes pylons that lie approximately 1.2km southwest of the proposed turbine at the closest point and the telecommunication masts on Mailer Hill and St. Magdalene's Hill that lie a similar distance to the southeast.

5.10.14 The visual baseline is informed by the Zone of Theoretical Visibility (ZTV) of the proposed turbine which is illustrated on a series of plans. The ZTVs should be interpreted as indicative of a maximum-effect scenario, since they cover tracts of the surrounding landscape where the Proposed Development would in reality be filtered or screened by other intervening elements (e.g. hedgerows, individual trees and scattered buildings).

5.10.15 The photography was undertaken with a high quality Digital SLR camera with a full frame sensor and fixed 50mm lens. Computer generated verified photomontages of the proposed turbine were prepared in accordance with latest NatureScot Guidance.

5.10.16 In order to meet the proportionate requirements of best practice guidance, viewpoint locations were not selected where intervening planting or buildings would screen views of the proposed turbine.

5.10.17 The Site for the Proposed Development has a simple landscape fabric and construction-related impacts on the fabric of the Site would be mostly limited to the loss of a small area of semi-improved grassland covering the footprint of the turbine and access.

5.10.18 The erection of the turbine would constitute the most noticeable aspect of the construction phase as perceived from the wider landscape. Concerning the erection of the turbine, given that the Proposed Development would appear to rise from the ground and be seen over a wider area, the effects would be 'emergent' and increasingly visible until the effects merged into those associated with the operational phase, described below.

5.10.19 The visual effects of the various aspects of the construction phase would be temporary and intermittent and will be minimised by good site management and a relatively short construction programme.

5.10.20 The only operational element of the scheme with the potential to affect the landscape and visual amenity of the study area is the wind turbine itself.

5.10.21 No landscape mitigation is considered to be required to compensate for the minimal loss of a small area of semi-improved grassland.

5.10.22 It is not considered essential to mitigate the close-range visual effects of the proposed development from a short section of the B9112 corridor near the Site entrance. However, following the feedback from NatureScot (formerly SNH) in the scoping report for the nearby refused turbine project, it is anticipated that the Local Planning Authority may consider it appropriate to request screen planting in this location secured by a planning condition.

5.10.23 During the operational phase of the development the effect upon the 'Urban' landscape character type and the adjacent rural landscape covered by the 'Lowland Hills' would be Moderate adverse and Not Significant. Further afield the level of effect upon all other landscape character types would be Minor adverse and Not Significant with the Igneous Hills experiencing a Moderate/Minor adverse effect that is Not Significant.

5.10.24 It is assessed that there would be No Significant adverse effects upon the Sidlaw Hills and Ochil Hills Special Landscape Areas and the overall integrity of both designations would remain intact.

5.10.25 The operational effect of the proposed turbine upon the visual amenity of public visual receptors in the surrounding landscape and urban areas has been assessed in detail. The visual amenity experienced from the closest parts of the urban area of Perth to the proposed turbine, including parts of the suburbs of Pitheavlis and Cherrybank would be Major to Major/Moderate adverse and Significant. The effects from other suburbs within Perth would range from No View to Moderate adverse and Not Significant. The settlements of Scone and Tarsappie where occasional long-range views of the proposed turbine would be available would experience up to a Moderate/Minor adverse effect that would be Not Significant.

5.10.26 The operational effects upon the visual amenity of users of the main transport routes would be greatest upon users of the M90 and B9112 at close range, where Major/Moderate and Significant localised adverse effects have been assessed. Views from other transport corridors would range from Moderate/Minor adverse and Not Significant from the A93, to Minor adverse and Not Significant from the A9, A94 and Railway.

5.10.27 The effects of the proposed turbine upon the visual amenity of recreational users would be Major/Moderate and Significant from several core paths close to the M90 and from parts of

the Craigie Hill Golf course. The visual amenity of users of other more distant core paths within the ZTV, where these do not coincide with higher sensitivity users such as people within urban parks and popular hill summits would experience Minor adverse effects that would be Not Significant.

5.10.28 Recreational users at the summit of popular hills surrounding Perth including Kinnoull Hill and Moncreiffe Hill would have views of the proposed turbine that would result in a Moderate adverse effect on visual amenity that is Not Significant.

5.10.29 It is an established planning principle that there is no right to a private view, however where developments by virtue of scale and proximity have the potential to result in overbearing effects upon living conditions then this is a material planning consideration.

5.10.30 There are many operational wind energy schemes in the U.K where residents would be located in close proximity to commercial scale wind turbines. An example is the operational 100m tall turbine at FMC which is located approximately 300m from the nearest housing on the edge of Dunfermline. The Little Raith windfarm comprising 9 turbines at 125m to tip is located approximately 800m distant from the edge of Cowdenbeath at the closest point.

5.10.31 The field assessment from public roads within the urban area, combined with reference to the ZTV and photomontages at Viewpoints 1 and 5, indicate that the likelihood of direct views of the proposed wind turbine from private dwellings would be comparatively limited in extent given the overall number of dwellings in the city. Intervisibility from dwellings along the B9112 and the nearby recently constructed housing estates would be limited by a combination of property orientation and the intervening coniferous tree planting along the boundary of the Site. Further afield, potential visibility from dwellings within the Cherrybank estate would be frequently restricted by intervening planting and buildings and where direct views occur, in particular from upper floor rear windows, it is predicted that the turbine would have a Major/Moderate adverse effect upon visual amenity that is Significant, but not overbearing.

5.10.32 In terms of cumulative considerations, within 5km of the turbine there are several micro turbines and a single small turbine closely associated with large buildings of a similar or larger scale e.g. Tesco Stores, Scottish and Southern Energy along the A9 corridor. These structures have no potential for any significant cumulative effects with the proposed development from the A9 or any other visual receptors in the locality.

5.10.33 The closest larger scale wind turbines are the 12 No. 91m to tip turbines that form part of the operational Lochelbank Glenfarg Windfarm. The potential for cumulative effects with the proposed development lies in theoretical sequential visual effects from the M90, however review in the field indicates that the operational windfarm is not visible from the motorway due to intervening landform.

5.10.34 It is clear from careful review in the field and analysis of the other wind energy schemes, that there is no potential for any significant cumulative landscape or visual effects with the proposed development.

5.10.35 In conclusion, the proposed turbine would have some localised significant adverse effects upon parts of the suburbs of Pitheavlis and Cherrybank within the urban area of Perth, a section of the M90 and B9112, parts of the Craigie Hill Golf course, and several core paths in close proximity tclimateXchangeo the proposed wind turbine. The turbine would be prominent from a relatively modest number of visual receptors and whilst some Significant adverse effects upon visual amenity are assessed, as demonstrated by the ZTV at **Figure 5.3, Volume 3**, the proposed turbine would not be visible from the overwhelming majority of the urban area of Perth. Significant adverse effects upon visual amenity would also not be experienced from receptors in the wider landscape including key hill-top summits to the east of the city.

6. Cultural Heritage Assessment

6.1 Introduction

6.1.1 This chapter presents an updated assessment of the effects of the proposed development on the historic environment in light of the revisions made to the scheme previously submitted for Planning Permission to Perth & Kinross Council (PKC) in September 2018 (Ref: 18/01656/FLL).

6.1.2 A detailed cultural heritage assessment was prepared as part of the Environmental Statement (ES) submitted in support of the previous planning application (Ref: 18/01656/FLL).

6.1.3 This revised chapter has been compiled by the Hurd Rolland Partnership and should be read in conjunction with the detailed Heritage Statement, also prepared by the Hurd Rolland Partnership, included at **Appendix 6.1, Volume 4**.

6.1.4 The objective of the assessment is to:

- Describe the location, nature and extent of any known heritage assets or areas of archaeological potential which may be affected by the revised proposal;
- Provide an assessment of the importance of these assets;
- Assess the likely scale of any impacts on the historic environment posed by the revised proposal;
- Outline suitable mitigation measures to avoid, reduce or offset significant adverse effects, as appropriate; and
- Provide an assessment of any residual effects remaining after mitigation.

6.1.5 Some of the heritage assets coincide with visual receptors or landscape character areas assessed in Chapter 5 (Landscape and Visual Impact Assessment). In such cases it is important to recognise the difference in approach between these two topics. Cultural heritage assessment addresses effects on the cultural heritage significance of heritage assets, which may result from, but are not equivalent to, visual impacts.

6.2 Policy and Guidance

6.2.1 The assessment has been undertaken with reference to the relevant current legislation, policy and guidance relating to Cultural Heritage, some of which has been updated since the submission of the previous Environmental Statement (ES) in support of the previous planning application (Ref: 18/01656/FLL).

Legislation

6.2.2 Scheduled Monuments and Listed Buildings are protected by statute.

6.2.3 Legislation regarding Scheduled Monuments is contained within The Ancient Monuments and Archaeological Areas Act 1979. Legislation regarding Listed Buildings is contained in The Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997.

6.2.4 The 1979 Act makes no reference to the settings of Scheduled Monuments. The 1997 Act does, however, place a duty on the planning authority with respect to Listed Buildings and Conservation Areas, and their settings. Section 59 of the 1997 Act states (in part):

"In considering whether to grant planning permission for development which affects a listed building or its setting, a planning authority or the Secretary of State, as the case may be, shall have special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses."

6.2.5 Section 64 states:

"In the exercise, with respect to any buildings or other land in a conservation area, of any powers under any of the provisions in subsection (2), special attention shall be paid to the desirability of preserving or enhancing the character or appearance of that area."

6.2.6 The Historic Environment Scotland Act 2014 defines the role of the new public body, Historic Environment Scotland (HES), and the processes for the designation of heritage assets, consents and rights of appeal.

Planning Policy

6.2.7 The Scottish Government's planning policies in relation to the historic environment are set out in paragraphs 135 -151 of Scottish Planning Policy (SPP) (The Scottish Government, June 2014). The historic environment is defined as "*the physical evidence for human activity that connects people with place, linked with the associations we can see, feel and understand*" and includes *"individual assets, related settings and the wider cultural landscape*". The policy principles are stated in Paragraph 137:

"The planning system should:

- promote the care and protection of the designated and non-designated historic environment (including individual assets, related settings and the wider cultural landscape) and its contribution to sense of place, cultural identity, social well-being, economic growth, civic participation and lifelong learning; and
- enable positive change in the historic environment which is informed by a clear understanding of the importance of the heritage assets affected and ensure their future use. Change should be sensitively managed to avoid or minimise adverse impacts on the fabric and setting of the asset, and ensure that its special characteristics are protected, conserved or enhanced."

6.2.8 The SPP applies these principles to all designated assets (Paragraphs 141-149). In particular it states that:

- Regarding developments affecting Listed Buildings, "special regard must be given to the importance of preserving and enhancing the building, its setting and any features of special architectural or historic interest";
- Proposals "which will impact on its appearance, character or setting [of a Conservation Area], should preserve or enhance the character and appearance of the conservation area";
- "Where there is potential for a proposed development to have an adverse effect on a scheduled monument or on the integrity of its setting, permission should only be granted where there are exceptional circumstances";
- "Where a development proposal has the potential to affect a World Heritage Site, or its setting, the planning authority must protect and preserve its Outstanding Universal Value";
- "Planning authorities should protect and, where appropriate, seek to enhance gardens and designed landscapes included in the Inventory of Gardens and Designed Landscapes and designed landscapes of regional and local importance" and
- "Planning authorities should seek to protect, conserve and, where appropriate, enhance the key landscape characteristics and special qualities of sites in the Inventory of Historic Battlefields".

6.2.9 The SPP also requires planning authorities to protect archaeological sites and monuments, preserving them in situ where possible, or otherwise ensure "*appropriate excavation, recording, analysis, publication and archiving before and/or during development*" (paragraph 150). "*Non-designated historic assets and areas of historical interest, including historic landscapes, other gardens and designed landscapes, woodlands and routes such as drove roads*" should also be preserved in situ wherever feasible (Paragraph 151).

6.2.10 The Historic Environment Policy for Scotland (HEPS) replaced the Historic Environment Scotland Policy Statement 2016 (HESPS) in May 2019. Unlike its predecessor HEPS is almost entirely focused on policy and principles and specifically refers to the Managing Change in the Historic Environment suite of documents published from 2010 onwards as the main source of detailed guidance.

6.2.11 The Strategic Development Plan for Perth and Kinross (prepared jointly with Dundee, Angus and Fife, as TAYplan: approved October 2017) covers the historic environment in Policy 2 and Policy 9. Regarding the historic environment Policy 2: Shaping Better Quality Places states:

"To deliver better quality development and places which respond to climate change, Local Development Plans, design frameworks masterplans/briefs and development proposals should be:

Place-led to deliver distinctive places by ensuring that the arrangement, layout, design, density and mix of development are shaped through incorporating and enhancing natural

and historic assets, natural processes, the multiple roles of infrastructure and networks, and local design context."

6.2.12 Policy 9 Managing TAYplan's Assets covers the historic environment;

"Land should be identified through Local Development Plans to ensure responsible management of TAYplan's assets by:

Safeguarding the integrity of natural and historic assets; Understanding and respecting the regional distinctiveness and scenic value of the TAYplan area through safeguarding the integrity of natural and historic assets; including …. landscapes, parks, townscapes, archaeology, historic battlefields, historic buildings and monuments."

6.2.13 The Perth and Kinross Local Development Plan 2, adopted in November 2019, contains the following policies which are relevant to this assessment;

- Policy 26: Scheduled Monuments and Archaeology
- Policy 27: Listed Buildings
- Policy 28: Conservation Areas
- Policy 29: Gardens and Designed Landscapes
- Policy 30: Protection, Promotion and Interpretation of Historic Battlefields
- Policy 31: Other Historic Environment Assets

Guidance

6.2.14 Planning Advice Note 2/2011: Planning and Archaeology provides technical advice to planning authorities and developers on dealing with archaeological remains. Among other issues it covers the balance in planning decisions between the preservation of archaeological remains and the benefits of development; the circumstances under which developers can be required to provide further information, in the form of a field evaluation, to allow planning authorities to reach a decision; and measures that can be taken to mitigate adverse impacts.

6.2.15 HES provides guidance on how to apply the policies set out in the SPP in a series of documents entitled 'Managing Change in the Historic Environment', of which the guidance notes on 'Setting' (Historic Scotland 2016) and 'Use and Adaptation' (Historic Scotland 2019) are particularly relevant.

6.2.16 HES has also contributed to the Environmental Impact Assessment Handbook (Version 5: April 2018), in collaboration with SNH, which provides guidance for competent authorities, consultation bodies and others involved in the EIA process in Scotland. Cultural Heritage is considered in Appendix 1 of the Handbook.

6.3 Consultation

Previous Proposal

6.3.1 The previous application for Planning Permission submitted in September 2018 (Ref: 18/01656/FLL) was refused by PKC under delegated powers in January 2019. However, subsequent to review by the Local Review Body, a minded to grant decision was taken on 20th August 2019.

6.3.2 The decision was subsequently referred to the Scottish Ministers primarily on the basis that it was contrary to the formal consultation response dated 2nd November 2018 submitted by HES under the planning process, which stated (**Appendix 6.2, Volume 4**);

"Thank you for your consultation which we received on 25 September 2018. We have considered it and its accompanying EIA Report (referred to in the submissions as Environmental Statement) in our role as a consultee…

Our Advice

*We **object** to the application because we consider that the proposed wind turbine development would have a significant adverse impact on the setting of category A-listed Aviva building. Our view is that the proposal raises issues of national interest and is contrary to paragraph 141 of SPP. The detailed reasons for our objection and our comments on the EIA report are set out in the Annex below..."*

6.3.3 The Annex to the letter stated (emphasis added);

"…The Aviva building is one of Scotland's most outstanding commercial buildings of the 20th century and is among a very small number of buildings of this relatively late date to have been listed.

The approach to the design of the building and its landscaped grounds has carefully considered their interconnected visual impact and placed very significant emphasis on factors such as the relationship to the skyline, and a desire to produce a building with both a striking visual architectural impact when viewed at close quarters and a degree of camouflage at a landscape scale. The strong horizontality and absence of any significant vertical features are key to this effect and form part of the building's special interest. How the building is seen both from within the site and further afield therefore makes an important contribution to its understanding and appreciation.

Panoramic views from the Aviva Building would generally be unaffected by the proposed turbine, and we are content to agree that this is not a significant factor in the overall level of impact.

The relationship between the building and the car park to the south is important, and the approach to the main entrance from the car park is significant in the way the building is

experienced by users and visitors. ***The turbine would affect this experience, but again we are content that this impact alone would not be objectionable.***

The key issue, in our view, is the impact that the proposed turbine would have on the experience and appreciation of the building from within the site. We agree with the assessment in the EIA report that the turbine would distract from the building and compete with it, and we consider that this is particularly problematic because it would work against the established strong horizontality and the carefully conceived relationship with the surrounding topography.

The size and location of the wind turbine would, in our view, potentially lead to it becoming the dominating element in the overall composition and redefine its focus. Given the significance of the Aviva building we do not consider that to be acceptable..."

6.3.4 The application for Planning Permission was eventually refused in a letter from the Scottish Ministers dated 12th November 2020. The Reporter appointed to consider the application noting (**Appendix 6.3, Volume 4**);

"…There is no doubt that the proposed very tall, vertical, moving structure would, in its entirety, dominate the skyline east of the category A listed building. It would undermine the very qualities that are an integral part of the design philosophy of the modernist building. It would disrupt the flow of the horizontal lines of the building and, as typically evidenced in Viewpoint 1, it would dominate the view southeast from the B9112. The proposal would have a significant adverse effect on the setting of the Aviva building..."

6.3.5 Importantly, HES offered the following advice;

"Given that the proximity of the proposed turbine to the A listed building is particularly problematic to us, we consider that the worst of the impacts could potentially be addressed by relocating the turbine a relatively short distance. We would be happy to discuss this in detail..."

Revised Proposal

6.3.6 HES were consulted informally regarding the opportunity to relocate the proposed wind turbine to adjacent land beyond the unlisted Recreation Centre approximately 150m further ESE of the Aviva Building.

6.3.7 An initial meeting with HES was held on 20th July 2021 during which the principle of repositioning the wind turbine as a more distant and discernibly independent element within the landscape was discussed.

6.3.8 Thereafter, Hurd Rolland and HES undertook a joint site visit on 26th July 2021 to view the proposed revised location of wind turbines and to consider the adjusted potential impact on the Aviva Building. It was agreed that Hurd Rolland would provide a detailed draft

Heritage Statement assessing the impact of the revised proposal in terms of the previous reasons for refusal.

6.3.9 Hurd Rolland submitted a draft Heritage Statement to HES in those terms on 1st December 2021.

6.3.10 The revised proposal was presented to PKC at a pre-planning meeting held on 8th December 2021 with HES in attendance.

6.3.11 HES provided a detailed written response to the revised proposal on 23rd December 2021, noting (**Appendix 6.4, Volume 4**);

*"**Current proposal***

We understand that the revised turbine location has been chosen to reduce the potential for significant adverse impacts on the setting of the Aviva building and to address our concerns regarding the previous proposal. We note that the parcel of land on which the new proposal would be located was not available to the applicant at the time of the original application.

Draft Heritage Statement

We have considered all the information received to date, including the Draft Heritage Statement (November 2021) and the visualisations from VP1 and VP5. The Draft Heritage Statement reviews the revised proposal against our objection of 02 November 2018 and the Reporter's decision and puts these in the context of national policy and guidance on heritage.

We raised a number of issues in our objection to the 2018 proposal but our letter identified the key issues as being the proposed turbine's potential effect on an appreciation of the building when within the site, and the way the turbine would compete with the horizontal architecture of the building and its relationship with the site. This was reflected in the Reporter's conclusion that the turbine would "overwhelm the building and dominate its skyline setting" and impact adversely on the horizontal emphasis of the building's architecture.

Visualisations of the proposed turbine in the revised location from two viewpoints have been provided and we are content that these give an early indication that our previous concerns have been addressed to the point that a future application would be unlikely to merit an objection from us. However, we would recommend that the exact same viewpoints are used to illustrate the difference in potential impacts between the current proposal and the previous one as the proposals are developed further.

Whilst it is clear that the proposed turbine would be visible in some views of the building, the visualisations provided suggest that, because of the increased distance between it and the Aviva building, the proposed turbine would read visually as a separate element from the building and would have less of an impact on the building's qualities as outlined in our previous advice and the Reporter's decision."

6.3.12 HES concluded;

*"**Our advice***

Overall, we consider that potential setting impacts from the currently proposed scheme are unlikely to reach a level where it would raise issues of national importance such that we would object. We welcome the revisions that have achieved this.

Please note that this is an indicative view on the principle of the revised development and is subject to our review of any more detailed information produced to support a planning application. We will provide more detailed comments on the proposal and any associated information once an application is submitted to Perth and Kinross Council and we are formally consulted by them…"

6.4 Methodology

The Assessment Process

6.4.1 A detailed cultural heritage assessment was undertaken as part of the EIA submitted in support of the proposal previously submitted for planning permission in September 2018 (Ref: 18/01656/FLL), using the following staged methodology;

- Desk-based study leading to the identification of heritage assets potentially affected by the development;
- Definition of baseline conditions, based on results of the desk-based study and visits to assets;
- Assessment of the importance of heritage assets potentially affected by the development;
- Identification of potential impacts on heritage assets, informed by baseline information, site visits, Zone of Theoretical Visibility (ZTV) mapping, wireframes and photomontages;
- Proposal of mitigation measures, to eliminate, reduce or offset adverse effects;
- Assessment of the magnitude of residual effects;
- Assessment of the significance of residual effects, broadly a product of the asset's importance and the magnitude of the impact; and
- Assessment of cumulative effects.

6.4.2 The revised assessment is focussed on the impact of the revised proposal on the cultural significance of the Category A Listed Aviva UK Insurance Building. Regarding the other previously assessed heritage assets most of the original assessment remains relevant and have only been revised where appropriate.

Study Areas

6.4.3 The Inner Study Area (ISA) is a 350m buffer from the proposed turbine. Within this area, all heritage assets are assessed for construction and operational effects.

6.4.4 The Outer Study Area (OSA) extends to 2km from the proposed turbine. Within this area background data has been collated to inform the archaeological potential of the Site, identify any heritage assets which may be affected as they continue into the site and to identify assets which may be subject to setting effects.

6.4.5 Under the revised proposal the centre of both study areas requires to be relocated approximately 150m ESE.

Data Sources

6.4.6 The baseline for the ISA was informed by a comprehensive desk-based study, based on all readily available documentary sources, following the Chartered Institute for Archaeologists' (CIfA) 'Standard and Guidance for historic environment desk- based assessment'. The following sources of information were referred to;

- Designation data downloaded from the Historic Environment Scotland website;
- The National Record of the Historic Environment (NRHE), including the Canmore database and associated photographs, prints/drawings and manuscripts held by HES;
- Historic Landscape Assessment data, viewed through the HLAMap website;
- The Perth and Kinross Heritage Trust Historic Environment Record (HER);
- The National Collection of Aerial Photography (NCAP);
- Geological data available online from the British Geological Survey;
- Historic maps held by the National Library of Scotland;
- Historic maps and plans held by the Perth and Kinross Archive;
- Relevant internet resources, including Pastmap;
- Readily available published sources and unpublished archaeological reports.

6.4.7 The ISA was originally visited on 24th and 25th July 2018. The purpose of these visits was to establish the potential for and assess the magnitude of any setting impacts on the Category A listed Aviva Building (LB52450), to assess the presence/absence, character, extent and condition of known assets and to identify any previously unrecorded assets. A further site visit was undertaken by Hurd Rolland, accompanied by HES on 26th July 2021.

6.4.8 The OSA was toured on 25th July 2018, visiting designated heritage assets to establish the potential for and assess the magnitude of any setting impacts. No further inspection of the OSA has been undertaken in relation to the revised assessment.

Definition of baseline conditions

6.4.9 Designated assets within both the ISA and OSA which have been previously recorded on the NRHE are labelled with the reference number assigned to them by HES (prefixed SM for Scheduled Monuments, and LB for Listed Buildings); undesignated assets are labelled with the reference number in the HER (prefixed with MPK – Monument Perth and Kinross).

6.4.10 The relocation of both study areas approximately 150m ESE introduces the following additional listed buildings into the OSA.

Nether Friarton House (Category C Listed)
Old Tollhouse, Edinburgh Road (Category C Listed)

Known heritage assets within the Inner Study Area

6.4.11 Assets within the ISA are shown in **Figure 6.1**, **Volume 3** with detailed descriptions compiled in a gazetteer (**Appendix 6.5, Volume 4**).

Heritage assets in the outer study area

6.4.12 Assets that meet the initial criteria for assessment are described briefly in Sections 6.5.20 – 6.5.23, listed in **Tables 6.5 – 6.7** and shown in **Figure 6.1, Volume 3**.

Identification of potential impacts

6.4.13 Effects on the historic environment can arise through direct physical impacts, impacts on setting or indirect impacts;

- Direct physical impacts describe those development activities that directly cause damage to the fabric of a heritage asset. Typically, these activities are related to construction works and will only occur within the application site.
- An impact on the setting of a heritage asset occurs when the presence of a development changes the surroundings of a heritage asset in such a way that it affects (positively or negatively) the cultural significance of that asset. Visual impacts are most commonly encountered but other environmental factors such as noise, light or air quality can be relevant in some cases. Impacts may be encountered at all stages in the life cycle of a development from construction to decommissioning but they are only likely to lead to significant effects during the prolonged operational life of the development.
- Indirect impacts describe secondary processes, triggered by the development, that lead to the degradation or preservation of heritage assets. For example, changes to hydrology may affect archaeological preservation; or changes to the setting of a building may affect the viability of its current use and thus lead to dereliction.

6.4.14 The scoping and consultations accompanying the previous cultural heritage assessment identified the Category A-listed Aviva Building as the principal heritage asset whose setting was likely to be affected. Visualisations from Viewpoints 1 & 5 were prepared to inform the assessment of the likely impact.

6.4.15 Potential impacts on the settings of other heritage assets were identified from an initial desk-based appraisal of data from HES and the HER, and consideration of current maps and aerial images available on the internet. Where the initial appraisal identified the potential for a significant effect, the asset was visited to define baseline conditions and identify key viewpoints. Initial appraisal of the additional listed buildings identified at

Paragraph 6.4.10 did not identify a potential significant impact and these sites have not been visited.

Mitigation measures and identification of residual effects

6.4.16 Proposed mitigation measures are described in Section 6.7. The preferred mitigation option is always to avoid or reduce impacts through design, or through precautionary measures such as fencing off heritage assets during construction works. Impacts which cannot be eliminated in these ways will lead to residual effects.

6.4.17 Adverse effects may be mitigated by an appropriate level of survey, excavation, recording, analysis and publication of the results, in accordance with a written scheme of investigation (SPP Paragraph 150 and PAN2/2011, Sections 25 - 27). Archaeological investigation can have a beneficial effect of increasing knowledge and understanding of the asset, thereby enhancing its archaeological and historical interest and offsetting adverse effects.

Impact Assessment Criteria

Heritage importance, cultural significance and sensitivity

6.4.18 Cultural heritage impact assessment is concerned with effects on cultural significance, which is a quality that applies to all heritage assets. The use of the word 'significance', referring to the sum of the values we attach to an asset because of its heritage interest, should not be confused with the unrelated usage in EIA where the significance of an effect reflects the weight that should be attached to it in a planning decision.

6.4.19 The importance of a heritage asset is the overall value assigned to it based on its cultural significance, reflecting its statutory designation or, in the case of undesignated assets, the professional judgement of the assessor (**Table 6.1**). Assets of national importance and international importance are assigned a high and very high level respectively. Scheduled Monuments, Inventory Gardens and Designed Landscapes, Inventory Historic Battlefields and Historic Marine Protected Areas are, by definition, of national importance. The criterion for listing is that a building is of 'special architectural or historic interest.' In accordance with the Designation Policy Selection Guidance published by HES in 2019, Category A refers to 'buildings of special architectural or historic interest which are outstanding examples of a particular period, style or building type,' Category B to 'buildings of special architectural or historic interest which are major examples of a particular period, style or building type', and Category C to 'buildings of special architectural or historic interest which are representative examples of a period, style or building type.' Conservation Areas are not defined as being of national importance and are therefore assigned to a medium level. Any feature which does not merit consideration in planning decisions due to its cultural significance may be said to have negligible heritage importance; in general, such features are not considered as heritage assets and are therefore excluded from the assessment.

Table 6.1: Criteria for Assessing the Sensitivity of Heritage Assets

Sensitivity	Guideline Criteria
High	Assets valued at an international or national level, e.g., World Heritage Sites, scheduled monuments, Category A listed buildings, Inventory gardens and designed landscapes, Inventory battlefields, historic marine protected areas, some conservation areas and non-designated assets that meet the relevant criteria for designation in the opinion of the assessor. Category B or C listed buildings where the existing designation does not adequately reflect their value, in the opinion of the assessor.
Medium	Assets valued at a regional level, e.g., Category B listed buildings, some conservation areas and non-designated assets of similar value in the opinion of the assessor. Category C listed buildings where the existing designation does not adequately reflect their value, in the opinion of the assessor.
Low	Assets valued at a local level, e.g., Category C listed buildings, some conservation areas and non-designated assets of similar value in the opinion of the assessor.

6.4.20 Cultural significance is assessed in relation to the criteria in Annexes 1 – 5 in the Designation Policy Selection Guidance published by HES in 2019, which is intended primarily to inform decisions regarding heritage designations but may also be applied more generally in identifying the 'special characteristics' of a heritage asset, which contribute to its cultural significance and should be protected, conserved and enhanced according to SPP paragraph 137. Annex 1 is widely applicable in assessing the cultural significance of archaeological sites and monuments, for instance, while the criteria in Annex 2 can be used in defining the architectural or historic interest of buildings, whether listed or not.

6.4.21 The special characteristics which contribute to an asset's cultural significance may include elements of its setting. Setting is defined in 'Managing Change in the Historic Environment: Setting' (HES 2016, Section 1) as 'the way the surroundings of a historic asset or place contribute to how it is understood, appreciated and experienced'. The setting of an asset is defined and analysed according to Stage 2 of the three-stage approach promoted in 'MCHE: Setting', with reference to factors listed on pages 9-10. The relevance of these factors to the understanding, appreciation and experience of the asset determines how, and to what extent, an asset's cultural significance derives from its setting. All heritage assets have settings; however, not all assets are equally sensitive to impacts on their settings. In some cases, setting may contribute very little to the asset's cultural significance, or only certain elements of the setting may be relevant.

6.4.22 Policy and guidance are clear that setting itself is not a heritage asset; rather, as the EIA Handbook (2018, Appendix 1, Paragraph 43) makes clear;

"When considering setting impacts, visual change should not be equated directly with adverse impact. Rather the impact should be assessed with reference to the degree that the proposal affects those aspects of setting that contribute to the asset's cultural significance."

Assessment of the magnitude of effects on cultural significance

6.4.23 The magnitude of an effect is a measure of the degree to which the cultural significance of a heritage asset will be increased or diminished by impacts resulting from the development. This definition of magnitude applies to impacts on the setting, as well as impacts on the physical fabric of an asset. Impacts on the settings of heritage assets are assessed with reference to the factors listed in 'MCHE: Setting' Stage 3 (evaluate the potential impact of the proposed changes, pages 10-11). It is important to note that the magnitude of an effect resulting from an impact on setting is not a direct measure of the visual prominence, scale, proximity or other attributes of the development itself, or of the extent to which the setting itself is changed; therefore, Landscape and Visual Impact Assessment criteria for scale/magnitude cannot be applied directly in determining the magnitude of effect on the setting of a heritage asset. It is also necessary to consider whether, and to what extent, the characteristics of the setting which would be affected contribute to the asset's cultural significance.

6.4.24 Magnitude is assessed as high/medium/low, and adverse/beneficial, or negligible, using the criteria in **Table 6.2** as a guide. In assessing the effects of a development, it is often necessary to take into account various impacts which affect an asset's significance in different ways, and balance adverse effects against beneficial effects. For instance, there may be adverse effects on an asset's fabric and on its setting, offset by a beneficial effect resulting from archaeological investigation. The residual effect, given in Section 6.8 and **Table 6.9**, is an overall measure of how the asset's cultural significance is reduced or enhanced.

Table 6.2: Criteria for Assessing the Magnitude of Effects on Heritage Assets

Magnitude	Guideline Criteria	
	Adverse	**Beneficial**
Substantial	Changes to the fabric or setting of a heritage asset resulting in the complete or near complete loss of its cultural significance, such that it may no longer be considered a heritage asset.	Preservation of the asset in situ where it would be completely or almost completely lost in the do-nothing scenario.
Moderate	Changes to the elements of the fabric or setting of the heritage asset that contribute to its cultural significance such that this is substantially altered.	Changes to key elements of the asset's fabric or setting that result in its cultural significance being preserved, where they would otherwise be lost, or restored.
Slight	Changes to the elements of the fabric or setting of the heritage asset that contribute to its cultural significance such that this is slightly altered.	Changes that result in elements of the asset's fabric or setting that detract from its cultural significance being removed.
Negligible	Changes to fabric or setting that leave significance unchanged.	

Assessment of the significance of effects

6.4.25 The significance of an effect (EIA 'significance') on the cultural significance of a heritage asset, resulting from a direct or indirect physical impact, or an impact on its setting, is assessed by combining the magnitude of the effect and the importance of the heritage asset. The matrix in **Table 6.3** provides a guide to decision-making but is not a substitute for professional judgement and interpretation, particularly where the importance or effect magnitude levels are not clear or are borderline between categories. EIA significance may be described on a continuous scale from negligible to major; it is also common practice to identify effects as significant or not significant, and in this sense major and moderate effects are regarded as significant in EIA terms, while minor effects are 'not significant'.

Table 6.3: Criteria for Assessing the Significance of Effects on Heritage Assets

Sensitivity of Environmental Receptor	Magnitude of Change			
	Substantial	**Moderate**	**Slight**	**Negligible/None**
High	Major	Major	Moderate	Negligible/None
Medium	Major	Moderate	Minor	Negligible/None
Low	Moderate	Minor	Minor	Negligible/None

Assessment of Cumulative Effects

6.4.26 Cumulative effects can occur when other existing or proposed developments would also be visible in views that are relevant to the setting of a heritage asset. Cumulative effects are considered in cases where an effect of more than negligible significance would occur as a result of the proposed development. Other existing or proposed wind energy developments are included in the cumulative assessment where they also lie within 5km of the asset, or within 20km in cases where an asset's wider landscape setting is judged to be exceptionally sensitive. A cumulative effect is considered to occur where the magnitude of the combined effect of two or more developments is greater than that of the developments considered separately.

6.5 Baseline Conditions

Archaeological and historical overview

Previous investigations

6.5.1 No previous archaeological work has been carried out in the ISA.

6.5.2 By contrast, a considerable amount of archaeological investigation has been undertaken in the OSA. Much of this has been centred in the historic town centre of Perth where modern development and good preservation of deposits of medieval date have provided a wealth of archaeological information (Bowler 2004); the results of this work, however, do not contribute to our understanding of the ISA and its archaeological potential.

Geology and geomorphology

6.5.3 The bedrock, formed approximately 393 to 419 million years ago in the Devonian Period, comprises extensive sandstone deposits making up the Scone Sandstone Formation. These rocks were formed from rivers depositing mainly sand and gravel detrital material in channels to form river terrace deposits, with fine silt and clay from overbank floods forming floodplain alluvium (British Geological Survey Website, accessed 24.07.18).

6.5.4 The superficial geology of the ISA was largely removed during the construction of the Aviva Building which involved extensive excavation and landscaping. Where the superficial geology has not been removed there are sedimentary deposits of Devensian till formed up to 2 million years ago during the Quaternary Period (British Geological Survey Website, accessed 24.07.18).

Prehistoric

6.5.5 No prehistoric assets have been recorded in the ISA.

6.5.6 Evidence of prehistory is limited within the OSA. The HER records three assets (not illustrated) of early prehistoric date; one, the site of a cist (MPK3470) found some time before 1939, near the seventh green of Craigie Hill Golf Course, is located roughly 250m to the southeast of the ISA. The others comprise Callarfountain cairn (MPK7441) a funerary cairn of Bronze Age date with associated standing stone, located roughly 1.2km to the south of the ISA, and a fallen standing stone at Hilton of Moncrieffe (MPK3484), roughly 1.4km to the south-east. These funerary and ritual monuments are evidence of early prehistoric activity in the area. The absence of any associated settlement remains recorded is relatively typical, and probably reflects that the buildings were made of less substantial materials, most probably timber and turf. It is also possible that settlements were kept separate from the areas in which they buried their dead.

6.5.7 One asset of possible Iron Age date – a banana-shaped cropmark interpreted as a possible souterrain – is recorded by the HER within the OSA; Woodhead of Aberdalgie souterrain (MPK18195: not illustrated) is located roughly 1km SSW of the ISA. In the wider area, approximately 4km to the southeast of the proposed turbine, Moredun Top fort (SM9440) and Moncrieffe Hill Fort (SM9438) occupy the summits of their eponymous hills. Such hill forts are indicative of Iron Age activity in the wider area.

6.5.8 The HER records a number of prehistoric find-spots within the OSA. Mesolithic arrowheads and scrapers (MPK3483) were found in 1927 at Perth Prison and a log boat (MPK3481) was recorded in 1878 or 1879, having been found ‘a number of years before’ during clay digging at Friarton brickworks and later interpreted as being of Mesolithic date.

6.5.9 Finds of Neolithic date include three stone axes: MPK3472 was found in ground disturbed by the aerial mast on Mailer Hill in 1987; MPK3548 was found in a garden in Perth City Centre in 1965 and MPK18599 was recorded in the area of Woodlands.

Medieval to Early Modern

6.5.10 The ISA is located approximately 1.7km to the southwest of the historic centre of Perth on the north-facing slope of Craigie Hill. The first map to depict the ISA in detail is Roy's Military Survey of 1747 – 1755 which depicts the area of Pill-thieflefs (sic) (Pitheavlis) as enclosed ground to the immediate west of a group of buildings, corresponding to Pitheavlis castle (LB39346) and its environs. The ISA would therefore be on the edge of the cultivated fields to the south of Pitheavlis. During the medieval period it is likely that the ISA would have been on the limit of the arable land and may have instead been used for upland grazing.

6.5.11 The Hill Farm of Pitheavlis (MPK7752) is first depicted on the first edition Ordnance Survey (surveyed 1860). A notable feature of the farmstead was its horsemill powered from the circular horse-engine house. The steading was subsequently remodelled, but the engine house remained roofed until at least the date of survey of the 2nd edition of the map (revised 1899/1900, published 1901). The engine house was demolished sometime prior to the 3rd edition of the map (revised 1930, published 1932).

6.5.12 The archaeological record for the medieval period in the OSA is rich and dominated by the medieval burgh of Perth. The relative lack of industrialisation along with regular flooding within the historic centre of Perth has resulted in exceptional preservation of medieval remains (Bowler 2004, 3).

Modern

6.5.13 The Hill Farm of Pitheavlis (MPK7752) was demolished in the early 1970s in advance of construction of the Aviva Building (LB52450).

6.5.14 Constructed over the period 1979 – 1983, the Aviva Building (LB52450) is a late Modernist office block which was designed as the world headquarters of General Accident Fire and Life Assurance Corporation. The building is built into the north- facing slopes of Craigie Hill in extensively landscaped grounds and continues in use as the headquarters building of Aviva Insurance UK.

Heritage Assets within the Inner Study Area (ISA)

6.5.15 There is one Category A listed building in the ISA: the Aviva Building (LB52450). As a Category A listed building, the Aviva Building is considered to be of national and high importance.

6.5.16 The HER records three further assets within the ISA, two of which – the hostel (MPK17595) and sports hall (MPK17596) – were built as part of the Aviva Building complex. The hostel (MPK17595) was demolished and removed in 2017; the sports hall (MPK17596) is still extant and is located to the east of the Aviva Building itself. The HES listing documentation notes that the sports hall is broadly typical of contemporary leisure buildings of its period

and is not of special interest in terms of listing. Although included in the local HER, this current assessment would identify both as sites of negligible importance.

6.5.17 The third recorded site within the ISA is the site of the Hill Farm of Pitheavlis which was demolished in the early 1970s in advance of the construction of the Aviva Building. Located at and around the southwest corner of the Aviva Building, it is unclear how much of this asset is likely to have survived following demolition and subsequent landscaping of the site; if remains do survive they are likely to be of local and low importance.

Table 6.4: Heritage assets within the Inner Study Area

Ref.	Name & Description	Period	Importance
LB52450	Aviva Building	Modern	High
MPK7752	Hill Farm of Pitheavlis (site of)	Post-medieval to Modern	Low
MPK17595	Hostel (site of)	Modern	Negligible
MPK17596	Sports Hall	Modern	Negligible

Potential for undiscovered heritage assets within the Inner Study Area

6.5.18 On the basis of the upland hillside nature of the ISA and the type of recorded assets in the surrounding area, the archaeological potential of the area is considered to be low.

6.5.19 However, it is clear that the construction of the Aviva Building and its associated infrastructure and the subsequent landscaping of its environs are likely to have involved extensive ground disturbance throughout much of the ISA in general and the proposed turbine site in particular. Such construction and groundworks are likely to have removed any cultural heritage assets that may have originally been present, reducing the archaeological potential of the proposed turbine site itself to negligible.

Heritage assets in the outer study area (OSA)

Listed Buildings

6.5.20 There are 46 listed buildings in the OSA, within 2km of the site boundary. Five of these are designated at Category A: the A K Bell Library (LB39323); Pitheavlis castle (LB39346), a 16th-century tower house which has been restored and divided into flats; and three buildings (LB39326, LB39328 and LB39331) which are part of the Perth Prison complex. Also, within 2km of the site boundary are a further 19 Category B listed buildings and 22 Category C listed buildings.

6.5.21 Around half of the 46 listed buildings are located within Perth Central Conservation Area which covers the historic town centre of Perth. These include the Category A listed A K Bell Library (LB39323),11 Category B listed buildings and 10 Category C listed buildings.

Table 6.5: Listed Buildings included in the assessment

Ref.	Name & Description	Category	Importance
LB39323	A K Bell Library including boundary wall to York Place	A	High
LB39326	Visitor Centre and Staff Club (former Guardrooms then Warders' Houses) HMP Perth, 3 Edinburgh Road, Perth	A	High
LB39328	Aultbea House (Former Surgeon's House) HMP Perth, 3 Edinburgh Road, Perth	A	High
LB39331	Crescent Block, A and B Halls and Tower Board Room, HMP Perth, 3 Edinburgh Road, Perth	A	High
LB39346	Pitheavlis Castle	A	High
LB39540	Pitheavlis Cottages	B	Medium

Conservation Areas

6.5.22 There is one Conservation Area in the OSA; Perth Central Conservation Area (CA577) which encompasses much of the historic centre of Perth.

Table 6.6: Conservation Areas included in the assessment

Ref.	Name
CA577	Perth Central

Inventory Battlefields

6.5.23 The eastern edge of the Inventory Battlefield – the Battle of Tippermuir (BTL39) – extends into the OSA.

Table 6.7: Inventory Battlefields included in the assessment

Ref.	Name
BTL39	Battle of Tippermuir

Other Designated Assets

6.5.24 There are no World Heritage Sites, Scheduled Monuments or Inventory Gardens and Designed Landscapes within the OSA.

6.6 Impact Assessment

Construction Impacts

6.6.1 Any planned construction works that involve ground disturbance can result in physical impacts on known assets or buried archaeology. Groundworks will include construction of the turbine base and hard standing, laying of grid connection cables and other services. Movement of heavy plant can also result in accidental damage to upstanding archaeological features.

Predicted Construction Impacts

6.6.2 There are no predicted construction impacts on the known assets within the ISA.

6.6.3 The potential for previously unrecorded cultural heritage assets within the ISA is considered to be low and negligible for the construction footprint of the proposed turbine itself. It is considered that the potential for construction impacts on previously unrecorded cultural heritage assets is very limited.

Proposed Mitigation

6.6.4 No potential construction impacts have been identified therefore no mitigation is proposed.

Operational Impacts

6.6.5 The erection of a wind turbine can result in effects on the settings of historic assets at a distance from the development, by affecting views towards or from the historic asset. The settings of assets within the ISA can also be affected in other ways that include noise, alteration of associated features and changes in land-use; none, however, has been identified and the operational effects that are assessed relate solely to the issue of visual effects on the settings of historic assets.

6.6.6 The effect on setting will last for the operational lifetime of the wind turbine (approximately 25 years) after which current conditions will be restored.

Predicted Operational Impacts

6.6.7 None of the locally designated heritage assets within the OSA has a wider landscape setting that contributes substantively to its cultural significance. The assessment, therefore, is concerned solely with potential impacts upon the settings of the conservation area, inventory battlefield and listed buildings within the study areas.

6.6.8 There is one Category A listed building within the ISA and a further five in the OSA. All of this group lies within the bare earth ZTV and the turbine will therefore be potentially visible in views to and/or from these assets. The group of Category B listed buildings –

Pitheavlis Cottages (LB39540) – lie immediately to the northwest of the ISA. Due to their proximity to the ISA they are therefore included in the assessment. Potential operational impacts on these seven listed buildings have been assessed.

6.6.9 The Perth Central Conservation Area (CA577) lies to the northeast of the OSA. The Conservation Area and the listed buildings within it, including the Category A listed A K Bell Library (LB39323), have been assessed as a group.

6.6.10 The Inventory Battlefield, The Battle of Tippermuir (BTL39) has also been assessed for potential operational impacts.

Inner Study Area

Aviva UK Insurance Building LB52450

6.6.11 A detailed assessment of the cultural significance of the Aviva UK Insurance Building and the likely impact of the wind turbine in its originally proposed position was included in the Environmental Statement submitted in support of the previous application for Planning Permission (Ref: 18/01656/FLL).

6.6.12 Further detailed assessments of the impact were provided in the consultation response submitted by HES and the Report to Scottish Ministers which eventually resulted in Planning Permission (Ref: 18/01656/FLL) being refused. These assessments identified the dominant effect of the wind turbine in views towards the listed building from the south and south-east as the critical issue.

6.6.13 The revised proposal is made in response to HES's indication within their consultation response that "Given that the proximity of the proposed turbine to the A listed building is particularly problematic to us, we consider that the worst of the impacts could potentially be addressed by relocating the turbine a relatively short distance. We would be happy to discuss this in detail..."

6.6.14 Detailed discussions were held with HES when the opportunity arose to locate the previously proposed wind turbine on land further to the east of the listed building in 2021. Following the submission of a full draft of the Heritage Statement prepared by the Hurd Rolland Partnership, HES provided an early indication that indicated that *"our previous concerns have been addressed to the point that a future application would be unlikely to merit an objection."* Recommending that *"the exact same viewpoints are used to illustrate the difference in potential impacts between the current proposal and the previous one as the proposals are developed further."*

6.6.15 A detailed assessment of the potential impact of the revised proposals on the cultural significance of the Aviva UK Insurance Building is included at **Sections 8.00, 10.00 & 11.00** of the finalised Heritage Statement prepared by the Hurd Rolland Partnership included at **Appendix 6.1**, **Volume 4.** An extract identifying how the new proposed location will

address concerns raised in relation to the previous proposal is included in **Table 6.8** (references are to Sections, Photographs and Appendices included in the Heritage Statement).

6.6.16 Comparative visualisations from the same viewpoints previously assessed (Viewpoints 1 & 5), illustrating the difference in potential impacts between the current proposal and the previous one is included at **Figure 5.24 a-c and Figure 5.25 a-c, Volume 3.**

Table 6.8 Extract from Heritage Statement (Appendix 6.1)

Concerns raised regarding the previous proposal	**Manner in which the concerns have been addressed**
Cultural Heritage Chapter of the Environmental Statement submitted in relation to application for Planning Permission Ref: 18/01656/FLL	
"…the proposed wind turbine would be a prominent feature in these…..south-facing views, disrupting the architectural composition that exists between the 'ground-scaping' building, the terraced hillside and the tree-studded skyline. The effect would be most-clearly demonstrated in the fracturing of the skyline, with the proposed wind turbine as a distracting feature, located immediately adjacent to or oversailing the listed building and competing visually with it….."	The relocation of the proposed wind turbine to the parcel of land to the east of the bowling green (**Appendix 4**) will; a. Place the presently disused Recreation Centre (**Photographs 24 – 26**) and line of trees between the existing site and new parcel of land (**Photographs 11, 16 & 28 – 32**), which will create a visual buffer between the site of the main building and the site of the wind turbine. b. Substantially reduce the extent to which the wind turbine will "fracture the skyline" over the main building. The only location from which the wind-turbine will be visible over the main building will be in glimpsed oblique views from the north-west (**Appendix 9 & Photograph 16**). It will not "fracture the skyline" over the building in views from the north, or from lower down the north facing slope (**Photographs 11 – 15**). c. Due to the increased distance from the building, in the limited views where the building and the wind turbine will be intervisible, the upper part of the wind turbine will be perceived as a more clearly separate entity within the landscape – such that visually it will become, at most, a secondary landscape feature.
"Visual change would be evident in south and southeast-facing views that contribute to the cultural significance of the Aviva Building, resulting in an appreciable but partial loss of the asset's cultural significance. The proximity of the proposed turbine to the asset would constitute an element of visual prominence and distraction to the architectural composition of the building and	For the reasons indicated above the impact of visual change on the special interest of the building and its setting will be substantially reduced such that the magnitude of impact might reasonably be considered to tend towards slight adverse (**Paragraph 9.06**). In terms of the EIA assessment criteria set out in the EIA Handbook, the overall significance of the

its landscaped surroundings. This would be an effect of medium adverse magnitude and moderate significance and, in EIA terms, would be considered to be a significant effect."	effect would be considered moderate adverse (**Paragraph 9.07**).
HES Consultation Response to application for Planning Permission Ref: 18/01656/FLL	
"Panoramic views from the Aviva Building would generally be unaffected by the proposed turbine, and we are content to agree that this is not a significant factor in the overall level of impact."	The panoramic views northwards from the Aviva Building will be unaffected by the revised proposal – the wind-turbine will not be visible in these views (**Photographs 6 & 7**).
"The relationship between the building and the car park to the south is important, and the approach to the main entrance from the car park is significant in the way the building is experienced by users and visitors. The turbine would affect this experience, but again we are content that this impact alone would not be objectionable."	The revised location of wind turbine beyond the Recreation Centre and the tree line to the east of the Aviva Building (**Appendix 4 and Photographs 24 – 32**) will substantially reduce any previously considered effect that the wind turbine might have on the way the building will be experienced in approached to the main entrance from the south (**Photographs 1 – 3**).
"The key issue, in our view, is the impact that the proposed turbine would have on the experience and appreciation of the building from within the site. We agree with the assessment in the EIA report that the turbine would distract from the building and compete with it, and we consider that this is particularly problematic because it would work against the established strong horizontality and the carefully conceived relationship with the surrounding topography."	It was in response to the impact that the proposed turbine would have had on the experience and appreciation of the building from within the site, particularly in views from the north facing slope, that HES noted that the worst of the impacts could potentially be addressed by relocating the turbine a relatively short distance. For all of the reasons indicated above it is considered that the revised siting of the wind turbine 200m from the building, beyond the buffer of both the recreation hall and treeline, to the parcel of land to the east of the bowling green (**Appendix 4**) will substantially address HES' previous concerns. Aviva have approached HES informally in this regard as part of their own internal pre-application protocol (**Appendix 4**).
"The size and location of the wind turbine would, in our view, potentially lead to it becoming the dominating element in the overall composition and redefine its focus. Given the significance of the Aviva building we do not consider that to be acceptable….."	
*"We **object** to the application because we consider that the proposed wind turbine development would have a significant adverse impact on the setting of category A-listed Aviva building. Our view is that the proposal raises issues of national interest and is contrary to paragraph 141 of SPP. The detailed reasons for our objection and our comments on the EIA report are set out in the Annex below….."*	As noted above it is considered that the revised location of the wind turbine will significantly reduce the magnitude of impact on the special interest and setting of the listed building such that the overall effect might reasonably be re-categorised to moderate adverse. Taken in conjunction with mitigation discussed below, it is considered that on balance the benefits that will be derived from the revised proposal will outweigh the substantially reduced impact on the setting of the listed building such that the previous

	objection from HES might reasonably be removed.
Report to Scottish Ministers in relation to called in application for Planning Permission Ref: 18/01656/FLL	
"….the potential impact of the rotating and vertical form of the turbine would be diametrically opposed to the horizontal emphasis and linear built form of the listed building. There is no doubt that the proposed very tall, vertical, moving structure would, in its entirety, dominate the skyline east of the category A listed building. It would undermine the very qualities that are an integral part of the design philosophy of the modernist building. It would disrupt the flow of the horizontal lines of the building and, as typically evidenced in Viewpoint 1, it would dominate the view southeast from the B9112. The proposal would have a significant adverse effect on the setting of the Aviva building."	The relocation of the proposed wind turbine to the parcel of land to the east of the bowling green (**Appendix 4**) will; a. Place the presently disused Recreation Centre (**Photographs 24 – 26**) and line of trees between the existing site and new parcel of land (**Photographs 11, 16 & 28 – 32**), which will create a visual buffer between the site of the main building and the site of the wind turbine. b. Substantially reduce the extent to which the wind turbine will be intervisible in key views towards the building. The only location from which the wind-turbine might be visible over the main building will be in glimpsed oblique views from the north-west (**Appendix 9 & Photograph 16**). It will not substantially disrupt the flow of the horizontal lines of the building – comparative photomontages of the previous and revised proposal are included at **Appendices 23 & 30 – 32**. c. Due to the increased distance from the building, in the limited views where the building and the wind turbine will be intervisible, the upper part of the wind turbine will be perceived as a more clearly separate entity within the landscape – such that visually it will become, at most, a secondary landscape feature. As noted above it is considered that the revised location of the wind turbine will significantly reduce the magnitude of impact on the special interest and setting of the listed building such that the overall effect might reasonably be re-categorised to moderate adverse. Taken in conjunction with mitigation discussed below, it is considered that on balance the benefits that will be derived from the revised proposal will outweigh the substantially reduced impact on the setting of the listed building.
"Overall, the setting of the Aviva building is an integral part of its architectural and historic interest which is therefore desirable to preserve. The proposal would be contrary to the development plan, Scottish Planning Policy and the guidance and policies of Historic Environment Scotland."	As set out in **Section 12.00**, it is considered that the revised proposal is in accordance with the development plan, Scottish Planning Policy and the key guidance and policies of Historic Environment Scotland.

6.6.17 In terms of the guideline criteria set out in the Environmental Impact Assessment Handbook published by HES, the revised location of the wind turbine will substantially reduce the previously assessed magnitude of impact on the setting of the listed building such that the magnitude of impact might now reasonably be categorised as **slight/moderate adverse**.

Outer Study Area

Perth Central Conservation Area (CA577) including Category A listed building A K Bell Library (LB39323)

6.6.18 Perth Central Conservation Area (CA577) covers the majority of Perth City Centre with its diverse townscape and areas of Georgian and Victorian buildings. As a Conservation Area it is considered to be of medium cultural heritage importance. Within the Conservation Area is the A K Bell Library (LB39323), a Category A listed building which is located on an area of raised ground with north-facing views to York Place, the A93 public road.

6.6.19 Perth Central CA is located on a low river terrace to the west of the River Tay. Perth Central CA is largely inward looking with internal views along the streets encompassing the many different building styles within the conservation area. The Conservation Area appraisals notes;

"Significant views within and out of the town include: West along the High Street to the spire of St Paul's and east to the spire of St John's; east along South Street and Marshall Place to Kinnoull Hill; north along Princes Street towards St John's; north along George Street to the Museum and Art Gallery; west along Canal Street to the former St Leonard's Parish Church, and east across the Tay to Kinnoull Aisle; north along Tay Street to Smeaton's Bridge, and out of the city to the North and South Inches."

6.6.20 The revised location of the proposed turbine lies approximately 1.6km to the southwest of the Conservation Area. In this location the turbine will be outside any of the significant views specified within the Conservation Area appraisal and will not be visible in views to or from the A K Bell Library. The bare earth ZTV (**Figure 5.2, Volume 3**) suggests that the turbine will be visible from the Conservation Area; however, the ZTV with Visual Barriers (**Figure 5.3, Volume 3**) places the majority of the Conservation Area outside the ZTV. Of the additional viewpoints assessed in Chapter 5, VP13 indicates that the turbine will be visible in the distance in views from North Inch Park above Rose Terrace. From this location and in those other areas where the proposed development may be visible from the Conservation Area it concluded that the re-sited wind turbine would not dominate or detract in a way that would significantly affect our ability to understand and appreciate the asset. It is therefore considered that the magnitude of change would be such that it would not affect the cultural significance of Perth Central Conservation Area (CA577) and the A K Bell Library (LB39323).

Category A listed buildings of Perth Prison: Visitor Centre and Staff Club (former Guardrooms then Warders' Houses) (LB39326); Aultbea House (Former Surgeon's House) (LB39328) and Crescent Block, A and B Halls and Tower Board Room (LB39331)

6.6.21 Perth Prison was originally built as Scotland's principal prisoner of war camp for French prisoners of the Napoleonic Wars and was designed between 1810 - 12. It was later developed as the site of the General Prison of Scotland in the 1840s. Perth Prison has been extensively redeveloped since the 1980s and continues in use as a prison. The Category A listed buildings are largely surviving buildings or fabric from the Napoleonic Prisoner of War Camp. HES's statement for special interest for this group of buildings states that they are 'exceptionally important in the history of prison architecture in Scotland' and that they contain 'fabric from Robert Reid's earlier Napoleonic Prison of War Camp of 1810-12 which is also of exceptional interest'. As Category A listed buildings these are assets of high cultural heritage importance.

6.6.22 Perth prison is located on a low river terrace to the west of the River Tay, with its entrance on Edinburgh Road. The view from the buildings at the entrance, including the Visitor Centre and Staff Club (LB39326) and Aultbea House (LB39328), is to the northwest across Edinburgh Road to a car salesroom and industrial buildings, with rising ground beyond. The high perimeter wall that surrounds most of the prison blocks outward views through the south to the northeast from these buildings. The Crescent Block, A and B Halls and Tower Board Room (LB39331) are behind the high perimeter wall and it is presumed that views from these buildings will be largely restricted to those within the prison wall. There are no obvious designed views into these assets.

6.6.23 The Category A listed Perth Prison buildings have intrinsic value in their fabric as a data source on the Napoleonic and later 19th-century prisons. As a prison this is a functional asset as an internment facility, as such the contextual value of these buildings lies in their relationship with their immediate surroundings and the other buildings within the prison. There is nothing to suggest this facility was built in relation to any wider views. There is associative value to this group in that cultural and social influences have affected the form of these buildings and early 19th century beliefs on internment have influenced their design.

6.6.24 The present surroundings of the asset contribute very little to our ability to appreciate and understand the asset. There is nothing to suggest that the prison complex was intended to be viewed from specific points in the landscape, nor that it was intended to have specific views across the landscape. Setting, therefore, is considered to contribute very little to its cultural heritage significance.

6.6.25 The proposed re-sited wind turbine would be located approximately 1.8km to the southwest of the prison. Although the bare earth ZTV (**Figure 5.2, Volume 3**) suggests the turbine would be visible from this group, the ZTV with Visual Barriers (**Figure 5.3, Volume 3**) places the majority of the prison buildings outside the ZTV. Nonetheless, the proposed development may lead to visual change within their setting, albeit in ways that do not

adversely affect their cultural significance. It is concluded therefore that the proposed erection of the re-sited wind turbine at the Aviva Building would have no effect on the cultural significance of the Category A listed buildings at Perth Prison.

Pitheavlis Castle (LB39346)

6.6.26 Pitheavlis Castle (LB39346) is a 16th-century castle which has been divided into flats and is now in use as private residences. As a Category A listed building this is an asset of high cultural heritage importance. The HES statement for this asset does not provide a definition of national importance for this asset.

6.6.27 The castle is located on the edge of a slope which provides it with wide open views to the southeast across the floodplain to the rising hills beyond. Views to the north, east and west of the castle are dominated by residential housing. Located in a prominent position, the castle was designed to be highly visible from the surrounding landscape and in distant views from the southeast. Views to the castle from all but its immediate surroundings are obscured by the surrounding housing.

6.6.28 The castle has intrinsic value in its fabric as a potential data source on the construction and design of 16th-century castles. The contextual value of this asset lies in its clear relationship with the surrounding landscape; this was a castle which was built to see and be seen and would have been designed to demonstrate the owner's wealth and status. The contextual value of the castle is diminished in that it is now surrounded by modern houses. This asset has associative value in its aesthetic attributes as a typical 16th-century castle.

6.6.29 Its location at a break of slope adds to our understanding of it as a prominent feature in the landscape. However, its immediate surroundings contribute very little to our ability to appreciate and understand the asset as it is now surrounded by modern housing. The contribution of the asset's setting to its cultural significance is therefore considered to be much diminished.

6.6.30 The proposed re-sited wind turbine would be located approximately 930m to the south southwest of the castle. In this location the turbine would be visible in restricted views from the castle along the line of the neighbouring houses of Needless Road. The turbine would not be located in the views of importance from this asset which are to the southeast across the floodplain; nor would it be visible in combination with the castle from other viewpoints. It is considered that the turbine would not dominate or detract in a way that significantly affects our ability to understand and appreciate the asset. It is concluded therefore that the proposed erection of the re-sited wind turbine at the Aviva Building would have no effect on the cultural significance of Pitheavlis castle.

Pitheavlis Cottages (LB39540)

6.6.31 The Pitheavlis Cottages (LB39540) are a group of eight cottages built around 1920 in the English Arts and Crafts style. Listed at Category B, the cottages are assets of regional and medium cultural heritage importance.

6.6.32 The eight cottages face onto Necessity Brae (B9112 public road). The central four cottages are set back from the road, with two cottages to either side set closer to the road. The view to the front of these cottages is limited to the deciduous trees which surround the Aviva building with occasional glimpsed views through the trees to the Aviva complex.

6.6.33 The cottages have intrinsic value in their fabric as a potential data source on the construction and design of 1920s cottages. The contextual value of this asset lies in its relationship with the surrounding landscape and their peripheral location beside one of the main routes into Perth; the discrete nature of the Aviva complex means that the cottages retain much of their original rural location. This asset has associative value in its aesthetic attributes as an attractive group of English Arts and Craft style cottages and this value is increased by the relative scarcity of this design style in Scotland.

6.6.34 The present surroundings of this asset contribute slightly to our ability to appreciate and understand the asset. There is nothing to suggest that the cottages were intended to be viewed from specific points in the landscape, nor that they were intended to have specific views across the landscape. Setting, therefore, is considered to contribute little to their cultural heritage significance.

6.6.35 The proposed re-sited turbine would be located approximately 450m to the southeast of these buildings. While the bare earth ZTV (**Figure 5.2, Volume 3**) suggests the turbine would be visible from this group, the ZTV with Visual Barriers (**Figure 5.3, Volume 3**) places the majority of the Pitheavlis Cottages outside the ZTV. Whilst it is possible that the proposed development may lead to visual change within the setting of the cottages, the turbine would not dominate or detract in a way that significantly affects our ability to understand and appreciate the asset. It is concluded therefore that the proposed erection of the re-sited wind turbine at the Aviva Building would have no effect on the cultural significance of the Pitheavlis cottages.

The Battle of Tippermuir Inventory Battlefield (BTL39)

6.6.36 The Battle of Tippermuir took place on 1st September 1644 across a wide area of ground to the west of Perth. The battle was between the Covenanters and the Royalists and was an important victory for the Royalists. As an Inventory Battlefield this is considered to be an asset of high cultural heritage importance. The inventory boundary defines the area in which the main events of the battle are considered to have taken place and where associated physical remains and archaeological evidence have either been found or may be expected.

6.6.37 The intrinsic value of the Inventory Battlefield is in the potential of the area to contain associated physical remains and archaeological evidence which may increase our

knowledge of the Battle of Tippermuir and 17th-century warfare. The contextual value is that the boundary contains the area in which the main events of the battle are considered to have taken place and while the area has been improved agriculturally the landscape is otherwise relatively unchanged with few modern developments in the area. The associative value of the battlefield lies in the association with the Battle of Tippermuir and the history of the Covenanter and Royalist campaigns of the 17th century.

6.6.38 The proposed re-sited turbine would be located approximately 2km to the southeast of the eastern edge of the Battle of Tippermuir inventory battlefield area. The turbine would be glimpsed in views beyond the Broxden Roundabout. The turbine would be out-with the area of the battlefield itself and would be at a distance where it would not significantly affect our ability to understand and appreciate the setting of the battlefield. It is concluded therefore that the proposed erection of the re-sited wind turbine at the Aviva Building would have no effect on the cultural significance of the Battle of Tippermuir battlefield.

6.7 Proposed Mitigation

Construction Phase

6.7.1 No predicted construction impacts have been identified for known assets within the ISA and the archaeological potential for the proposed turbine site itself is negligible. No mitigation programme is therefore identified.

Operational Phase

6.7.2 Regarding Mitigation, MCHE: Setting states

"Where the assessment indicates that there will be an adverse impact on the setting of a historic asset or place……alterations to the siting or design of the new development should be considered to remove or reduce this impact.

The most effective way to prevent impacts on setting is during site selection and early design. Any mitigation and enhancement proposals should be discussed as part of the pre-application process….."

6.7.3 The revised proposal specifically seeks to address the assessed adverse effect on setting of the previous proposal by re-siting the wind turbine such that the magnitude of impact will be substantially reduced. The principal physical mitigation offered under the revised proposal is the re-siting of the wind turbine on adjacent land 200m east southeast of the listed Aviva building beyond the neighbouring unlisted recreational hall and intervening tree bund.

6.7.4 In this respect a slight/moderate adverse magnitude of impact on the setting of the Category A listed Aviva Building has been predicted for the re-siting of the proposed wind turbine.

6.7.5 In wider mitigation, and largely overlooked in relation to the previous application, Aviva's aspiration to convert Pitheavlis to 100% self-generated renewable energy will substantially improve the prospects for the long-term future use of the building in its current configuration, with no physical impact on the fabric of the listed building and might reasonably be considered beneficial (see Section 10.00 of the Heritage Statement (**Appendix 6.1, Volume 4**).

6.7.6 In this respect it might reasonably be concluded that the overall magnitude of impact on the cultural significance of the listed building be adjusted to a **slight**/**moderate beneficial** significance in terms of the Environmental Impact Assessment Handbook (April 2018).

6.7.7 In addition, a programme of enhancement measures will be proposed to offset the impact of the proposed development. These include;

- Improving access to the interior of the Aviva Building to allow appreciation of the qualities for which the building was listed. This will be facilitated through a number of guided tours specific to the cultural heritage and architecture of the building.
- An annual fund of £1000 to support archaeological research in Perth and Kinross.

6.8 Residual Effects

6.8.1 Residual effects of more than negligible significance are summarised in **Table 6.9**.

Table 6.9: Summary table of residual effects

Effect (Section 6.6)	Mitigation (Section 6.7)	Significance of residual effect (Section 6.7)
The proposed development will have a **moderate adverse** effect on the setting of the Category A Listed Aviva Building.	In mitigation, the magnitude of this effect will be substantially reduced by the re-siting of the wind turbine on adjacent land 200m east southeast of the listed Aviva building beyond the neighbouring unlisted recreational hall and intervening tree bund. In wider mitigation, and largely overlooked in relation to the previous application, Aviva's aspiration to convert Pitheavlis to 100% self-generated renewable energy, facilitated by the new wind turbine, will substantially improve the prospects for the long-term future use of the building.	**Slight/moderate beneficial**.

	In addition, a programme of enhancement measures will be proposed to offset the impact of the proposed development.	

6.9 Cumulative Effects

6.9.1 Cumulative effects can occur when the proposed development would be visible in the setting of an asset in combination with other operational or consented wind turbines. Cumulative effects are considered in cases where an effect of minor or greater significance has been predicted on the setting of a historic asset as a result of the proposed development. The purpose of this threshold is to ensure that the assessment remains proportionate and focused on those cases where there is potential for an EIA-significant effect to arise. Only one asset – the Aviva Building – has been identified in Section 6.6 above where there is potential for such cumulative effects to arise.

6.9.2 The distribution of micro-, small, medium and large wind turbines within 25 km of the proposed development is discussed in the LVIA chapter (Chapter 5) and depicted in **Figure 5.7, Volume 3**. That assessment has concluded that there is no potential for any significant cumulative landscape or visual effects with the proposed development.

6.9.3 Similarly, there are no in-combination views with other operational or consented wind turbines which are relevant to those elements of the setting of the Aviva Building that contribute to its significance. There is therefore no potential for any significant cumulative effect on its setting.

6.10 Conclusions

6.10.1 In terms of the guideline criteria set out in the Environmental Impact Assessment Handbook published by HES, the revised location of the wind turbine will substantially reduce the previously assessed magnitude of impact on the setting of the listed building such that the overall effect might now reasonably be categorised as **slight/moderate adverse.**

6.10.2 Taken in conjunction with the resultant improvement to the prospects for the long-term future use of the building, on balance, the benefits that will be derived from the revised proposal will outweigh the substantially reduced impact on the setting of the listed building, such that the magnitude of impact on the cultural significance of the listed building might reasonably be adjusted to **slight/moderate beneficial.**

6.10.3 No other heritage assets in the study areas will be affected by the proposed development.

6.10.4 The effect on the setting of the Aviva Building will last for the operational lifetime of the proposed wind turbine (approximately 25 years), after which the current conditions will be restored.

7. Ecology Assessment

7.1 Introduction

7.1.1 This chapter of the Environmental Statement (ES) has been prepared by Avian Ecology Ltd. and provides an assessment of potential effects upon ecological and ornithological features in relation to the construction, operation and decommissioning of the proposed Aviva single wind turbine ('the Proposed Development').

7.1.2 The objectives of this chapter are to:

- Establish and outline baseline ecology and ornithology conditions;
- Identify, describe and evaluate potentially significant effects, including direct, indirect and cumulative effects upon ecological features;
- Identify and describe any mitigation measures required to address potentially significant effects;
- Identify any residual effects; and,
- Outline enhancement measures, where opportunities arise, to result in net biodiversity gains.

7.1.3 Baseline information has been compiled through desk study, consultation and field surveys. The chapter is supported by the following technical appendices and figures:

- **Appendix 7.1, Volume 4** – Extended Phase 1 Habitats Survey
- **Appendix 7.2, Volume 4** – Bat Activity Survey Data
- **Figure 7.1, Volume 3** – Site Location & Statutory Designated Sites
- Figure 7.2, Volume 3 – Phase 1

7.2 Project Description

7.2.1 A full detailed scheme description is provided in Chapter two 'The Proposed Development'.

7.2.2 In summary, the proposed scheme comprises the installation of a single wind turbine with a maximum blade tip height of 76.5m, together with associated infrastructure.

7.2.3 The construction phase of the development is anticipated to last approximately 6 months, followed by an operational lifetime of 25 years.

7.3 Scope of Assessment

7.3.1 The assessment presented herein has been undertaken with reference to CIEEM (2018)[15] guidance, and focuses on those activities that could potentially generate significant environmental effects on ecological receptors.

7.3.2 A desk study review of ecological features known or potentially present on and within the vicinity of the Site, together with a review of the likely activities associated with the proposed scheme, was used to define the scope of the assessment and identify appropriate 'zones of influence' for study.

7.3.3 On this basis, the desk study sought to identify ecological features within at least 2km of the Site boundary where data was available, extended to 5km for designated sites for nature conservation and 10km for internationally designated sites for nature conservation.

7.3.4 Surveys undertaken in 2017 for an earlier single wind turbine planning application (18/01656/FLL, hereafter 'the 2018 application'), located approximately 190m to the north-west of the Proposed Development turbine location, have been reviewed and referenced where appropriate.

7.3.5 Full details of field surveys undertaken in 2021 are provided in **Appendices 7.1** and **7.2, Volume 4**.

7.3.6 Desk study and field survey information was used to inform the valuation of ecological features and the identification of important ecological features 'scoped-in' to the assessment.

7.3.7 The assessment presented within this chapter considers the following main potential impacts upon ecological features associated with wind farm developments, which include:

- *Designated Sites* – potential indirect effects upon designated sites for nature conservation;
- *Habitat Loss / Deterioration* – long-term, short-term, direct and indirect loss and deterioration of habitats; and,
- *Disturbance / Displacement of Species* – long-term, short-term disturbance and displacement of faunal species; loss, damage or disturbance to their resting places.

7.3.8 The potential for effects are considered as a result of the proposed scheme during the construction, operational and decommissioning phases, alone and cumulatively, in-combination with other existing and proposed wind turbine developments.

[15] CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester.

7.4 The Site

7.4.1 The following term is used throughout this chapter:

- *Site* – the land contained within the red line application site boundary as shown in **Figure 7.1**, **Volume 3.**
- *Survey Area* – the land surveyed during the Extended Phase I Habitat Survey and Bat Activity Surveys respectively.

7.4.2 The Site is set within land adjacent to the Aviva UK Insurance Building and surrounding land, located on the south west fringe of Perth. The Aviva site is bounded by the M90 motorway running north-west / south-east, Craigie Hill golf club immediately to the east and residential housing to the north-west.

7.5 Key Legislation, policy and Guidance

7.5.1 Reference has been made to planning policy, legislation and guidance, as summarised in **Table 7.1**.

Table 7.1: Key Legislation, policy and Guidance

International
• Convention on Wetlands of International Importance especially as Waterfowl Habitat 1971 (hereafter referred to as the 'the Ramsar Convention)[16]; • Convention on the Conservation of European Wildlife and Natural Habitats 1979 (hereafter referred to as the 'the Bern Convention'[17]; • UNESCO convention on the protection of the World Cultural and Natural Heritage (1972)[18]; • the Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora); and, • the Birds Directive (Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds)
National
• The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) in Scotland via the Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019 ("The Habitats Regulations")[19];

[16] https://www.ramsar.org/
[17] https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/104
[18] https://whc.unesco.org/en/convention/
[19] https://www.legislation.gov.uk/uksi/2019/579/contents/made

• The Wildlife and Countryside Act 1981 (as amended); • The Wildlife and Natural Environment (Scotland) Act 2011; • The Nature Conservation (Scotland) Act 2004; • The United Kingdom Biodiversity Action Plan (UK BAP); • Scottish Biodiversity List (SBL) 2020; • Protection of Badgers Act 1992; • The Invasive Alien Species (Enforcement and Permitting) Order 2019; • Scottish Planning Policy (2014, revised 2020); • 'General Pre-application and Scoping Advice for Onshore Wind Farms' (NatureScot, 2020); • 'Good Practice during Wind Farm Construction' (joint publication 2019)[20]; • 'Assessing the Impact of Small-Scale Wind Energy Proposals on the Natural Heritage' (SNH, 2016); • 'Assessing Connectivity with Special Protection Areas (SPAs)' (SNH, 2016); • 'Assessing the Cumulative Impact of Onshore Wind Energy Developments' (SNH, 2018); • Standing Advice for Planning Consultations - Protected Species (NatureScot)[21]; • 'Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation' (NatureScot, 2021); • 'Birds of Conservation Concern 5' (Stanbury *et al*., 2021)[22]; and, • BS 42020:2013 Biodiversity – Code of Practice for Planning and Development.
Local
• Perth and Kinross Local Development Plan (LDP) (2019)[23]; and, • Tayside Local Biodiversity Action Plan (2016-2026)[24].

[20] https://www.nature.scot/sites/default/files/2020-12/Good%20Practice%20during%20wind%20farm%20construction%20-%204th%20Ed.pdf
[21] https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/planning-and-development-standing-advice-and-guidance-documents
[22] Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D., and Win I. 2021. The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. British Birds 114: 723-747
[23] https://www.pkc.gov.uk/media/45242/Adopted-Local-Development-Plan-2019/pdf/LDP_2_2019_Adopted_Interactive.pdf?m=637122639435770000
[24] https://www.pkc.gov.uk/media/37386/Tayside-Local-Biodiversity-Action-Plan/pdf/Tayside_LBAP_report_GP_10_Web.pdf?m=636123832272230000

7.5.2 The 'UK Post-2010 Biodiversity Framework' succeeds the UK Biodiversity Action Plan (UK BAP) and 'Conserving Biodiversity – the UK Approach'. Biodiversity priorities in Scotland are set out in the SBL and in regional LBAPS, however the lists of priority species and habitats agreed under UK BAP still form the basis of much biodiversity work and are therefore considered within this report where relevant.

7.6 Methodology

Desk Study

7.6.1 A desk study was undertaken to collate existing information on the presence of designated sites for nature conservation with ecological interests and existing records of protected or notable species where available.

7.6.2 Information gathered to inform the 2018 application, including field survey data, desk study and consultations were reviewed and are presented where relevant. Field surveys undertaken to inform the 2018 application comprised:

- Extended Phase 1 habitat survey (July 2017); and,
- Bat activity surveys (July to August 2017).

7.6.3 The suitability of habitats present within the Site and surrounding area to support sensitive species was also considered.

7.6.4 The following key sources were consulted during the desk study:

- Nature Scot and Joint Nature Conservation Committee (JNCC) websites,
- Perth Museum & Art Gallery.

7.6.5 In response to the 2018 application, Perth Museum & Art Gallery confirmed by email (August 2018) that they no longer operate a biological records centre and were therefore unable to respond to data requests. As such, there is no available supplier of biological records for the project area.

7.6.6 Ordnance Survey maps of the wider area and online aerial images (www.google.co.uk/maps) were also consulted in order to determine any receptors of nature conservation interest in the surrounding landscape.

Field Surveys

7.6.7 The scope of field surveys undertaken was determined with reference to key guidance (**Table 7.2**).

7.6.8 Ornithology surveys were not undertaken. The Site is set within an urban fringe area and does not provide suitable habitat for those species considered sensitive to wind energy

developments in NatureScot (SNH, 2018)[25] guidance '*Assessing the significance of impacts on bird populations from onshore wind farms that do not affect protected areas'.* Whilst occasional flights over the Site by such species may occur, these are considered highly unlikely to be regular enough to constitute any risk through collision to the conservation status of each species within the 'Eastern Lowlands' Natural Heritage Zone (NHZ)[26]. This approach is consistent with that applied to the 2018 application and which was accepted by Scottish Natural Heritage (SNH, now NatureScot), whose response to Perth and Kinross Council scoping request for that application stated "*the proposed development is out with a nationally or internationally designated nature conservation site and has no significant connectivity to such a site".*

7.6.9 The following field surveys were completed:

- Extended Phase 1 habitat survey (July 2021, as a revision of the 2017 survey); and,
- Bat activity surveys (May to September 2021).

7.6.10 **Table 7.2** provides a summary of field survey methodologies followed.

[25] https://www.nature.scot/doc/guidance-assessing-significance-impacts-bird-populations-onshore-wind-farms-do-not-affect-protected
[26] https://www.nature.scot/sites/default/files/2017-06/A306377%20-%20Natural%20Heritage%20Futures%20-%20Eastern%20Lowlands.pdf

Table 7.2 – 2021 Field Survey Methodologies

Ecological Feature	Methodology
Habitats	The survey was undertaken in accordance the UK industry standard Joint Nature Conservation Committee (JNCC) 'Phase 1 Habitat Methodology' (JNCC, 2010[27]), extended to include the additional recording of specific features indicating the presence, or likely presence, of protected or notable species. The study area comprised all habitats within approximately 250m of the proposed turbine location (**Figure 7.2, Volume 3**). Full methodology details and results are presented in **Appendix 7.1, Volume 4**
Bats	Surveys followed a methodology based on NatureScot guidance '*Bats and onshore wind turbines - survey, assessment and mitigation*' (NatureScot, 2021)[28] and Bat Conservation Trust (BCT) guidance '*Bat Surveys: Good Practice Guidelines'* (Hundt, 2012)[29]. It should be noted that the NatureScot 2021 states that "*it is not intended for use in relation to single wind turbines, micro installations (under 50kW) or offshore wind farms, although some aspects of the guidance may be relevant*". There is currently no guidance for single wind turbines with a detailed survey or assessment methodology; as such surveys and subsequent follow the broad principles of the above guidance. Three periods of automated/static activity surveys were undertaken; spring, summer and autumn 2021. Three monitoring stations were deployed, one in close proximity to the proposed wind turbine location and two at nearby control sites. Full methodology details and results are presented in **Appendix 7.2, Volume 4.**
Terrestrial Mammals	Searches for signs indicating the presence of protected terrestrial mammals were undertaken in conjunction with the updated Extended Phase 1 habitat survey in July 2021. Full methodology details and results are presented in **Appendix 7.1, Volume 4.**

[27] JNCC (2010). Handbook for Phase I Habitat Survey – a Technique for Environmental Audit. JNCC, Peterborough
[28] https://www.nature.scot/doc/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation
[29] Hundt, L. (2012) 'Bat Surveys: Good Practice Guidelines, 2nd edition' Bat Conservation Trust

Impact Assessment

7.6.11 The impact assessment has been undertaken with reference to the CIEEM guidelines (CIEEM, 2018). Ecological Impact Assessment (EcIA) as defined within the guidelines is '*a process of identifying, quantifying and evaluating the potential effects of development-related or other proposed actions on habitats, species and ecosystems*'.

7.6.12 The process includes the following stages:

- determination and evaluation of important ecological features;
- identification and characterisation of impacts;
- outline of mitigating measures to avoid and reduce significant impacts;
- assessment of the significance of any residual effects after such measures;
- identification of appropriate compensation measures to offset significant residual effects; and,
- identification of possible opportunities for ecological enhancement.

Determining Importance

7.6.13 In accordance with the CIEEM guidelines, an EcIA need only assess in detail, impacts upon important ecological features i.e., those that are considered important and potentially significantly affected by a proposed development. It is not necessary to carry out detailed assessment of features that are sufficiently widespread, unthreatened and resilient to project impacts. Where ecological features are not considered important enough to warrant further consideration, or where they will not be significantly affected, these are scoped out of the assessment presented here, with justification for exclusion provided.

7.6.14 Relevant European, national and local guidance from governments and specialist organisations (as outlined above) has been referred to in order to determine the importance (or 'sensitivity') of ecological features. In addition, importance has also been determined using professional judgement and taking account of the results of baseline surveys and the importance of features within the context of the geographical area.

7.6.15 Importance does not necessarily relate solely to the level of legal protection that a feature receives and ecological features may be important for a variety of reasons, such as their connectivity to a designated site and the rarity of species or the geographical location of species relative to their known range.

7.6.16 For the purposes of this assessment the importance of an ecological feature is considered within a defined geographical context, as outlined below in **Table 7.3**.

Table 7.3 – Geographic scale of ecological feature importance.

Importance	Definition
International	A European designated site i.e., Special Area of Conservation (SAC) and/or Ramsar site or candidate site (or cSAC). Large areas of priority habitat listed under Annex I of the Habitats Directive, and smaller areas of such a habitat that are essential to maintain the viability of that ecological resource. A regularly occurring, nationally significant population of any internationally important species, listed under Annex II or Annex IV of the Habitats Directive.
National	A nationally designated site e.g., Site of Special Scientific Interest (SSSI), or area meeting criteria for national level designations. Significant extents of a priority habitat identified in the UKBAP / Scottish Biodiversity List, or smaller areas which are essential to maintain the viability of that ecological resource. A regularly occurring, regionally significant population of any nationally important species listed as a UK BAP / Scottish Biodiversity List priority species and Species listed under Schedule 1 or Schedule 5 of the Wildlife and Countryside Act.
Regional	Viable areas of key semi-natural habitat identified in the UKBAP. A regularly occurring, locally significant population of any nationally important species listed as a UK BAP / Scottish Biodiversity List priority species and Species listed under Schedule 5 of the Wildlife and Countryside Act. Sites which exceed the local authority-level designations but fall short of SSSI selection guidelines, including areas of semi-natural woodland exceeding 0.25ha.
County	Areas of semi-natural ancient woodland smaller than 0.25ha. Sites of Importance for Nature Conservation or equivalent sites selected on local authority criteria. Local Nature Reserves. Other species of conservation concern, including species listed under the Local BAP (LBAP). Areas of habitat or species considered to appreciably enrich the ecological resource within the local context e.g., species-rich flushes or hedgerows.
Local	All other species and habitats that are widespread and common and which are not present in locally, regionally or nationally important numbers or habitats which are considered to be of poor ecological value (e.g., commercial forestry).

Characterising Impacts

7.6.17 Once identified, the potential impacts arising from the proposed scheme are described making reference to the following characteristics as appropriate:

- positive or negative;
- extent;

- magnitude;
- duration;
- timing;
- frequency; and,
- reversibility.

7.6.18 The assessment only makes reference to those characteristics relevant to understanding the ecological effect and determining the significance.

7.6.19 The likelihood or probability that an impact will occur is also described as far as possible based on available information. The likelihood of an impact occurring is referred to throughout this chapter using the following terms: certain, likely, unlikely or highly unlikely.

7.6.20 The criteria used to determine the magnitude of impact are set out in **Table 7.4** below.

Table 7.4: Impact magnitude

Magnitude	Description
High	The effect (either on its own or with other proposals) may adversely or positively affect the biodiversity conservation status of a site/population, in terms of the coherence of its ecological structure and function (integrity), across its whole area, that enables it to sustain the habitat, complex of habitats and/or the population levels of species of interest.
Medium	Biodiversity conservation status of a site or population would not be adversely or positively affected, but some element of the functioning might be affected and the effect on the site/population is likely to be significant in terms of its ability to sustain some part of itself in the long term.
Low	Neither of the above applies, but some minor adverse or beneficial effect is evident on a temporary basis or affects the extent of habitat/species abundance in the local area.
Negligible	No observable effect in either direction.

Determining Significance

7.6.21 Ecological effects are considered in terms of geographic scale, capacity of receiving features to accommodate change, conservation objectives, conservation status and condition of the site or its interest/qualifying features. It considers whether the structure and function of an ecosystem may be changed, whether processes or key characteristics will be removed or changed, or whether there will be an effect on the nature, extent, structure and function of component habitats; or whether there is an effect on the average population size and viability of component species.

7.6.22 A significant effect is assessed to be an effect that either supports or undermines biodiversity conservation, including effects on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (such as extent, abundance and distribution).

7.6.23 The CIEEM guidelines on EcIA note that "A significant effect does not necessarily equate to an effect so severe that consent for the project should be refused planning permission. For example, many projects with significant negative ecological effects can be lawfully permitted following EIA procedures as long as the mitigation hierarchy has been applied effectively as part of the decision-making process."

7.6.24 Professional judgement is used based on these variables. In cases of reasonable doubt, where it is not possible to robustly justify a conclusion of no significant effect, a significant effect has been assumed as a precautionary approach. Where uncertainty exists, this is acknowledged.

7.6.25 Where the EcIA proposes measures to mitigate adverse effects on ecological features, a further assessment of residual ecological effects, taking into account any ecological mitigation recommended, has been undertaken.

7.6.26 CIEEM guidelines do not use a matrix table as commonly set out in environmental statement chapters to determine 'significant' and 'non-significant' effects. For this chapter, the CIEEM methodology has been adapted as set out in **Table 7.5**, which also shows the equivalent EIA terms often used in other disciplines for clarity.

Table 7.5: Effect significance

Effect (EIA Significance)		**Equivalent CIEEM terms**
Neutral	**Negligible**	No Significant Impact on ecological integrity or conservation status.
Non-significant	**Minor Adverse**	Significant Adverse Impact on ecological integrity or conservation status at a Local level
Significant	**Moderate Adverse**	Significant Adverse Impact on ecological integrity or conservation status at a County level.
	Major Adverse	Significant Adverse Impact on ecological integrity or conservation status at a Regional, National or International level

Assessment of Cumulative Effects

7.6.27 Potentially significant cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location.

7.6.28 Cumulative impacts have therefore been assessed with reference to NatureScot guidance *'Assessing the Cumulative Impact of Onshore Wind Energy Developments'* (NatureScot, 2021)[30], and encompass the effects of the proposal in-combination with relevant:

- existing developments, either built or under construction;
- approved developments, awaiting implementation; and,
- proposals awaiting determination within the planning process with design information in the public domain.

7.6.29 Those developments currently in scoping are not considered as it is as yet unknown whether they will progress to full planning status and there is insufficient certainty as to the nature of the projects for assessment purposes.

7.6.30 The purpose of the cumulative impact assessment is to determine whether effects are likely to affect the 'Site Integrity' or the 'Favourable Conservation Status' of an ecological feature. Where the habitat or species is associated with an internationally designated site, cumulative effects are assessed in context with this population or area. Where species are not associated with an internationally designated site, cumulative effects are assessed in a regional context. Regional context is identified as the Natural Heritage Zone (NHZ) within which the Proposed Development is located.

7.7 Baseline Conditions

Designated Sites for Nature Conservation

7.7.1 This section should be read with reference to **Figure 7.1**, **Volume 3**.

7.7.2 **Table 7.6** provides a summary of statutory designated sites for nature conservation located within 5km of the proposed turbine location, extended to 10km for internationally designed sites. A 10km search radius for international sites was considered appropriate relative to the scale of the development.

7.7.3 There are no statutory designated sites for nature conservation located within the Site boundary or immediate surrounding area.

[30] https://www.nature.scot/doc/guidance-assessing-cumulative-landscape-and-visual-impact-onshore-wind-energy-developments

Table 7.6: Summary of statutory designated sites for nature conservation.

Site Name	Distance & Direction	Description
Internationally Designated Sites: SPAs, SACs and Ramsars within 10km of the proposed turbine location		
River Tay SAC	1.8km east	Designated for habitats (Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea), Atlantic salmon *Salmo salar*, Sea Lamprey *Petromyzon marinus*, Brook lamprey *Lampetra planeri*, River lamprey *Lampetra fluviatilis* and Otter *Lutra lutra*.
South Tayside Goose Roosts SPA & Ramsar	6.6km south west	Comprises a series of seven lochs utilised by roosting over-wintering goose species: • Greylag goose *Anser anser* • Pink-footed goose *Anser brachyrhynchus*
Pitkeathly Mires SAC	7.2km south	Designated for habitats (transition mires and quaking bogs) and the most northerly location for the rare slender green feather-moss Drepanocladus vernicosus.
Methven Moss SAC	8.3km west	Designated for habitats (raised bog)
Nationally Designated Sites: SSSIs within 5km of the proposed turbine location		
Kinnoull Hill SSSI	2.6km east	Woodland park area.
Almondbank SSSI	4.4km north east	Geological site.

Habitats

7.7.4 The application Site (red line boundary) is located entirely within landscaped and car parking areas which form part of the Aviva commercial area.

7.7.5 The survey area used for the Extended Phase 1 was the proposed turbine location plus a 250m buffer, as illustrated on **Figure 7.2, Volume 3**, where access allowed. Further details are provided in **Appendix 7.1**, **Volume 4.**

7.7.7 The following habitats were identified within the survey area (with reference to corresponding JNCC habitat codes[31]):

2.1 Woodland and scrub

- A1.1.1 Broadleaved woodland: semi-natural
- A1.2.2 Coniferous woodland: plantation (*Cupressus* sp.)
- A1.3.2 Mixed woodland: plantation
- A3 Parkland and scattered trees

2.2 Grassland and marsh

- B2.2 Neutral semi-improved grassland

2.6 Boundaries / other

- J1.1 Arable
- J1.4 Introduced shrub
- J4 Bare ground
- J3.6 Buildings
- 2.7 Open water
- G2.2 Running mesotrophic water (stream)

Protected and Notable Species

Bats

7.7.8 Surveys undertaken in 2017 (to inform the 2018 application) recorded the presence of three bat species; common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus* and noctule *Nyctalus noctulea.*

7.7.9 Common pipistrelles dominated activity recorded during the 2017 monitoring period. Noctule was recorded once during the manual activity (transect) survey, which passed the Proposed Development location. Overall, the automated results suggest that the edge of the broad-leaved woodland in the vicinity of the Proposed Development provided a commuting and foraging corridor for bats. Activity was overall low however suggesting the survey area does not represent an important site for bats at a population level.

7.7.10 The 2021 surveys identified activity from the following species; common pipistrelle, soprano pipistrelle, noctule, brown long-eared bat *Plecotus auritus* and Myotis species *Myotis sp.*

[31] http://jncc.defra.gov.uk/page-4258

7.7.11 Three monitoring stations (L1, L2 and L3) were utilised during automated surveys in 2021. The highest bat activity levels were recorded at L1 the closest detector to the proposed wind turbine, with 51.47% of all calls and three species recorded. The detector located at the edge of the golf course (L3) recorded 36.38% of the total calls and three species. The lowest bat activity was recorded at the detector located on the edge of the woods and adjacent to the golf course (L2) recording 12.15% of the total calls and five species (**Table 7.7**).

7.7.12 Common pipistrelle was recorded at all three monitoring stations at high to moderate levels and was the dominant species recorded during the 2021 monitoring period (**Table 7.8**). Soprano pipistrelle was also recorded at high to moderate levels at each monitoring point throughout the monitoring period. Noctule, brown long-eared bat and myotis species were recorded at low to moderate levels.

7.7.13 Following NatureScot guidance (NatureScot, 2021)[32] *Ecobat*[33] was used to provide an objective interpretation of the relative importance of bat activity levels recorded (**Table 7.8**). A full breakdown of results is found in **Appendix 7.2.**

[32] https://www.nature.scot/doc/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation
[33] Lintott, P.R., Davison, S., van Breda, J., Kubasiewicz, L., Dowse, D., Daisley, J., Haddy, E. and Mathews, F., 2018. *Ecobat*: An online resource to facilitate transparent, evidence-based interpretation of bat activity data. Ecology and evolution, 8(2), pp.935-941

Table 7.7: Summary table showing the number of nights recorded bat activity fell into each activity band for each species.

Species	Location	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
Common pipistrelle	L1	9	7	1	1	5
	L2	1	7	10	0	7
	L3	4	10	4	1	1
Soprano pipistrelle	L1	0	1	8	6	2
	L2	0	3	4	1	5
	L3	1	13	2	3	0
Noctule	L1	0	0	0	1	7
	L2	0	0	0	0	0
	L3	0	0	0	1	2
Brown long-eared	L1	0	0	0	0	0
	L2	0	0	0	0	0
	L3	0	0	0	0	5
Myotis species	L1	0	0	0	0	0
	L2	0	0	0	0	7
	L3	0	0	0	0	3

Table 7.8 Number of nights recorded bat activity fell into each activity band for each species within the turbine area.

Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
Common pipistrelle	14	24	15	2	13
Soprano pipistrelle	1	17	14	10	7
Noctule	0	0	0	2	9
Brown long-eared	0	0	0	0	5
Myotis species	0	0	0	0	10

7.7.14 Overall, the 2021 automated results were consistent with 2017 surveys, and both suggest that the edge of the broad leaved woodland adjacent to the Proposed Development provides a commuting and foraging corridor for bats, most notably common pipistrelle and soprano pipistrelle.

7.7.15 Activity from all surveys was relatively low however, indicating that the survey area does not represent an important site for bats at a population level.

Other Terrestrial Mammals

7.7.16 The Site provides limited habitat for other protected terrestrial mammal species. The habitat survey area has some potential to support badgers *Meles meles*, although no confirmed evidence was found.

7.7.17 Habitats potentially suitable for other protected mammal species were also absent from within the Site. The watercourse within the wider habitat survey area was considered to be unsuitable for otter *Lutra lutra* and water *vole Arvicola amphibious*.

Reptiles

7.7.18 The Site provides some suitable habitat for widespread reptile species, such as slow worm *Anguis fragilis*, particularly along woodland edges. However, the relatively isolated nature of the Site, bounded by a motorway to the south and urban areas to the north, suggests the area is unlikely to support any large populations of reptiles.

Additional Species

7.7.19 No other species are considered pertinent to the assessment and subject to potentially significant effects.

Likely Future Baseline

7.7.20 In the absence of the Proposed Development, or assuming a gap between baseline surveys and the commencement of the proposal's construction, changes in baseline ecology conditions (i.e., distributions and populations) are considered unlikely to occur.

7.7.21 In the absence of development, the habitats within the Site are considered to largely remain under the existing management regime.

Design Evolution

7.7.22 Full details of the scheme design evolution and embedded mitigation measures are detailed in chapter four 'Planning the Development' and pollution control measures are presented in Chapter two 'The Proposed Development'.

7.7.23 The adoption of embedded mitigation measures to avoid or minimise adverse impacts upon ecological features resulting from the proposed scheme has been part of the iterative design process. Design consideration and measures included to avoid and minimise impacts upon ecological features have included:

Bats

7.7.24 NatureScot guidance (2018) recommends that a buffer distance of 50m between turbine blade tip and nearest woodland (or other key habitat feature) should be applied as a basic standard mitigation measure for all bat species occurring at proposed wind farms. However, the guidance also states that "*it is not intended for use in relation to single wind turbines*".

7.7.25 The proposed wind turbine is a EWT DW61 model, with a 46m tower, 61 diameter blades and a 76.5m total tip height. The nearest trees are approximately 15m in height. These measurements would require the turbine location to be cited a minimum of 73.75m from the nearest bat habitat feature (mature trees). The turbine is located at grid reference 310031, 722033, which is 20m from the nearest trees. As such the proposed wind turbine does not achieve a 50m buffer and the turbine blades will 'over-sail' the woodland.

7.7.26 Subsequently mitigation by design was not possible and an alternative approach to mitigation is proposed (see Section 7.9).

Pollution Prevention Control

7.7.27 Standard pollution control measures and good practice construction methods, in accordance with current industry and Scottish Environment Protection Agency (SEPA) guidelines, will be implemented throughout the construction period of the proposed scheme. Further information is presented in Chapter two. Such measures will be included within a Construction Environmental Management Plan (CEMP).

7.8 Assessment of Potential Effects

7.8.1 In accordance with CIEEM (2018) guidelines, only ecological features that are considered to be important and potentially significantly affected by the proposed scheme require a detailed assessment.

7.8.2 Features which are unlikely to be significantly affected by the proposed development or which are considered sufficiently widespread, unthreatened or resilient to impacts, and hence will remain viable and sustainable, have therefore not been subject to a detailed assessment (scoped-out), but where relevant are considered under mitigation.

Ecological Features Scoped out of Assessment

Designated Sites for Nature Conservation

7.8.3 Potential impacts upon statutory designated sites are scoped-out from detailed assessment, as is consistent with the 2018 application.

Habitats

7.8.4 The Proposed Development will not lead to direct impacts on any protected or notable habitats.

7.8.5 **Plate 1** shows the development area. Construction loads will follow the existing roadway to the edge of an overflow car park. Beyond the edge of the car park the crane hard standing will be constructed (red block) and this will be the only new hard surface. The construction compound will be on the existing overflow car park. The hatched area shown is the temporary 'set down area' for the wind turbine blades before they will be lifted into position.

Plate 7.1: The Proposed Development

7.8.6 Nearby watercourses will be protected through standard pollution control measures and therefore significant effects avoided.

Birds

7.8.7 Potentially significant effects on sensitive bird species are not considered likely to occur (see para 7.6.8). Sensitive bird species are defined as those listed in NatureScot (SNH, 2018) guidance '*Assessing the significance of impacts on bird populations from onshore wind farms that do not affect protected areas*'. The Site and surrounding area do not provide suitable habitat for such species. Whilst occasional flights over the Site may occur, these are considered highly unlikely to be regular enough to constitute any risk through collision to the conservation status of any such species within the Eastern Lowlands Natural Heritage Zone.

Terrestrial Mammals

7.8.8 The Site is considered unsuitable for regular use by protected or notable terrestrial mammal species. The possible presence of badgers in the surrounding area is acknowledged; however, no evidence of presence has been observed.

7.8.9 Whilst potentially significant adverse impacts upon terrestrial mammals are considered highly unlikely, mitigation measures are recommended as a precaution to ensure legislative compliance during the construction and decommissioning phases.

Reptiles

7.8.10 The Site provides limited habitat for reptiles, although the possible presence of slow worms is acknowledged. Given the protection afforded to individual reptiles against international or reckless killing and injuring reptiles are considered for mitigation, to ensure legislative compliance during the construction and operational phases.

Other Species

7.8.11 No other species are considered pertinent.

Important Ecological Features

7.8.12 This section identifies key ecological features, to be subject to more detailed assessment. Key ecological features are those that are considered to be important at more than a local level, and/or potentially significantly affected by the proposed development, adopting a precautionary approach where necessary.

7.8.13 A summary of identified important ecological features "scoped-in" for detailed assessment is provided in **Table 7.9** below.

7.8.14 Ecological features have been assigned a level of importance based on the evaluation criteria presented within **Table 7.4** and professional judgement.

Table 7.9: Ecological features scoped in/out for detailed assessment.

Ecological Feature	Importance	Rationale
Bats	Local	All UK bats and their roosts are protected under the provisions of the Wildlife and Countryside Act 1981 (as amended) and the Habitat Regulations, deeming them European Protected Species (EPS). So far as achievable, the project design has avoided habitat features likely to be used by bats. All species assemblage recorded during baseline surveys were all common and widespread species and activity was very low (<2 bat passes per hour maximum). As such a County level of importance is assigned to all species.

		Scoped into the assessment.

Assessment of Effects

7.8.15 This section identifies the main potential effects of the construction, operational and decommissioning phases of the scheme on important ecological features scoped-in for detailed assessment, in the absence of mitigation:

- **Construction phase** - the construction of the proposed scheme will require the modification of an existing access track and construction areas for installation of the proposed wind turbine and associated infrastructure, along with temporary construction compounds. In addition, there will be a temporary increase of disturbance through vehicular traffic, site staff and plant machinery.
- **Operational phase** - operational impacts of the proposed turbine would comprise the operation of the wind turbine and the maintenance of the turbine and all associated infrastructure. Maintenance works would require intermittent site visits from staff during daytime hours. It is envisaged such visits would cause no more disturbance than the current use of the Site.
- **Decommissioning phase** - impacts associated with the decommissioning of the scheme are considered to be broadly the same as construction impacts, requiring the temporary creation of compounds and a temporary increase of disturbance as a result of site traffic and personnel. Consequently, decommissioning effects are considered to be the same as, or less than, construction effects and are not discussed exclusively.

Bats

Construction Effects

7.8.16 The construction of the proposed scheme will not result in the permanent and temporary loss of habitats, which are typically of low foraging and commuting value to bats.

7.8.17 Noise, lighting and dust generation during the construction period, could potentially result in reduced foraging opportunities for bats, particularly if night-time work is undertaken. Extensive night-time working is not anticipated during the core bat activity period, April to September, due to available daytime working hours. Embedded best practice construction techniques (secured via the CEMP) will also limit the potential for dust and contaminant generation. As such, any effect of onsite disturbance to bat species would be of negligible magnitude, and would not be significant or affect the favourable conservation status of any bat species.

Operation Effects

7.8.18 NatureScot guidance (2021) states that wind farms can affect bats in the following ways:

- Collision mortality, barotrauma and other injuries (although it is important to consider these in the context of other forms of anthropogenic mortality);

- Loss or damage to commuting and foraging habitat, (wind farms may form barriers to commuting or seasonal movements, and can result in severance of foraging habitat);
- Loss of, or damage to, roosts; and / or
- Displacement of individuals or populations (due to wind farm construction or because bats avoid the wind farm area).

7.8.19 However operational impacts on bats can be difficult to characterise due to the limited evidence base pertaining to bats and wind farms in the UK, which prohibits mortality risks to be accurately quantified and predicted.

7.8.20 Research published by the University of Exeter provides the most comprehensive understanding of the risks posed to bats from onshore wind turbine developments the UK (Mathews *et al.*, 2016[34]).

7.8.21 The report concludes:

- Bat casualties occur at British wind energy installations at rates similar to those reported elsewhere in Europe.
- The species identified as being at highest risk of collision are common pipistrelle, soprano pipistrelle and noctule *Nyctalus* bats.
- Casualty rates are highly variable. Most of this variability appears to be due to site-specific factors, and is not simply explained by differences in bat activity levels. Collision risk is generally lowest at locations with low bat activity, but risks rise very rapidly with increasing activity, and not all sites with high risk had high bat activity.
- The size of the wind energy installation had no link with the per-turbine casualty rate. Turbine numbers had a greater effect on the risk that a site posed to bats than any other feature identified in the project;
- Turbines with larger blade lengths pose an increased risk to bats,
- Most fatalities occur on nights of relatively low mean wind speed (≤5m/s at ground level), however most turbines with mean low wind speeds have no bat casualties;
- The presence of woodland within a 1,500m radius of wind farms in the vicinity of wind turbines appears to reduce the risk to pipistrelles but increase the risk to noctule bats. However, noctule bat casualties are relatively uncommon events and therefore most of the sites with woodland within this radius will experience no casualties.

7.8.22 Following NatureScot guidance (NatureScot, 2021), a Stage 2 'Overall Risk Assessment' (ORA) should be carried out separately for all high collision risk species recorded, which comprises the following species recorded during 2017 and 2021 bat activity surveys:

- Noctule bat

[34] Mathews, F., Richardson, S., Lintott, P., Hosken, D. (2016) Understanding the Risk to European Protected Species (bats) at Onshore Wind Turbine Sites to inform Risk Management. Final Report. University of Exeter/DEFRA.

- Common pipistrelle
- Soprano pipistrelle

7.8.23 In order to derive an ORA, the determined Bat Activity Category (derived from the 'Ecobat' Tool Output Report, as presented in **Appendix 7.2, Volume 4**) is compared against the turbine area Risk Level ('Stage 1' assessment) using a matrix approach to determine the level of overall risk. The detailed results are presented in **Appendix 7.2, Volume 4** and summarised as follows:

- Noctule bat – low to medium risk (low to moderate percentile category).
- Common pipistrelle – medium to high risk (moderate to high percentile category).
- Soprano pipistrelle – medium to high risk (moderate to high percentile category).

7.8.24 As outlined **Appendix 7.2, Volume 4**, the Ecobat tool is in its relative infancy and given current limitations in available bat survey data on the database, definitive bat activity for regions is not generated and bat activity representations are instead indicative for each region.

7.8.25 In the absence of mitigation, the Proposed Development is considered to represent a Medium level impact, which represents a Major Adverse Effect on a receptor of Regional Value, and therefore a potentially Significant effect in EIA terms (see **Table 7.5**). However, given the limited evidence available on actual effects on bat populations this conclusion should be considered highly precautionary, further so given the scale of the development (i.e., a single wind turbine).

Decommissioning

7.8.26 Potential decommissioning effects are considered to be of a similar nature as temporary habitat losses incurred during the construction phase, as such will not be significant.

7.9 Mitigation

7.9.1 Potentially significant effects are predicted only in relation to bats during the operational period and therefore mitigation is proposed.

7.9.2 No other significant ecological effects at a county scale or higher have been predicted, and therefore no further specific mitigation measures are outlined; however good practice measures are outlined to ensure the construction of the proposed scheme is carried out in an environmentally sensitive manner and to ensure legislative compliance with respect to protected species.

Construction and Environmental Management Plan

7.9.3 A Construction Environmental Management Plan (CEMP) will be produced prior to the commencement of construction works, with reference to current industry guidance. Measures detailed within the CEMP will ensure construction is undertaken in compliance

with relevant environmental and ecological legislation and good practice construction methods.

Operation - Bats

7.9.4 Mitigation is proposed following the methodology detailed in NatureScot guidance (2021), which states that there is evidence that bat casualties at wind farms are reduced by pitching the blades out of the wind ("feathering") to reduce rotation speeds below 2 rpm while idling. The reduction in speed resulting from feathering compared with normal idling may reduce fatality rates by up to 50%.

7.9.5 Feathering will therefore be implemented using automated SCADA data for the lifetime of the Proposed Development.

7.10 Enhancement

7.10.1 Enhancement measures compatible with the proposed scheme will be agreed in consultation with relevant parties, to provide biodiversity enhancements at a local level. Suitable measures may include on-site planting or the installation of bats and bird boxes. Further information on the types of biodiversity enhancement can be found in **Appendix 7.3, Volume 4.**

7.11 Residual Effects

Operation – Bats

7.11.1 Following the implementation of mitigation, effects arising from the Proposed Development are considered reduced to a Minor Adverse Effect on a receptor of Regional value, and therefore not significant in EIA terms.

Other Effects

7.11.2 No significant residual effects are anticipated.

7.12 Cumulative Effects

7.12.1 In accordance with NatureScot guidance (2021), a cumulative impact assessment need only be sought where it is considered that a proposal could result in significant cumulative impacts.

7.12.2 Likely impacts of the proposed development will not extend beyond the boundaries of the Site and subsequently no potentially significant cumulative effects upon ecological features are reasonably predicted to occur.

7.13 Conclusion

7.13.1 The Proposed Development has been assessed for the likely impacts on features of biodiversity value, including protected and notable species, along with statutory sites for nature conservation importance.

7.13.2 The Site is set within land adjacent to the Aviva UK Insurance Building, located on the south west fringe of Perth. The Aviva site is bounded by the M90 motorway running north-west / south-east, Craigie Hill golf club to the east and residential housing to the north west. The turbine will be located between the Aviva site and a golf course, but close to mature woodland.

7.13.3 Field surveys and desk study, including that undertaken for a 2018 application in close proximity, comprised Extended phase 1 habitat survey and bat activity surveys. These concluded that the habitats within the application Site and wider survey area were of limited overall ecological value.

7.13.4 Bat activity surveys in 2017 and 2021 found moderate levels of bat activity; however due to the proximity of the proposed wind turbine to woodland risks were considered to be moderate to high for some widespread bat species, although this is a highly precautionary conclusion. Subsequently, as a precaution, mitigation is proposed following a methodology recommended in NatureScot (2021) guidance, whereby the pitching of the blades is reduced to reduce rotation speeds whilst the turbine is idling. This reduces bat fatality rates by up to 50%. With the implementation of such a strategy the predicted effects are substantially reduced and not considered to be significant.

7.13.5 Any construction related impacts, such as pollution or noise, will be minimised through implementation of standard control measures.

7.13.6 Potentially significant effects on sensitive bird species are not considered likely to occur. The Site and surrounding area do not provide suitable habitat for sensitive bird species, as defined by NatureScot. Whilst occasional flights over the Site may occur, these are considered highly unlikely to be regular enough to constitute any risk through collision to the conservation status of any such species within the Eastern Lowlands Natural Heritage Zone.

7.13.7 Subsequently, the project will not lead to any significant adverse impacts or effects in relation to protected and notable habitats or species, or nationally or internationally designated sites. Specific mitigation measures beyond those incorporated into project design are therefore not required.

7.14 Statement of No Likely Significant Effects

7.14.1 Under the Habitats Regulations, all competent authorities (in this case Perth and Kinross Council) must consider whether any plan or project will have a ‘likely significant effect’ on a Natura site. Natura sites are those afforded status as a Special Protection Areas (SPA) or

Special Areas of Conservation (SAC); Ramsar wetland sites must also be considered. If likely significant effects may occur, the competent authority must carry out an 'appropriate assessment', or 'Habitats Regulations Appraisal' (HRA).

7.14.2 This Chapter provides sufficient evidence for the competent authority, in their HRA, to conclude that the project, either alone or in combination, will not lead to 'likely significant effects' on any Natura site or Ramsar. This conclusion is supported by SNH in their correspondence relating to the 2018 application.

8. Ground and Water Assessment

8.1 Introduction

8.1.1 This chapter addresses the assessment of the potential effects of the proposed wind turbine at Aviva on the surface water and groundwater environment. In addition, the chapter addresses the potential effect of the proposed development on soil and geology.

8.1.2 The assessment is primarily concerned with the proposed wind turbine and associated infrastructure (access track, electrical cable, and temporary construction compound), referred to as the proposed development, and covers a study area of up to 2 kilometres (km) from the proposed development site.

8.2 Methodology

Information Sources

8.2.1 The following sources of information have been utilised during the assessment:

- Ordnance Survey mapping, Openstreetmap and Google aerial imagery
- British Geological Survey Portal[35]
- Envirocheck Data - Included in **Appendix 8.1, Volume 4**
- Consultation with SEPA
- Published Sources on the SEPA website

Consultation

8.2.2 Before undertaking an assessment, key consultees with a specific interest in the water, soils and geological environment were contacted, including the Scottish Environment Protection Agency (SEPA).

8.2.3 SEPA responded to the original planning application with the following comments:

- Given the distance between the site and the abstractions there is unlikely to be a significant impact as a result of this development, however, we would still wish to see some form of mitigation incorporated, specifically to protect the watercourses which flow through Buckie Braes; this should also protect any abstraction at Pickembrae Spring.

- We would expect to see and approve the finalisation of the CEMP once it has been drafted which we presume will be completed after a contractor has been appointed. In this respect we would request that any planning approval issued for the site includes a condition which requires the submission of the CEMP for the approval of the Planning

[35] https://mapapps.bgs.ac.uk/geologyofbritain/home.html

Authority, in consultation with SEPA, at least 6 weeks before the construction works commence at the site.

- The risk of this proposal to 'Cock Robin Well' is minimal with risk further reduced due to it being sited on alluvial material rather than superficial deposits as a result of its proximity to the aforementioned burn. With this considered it is also likely to be shallow in depth.

- Whilst we consider the risk to the groundwater environment to be low, we would ask that the findings from the geotechnical investigation (which the applicant has confirmed is to be undertaken) are submitted for the approval of the planning authority in consultation with SEPA – we would ask that this be secured by way of a suitably worded planning condition.

8.2.4 Comment on the revised proposal has been sought from SEPA however we have been advised that due to an accumulated backlog of casework, liaison with planning authorities will be the main communication route for planning related advice. For queries relating to sites not in planning SEPA will only be to give site specific advice on a small number of cases where there is potential for significant environmental impact. This project therefore falls outside of the categories where a consultation response will be issued.

8.2.5 Scottish Water responded to the original planning application with no objections. Consultation has been undertaken on the revised turbine location however a response has been received advising that they only currently comment on projects in the planning system. The revised turbine location is further from Scottish Waters Assets and therefore we expect to maintain no objections from Scottish Water.

Assessment Methodology

8.2.6 The assessment has been undertaken primarily using a qualitative assessment based on professional judgement and statutory and general guidance. It assesses potential effects during the construction and operation of the proposed development and outlines mitigation measures to control the predicted effects where appropriate.

8.2.7 There are no published guidelines or criteria for assessing and evaluating effects on hydrology, hydrogeology, geology or soil within the context of an EIA, therefore the assessment is based on a methodology derived from generic EIA regulation guidance.

8.2.8 The methodology sets a list of criteria for evaluating the environmental effects, as follows:

- The sensitivity of a receptor on a scale of low to very high, defined within Table 8.1 below. The sensitivity of a receptor is its ability to absorb the anticipated impact without perceptible change occurring.
- The magnitude of the effect on a scale of no change to high and includes consideration of, scale, size and duration of a potential effect. The definitions are displayed in Table 8.2 below.

- The overall significance of potential effects is evaluated through professional judgement with reference to the criteria listed above and in accordance with Table 8.3 which sets out how the interrelationship between the magnitude and the sensitivity of the feature is evaluated to identify overall significance.

Table 8.1 – Sensitivity Criteria

Sensitivity Context	Criteria	Water and Soil Definition
Very High	Attribute has a high quality and rarity on a National or International scale	Water Framework Directive (WFD) Class 'High'. Site protected/designated under EC or UK habitat legislation (Special Area of Conservation (SAC) Special Protection Area (SPA) Site of Special Scientific Interest (SSSI) Water Protection Zone (WPZ) Ramsar site. Areas known to be at risk of flooding from river or sea on SEPAs indicative flood map with sensitive receptors upstream or downstream. Source protection zone 1 within a Principal or Major Aquifer.
High	Attribute has a high quality and rarity on a regional scale	Water Framework Directive (WFD) Class 'Good'. Main river, over 10 m wide. Watercourse that supports species protected under EC or UK habitat legislation but is not a designated site. Areas known to be at risk of flooding from river or sea on SEPAs indicative flood map. Source protection zone 2 within a Principal or Major Aquifer.
Medium	Attribute has a medium quality and rarity on regional scale	Water Framework Directive (WFD) Class 'Moderate' Main river less than 10 m wide. Ordinary watercourse greater than 5m wide. Areas directly adjacent to SEPA indicative flood plains Private water supplies, located within the vicinity of mains water supply. Source protection zone 1 within a Secondary or Minor Aquifer.
Low	Attribute has a low quality and rarity on local scale	Water Framework Directive (WFD) Class 'Poor'. Unclassified field ditch which is therefore likely to be less than 5 m wide.

		Areas not within or in close proximity to SEPA indicative flood plains.

Table 8.2 – Magnitude of Effect Criteria

Magnitude of Potential Effects	Definition
High	Fundamental change to hydrological conditions resulting in temporary or permanent consequential changes such as altering the water body's existing Water Framework Directives ecological status.
Medium	Detectable change to hydrological conditions resulting in non-fundamental or partial, temporary or permanent consequential changes.
Low	Detectable but minor change to hydrological conditions.
Negligible	Non-detected, or unquantifiable change in hydrological conditions.

Table 8.3 – Overall Significance Criteria

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

8.2.9 Where the effect has been classified as moderate or above this is considered to be the equivalent to likely significant effects referred to in the Environmental Impact Assessment (Scotland) Regulations 2017. The conclusion that some effects are 'significant' must not be taken to imply that they are necessarily adverse or should warrant refusal.

8.3 Baseline Conditions

Site Visit

8.3.1 A site visit was undertaken on the 19th October 2021 by M Davis from Our Footprints in combination with the site services engineer who has a good knowledge of the area. During

the visit key features were identified, including existing surface water drainage, and other land use characteristics likely to influence hydrological processes.

Landform, Land Use and Climate

8.3.2 The proposed development site sits adjacent to a commercial office complex within a field that has had previous planning consent for an extensive parking area. The maximum elevation in the area is 100m AOD. The site was extensively landscaped in the 1980's when the office complex was built. The site is built on the side of a hill which has been landscaped and consists of a number of level tiered areas, with grassed and planted areas between the tiers, with low to medium gradients. Surface water runoff is expected to be negligible.

8.3.3 Average annual rainfall for the study area is approximately 348 millimetres (mm) based on data obtained from the CEH 1961 to 1990 Standard-period Average Annual Rainfall (SAAR) National River Flow Archive. This average rainfall is considered to be consistent and reflect the relatively dry climate eastern Scotland, compared with Scotland as a whole.

Soils and Geology

8.3.4 According to the Envirocheck Report No. 173485682 and the British Geological Survey Maps Portal the area around the turbine position consists of Devesian till, low permeable deposits which include tills, Lacustrine deposits, clay with flint and brick earth. There are no peat deposits shown on soil mapping within the study area.

8.3.5 The underlying geology is considered to be Dundee Flagstone Formation sandstone bedrock.

Mining and Quarrying

8.3.6 The site is located in an area that is not affected by historic coal mining activities.

8.3.7 There are no records of quarrying activity in the area.

8.3.8 No visible or recorded evidence of mining and or quarrying within the study area was found during the site walkover or on review of historical mapping records.

8.3.9 Given that the site is not within an area that may be affected by coal mining, there are no mining sites in the area and that the risk of landslide or other subsidence hazards is very low, it is highly unlikely there will be any potential effects arising from mining activity. Therefore, no mitigation action has been suggested.

Contaminated Land

8.3.10 According to the Envirocheck Report No. 173485682 the area around the turbine position has no potential for contaminated land or historical landfill.

8.3.11 There are no historic landfill sites within 1km of the site

Flood Risk

8.3.12 The proposed development is not located within or in close proximity to SEPA flood risk areas for coastal or river flooding. There is a small area of land, the Buckie Brae watercourse, designated as high risk to surface water flooding within 50m of the proposed turbine location, however this area is downslope of the proposed development therefore the risk of flooding is deemed to be negligible.

Hydrology and Hydrogeology

8.3.13 According to the Envirocheck Report No. 173485682 the underlying geology has the potential to contain groundwater in limited local exploitable quantities, for private abstractions and water supplies. Groundwater may be important for some base flow supply to surface water bodies; however, surface water bodies are most likely to be dominated by runoff from the existing hard landscaped areas.

8.3.14 Overall, the groundwater is considered to be of low sensitivity, therefore not significant in EIA terms.

Water Resources

8.3.15 Within the study areas there is one minor watercourse, Buckie Brae. **Figure 8.1, Volume 3** – Water Environment Plan shows the watercourse in relation to the proposed site location.

8.3.16 Scottish Water was consulted with regards to the Proposed Development and have not responded prior to planning submission. However Scottish Water had no objections to the original application citing "a review of our records indicates that there are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive, in the area that may be affected by the proposed activity."

8.3.17 There are two registered public water supply sources within 1 km of the proposed development they are listed below and shown on **Figure 8.2, Volume 3** - Ground Water Abstraction Plan:

- Cock Robin Well 97m north (310030, 722130)
- Pickembere Spring 376m north (310040, 722410)

8.3.18 Both abstraction points are downstream/downslope of the proposed development.

8.3.19 Neither of these locations has an authorised abstraction from SEPA under the Water Environment (Controlled Activities) Regulations and as such SEPA assumes any abstraction from either point to be less than 10m3 per day and falls under the terms of General Binding Rule (GBR) category.

8.3.20 Given the distance between the site and the abstractions there is unlikely to be a significant impact as a result of the proposed development, however mitigation will be incorporated to protect the watercourse which flows through Buckie Braes and included within a Construction Environmental Management Plan (CEMP).

8.4 Potential Effects

8.4.1 The potential risks of the proposed development, relate wholly to the construction phase of the development, based on an assessment of activities occurring during the construction of the wind turbine and associated infrastructure.

8.4.2 The potential effects from the construction of the proposed development are:

- Potential risks to surface water and groundwater quality resulting from the use and storage of fuels, oils and other potentially polluting substances.
- Potential risks to surface water and groundwater quality resulting from, transporting and pouring of concrete for turbine foundation.
- Mobilisation of potentially contaminated soils and groundwater.

Mitigation Measures

8.4.3 The following mitigation measure will be actioned:

- A Construction Method Statement (CMS) containing details of the proposed and agreed working practice to be adopted on site for all construction activities. This will include a pollution prevention plan, accident management plan and waste management plan.
- A Construction Environmental Management Plan (CEMP) to incorporate detailed pollution prevention and mitigation measures for all construction elements potentially capable of giving rise to pollution during all phases of construction and reinstatement after construction.
- A location map of all potential chemical contamination sources, including all fuel, oil and chemical storage areas, vehicle compounds, refuelling sites, waste depots and on-site sewage systems:
- Procedures for dealing with water contaminated from cement and the excavations into which the cement is to be poured: and
- Timing of works, including a programme of works which takes into consideration and avoids working during high rainfall events.

8.5 Predicted Residual Effects

8.5.1 Due to mitigation measures to be adopted which minimise or avoid the occurrence of any potential impacts, the construction, operational and decommissioning activities considered in this chapter would not result in any significant residual effects.

8.6 Summary and Conclusions

8.6.1 The assessment found that there are no significant hydrological, hydrogeological or geological issues affecting the site. Additionally, there are no significant flooding, mining or water quality and abstraction issues affecting the site.

8.6.2 No mitigation measures other than following the relevant Pollution Prevention Guidelines and implementing best practice measures, during the construction phase of the development, will be required.

9. Shadow Flicker Assessment

9.1 Introduction

9.1.1 350renewables was commissioned by Purple Renewables to undertake a shadow flicker assessment for the proposed Aviva wind turbine generator. The site is located within the Perth and Kinross council area of Scotland, southwest of the city of Perth, between the M90 motorway and the Craigie Hill Golf Course.

9.1.2 According to a report commissioned by climateXchange[36], shadow flicker effects that may be perceptible near an operational wind turbine generator are most commonly defined as follows:

> *"Under certain combinations of geographical position, time of day and time of year, the sun may pass behind the rotor and cast a shadow over neighbouring properties. When the blades rotate, the shadow flicks on and off; the effect or impact is known as shadow flicker".*

9.1.3 The area within which an observer may be subjected to shadow flicker surrounding a wind turbine is constrained in size and shape by astronomical and geometrical parameters, such as the trajectory of the sun and the position and dimensions of the wind turbines. It is possible to predict when, where and for how long shadow flicker could theoretically occur using commercially available computer programmes.

9.2 Summary of relevant guidance

Scottish Guidance

9.2.1 According to the Onshore Wind Policy Statement[37]

> *The Scottish Government believes that our ambitious renewable energy goals are very much in the interest of Scotland's citizens and environment. We also believe that developments can and must strike the right balance between utilising Scotland's significant renewable energy resources whilst protecting our finest scenic landscapes, natural heritage."*

9.2.2 Shadow flicker is mentioned as a specific effect in the Onshore Wind Turbines: Planning Advice[38]

> *It occurs only within buildings where the flicker appears through a narrow window opening. The seasonal duration of this effect can be calculated from the geometry of the machine and the latitude of the potential site.*

[36] LUC (in association with Pager Power), „Review of Light and Shadow Effects from Wind Turbines in Scotland," 2017.
[37] Scottish Government, „Onshore Wind Policy Statement," 2017.
[38] Scottish Government, „Onshore wind turbines: planning advice," 2014

Where this could be a problem, developers should provide calculations to quantify the effect. In most cases however, where separation is provided between wind turbines and nearby dwellings (as a general rule 10 rotor diameters), "shadow flicker" should not be a problem. However, there is scope to vary layout / reduce the height of turbines in extreme cases.

Local Guidance

9.2.3 Perth & Kinross Council issued Supplementary Guidance: Wind Energy in 2005[39]. Guideline 6 of the document encourages the development of wind energy, except in locations where it has been assessed to significantly and adversely affect the amenity of any dwellings within a distance of 20 times the tip-height of the proposed wind turbines, unless the effect can be mitigated. In relation to shadow flicker, the document also refers to the 10-rotor diameter separation distance mentioned in the Scottish Guidance, beyond which shadow flicker problems should not be expected.

9.2.4 The Supplementary Guidance is no longer in force and is expected to be replaced by Perth & Kinross Council's Supplementary Guidance on Renewable and Low Carbon Energy, which is currently available as a Consultation Draft[40]. The draft document indicates the following in relation to shadow flicker:

Impacts should be avoided primarily through site selection, siting and separation distances, and design with residual impacts mitigated through technical controls.

Applicants for large turbines and wind farms should identify dwellings that may be significantly affected. This includes dwellings within 10 rotor diameters distance and within 130°either side of North but should take into account that turbine height, topography and latitude may result in a greater or lesser effect on dwellings in a specific location. Submissions should demonstrate that impacts on affected dwellings are for no more than 30minutes per day or 30 hours per year at any dwelling.

Other relevant references

climateXchange study

9.2.5 The "Wind Farm Impacts Study" published in 2015[41] highlighted certain shortcomings in the way visual, shadow flicker and noise impact of wind farms are typically evaluated and communicated to affected residents. As a follow-up, the Scottish Government commissioned climateXchange to research in more detail how light and shadow effects from wind farms are considered in the development planning process in Scotland. The report was published in 2017 and presented a number of findings and recommendations

[39] Perth & Kinross Council, „Supplementary Planning Guidance for Wind Energy Proposals in Perth & Kinross," 2005.
[40] Perth & Kinross Council, „Draft Supplementary Guidance - Renewable and Low Carbon Energy," 2019. [Online]. Available: https://www.pkc.gov.uk/ldp2renewables
[41] Hoare Lea Acoustics, „Wind Farm Impacts Study," 2015.

which have been taken into account in the shadow flicker assessment of the proposed Aviva project:

- There does not appear to exist robust evidence to support the assumption that beyond a distance of 10-rotor diameters from the wind turbine(s) shadow flicker effects are unlikely to cause problems. In other countries (specifically Germany), larger cut-off distances are considered. In general, cut-off distances should likely be linked to the observed intensity of the flicker, which is linked to how much of the sun's disk is covered each time a blade passes in front of it, which in turn depends on the blade dimensions and the distance between the wind turbine and the receptor.
- The lack of defining significance criteria, and what an acceptable impact may be, within existing Scottish and local guidance sometimes results in inconsistent approaches in assessing the effect.
- Different types of receptors may display a different degree of sensitivity towards the effect depending on the use or depending on a possible financial involvement with the project.
- Modelling should clearly define and distinguish between "worst-case" and "likely case" scenarios and state the parameters taken into account to calculate either of them. Criteria that may be used to assess the significance should also differentiate between a "worst-case" and a "likely case" scenario.

German regulations

9.2.6 Germany was among the first countries which controlled shadow flicker effects by means of defining an assessment and calculation procedure[42] [43]. If effects that are predicted according to the "astronomic worst-case" modelling scenario were to exceed 30 minutes per day or 30 hours per year inside a sensitive receptor[44] the operator(s) of the wind turbine or wind farm(s) would be required to limit actual cumulative[45] exposure under real-world conditions of each receptor to not more than 8 hours per year and 30 minutes per day. This is implemented via automated temporary shut-downs of individual wind turbines during those periods which would otherwise result in an exceedance of the aforementioned limits in a particular receptor.

9.2.7 The German guidelines are a useful point of reference as the calculation procedure and modelling parameters are outlined in great detail, which allows for a standardisation of assessments. In the absence of comparable detailed technical guidance in Scotland, this

[42] Länderausschuss für Immissionsschutz, "Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergieanlagen," 2002.
[43] Bund/Länder-Arbeitsgemeinschaft Immissionsschutz (LAI), „Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windkraftanlagen Aktualisierung 2019," 2020
[44] such as residences, hospitals, hotels, schools, offices, etc
[45] from all WTG that could generate effects in a particular receptor

study therefore adopts the German modelling procedure and the relevant parameters will be outlined in the following section.

9.3 Assessment methodology

Calculation software & basic parametrisation

9.3.1 The shadow flicker calculations in this assessment were carried out using the WindPRO software package version 3.5. For an overview of its capabilities and the calculation model, reference shall be made to the supplier's website[46].

9.3.2 The calculation model was configured with the following basic parameters and inputs:

- Solar trajectory of the year 2022[47],
- A digital terrain model generated from Ordnance Survey (OS) Terrain 5 data (for technical specifications refer to footnote[48]), representing the landform within 5km surrounding the proposed wind turbine location,
- A generic wind turbine model with a hub height of 46m and 61m rotor diameter, located at OS British National Grid Easting of 310031m and Northing 722033m.
- Disregarding any shadow flicker effects that would occur whenever the sun is very low above the horizon (<3 degrees), in line with the German calculation procedure.
- The orientation of the wind turbine rotor follows the trajectory of the sun, thus maximising the size of the rotor's shade,
- The wind turbine rotor is always turning, without any down-time for lack of wind or maintenance,
- Clouds never obscure the sun (which would avoid the effect).

9.3.3 A modelling scenario with these assumptions is also referred to as the "astronomic worst-case" and yields a conservative estimate of the impact as it does not take into account a number of naturally occurring mitigation factors, such as the possibility of cloud cover or the actual orientation of the rotor.

Definition of assessment area

9.3.4 An initial calculation was carried out using the aforementioned basic modelling parameters, with the purpose of identifying the theoretical zone of influence, i.e., areas within which an observer inside a building could potentially be subjected to shadow flicker

[46] EMD International A/S, „WindPRO SHADOW module," [Online]. Available: https://www.emd-international.com/windpro/windpro-modules/environment-modules/shadow/.
[47] Small variations in the solar trajectory may occur during the operational lifetime of the proposed WTG, e.g. due to the movement of the earth's rotational axis. However, in the context of a shadow flicker assessment, they are minimal.
[48] Ordnance Survey, "OS Terrain 5," [Online]. Available: https://www.ordnancesurvey.co.uk/business-and-government/products/os-terrain-5.html

effects under the right circumstances. **Figure 9.1, Volume 3** displays the outcome of the initial calculation and identifies the theoretical zone of influence, which is constrained by astronomic, geographic, and geometric factors. Outside this area, no shadow flicker effects should be expected.

9.3.5 Within the theoretical zone of influence, the significance of the effect would differ greatly at different locations. Towards the outer edges of that area, the flicker that may be observable inside an affected dwelling may be too faint to be noticeable and/or only occur extremely rarely and for a brief duration. On the other hand, within a dwelling located close to the proposed wind turbine, the shadow flicker effect could be more clearly perceptible and may occur frequently enough to affect the residential amenity to a lesser or greater degree.

9.3.6 The exact distance from the proposed wind turbine beyond which the effect would become insignificant is subject to debate (also refer to section 9.2.5). Although Scottish Guidance indicates that at a distance beyond 10 rotor diameters problems with shadow flicker are less likely, this study adopts the more conservative German Guidelines, according to which effects may be of sufficient intensity to require regulation up to the distance at which the average blade width of the wind turbine would only cover approximately 20% of the sun's disc whenever it passes in front of it. In the case of a wind turbine with the dimensions considered here this maximum distance is approximately 1.1km.

9.3.7 The assessment area, within which individual receptors were evaluated, was limited to those parts of the theoretical zone of influence that lie within the 1.1km cut-off distance, measured from the base of the wind turbine. It is indicated by the blue polygon in **Figure 9.1, Volume 3.**

Receptors

9.3.8 In line with Scotland's Onshore Wind Turbines Planning Advice and the German Guidelines, the assessment focussed on evaluating the potential for shadow flicker effects inside buildings located within the assessment area. Due to the nature of wind turbine shadow flicker, which requires the transmission from the outside to the inside of a building through an aperture such as a window, outdoor areas such as gardens, parks, roads, etc (including the Craigie Hill Golf Course) are not susceptible to a degree that would require a regulation of the effect and is therefore scoped out of this assessment.

9.3.9 The following information was utilised to identify potential receptors and to incorporate them into the calculation model:

- OS Mastermap topography layer data[49], which identifies the footprint of buildings as georeferenced polygons and indicates their respective height,

[49] Ordnance Survey, "OS MasterMap Topography Layer," [Online]. Available: https://www.ordnancesurvey.co.uk/business-and-government/products/topography-layer.html

- OS AddressBase Plus data[50], which identifies individual postal addresses
- A site survey carried out on the 23 of July 2018.

9.3.10 It shall be noted that the information included in the OS Mastermap and OS AddressBase Plus data does not always conclusively identify the use of a particular building. In some cases, buildings that may be garages, sheds or other structures with limited sensitivity towards wind turbine shadow flicker have been included in the assessment.

9.3.11 The modelling procedure requires the specification of the location, dimension and orientation of windows and similar building apertures that could expose the inside of a receptor to shadow flicker effects. Since a very large number of receptors had to be included in the assessment it was not practical to determine the required information for each window. Instead, it was conservatively assumed that the window dimensions are identical to each building's façade dimensions (as outlined in the OS Mastermap data), with the same orientation and a height identical to the building's maximum height. In some cases, e.g., if a building is very large and subdivided into several flats, this could lead to substantially overestimating the exposure of an observer located within a particular sub-unit.

9.3.12 Only two exceptions to this approach were made: the two buildings closest to the proposed WTG location, in which case individual window fronts, as opposed to entire facades, were modelled under consideration of photo documentation obtained during the site visit and imagery from Google Streetview.

9.3.13 In total, 1829 individual receptors were identified within the assessment area. **Figure 9.2, Volume 3** indicates their location and the respective facades modelled in the assessment. A reference location is also indicated for each of them as British National Grid Coordinates in **Appendix 9, Volume 4**.

Detailed assessment

Astronomic worst-case

9.3.14 In line with the initial modelling carried out to define the detailed assessment area, an astronomic worst-case calculation was performed for each receptor (refer to sections 9.3.1 for the modelling parameters and assumptions). As an additional calculation parameter, the buildings were also taken into account as an obstacle layer in the model so that the screening effect which one building may afford upon a neighbouring one could be simulated.

9.3.15 The results of the astronomic worst-case calculation are listed for each receptor in **Appendix 9.1, Volume 4**. Care needs to be taken when interpreting the results of an astronomic worst-case calculation, as they substantially overestimate the actual duration

[50] Ordnance Survey, „AddressBase Plus," [Online]. Available: https://www.ordnancesurvey.co.uk/business-government/products/addressbase-plus.

of the effect which the respective receptor is likely to be exposed to under real-world conditions given the simplifications made in the modelling procedure.

Incorporating mitigating effect arising from clouds

9.3.16 Shadow flicker cannot occur when the sky is overcast, a mitigating factor that is not considered in the previous modelling step. An adjustment was therefore made by incorporating sunshine duration data, which is available from the World Radiation Data Center (WRDC)[51]. Data from the surface observation station Shanwell, which is located approximately 35km east of the proposed WTG site, was used in this case. The data is provided as monthly mean of daily sunshine hours, which can be converted into sunshine probabilities (Table 1) considering sunrise and sunset times:

$$monthly\ sunshine\ probability = \frac{number\ of\ days\ per\ month \times daily\ mean\ sunshine\ hours}{sum\ of\ monthly\ hours\ between\ sunrise\ and\ sunset}$$

9.3.17 The sunshine probabilities can then be used to adjust, on a month-by-month basis, the predicted annual shadow flicker hours at each receptor

$$Estimate\ with\ sunshine\ probabilities = \sum_{m=Jan}^{Dec} monthly\ shadow\ flicker\ hours_m \bullet sunshine\ probability_m$$

Table 1 Monthly means of daily sunshine duration (obtained from World Meteorological Organisation) and derived sunshine probabilities

Month	Mean of daily sunshine hours	Sunshine probability
Jan	2.0	26.3%
Feb	2.7	28.4%
Mar	3.6	30.7%
Apr	5.1	36.3%
May	6.3	38.7%
Jun	5.8	33.2%
Jul	6.2	36.6%
Aug	5.5	36.5%
Sep	4.4	34.3%
Oct	3.3	31.5%
Nov	2.3	27.5%
Dec	1.5	21.7%

9.3.18 The estimated annual shadow flicker hours, taking sunshine probabilities into account, are summarised for each receptor in the column identified as “With clouds” in **Appendix 9.1, Volume 4**. Relative to the astronomic worst-case modelling scenario, taking sunshine probabilities into account led to a substantial reduction of the predicted annual shadow

[51] World Meteorological Organisation, „World Radiation Data Center,“ [Online]. Available: http://wrdc.mgo.rssi.ru.

flicker hours, between approximately 64% and 78% (depending on the receptors and during which part of the year it may be affected).

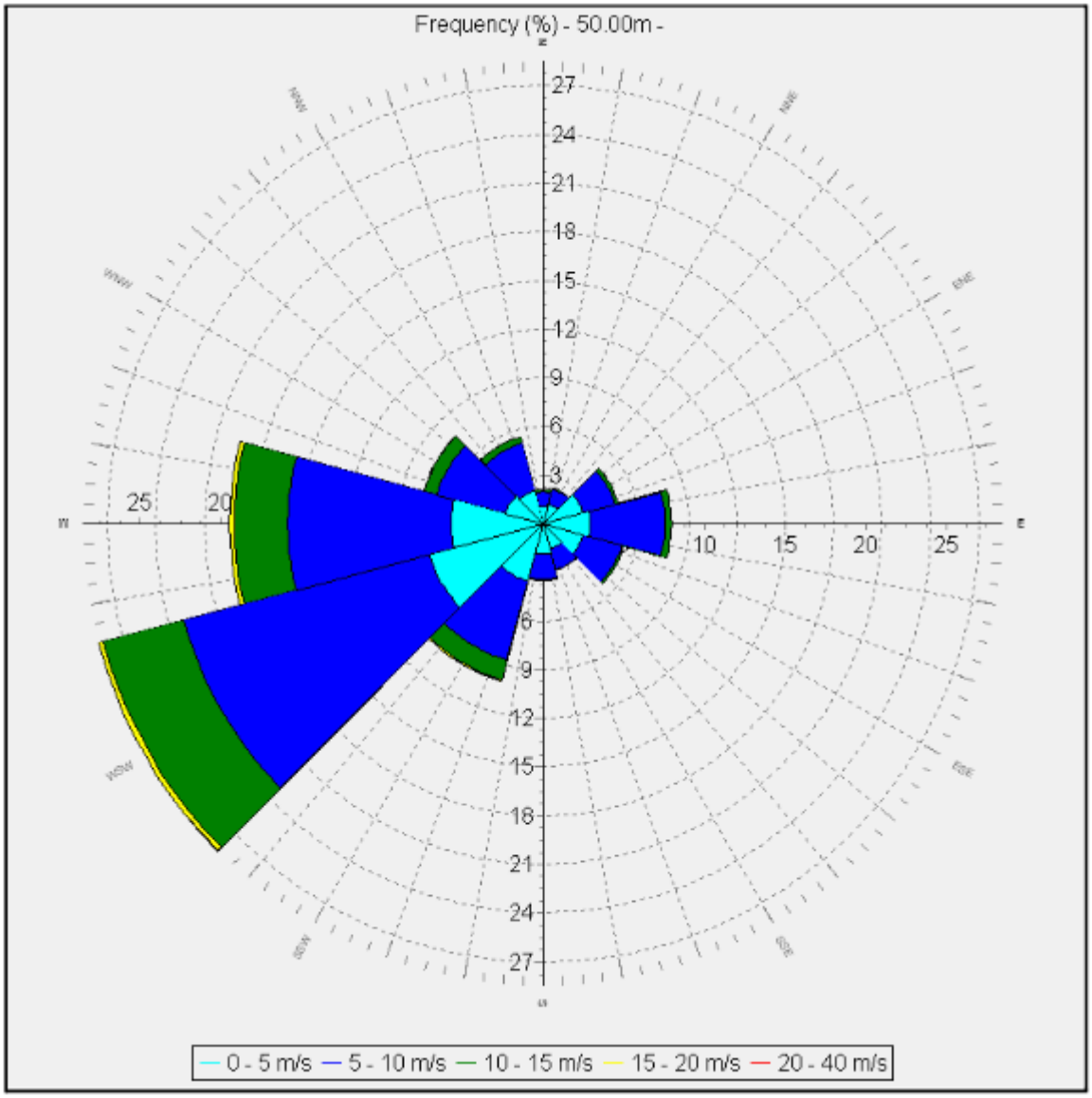
Incorporating mitigating effect arising from the wind direction

9.3.19 The wind turbine rotor will align itself towards the wind, as opposed to follow the movement of the sun across the sky like it was assumed in the astronomic worst-case calculation (see section 9.3.1). The area shaded by the WTG's rotor will therefore be smaller, and the effect will pass over an affected receptor more quickly than predicted by the astronomic worst-case modelling procedure.

9.3.20 The WindPRO software can estimate the resulting reduction of the annual shadow flicker duration if a wind rose is inputted into the calculation. It was obtained from the EMD-ConWx Europe Mesoscale Dataset[52], relating to the latitude of 56.39 degrees North and longitude 3.46 degrees West, which is located approximately 900m to the north of the proposed wind turbine site.

[52] EMD International A/S, "EMD-ConWx Europe Mesoscale Data," [Online]. Available: https://help.emd.dk/mediawiki/index.php?title=EMD-ConWx_Meso_Data_Europe.

Plate: 9.1 - Wind rose considered in the assessment



9.3.21 The estimated annual shadow flicker hours, taking the presence of clouds (from the previous step) as well as the wind direction into account, are summarised for each receptor in the column identified as “With clouds and wind direction” in **Appendix 9.1, Volume 4**. Relative to the astronomic worst-case one should expect a reduction between 75 and 90% of the annual exposure to the effect, depending on the receptor, which indicates just how conservative the astronomic worst-case is and how much it overpredicts the likely real-world exposure of a receptor.

9.3.22 It shall be noted that other mitigating factors, such as screening of a receptor by large trees which may interrupt the direct line of sight of the wind turbine, may further reduce the exposure of a receptor. However, such possible circumstances have not been considered in this study, thus resulting in a somewhat conservative assessment of the likely shadow flicker impact.

9.4 Evaluation of findings

Review of results

9.4.1 As pointed out by the climateXchange report, a consistent assessment of shadow flicker effects within the context of the Scottish Planning System is currently hampered by the lack of agreed significance criteria. Once formally adopted, the Perth & Kinross Supplementary Guidance Renewable & Low Carbon Energy would go some way in addressing the issue.

9.4.2 In the meantime, the 30 hours per year and 30 minutes per day limits as per astronomic worst-case stated in the German Guidelines, which are also mentioned in the Perth & Kinross Draft Supplementary Guidance, were adopted to discard effects as not significant in receptors in which neither of these two criteria was found to be exceeded based on the modelling results.

9.4.3 130 of the 1829 modelled receptors in the assessment area were found to exceed one or both of these criteria and it is suggested that technical mitigation measures are to be implemented to limit the actual exposure of these receptors.

Other considerations

9.4.4 Concerns are occasionally raised that wind turbine shadow flicker could pose a health issue for sufferers from photosensitive epilepsy. This is a medical condition in which epileptic seizures may be triggered by flashing lights or certain contrasting light and dark patterns. According to the Epilepsy Society[53] wind turbines would have to cause shadow flicker with a frequency exceeding 3 Hz to be able to act as triggers, which typically can only happen with small micro-wind turbines.

9.4.5 Wind turbine models of the dimensions considered in this assessment have an operational rotor speed not exceeding 30 revolutions per minute[54], which, as a result of the three bladed design, would lead to flicker frequencies not exceeding 1.5 Hz. This is sufficiently below the above-mentioned trigger frequency to rule out that the proposed wind turbine poses a health risk in relation to photosensitive epilepsy.

9.5 Mitigation options

9.5.1 Shadow flicker can be easily mitigated. The wind turbine would be equipped with an electronic controller that pauses the rotor automatically during periods when an exceedance of the limit may occur at a receptor, and provided that the meteorological conditions are favourable for the occurrence of the effect.

[53] Epilepsy Society, „Wind Turbines And Photosensitive Epilepsy,“ [Online]. Available: https://www.epilepsysociety.org.uk/wind-turbines-and-photosensitive-epilepsy#.W3RfdOhKhPY.
[54] EWT, “DW61 Specifications,” [Online]. Available: https://ewtdirectwind.com/products/dw61/

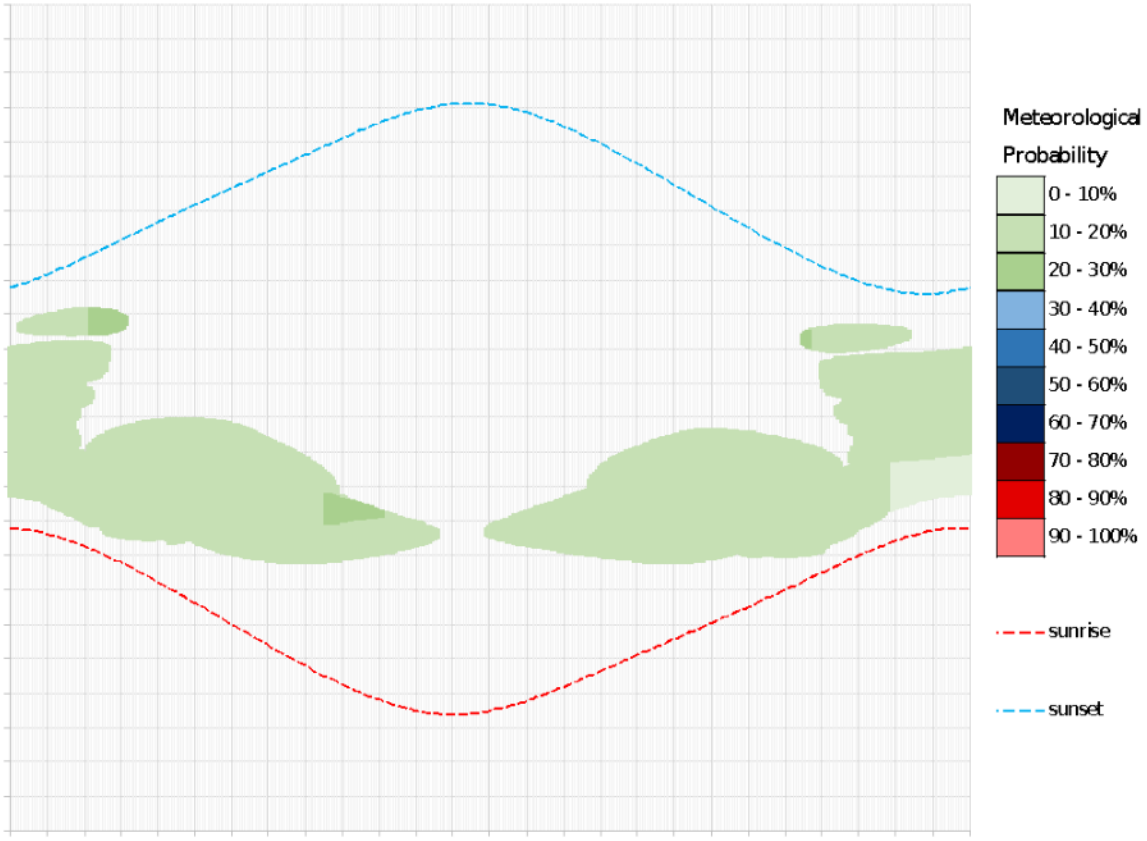
9.5.2 Given the ambiguity of Scottish and Local Guidance, which does not explicitly distinguish limits for the astronomic worst-case and real-world conditions, it is proposed that the annual exposure of the sub-group of 130 receptors identified as potentially significantly affected is limited to 8 hours, in line with the German Guidelines. Daily exposure of these receptors would be limited to not exceeding 30 minutes.

9.5.3 Caption 9.2 on the following page indicates the temporal distribution of the shadow flicker effects that the proposed WTG could generate, if such effects were not mitigated, in relation to the sub-group of 130 significantly affected receptors. Note that the actual generation of the effect depends on the meteorological conditions, which is why the occurrence can only be indicated probabilistically (also refer to sections 9.3.16 and 9.3.19), as opposed to in absolute terms.

9.5.4 Mitigation would be limited to a fraction of the time periods indicated in the chart, given that frequently the meteorological conditions would not be favourable for generating the effect, and that furthermore mitigation would not need to be complete, i.e., up to 30 minutes per day per receptor and up to 8 hours per year per receptors would be allowed. The exact moment when the WTG would need to be paused therefore depends on the meteorological conditions, which should be expected to vary somewhat from year to year.

9.5.5 However, based on the meteorological information considered in this assessment (see sections 9.3.16 and 9.3.19), it is estimated that WTG down-time due to shadow flicker mitigation would remain below 2% of the year. This estimate could be reduced further if mitigation requirements would be more lenient for the two most affected receptors, the former Leisure Centre and the Aviva Headquarters.

Plate: 9. 2 - Temporal distribution of the effects in the sub-group of 130 significantly affected receptors.



9.5.6 In specific cases, mitigation on the receptor side could also result in a satisfactory solution of the issue, for example by fitting window blinds to affected windows, thus preventing the rotor blade shadows from entering the inside of a building. This type of mitigation is particularly worth considering for receptors such as the Aviva offices, which have some form of affiliation with or interest in the proposed wind turbine project.

9.6 Predicted Residual Effects

9.6.1 Due to mitigation measures, which could be adopted if appropriate, to reduce or remove the occurrence of any potential impacts from shadow flicker considered in this chapter would not result in any significant residual effects.

9.7 Conclusion

9.7.1 Shadow flicker is a phenomenon that can impact the residential amenity of receptors located in the vicinity of wind turbines. An assessment was carried out to estimate the likely impacts that may occur surrounding a proposed wind turbine near the Aviva Headquarters in Perth, Scotland.

9.7.2 An initial calculation was used to determine the area that could potentially be affected, as it is constrained in size and shape by a range of parameters, such as the location and dimension of the wind turbines, the surrounding landform and the trajectory of the sun across the sky. Additionally, Scottish and German guidance has been considered to

determine the likely maximum distance beyond which the effect is likely to be less or not at all perceptible, thus defining an assessment area extending up to 1.1km from the proposed wind turbine location.

9.7.3 Within the assessment area, shadow flicker effects have been modelled for 1829 receptors, which were identified using mapping data obtained from Ordnance Survey as well as information gathered during a site visit. The modelling process started with a conservative astronomic worst-case scenario, with additional detail added-in during subsequent steps to refine the model and to finally arrive at an estimate of the likely shadow flicker effects that should be expected at each receptor under real-world conditions and without mitigation measures in place.

9.7.4 In the absence of agreed significance criteria within the context of the Scottish Planning System, the prediction results have been compared to the German astronomic worst-case exposure thresholds (30 hours per year and 30 minutes per day) in order to aid a judgement regarding the likely significance of the predicted impacts. It was found that for 130 of the receptors these criteria could be exceeded and mitigation measures would be required.

9.7.5 It is suggested that such mitigation measures would limit the actual exposure of these 130 receptors to not more than 8 hours per year and 30 minutes per day under real-world conditions, in line with the German Guidelines. Mitigation related wind turbine down-time was estimated to remain below 2% of the year.

10. Noise Assessment

10.1 Introduction

10.1.1 This chapter considers the likely significant effects with respect to the noise associated with the operation of the Proposed Development. The specific objectives of the chapter are to:

- describe the noise baseline;
- describe the assessment methodology and significance criteria used in the noise assessment;
- describe the potential effects;
- describe the mitigation measures proposed to address likely significant effects (if required); and
- assess the residual effects remaining following the implementation of mitigation (if required).

10.1.2 This chapter is supported by Technical **Appendix 10.1, Volume 4**: Operational Noise Report. The supporting Technical Appendix has been referenced in the text where relevant.

10.1.3 This chapter was prepared by TNEI Services Ltd. TNEI is a specialist energy consultancy with an Acoustics team which has undertaken noise assessments for over 4.5GW of onshore wind farm developments. The noise assessment was undertaken by staff who are all affiliated with the Institute of Acoustics.

10.1.4 The operational noise assessment has been undertaken in stages, firstly to derive appropriate Noise Limits and then to show the noise predictions from the Proposed Development against the Noise Limits.

10.2 Legislation, Policy and Guidance

10.1.1 The assessment used the following combination of guidance and assessment methodologies:

- Planning Advice Note PAN 1/2011: *'Planning and Noise'* (Scottish Government, 2011)[55];
- Web Based Renewables Advice: *'Onshore Wind Turbines'* (updated May 2014) (Scottish Government, 2014)[56];

[55] Scottish Government (2011). *PAN 1/2011: Planning and Noise.* Scotland: The Crown

[56] Scottish Government (2014). *Web Based Renewables Advice: 'Onshore Wind Turbines'* – updated May 28th 2014. [online] Available at: https://www.webarchive.org.uk/wayback/archive/3000/https://www.gov.scot/Resource/0045/00451413.pdf [Accessed on: 4 March 2021].

- ETSU-R-97 *'The Assessment and Rating of Noise from Wind Farms'* (ETSU for the Department of Trade and Industry, 1996)[57];
- ISO 9613-2:1996 'Acoustics - Attenuation of sound during propagation outdoors Part 2: General method of calculation' (ISO, 1996)[58]; and
- Institute of Acoustics 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise' (IOA, 2013)[59].

10.1.2 The above documents are discussed in detail within Section 2 of Technical **Appendix 10.1, Volume 4**: Operational Noise Report, where relevant.

10.1.3 Whilst there is Government Guidance that establishes acceptable levels of noise with regards to the protection of residential amenity, there is no equivalent guidance in place that identifies the requirements of sports facilities or protects the sporting amenity enjoyed by sports players and/or spectators.

10.3 Consultation

10.3.1 Background noise monitoring was undertaken by ACIA Engineering Acoustics in 2018 as part of the noise assessment works undertaken for a previous application at the site. As part of that work, detailed consultation was undertaken with the Council's Environmental Health Department to agree on the assessment methodologies. A copy of the correspondence is included within Annex 3 of Technical **Appendix 10.1, Volume 4**: Operational Noise Report. No further consultation was undertaken by TNEI.

10.4 Assessment Methodology and Significance Criteria

Study Area

10.4.1 An initial desktop assessment was undertaken in 2018 to identify the nearest noise sensitive receptors to the site and to determine potential Noise Assessment Locations (NALs). In total, seven NALs to the north of the site were identified and the same seven NALs have been considered in this assessment. The NALs are shown in Figure A1.1, Annex 1 of Technical **Appendix 10.1, Volume 4**: Operational Noise Report.

Site Visit

10.4.2 The background noise survey was undertaken in the Summer of 2018 at one dwelling (16 Arthur Park) and also within the grounds of the Aviva office complex. The chosen monitoring locations were deemed to be representative of the noise environment at the

[57] The Working Group on Noise from Wind Turbines (NWG) (1996). *ETSU-R-97 'The Assessment and Rating of Noise from Wind Farms'.* UK: Energy Technology Support Unit

[58] ISO (1996). *ISO 9613-2:1996 Acoustics – Attenuation of Sound during Propagation Outdoors: Part 2 – General Method of Calculation*. Geneva: International Organization for Standardisation.

[59] IOA (2013). *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'*. UK: Institute of Acoustics.

other noise sensitive receptors. The data collected during this survey was re-analysed by TNEI for the purposes of this assessment. No additional monitoring was undertaken.

Operational Noise Assessment Methodology

10.4.3 The assessment has been undertaken in accordance with ETSU-R-97 and current good practice, as specified in the Policy, Legislation and Guidance section (Section 10.2). ETSU-R-97 provides a robust basis for determining acceptable noise limits for wind turbine developments. Consequently, the test applied to operational noise is whether or not the calculated wind turbine noise levels at nearby noise sensitive receptors would be below the noise limits derived in accordance with ETSU-R-97.

10.4.4 Limits differ between daytime and night-time periods. The daytime criteria are based upon background noise data collected during the 'quiet periods of the day' comprising:

- All evenings from 18:00 to 23:00; plus
- Saturday afternoons from 13:00 to 18:00; and
- All day Sunday 07:00 to 23:00.

10.4.5 Night-time periods are defined as 23:00 to 07:00 with no differentiation made between weekdays and weekends.

10.4.6 In addition to ETSU-R-97, the recommendations included in the IOA GPG have been considered in the noise assessment. These are discussed in detail within Technical **Appendix 10.1, Volume 4**: Operational Noise Report.

10.4.7 The aim of the operational noise assessment was to establish the Noise Limits, determine the likely impacts of the Proposed Development at the nearest noise sensitive receptors, and to demonstrate that the Proposed Development can meet the limits.

10.4.8 Predictions of wind turbine noise for the Proposed Development were based upon the sound power level data for the EWT DW61 1 MW wind turbine with a 46 m hub height. Uncertainty in the sound power data for the Proposed Development was accounted for using the guidance contained within Section 4.2 of the IOA GPG. The location of the wind turbine for the Proposed Development is shown on Figure A.1, Annex 1 of Technical **Appendix 10.1, Volume 4**: Operational Noise Report.

10.4.9 Noise predictions were undertaken using the propagation model contained within Part 2 of International Standard ISO 9613-2, '*Acoustics – Attenuation of sound during propagation outdoors'* (ISO, 1996). The model calculates, on an octave band basis, attenuation due to geometric spreading, atmospheric absorption, and ground effects. The noise model was set up to provide realistic noise predictions, including mixed ground attenuation (G=0.5) and atmospheric attenuation relating to 70% Relative Humidity and 10°C.

10.4.10 In line with the IOA GPG, an assessment was undertaken to determine whether a concave ground profile correction (+3dB) or barrier correction (-2dB), was required due to the

topography between the wind turbine and the noise sensitive receptors. Propagation across a valley (concave ground) increases the number of reflection paths, and in turn, has the potential to increase sound levels at a given receptor. Topographical screening effects from terrain surrounding a wind turbine can result in reductions in the observed sound level between the source and receiver where no line of sight is present. Concave ground and barrier corrections were found to not be required for the proposed turbine (as summarised in Annex 6, Technical **Appendix 10.1, Volume 4**: Operational Noise Report).

10.4.11 Information relating to operational noise such as amplitude modulation (AM), a potential characteristic of wind turbine noise, and Low Frequency Noise are also addressed within Annex 2 of Technical **Appendix 10.1, Volume 4**: Operational Noise Report.

Assessment of Likely Effect Significance

10.4.12 Planning Advice Note PAN 1/2011 'Planning and Noise' provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise. PAN 1/2011 refers to the Web-based planning advice on renewable technologies for Onshore Wind Turbines which states that ETSU-R-97 should be used to assess and rate noise from wind energy developments. ETSU-R-97 does not define significance criteria but describes a framework for the measurement of wind turbine noise and gives indicative noise levels considered to offer a reasonable degree of protection to wind turbine neighbours, without placing unreasonable restrictions on wind turbine development. Achievement of ETSU-R-97 derived noise limits ensures that wind turbine noise will comply with current Government guidance.

10.4.13 In terms of the EIA Regulations (Scottish Government, 2017)[60], the use of the term "significance" in this chapter refers to compliance / non-compliance with the ETSU-R-97 derived noise limits. For situations where predicted wind turbine noise meets or is less than the noise limits defined in ETSU-R-97, then the noise effects are deemed not significant. Any breach of the ETSU-R-97 derived noise limits due to the Proposed Development is deemed to result in a significant adverse effect.

10.4.14 For the purposes of this assessment, the identified noise sensitive receptors are residential properties.

Limitations to Assessment

10.4.15 No assumptions or data gaps have been identified.

[60] Scottish Government (2017). *The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017*. Available at: http://www.legislation.gov.uk/ssi/2017/101/contents/made

10.5 Baseline Conditions

10.5.1 The site is located at the Aviva UK Pitheavlis Terrace Office Complex, adjacent to the M90 motorway. There are some residential properties to the north of the site where measured background noise levels were influenced by road traffic noise from the A93 to the north and M90 to the south.

10.5.2 The background noise assessment survey was undertaken in the Summer of 2018 at one dwelling (16 Arthur Park) and also within the grounds of the Aviva office complex. The data collected during this survey was re-analysed by TNEI for the purposes of this assessment. The NMLs are detailed in Table 10.1 and shown on Figure A1.1 of Technical **Appendix 10.1, Volume 4**: Operational Noise Report. Further information on the noise monitoring locations can be found in Annex 3 of Technical **Appendix 10.1, volume 4**: Operational Noise Report.

Table 10.1 Noise Monitoring Locations

NML	Receptor Name	Easting	Northing
NML1	16 Arthur Park	309902	722520
NML2	Aviva Office Grounds	309833	722309

10.5.3 Wind speed/ direction were obtained from an AQ500 Windfinder integrated SoDAR system. The trailer was located close to the proposed wind turbine location and the unit recorded ten-minute mean wind speeds and wind directions at various heights by sound detection and ranging. The wind speed data collected at 50m were standardised to 10m height in accordance with current good practice. Whilst the hub height of the turbine is expected to be 46m, using 50m to standardise to 10m is considered conservative as the higher the hub height assumed the higher the wind speed and the further the shift of the wind speed data over to the right of the wind speed axis. This has the overall effect of lowering limits over the wind speed range necessary to be assessed in accordance with ETSU-R-97.

10.5.4 Wind speed/direction and rainfall data were collected over the same time scale and averaged over the same ten-minute periods as the noise data to allow analysis of the measured background noise as a function of wind speed and wind direction. All data analysis was undertaken in accordance with ETSU-R-97 and the IOA GPG.

10.5.5 The prevailing background noise levels are shown on Figures A1.2a-A1.2b included in Annex 1 of Technical **Appendix 10.1, Volume 4**: Operational Noise Report.

10.5.6 ETSU-R-97 recommends that wind farm noise for the daytime periods should be limited to 5dB(A) above the prevailing background or a fixed minimum level within the range 35 - 40dB $L_{A90,10min}$, whichever is the higher. The precise choice of criterion level within the range 35 - 40 dB(A) depends on a number of factors, including the number of dwellings in

the neighbourhood of the wind farm, the effect of noise limits on the number of kWh generated and the duration and level of exposure to any noise.

10.5.7 For the noise assessment, the daytime fixed minimum Noise Limits have been set at 35dB or 5dB(A) above prevailing background whichever is the higher.

10.5.8 For night-time periods the noise limits have been set at a fixed minimum level of 43dB $L_{A90,10min}$ or 5dB(A) above prevailing background whichever is higher.

10.5.9 The exception to the setting of both the daytime and night time fixed minimum noise limits occurs where a property occupier has a financial involvement in the wind turbine development where the fixed minimum limit can be increased to 45dB(A) or a higher permissible limit above background during the daytime and night time periods. For the purposes of this assessment, it has been assumed that there are no financially involved properties.

10.6 Receptors Brought Forward for Assessment

10.6.1 A total of seven noise sensitive receptors were chosen as representative NALs. The chosen NALs are the same as those identified by ACIA in 2018. As it is a suburban environment, not every house was modelled, and instead a representative sample of NALs were chosen. The NALs refer to the position in the curtilage of a property as detailed in Table 10.2 and shown in Figure A1.1 of Technical **Appendix 10.1, Volume 4**: Operational Noise Report.

Table 10.2 Noise Assessment Locations

Noise Assessment Location (NAL)	Easting (m)	Northing (m)	Elevation (m Above Ordnance Datum)	Approximate Distance to Turbine (m)	Dataset used for Setting Noise
NAL1 - 8 Pitheavlis Cottages	309646	722403	73	530	NML1
NAL2 - 1 Pitheavlis Cottages	309737	722442	66	500	NML1
NAL3 - 19 Bell Gardens	309836	722488	60	493	NML1
NAL4 - 16 Arthur Park	309905	722515	54	496	NML1
NAL5 - 1 Pickenbere	310060	722463	50	430	NML1
NAL6 - 34-44 Low Road	310170	722583	40	564	NML1
NAL7 - 64 Woodside Crescent	310385	722607	43	672	NML1

* As per the approach adopted by ACIA for the original noise assessment, the noise limits have been derived using the background noise data collected at 16 Arthur Park, since the measured levels were consistently lower than those at the Aviva site.

10.7 Likely Effects

10.7.1 Based on the prevailing background noise levels, the Noise Limits has been derived for each NAL as detailed in Table 10.3 and Table 10.4 below.

10.7.2 Table 1.3 and 1.4 also show a comparison between the derived Noise Limits for the daytime and night time periods and the predicted wind turbine noise level. The Tables show the exceedance level which is the difference between the predicted wind turbine noise level and the Noise Limits at a given wind speed. A negative exceedance level indicates satisfaction of the noise limit.

10.7.3 The assessment shows that the predicted wind turbine noise emission levels for the proposed development meet the Noise Limits under all conditions and at all locations for both daytime and night-time periods.

Table 10.3 ETSU-R-97 Compliance Table – Daytime

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
NAL1 – 8 Pitheavlis Cottages	Noise Limit	46.1	46.1	46.1	46.3	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5
	Predicted Wind Turbine Noise L_{A90}	-	-	-	24.9	29.3	33.5	35.6	36.3	36.3	36.3	36.3	36.3
	Exceedance Level L_{A90}	-	-	-	-21.4	-17.2	-13	-10.9	-10.2	-10.2	-10.2	-10.2	-10.2
NAL2 – 1 Pitheavlis Cottages	Total ETSU-R-97 Noise Limit	46.1	46.1	46.1	46.3	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5
	Predicted Wind Turbine Noise L_{A90}	-	-	-	27.8	32.2	36.4	38.5	39.2	39.2	39.2	39.2	39.2
	Exceedance Level L_{A90}	-	-	-	-18.5	-14.3	-10.1	-8	-7.3	-7.3	-7.3	-7.3	-7.3
NAL3 - 19 Bell Gardens	Total ETSU-R-97 Noise Limit	46.1	46.1	46.1	46.3	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5
	Predicted Wind Turbine Noise L_{A90}	-	-	-	27.9	32.3	36.5	38.6	39.3	39.3	39.3	39.3	39.3
	Exceedance Level L_{A90}	-	-	-	-18.4	-14.2	-10	-7.9	-7.2	-7.2	-7.2	-7.2	-7.2
NAL4 – 16 Arthur Park	Total ETSU-R-97 Noise Limit	46.1	46.1	46.1	46.3	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5
	Predicted Wind Turbine Noise L_{A90}	-	-	-	27.9	32.3	36.5	38.6	39.3	39.3	39.3	39.3	39.3
	Exceedance Level L_{A90}	-	-	-	-18.4	-14.2	-10	-7.9	-7.2	-7.2	-7.2	-7.2	-7.2

NAL5 – Pickenbere	Noise Limit	46.1	46.1	46.1	46.3	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5
	Predicted Wind Turbine Noise L_{A90}	-	-	-	29.2	33.6	37.8	39.9	40.6	40.6	40.6	40.6	40.6
	Exceedance Level L_{A90}	-	-	-	-17.1	-12.9	-8.7	-6.6	-5.9	-5.9	-5.9	-5.9	-5.9
NAL6 - 34-44 Low Road	Noise Limit	46.1	46.1	46.1	46.3	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5
	Predicted Wind Turbine Noise L_{A90}	-	-	-	26.6	31	35.2	37.3	38	38	38	38	38
	Exceedance Level L_{A90}	-	-	-	-19.7	-15.5	-11.3	-9.2	-8.5	-8.5	-8.5	-8.5	-8.5
NAL7 – 64 Woodside Crescent	Noise Limit	46.1	46.1	46.1	46.3	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5
	Predicted Wind Turbine Noise L_{A90}	-	-	-	24.9	29.3	33.5	35.6	36.3	36.3	36.3	36.3	36.3
	Exceedance Level L_{A90}	-	-	-	-21.4	-17.2	-13	-10.9	-10.2	-10.2	-10.2	-10.2	-10.2

Table 10.4 ETSU-R-97 Compliance Table– Night time

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
NAL1 – 8 Pitheavlis Cottages	Noise Limit	43	43	43	43	43	43	43	43	43	43	43	43
	Predicted Wind Turbine Noise L_{A90}	-	-	-	24.9	29.3	33.5	35.6	36.3	36.3	36.3	36.3	36.3
	Exceedance Level L_{A90}	-	-	-	-18.1	-13.7	-9.5	-7.4	-6.7	-6.7	-6.7	-6.7	-6.7
NAL2 – 1 Pitheavlis Cottages	Noise Limit	43	43	43	43	43	43	43	43	43	43	43	43
	Predicted Wind Turbine Noise L_{A90}	-	-	-	27.8	32.2	36.4	38.5	39.2	39.2	39.2	39.2	39.2
	Exceedance Level L_{A90}	-	-	-	-15.2	-10.8	-6.6	-4.5	-3.8	-3.8	-3.8	-3.8	-3.8
NAL3 - 19 Bell Gardens	Noise Limit	43	43	43	43	43	43	43	43	43	43	43	43
	Predicted Wind Turbine Noise L_{A90}	-	-	-	27.9	32.3	36.5	38.6	39.3	39.3	39.3	39.3	39.3
	Exceedance Level L_{A90}	-	-	-	-15.1	-10.7	-6.5	-4.4	-3.7	-3.7	-3.7	-3.7	-3.7
NAL4 – 16 Arthur Park	Noise Limit	43	43	43	43	43	43	43	43	43	43	43	43
	Predicted Wind Turbine Noise L_{A90}	-	-	-	27.9	32.3	36.5	38.6	39.3	39.3	39.3	39.3	39.3
	Exceedance Level L_{A90}	-	-	-	-15.1	-10.7	-6.5	-4.4	-3.7	-3.7	-3.7	-3.7	-3.7

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL5 – Pickenbere	Noise Limit	43	43	43	43	43	43	43	43	43	43	43	43
	Predicted Wind Turbine Noise L_{A90}	-	-	-	29.2	33.6	37.8	39.9	40.6	40.6	40.6	40.6	40.6
	Exceedance Level L_{A90}	-	-	-	-13.8	-9.4	-5.2	-3.1	-2.4	-2.4	-2.4	-2.4	-2.4
NAL6 - 34-44 Low Road	Noise Limit	43	43	43	43	43	43	43	43	43	43	43	43
	Predicted Wind Turbine Noise L_{A90}	-	-	-	26.6	31	35.2	37.3	38	38	38	38	38
	Exceedance Level L_{A90}	-	-	-	-16.4	-12	-7.8	-5.7	-5	-5	-5	-5	-5
NAL7 – 64 Woodside Crescent	Noise Limit	43	43	43	43	43	43	43	43	43	43	43	43
	Predicted Wind Turbine Noise L_{A90}	-	-	-	24.9	29.3	33.5	35.6	36.3	36.3	36.3	36.3	36.3
	Exceedance Level L_{A90}	-	-	-	-18.1	-13.7	-9.5	-7.4	-6.7	-6.7	-6.7	-6.7	-6.7

Summary of Effects

10.7.4 Predicted wind turbine noise levels are below the Noise Limits for the daytime and night-times periods; therefore, the predicted noise levels are **not significant**.

Summary of Cumulative Effects

10.7.5 There are no wind turbines within the vicinity of the proposed development, therefore a cumulative assessment was not required.

Construction Phase Effects

10.7.6 Noise emitted during construction will be short term in nature and can be minimised through careful construction practices. The effective control of these impacts can be achieved by way of a suitable planning condition. To determine whether a full construction noise assessment was required, some preliminary construction noise modelling was undertaken in accordance with BS5228 1:2009+A1:2014 using the proprietary modelling software CadnaA. The modelling was conservative in nature with more plant being modelled than there is expected to be operating in reality. The sound power level data used for the pieces of plant, such as for the mobile telescopic cranes or wheeled excavator, were taken from Annex C of BS5228. It was found that predicted daytime noise levels were below 50 LAeqT dB at the nearest receptor, well within the most stringent category A threshold of 65 LAeqT dB presented in BS5228. On that basis noise emissions during construction are not likely to result in significant effects and as such a detailed construction noise assessment has not been undertaken for the proposed development.

10.8 Additional Mitigation and Enhancement

Operational phase

10.8.1 No mitigation is proposed at this stage as the predicted wind turbine noise levels meet the Noise Limits for the daytime and night time period.

10.9 Residual Effects

Operation

10.9.1 Predicted operation noise levels at the NALs lie below the Noise Limits during the daytime and night-time period. There would be **no significant effects**.

10.9.2 At some locations, under some wind conditions and for a certain proportion of the time wind turbine noise from the Proposed Development would be audible; however, it would be at an acceptable level in relation to the ETSU-R-97 guidelines.

10.10 Summary

10.10.1 In terms of operational noise, the guidance contained within ETSU-R-97 was used to assess the likely operational noise impact of the Proposed Development. Predicted levels indicate that for dwellings neighbouring the Site, wind turbine noise would meet the noise

criteria established in accordance with ETSU-R-97, therefore the operational noise impact is **not significant**.

11. Infrastructure Assessment

11.1 Introduction

11.1.1 This chapter addresses the potential effects of the proposed wind turbine on microwave links and other electromagnetic signals (such as those associated with airfields), which are transmitted throughout the country by a wide range of operators, including both statutory agencies and commercial companies. There is potential for interference to the transmission of these signals from large structures, including wind turbines, which may be sited close to the signal path.

11.2 Methodology and Approach

Information Sources

11.2.1 The following sources of information have been used:

- Consultation responses; and
- Stakeholder and industry body publications and websites.

Consultation

11.2.2 In order to establish the baseline conditions a number of organisations have been consulted that could potentially be impacted by the proposed development.

11.2.3 Table 10.1 below summarises the main aspects and outcomes of the consultation exercise.

Table 11.1 – Infrastructure Consultation Summary

Consultee	Comment
Telecommunications	
Ofcom	No longer provide details of relevant link operators in the vicinity of the proposed development due to GDPR constraints however signpost to the Spectrum Information Portal which displays one fixed link (Arqiva) in close proximity to the development.
Ericsson	One link crossed the proposed development area. A set-back distance has been agreed with the operator.
Vodafone	Identified by Ofcom as one link with potential to be impacted upon, no response from original consultation and subsequent attempts to contact this operator.

PKC Tech	Identified by Ofcom as having one link with potential to be impacted upon, an initial response commented that an assessment will be undertaken. However, no further comment has been received.
Arqiva	One link crossed the proposed development area. A set-back distance has been agreed with the operator.
BT	BT has confirmed that there is no infrastructure in the area with potential to be affected.
Telefonica	Telefonica has confirmed that there is no infrastructure in the area with potential to be affected.
Police Scotland	Identified by Ofcom as having links with potential to be impacted upon, no response from original consultation, however there is likely to be no infrastructure in the area with potential to be affected.
Atkins Global	Atkins has confirmed that there is no infrastructure in the area with potential to be affected.
Joint Radio Company	Identified eleven scanning telemetry links and six microwave links within the area which are located within 2km of the centre of the Proposed Development and that further studies would be required; these studies have subsequently been undertaken and discussed in this chapter.
Aviation	
Ministry of Defence (MoD)	The MoD no longer offers pre-application planning advice.
National Air Traffic Systems (NATS)	NATS have commented that there would be no objection to the proposed development.
Civil Aviation Authority (CAA)	No comment.
Perth Airport	Airfield Air Manager confirms no operational impact on ATZ.

11.3 Potential Impacts

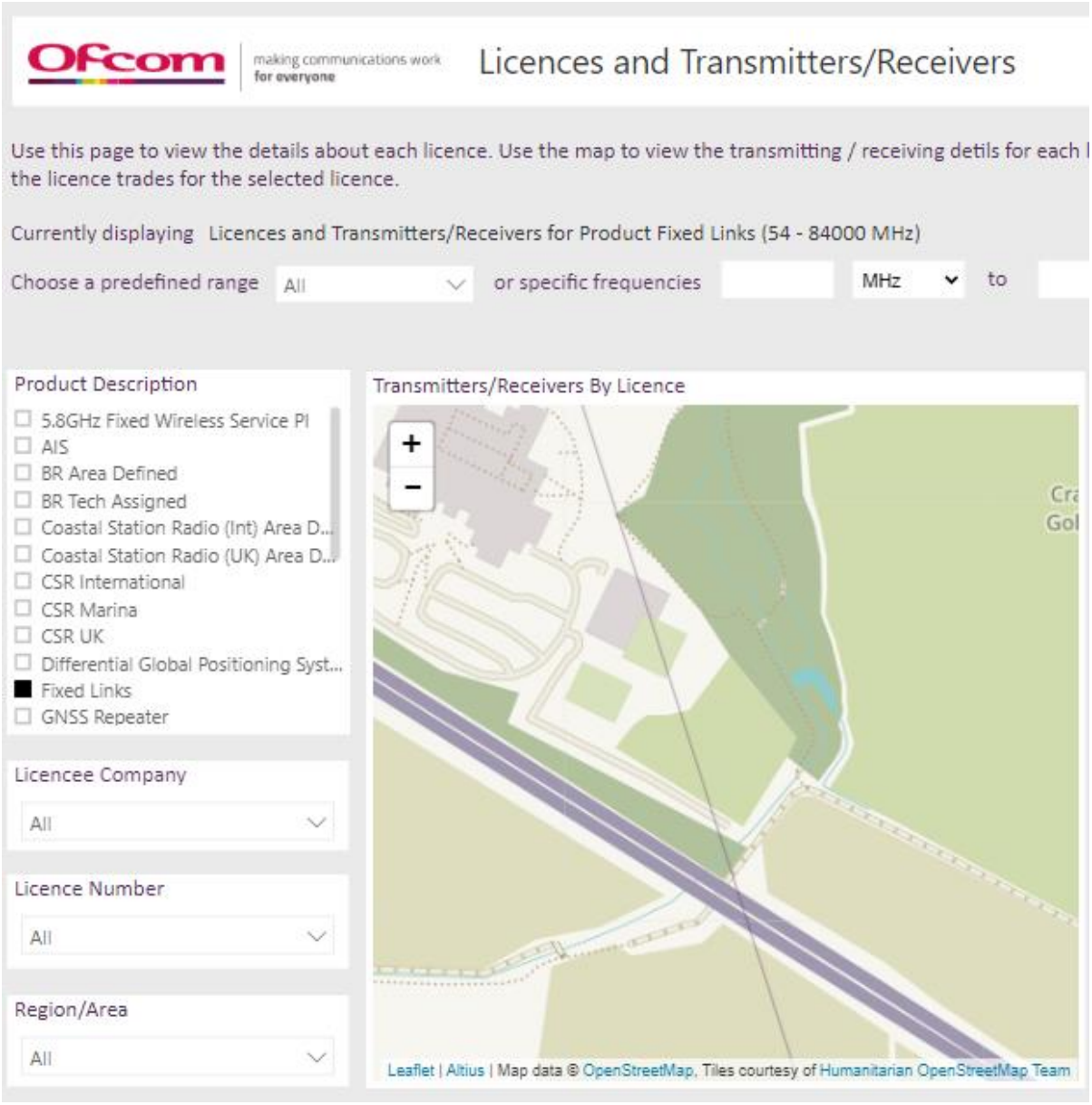
Telecommunications

11.3.1 Wind turbines can potentially interfere with radio signals (such as microwave links) if they are located within the signal path, or in the vicinity of a radio tower. A number of organisations which may have an interest in telecommunications were contacted as part of the EIA. Responses received are outlined in Table 11.1 above.

11.3.2 In 2018 European General Data Protection Regulations (GDPR) were introduced and as a result of GDPR Ofcom have stopped fulfilling consultation requests. As an alternative Ofcom advise that stakeholders can now access Ofcom licence information via the Ofcom Spectrum Information System (SIS). The SIS includes licence data for UK fixed links that

are assigned and co-ordinated by Ofcom. Scanning Telemetry links, used by the utilities and other services (operating in the bands 457.5 – 458.5 MHz & 463 – 464 MHz), are managed externally by Atkins Limited and the Joint Radio Company (JRC)

Plate 11.1 – Ofcom Radio Licence Online Tool[61]



11.3.3 Microwave link operators tend to take a conservative approach and initially object to any development within 100m of the link, or 1km for the JRC. All links were plotted on a constraints map and for the majority of links a 100m buffer either side of the link paths were adopted. Where the link was closer than 100m a detailed coordination was undertaken which included checking the positions of the start and end links and

[61] https://www.ofcom.org.uk/spectrum/information/spectrum-information-system-sis/spectrum-information-portal

calculating the second Fresnel zone (zone of potential interference), following which appropriate reduced buffers were agreed with the link operators.

11.3.4 For the JRC operated links, a larger separation is generally required and any turbine sited within 1 km would receive an initial objection until further investigation can be undertaken. The JRC have identified eleven links within a 1 km radius of the centre of the proposed development and an initial objection to the proposed development was received pending further assessment.

11.3.5 An assessment has been undertaken by the JRC in order to further assess any potential impacts on the links caused by the proposed turbine. Unfortunately details of the assessment are confidential, at the request of the JRC and cannot be appended to this ES.

11.3.6 The proposed development has the potential to affect links due to scattering / reflection impacts creating degradation in the quality of the scanning telemetry links, which are operated by JRC on behalf of Scottish and Southern Electricity (SSE); and Mitigation could be required to ensure that the links in question are not impacted upon to unacceptable levels.

11.3.7 There is on-going consultation between the Applicant, JRC and SSE to establish suitable mitigation. The Applicant will continue to liaise with Perth and Kinross Council (PKC) regarding the progress of identifying suitable mitigation if required.

11.3.8 With the exception of the JRC operated scanning telemetry links no other telecommunication link will be impacted upon.

Television Reception

11.3.9 There is a very low probability that the proposed development could interfere with domestic television reception. Sources of interference is caused by the physical blocking of the transmitted signal, or by introducing multipath interference where some of the transmission signal is reflected through different routes causing the signal to break up.

11.3.10 Given the national switchover to a wholly digital transmission, and the large take up of satellite TV, analogue interference is now a reasonably rare occurrence. If interference is deemed to have occurred, then simple mitigation measures can be undertaken.

Aviation

11.3.11 The development of wind turbines has the potential to cause a variety of effects on aviation. These range from physical safeguarding, generation of unwanted returns on primary radar, affecting the performance and propagation of SSR, navigation aids and communication facilities.

11.3.12 Wind turbines have the potential to cause some interference to radar operations if there is a line of sight between the turbines and the radar. Where a line of sight does exist moving

turbine blades can have the effect of appearing on radar as unwanted radar returns (clutter), such effects could have an adverse impact on aircraft safety.

11.3.13 The proposed development lies outside the consultation zone for Perth Scone Airport 8km to the north east, Fife Airport 26km south east, Dundee Airport 27km east and Edinburgh Airport 47km South.

11.3.14 The Civil Aviation Authority (CAA) no longer comments on proposals during the pre-application process.

National Air Traffic Systems (NATS)

11.3.15 NATS produce self-assessment maps to assist in determining whether further detailed assessments need to be carried out in relation to primary surveillance radars which is based on a radar line of sight assessment. The assessment maps have been applied to the dimensions of the turbines being considered which indicate that the proposed development is outside NATS Radar visibility.

11.3.16 NATS have produced maps showing safeguarding zones around navigation aids. The proposed development falls within the 10km consultation zone for the Perth DVOR. The Perth DVOR (PTH) operates at 110.4 Mhz and is a directional radio beacon looking immediately above and is used for aircraft guidance. At over 8km from the DVOR the wind turbine is likely to have minimal impact on this infrastructure due to the low frequency characteristics. The removal of outdated VORs has already started with Cranfield being the first to be decommissioned. The Perth VOR was assessed for withdrawal in 2016 and NATS are planning to decommission this VOR in the near future.

11.3.17 NATS have confirmed that they do not anticipate any safeguarding issues with the DVOR or any other assets as a result of the proposed development.

Ministry of Defence (MoD)

11.3.18 The proposed development is located within a low priority low flying zone, and is out with MOD onshore radar coverage.

11.3.19 The closest MOD facility is Munduff Hill Meteorological Radar which is operated by MOD on behalf of the Met Office and is used for weather forecast predictions. The proposed development is 20.8km to the north of the Munduff Hill radar and out with the 20km consultation zone for wind turbine developments.

11.3.20 The MoD was consulted for the previous application and raised no objection to the proposed development. The MoD no longer comments on pre-planning applications; therefore, it is anticipated that a 200m change in the turbine location would not trigger an objection from the MoD.

11.3.21 Should aviation lighting be required, the specification would be agreed with the aviation authorities and such lighting would likely be infrared or directional which would not be visible to the human eye from ground level.

Health and Safety

11.3.22 A number of health and safety considerations have been taken into account during the EIA process and design of the proposed development. These include:

- Proximity of turbines to public roads;
- Proximity of turbines to overhead power lines;
- Proximity to high pressure gas pipelines;
- Proximity to Aviva's onsite services;
- Proximity of turbines to rights of way;
- Extreme weather conditions; and
- Health and safety during construction.

Public Roads

11.3.23 Appropriate buffers have been applied to ensure that the turbine is located sufficiently far from existing road infrastructure, including the M90 motorway. A minimum buffer of 1.5 x tip height has been applied.

11.3.24 With regards to road safety and driver distraction, drivers are faced with a number of varied and competing distractions during any normal journey, including advertising boards which are deliberately designed to attract attention. At all times drivers are required to take reasonable care and ensure their own and others safety. Wind turbines should therefore not be treated any differently from other distractions a driver must face and should not be considered particularly hazardous. There are now a large number of wind farms adjoining or in close proximity to road networks and there is no evidence that they affect traffic accident rates.

Overhead Power Lines

11.3.25 There are no overhead power lines within the proposed development site.

High Pressure Gas Pipelines

11.3.26 Appropriate buffers have been applied to ensure that the turbine is located sufficiently far from existing gas pipelines. A minimum buffer of 1.5 x hub height has been applied, therefore no health and safety effects are likely to occur on the gas network.

Aviva's Onsite Services

11.3.27 There are a number of on-site services in the vicinity of the proposed development. These include electricity cables for the carpark lighting.

11.3.28 A Drainage Management Plan will be undertaken to amend existing surface water drainage and to detail proposed additional surface drainage measures to treat and deal with all the surface runoff from the site, to be designed in accordance with SUDS principals.

Public Access and Rights of Way

11.3.29 There are a number of rights of way and core paths in the vicinity of the proposed development, however there are none within the swept area of the blades. The closest public footpath is within the woodland to the northeast of the proposed turbine, with public access separated from the Aviva Site by tall, mesh fencing, therefore no effects with regards to health and safety would be anticipated.

11.3.30 The Aviva site is a private commercial operation, with access to the vicinity of the turbine limited to employees and controlled visitors. During the construction period, access will be governed under the Health and Safety of Work Act 1974 and associated legislation and for safety reasons all public access will be prohibited during the construction period. During the operational period appropriate warning signs will be installed concerning restricted areas such as transformers, switchgear and metering systems. All on-site electrical cables will be buried underground with relevant signage.

Extreme Weather

Lightning Strike

11.3.31 Due to the nature of wind turbines (tall metal structures) they can be susceptible to lightning strikes. Measures to control lightning strikes are considered during the design of the machines which allows a safe passageway for lightning to be conducted down to earth minimising the risk of damage to the wind turbine. If the wind turbine is struck by lightning the machine will automatically shut down and will only be re-started following inspection.

Ice Throw

11.3.32 Ice build-up on blade surfaces can occur in cold weather. Wind turbines will shut down automatically as soon as there is a sufficient build up to cause aerodynamic or physical imbalance of the rotor assembly. Potential icing conditions affecting turbines can be expected for between 2-7 days per year (light icing) in Scotland (WECO, 1999).

11.3.33 Modern wind turbines have monitoring systems and protocols in place to ensure safe, controlled start-up of the turbine following a period where icing conditions could occur. The risk to public safety is considered to be very low due to the few likely occurrences of these conditions combined with the operational circumstances that can result in ice throw. Despite a recent increase in wintery condition, there have been no recorded incidents of ice throw injury to the public or to operational staff at any wind turbine site within the UK, including on-site wind turbines located within operational sites such as chemical and manufacturing companies.

11.3.34 In order to avoid any potential harm to the public, employees and visitors to Aviva, appropriate signage will be positioned to advise those in the vicinity of the wind turbine that in conditions when icing may occur there is a risk of ice throw and not to approach the wind turbine.

Health and Safety During Construction

11.3.35 A number of construction related activities outlined in Chapter 2, have the potential to injure workers, therefore all site work will comply with the following relevant regulations:

- The Construction (Design and Management) Regulations 2007 approved code of practice;
- The Health and Safety and Work Act 1974;
- The Management of Health and Safety at Work Regulations 1999;
- Provision and Use of Work Equipment Regulations 1998;
- Control of Substances Hazardous to Health 1999; and
- The Works at Heights Regulations 2005.

11.3.36 The above legislation requires the safe operation of the proposed development site and the health and safety of all employees, contractors, visitors, and members of the public who may have access to the proposed development site.

11.3.37 A Construction Health and Safety Plan will be developed to manage safety during construction.

11.4 Residual Impacts

11.4.1 Residual effects are summarised in Table 11.2.

Table 11.2: Summary table of residual effects

Effect	Mitigation	Significance of residual effect
Potential Impacts on telemetry links operated by JRC on behalf of Scottish and Southern Electricity (SSE).	Mitigation measures to be agreed with the JRC if required.	Negligible significance.

11.6 Conclusions

11.5.1 A comprehensive consultation process has been undertaken with organisations with an interest in telecommunications, aviation, safety and infrastructure for the proposed development site.

11.5.2 The proposed development is outside consultation zones associated with civil aviation, although within the VOR consultation zone. The DVOR at Perth Airport is over 8km from the proposed development and NATS have commented that there are no anticipated safeguarding issues as a result of the proposed development. The MoD no longer consults on pre-planning applications, however no impact upon their operations is anticipated given they raised no objection to the previous application.

11.5.3 No potential impacts on television signals are anticipated due to the digital switchover. However, in the unlikely event that reception may be affected, there are several mitigation measures that will be put in place.

11.5.4 Several microwave links have been identified within a 1 km radius of the site and the potential effects on these have been taken into consideration in the site design process. The turbine is located so the majority of these links will be unaffected, there are however JRC links which have the potential to be impacted upon and as a result it is recognised that JRC may place a holding objection against the proposed development. Consultation is ongoing with the JRC and the applicant is confident that mitigation can be implemented and agreed upon. It is proposed that appropriate conditions are agreed with the Council to ensure the delivery of these mitigation measures.

12. Tourism, Recreation and Socio-economic Assessment

12.1 Introduction

12.1.1 This chapter considers the potential effects of the proposed development at Aviva on tourism, recreation and economic activity.

12.1.2 The proposed development will likely give rise to a number of socio-economic impacts which should be properly considered and assessed in the determination of this application.

12.1.3 An assessment of the existing socio-economic and demographic situation in Perth and Kinross has been undertaken to establish the understanding of the local area and to establish a baseline for consideration of the impacts of the proposal. Consideration is given to the current climate of public opinion towards wind turbine development and subjects such as impact on tourism and recreation, the likely economic impacts and the national interest over a range of scales, local, regional and national.

12.1.4 The concept of economic benefit as a material consideration is explicitly confirmed in the SPP and fits with the priorities of the Scottish Government to grow the Scottish economy and invest in a low carbon economy.

12.2 Assessment Methodology

Data Sources

12.2.1 The following sources of information have been used:

- General Register Office for Scotland;
- ONS (NOMIS Official Labour Market Statistics);
- Scottish Government;
- Perth and Kinross Council (PKC); and
- Scottish Neighbourhood Statistics.
- Visit Scotland Statistic
- Government Public Attitude Tracker

Study Area

12.2.2 The proposed development lies in Perth and Kinross, one of the 32 Council areas of Scotland. Perth and Kinross covers an area of 5,286km^2 and has wide variety of landscapes, from the rich agricultural areas in the east, to the high mountains of the southern Highlands.

Methodology

12.2.3 The methodology adopted in this assessment has involved the following key stages:

- Determine baselines;
- Review Proposed Development for effects;
- Evaluate significance;
- Identify mitigation; and
- Assess residual impacts.

12.2.4 The assessment presents impacts across the various stages of the wind turbine life cycle, which involves three main stages:

- Construction;
- Operations and maintenance; and
- Decommissioning.

12.2.5 The scale of significance used to assess potential and residual effects of the proposed development against baseline conditions is identified in Table 12.1 below. The assessment process aims to be objective and quantifies effects as far as possible, however it should be noted that some effects can only be evaluated on a qualitative basis.

Table 12.1 Significance Criteria for Tourism, Recreation and Socio-economic Assessment

Effect	Description
Major	A fundamental change to a location, environment or sensitive receptor.
Moderate	A material but not fundamental change to a location, environment or sensitive receptor
Minor	A detectable but not material change to a location, environment or sensitive receptor
Negligible	No detectable change to a location, environment or sensitive receptor.

12.2.6 When assessing significance, consideration has been given to the national, regional and local baseline situation. The magnitude of the impact is determined in proportion to the area of impact relevant to each receptor.

12.3 Socio Economics

Baseline

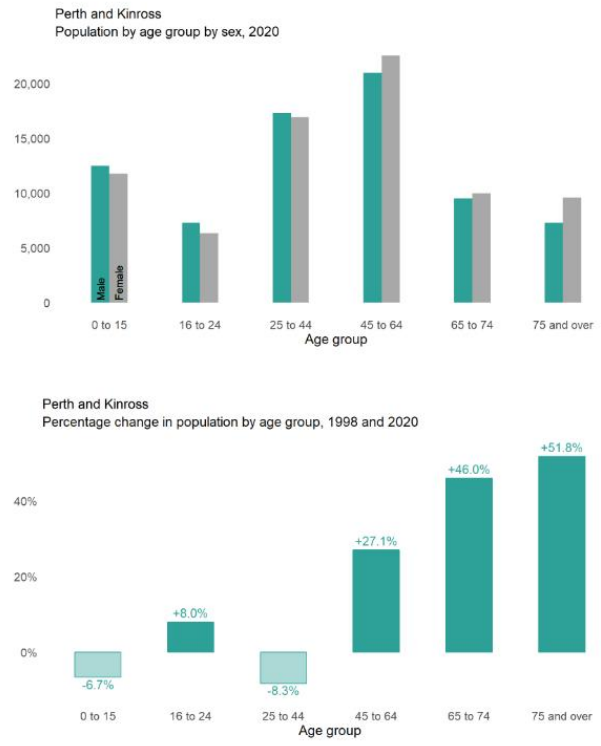
Population

12.3.1 On 30 June 2020, the population of Perth and Kinross was 151,910. This is a slight decrease from 150,950 in 2019. Over the same period, the population of Scotland increased by less than 0.1%[62].

12.3.2 Over the last 20 years the population of Perth and Kinross has increased by 12.9%. This is the 7th highest percentage change out of the 32 council areas in Scotland. Over the same period, Scotland's population as a whole rose by 7.7%[63].

12.3.3 The population structure of Perth and Kinross is characterised by an ageing population. In terms of overall size, the 45 to 64 age group was the largest in 2020, with a population of 43,504. In contrast, the 16 to 24 age group was the smallest, with a population of 13,644.[64]

Plate: 12.1 Population Statistics



[62] https://www.nrscotland.gov.uk/files/statistics/council-area-data-sheets/perth-and-kinross-council-profile.html
[63] https://www.nrscotland.gov.uk/files/statistics/council-area-data-sheets/perth-and-kinross-council-profile.html
[64] https://www.nrscotland.gov.uk/files/statistics/council-area-data-sheets/perth-and-kinross-council-profile.html

12.3.4 The population of Perth and Kinross is projected to increase from 151,290 to 152,779 over the next 8 years. This is an increase of one percent, and the average age of the population of Perth and Kinross is projected to increase as the baby boomer generation ages and more people are expected to live longer.[65]

Employment

12.3.5 Nomis official labour market statistics identifies that 77.6 percent of the Perth and Kinross area is economically active (74,900 persons)[66]

12.3.6 The largest share of employment is in the service sector (wholesale and retail) which accounts for 15.5 percent of the workforce, which is higher than Scotland as a whole at 13.9 percent.

12.3.7 Compared to Scotland as a whole Perth and Kinross has a smaller share of employees in Information and Communications (2.1% below) and Professional, Scientific and Technical Activities (1.9% below). In contrast employment share in the Electricity and Gas sector is significantly above the Scottish average by 4.3 percent, this is likely due to the presence of Scottish and Southern Energy (SSE) a renewable energy and conventional energy supplier, locating its headquarters in Perth.

12.3.8 The employment share for Finance and Insurance is slightly lower than the Scottish average by 0.3 percent, however it should be noted that the employment in this sector (1,750 positions) is largely serviced by one employer Aviva, the applicant for the proposed development.

Unemployment

12.3.9 Nomis official labour market statistics shows that unemployment in Perth and Kinross is lower than the Scottish average. Records from October 2020 - September 2021 identify that approximately 2600 people were unemployed equating to 3.4 percent of the population. This is compared to an average of 4.2 percent unemployment across Scotland.

Socio-economic Summary

12.3.10 The population of Perth and Kinross has been increasing over the last 20 years and is projected to continue to increase over the next 8 years increasing demand on local services including electricity.

12.3.11 There is a good level of employment in Perth and Kinross, approximately 77.6% are in employment which is higher than the Scottish average. The predominant employment sector is retail 15.5% which is slightly higher than the national average. The Perth economy is made up of a number of major plc's such as SSE, Stagecoach and Aviva who

[65] https://www.nrscotland.gov.uk/files/statistics/council-area-data-sheets/perth-and-kinross-council-profile.html
[66] https://www.nomisweb.co.uk/reports/lmp/la/1946157428/report.aspx#tabjobs

have chosen to locate offices in the region. It is anticipated following the merger of Stagecoach and National Express that the headquarters will be moved to Birmingham raising fears of job losses in the area.

12.3.12 Aviva has downsized the occupancy of office space recently by 50%, offering their staff increased flexibility in where and how they work. Aviva are keen to attract new like-minded occupiers to join them in their Perth office. To be successful Aviva needs to demonstrate they are a low carbon and cost-effective location.

Low Carbon Economy

12.3.13 The Scottish Executive's commitment to renewable energy is driven both by environmental imperatives and by the potential for new economic development. An increase in renewable electricity generation as a means of reducing carbon emissions forms an important part of Scotland's efforts to tackle climate change.

12.3.14 Scotland's long-term climate change targets will require the near complete decarbonisation of our energy system by 2050, with renewable energy meeting a significant share of their needs.

12.3.15 The 2020 publication, Securing a green recovery on a path to net zero[67], has identified that:

- The transition to net zero will require significant upfront investment in modernised infrastructure and capital projects, preserving and restoring Scotland's natural environment, and modernising our building stock.
- Our 2020–2021 Budget brought our overall low carbon capital spend to £1.8 billion on an annual basis, while our 2020-2021 Programme for Government and our draft Infrastructure Investment Plan committed an additional £2 billion capital investment to support the green recovery over the life of the next Parliament.
- The draft Infrastructure Investment Plan for 2021/22 to 2025/26 published in September 2020 details around £24 billion of major projects and national programmes, with more to be confirmed in future years. These investments will provide a near-term stimulus to support Scotland's economic recovery, and also lay the foundations for long-term green growth.

12.3.16 The Scottish Executive already invests £1.8 billion of capital each year in low carbon policies and programmes. Scottish Ministers have committed to increasing the level of spending by an additional £2 billion over the next 5 years.

12.3.17 As the Scottish Executive invests in a green recovery, they will work in partnership with businesses to best align business recovery support with their long-term climate, environmental, economic and social goals.

[67] https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/pages/4/

12.3.18 The Scottish National Investment Bank launched on 23 November 2020. Working in tandem with the business community and public sector partners, the Bank will be at the forefront of shaping an economy with the transition to a net zero economy, fair work, and inclusive growth at its heart. The Scottish Government has committed to capitalising the Bank with £2 billion over 10 years.

12.3.19 In 2018, the low carbon electricity sector directly supported 7,800 full time equivalent jobs across Scotland, and contributed more than £3.6 billion to the Scottish economy. Recent analysis by National Grid estimated that 50,000 jobs in Scotland will be required in the Net Zero Energy Workforce.[68]

12.3.20 At the centre of Scotland's green recovery is a commitment to increase the number of good, green jobs and to enable people to access these jobs, including through training and reskilling. This is fundamental to the National Mission for Jobs set out in the 2020-2021 Programme for Government.

12.3.21 The green recovery offers an opportunity to accelerate retraining and bring much needed skills and labour into sectors scaling up for the transition to net zero, including where there is immediate demand for skills and labour such as in construction, land-based roles in woodland creation and peatland restoration and in energy.[69]

Impact Assessment

Construction Impacts

12.3.22 The construction phase of the proposed development could generate economic impacts through construction activities including balance of plant and grid connection works.

12.3.23 The costs for the proposed development are estimated to be around £1.2 million which will include the turbine supply and construction costs (grid connection, balance of plant and construction management).

12.3.24 The sourcing of the wind turbine will likely be from the EU, as there are no suppliers for this specialist equipment manufacturing in Scotland or other areas of the UK. The construction works may be sourced from Scottish companies.

12.3.25 The construction works would be subject to a tendering process. The extent to which local companies could benefit from the proposed development would depend on the range of companies operating locally, their competence and experience.

68 https://www.nationalgrid.com/stories/journey-to-net zero/net zero-energy-workforce
[69] https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/pages/4/

12.3.26 The socio-economic impacts of the construction phase of the proposed development are considered to be of minor significance and positive but short term at a regional level, should local companies be successful at the tendering stage of the project.

Operational Impacts

12.3.27 The operational phase of the proposed development could generate economic impacts through turbine maintenance, civil maintenance, electrical maintenance and operational management.

12.3.28 The socio-economic impacts of the operational phase of the proposed development are considered to be of minor significance and positive but short term at a regional level should local companies be successful at the tendering stage of the project.

Economic Impact for Aviva

12.3.29 Aviva pride themselves in being an important part of the community in which they operate and take responsibilities towards that community very seriously. The company also considers itself an important part of the economic wellbeing of the area, both as a major employer, directly employing over 1000 staff and through local sourcing of goods and services through the supply chain.

12.3.30 The initial capital outlay of over £1 million pounds would be a significant investment by Aviva into their Perth facility and the Perth economy as a whole. It would be a milestone towards achieving 100% of electricity supplied by on-site renewable generation and would showcase the Perth site as an exemplar site for the whole Aviva Group worldwide.

12.3.31 The energy generated from the proposed wind turbine would supply over 75 percent of the Aviva current electricity demand, significantly reducing the operating cost of the facility, especially as electricity prices are forecasted to continue to rise, as electricity demand increases with the move towards a decarbonised economy

12.3.32 Perth has an energy use intensity 45% greater than any other building in the Aviva estate which clearly shows the challenge Aviva face with operation of this building. This effectively means that the energy costs Aviva incur in Perth, are 45% more per sqm than other buildings in their estate. Whilst Aviva are proud of their listed building, the design features for which it is celebrated, such as high ceilings and terraced garden/soil rooftops do lead to heat loss and create inefficiencies.

12.3.33 Over the next few years, Aviva are seeking to refocus their operational property portfolio to align with their Environment, Social and Governance agenda and buildings which cannot meet that criterion have questionable longevity. The current energy usage at Perth, presents an operational challenge for Aviva from a cost perspective, particularly considering current global instability and fluctuation in energy prices. The turbine will future proof running costs by stabilising energy prices. The turbine will also enable Aviva's

staff and visitors to use cost effective and green supply EV charge points and allows investment in removing gas from the site.

12.3.34 The reduction and stabilisation of Aviva's energy spend in Perth will not only directly benefit Aviva but will also benefit the local community through the ongoing support and investment Aviva are able to provide.

12.3.35 Whilst there will be an economic saving on electricity costs for Aviva, the overwhelming drive for installing the wind turbine has always been to meet Aviva's operations Net Zero ambition by 2030.

12.3.36 The socio-economic impacts for Aviva of the proposed development are considered to be of major significance and positive although medium term (25 years) at a local level.

Community Fund

12.3.37 Aviva has already established a community fund which allows people to vote to fund projects which can make a difference in local communities. Organisations and charities in the Perth and Kinross Area have already benefited from this fund. In line with Aviva's existing commitment, they proposed to extend/create an additional community fund which is linked to the operation of the wind turbine. This community fund will equate to a minimum of £5,000 per annum for the lifetime of the proposed development.

12.3.38 The economic impacts arising from the community fund will depend on how the community decides the fund can best serve their area. Initial survey results from the Open Day indicated that local people would like to see the fund spent on activities that would benefit the environment or relieve fuel poverty.

12.3.39 The socio-economic impacts of a community fund for the proposed development are considered to be of minor/moderate significance and positive but medium term (25 years) at a local level.

12.4 Tourism and Recreation

Baseline

12.4.1 Tourism in Scotland for the first 3 months of 2020 saw 367,000 tourism trips (International) taken generating over 204 million in expenditure[70]. Tourism is an important industry in Perth and Kinross and Scotland as a whole.

12.4.2 In 2019, Perth and Kinross witnessed growth in overnight tourism. Annual visitor figures suggest that domestic travellers increased slightly, while international visitor figures rose

[70] https://www.visitscotland.org/binaries/content/assets/dot-org/pdf/research-papers-2/scotland-tourism-performance-in-q1-2020.pdf

massively from 2018 when they were at the lowest in a decade. With the worldwide pandemic from 2020 onwards, visitor numbers are expected to have reduced significantly.

12.4.3 The most popular visitor attraction in Perthshire in 2019 was the Tay Forest Park (279,349 visitors), Hermitage (173,288 visitors) and Provost Walk (154, 101), all over 20km from the proposed development.[71] Within the top 10 Perthshire tourist attractions, Scone Palace received (121,698 visitors) and the museum of the Black Watch received (97,989 visitors).

12.4.4 Scone Park is located approximately 4-5km north of the proposed turbine. Figure 5.3, Volume 3, indicates theoretical visibility, however review in the field indicates that frequent layers of parkland tree cover, including coniferous species, limits visibility towards the Site, even in winter. Whilst no views are indicated near Scone Palace, there is the potential for limited and heavily restricted glimpses in winter from some peripheral areas of the park. The Black Watch Museum is located in an area with no predicted visibility of the wind turbine.

12.4.5 Reasons for visiting Perthshire range from visiting historic venues, walking and shopping.

12.4.6 The potential for the proposed development to effect tourism and recreation is closely linked to public attitudes towards wind turbines and whether these are positive or negative.

Public Attitudes to Wind Farms

12.4.7 There have been numerous studies on public attitudes toward wind farms over the last 30 years. In 2012 the Government started to track public attitudes towards renewable energy with their Public Attitudes Tracker (PAT). The most recent PAT survey in May 2021 found 70 percent supported on-shore wind and since surveys began in 2012 support has never fallen below 64 percent.[72]

12.4.8 Eight in ten people (80%) in March 2021 were either very concerned (33%) or fairly concerned (47%) about climate change. The overall level of concern about climate change has remained relatively stable since June 2020

12.4.9 A survey on consumer attitudes towards renewable energy in the UK was released by Ørsted (a Danish energy company) in July 2018.[73] The survey explores attitudes towards the purchase of goods from supermarkets, as well as food and beverages, clothing, electronics and beauty products. Ørsted commissioned the survey to gain a greater

[71] https://www.visitscotland.org/binaries/content/assets/dot-org/pdf/research-papers-2/insights---tourism-in-scotlands-regions-2016_update-may-18.pdf

[72] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/985092/BEIS_PAT_W37_-_Key_Findings.pdf

[73] https://orsted.co.uk/en/Media/Newsroom/News/2018/07/New-survey-reveals-73-percent-of-UK-consumers-would-choose-retailers-that-use-renewable-energy

understanding of the influence of renewable energy on purchasing decisions, and how it can drive the behaviour of consumers. The survey concluded that:

- 73% of consumers would choose a retailer that uses renewable energy, over one that doesn't.
- 86% of consumers believe it's worth buying products made using 100% renewable energy.
- 60% of consumers showed a preference for logos displaying a green message

12.4.10 Overall, it can be noted that public support for wind farms have remained consistently high. It is notable that in the public enquiry for the consented Harburnhead Wind Farm the Reported noted that *"if wind farms had a significant adverse impact on the number or experience of visitors, we would expect clear evidence of this by now."*

Wind Farm Tourist Reports

12.4.11 The main source of data on the impact on tourism of wind farms in Scotland is the 2008 Moffat Report which focused on four geographical regions in Scotland. This study concluded that even using a worst-case scenario the impact of current application would be very small and would be more than balanced by the economic benefits of wind farm development.

12.4.12 A climateXchange report issued in 2012 concluded that the is no new evidence to contradict the earlier findings that wind farms have little or no adverse impact on tourism in Scotland. The report highlighted that:

- 80% of UK respondents, and 83% of Scottish respondents said their decision on where to visit or where to stay would not be affected by the presence of a wind farm;
- 52% of all respondents disagreed that wind farms spoil the look of the UK/Scottish countryside, with a further 29% neither agreeing, nor disagreeing.

Impact Assessment

Construction Impacts

12.4.13 The potential impacts of the proposed development during the construction stage have been assessed in detail in both the landscape, cultural heritage and noise chapters of this ES. The potential for reduction in amenity value of any nearby sites of tourist or recreational interest would be short term and negligible significance.

Operational Impacts

12.4.14 Drawing on the conclusions from previous chapters in this ES, it is unlikely that the majority of tourists will be adversely affected by the proposed development.

12.4.15 The landscape chapter identifies there is a network of core paths within the woodland to the north of the proposed turbine, with public access separated from the Aviva Site by tall,

mesh fencing. The routes were walked in winter when deciduous trees were not in leaf and intervisibility with the proposed turbine would be largely fully restricted by tree cover including conifers and shrub/ivy understorey. Where the route passes to within circa 50m of the proposed turbine, in winter it is predicted that core path users would be aware of the rotor movements through intervening mature woodland. Where the turbine can be seen through the vegetation there would be a significant localised visual change. Following the development of the turbine there may be potential for increased public access and recreational use of the grounds. Aviva would welcome the opportunity to provide information boards visible from the core paths to explain Aviva's journey to Net Zero, details about the listed building and information on the designed landscape.

12.4.16 Beyond 1.5km, recreational users at the summit of popular hills surrounding Perth including Kinnoull Hill and Moncreiffe Hill would have views of the proposed turbine that would result in a Moderate adverse effect on visual amenity that is not significant in EIA terms.

12.4.17 Visibility of the turbine from the northern part of the golf course would be partly restricted by intervening woodland cover and further restricted by belts of tree planting along the fairways. At the southern more elevated parts of the course clear views of the turbine would be frequently available, particularly near the southern boundary (see Viewpoint 3 from adjacent Core Path). The value of views and susceptibility of viewers is assessed to be Medium, resulting in an overall medium sensitivity. The magnitude of change is assessed as ranging between no view and high. The overall effect upon visual amenity of golfers playing on the course would range from no view to major/moderate and significant in EIA terms. Craigie Hill Golf Course has recently approached Aviva regarding increasing access and recreation opportunities with the golf course. There is a willingness to discuss options between both parties.

12.4.18 On the application site, the Aviva building itself is a Category A listed building. A significant part of this listing relates to the interior of the building where the entrance hall, reception area and boardroom are singled out for special architectural treatment. The building currently has no public access as it operates as a commercial office space. As part of this application Aviva intends to open up the building on a number of days to host guided tours which will allow people to experience the architectural qualities of the listing. It is anticipated that these tours would draw cultural heritage and archaeology enthusiasts to the area, therefore increasing tourism in the area.

12.4.19 It has been consistently demonstrated that well sited on-shore wind farms do not have a detrimental impact on tourism, therefore the impact would be negligible. Balanced against the opportunity to improve access and appreciation of the Aviva building, providing a new tourist attraction to the area. The overall impact is assessed to be minor significance and positive over the long term at a local level.

12.5 Residual Impacts

12.5.1 Residual effects of more than negligible significance, that are not already covered in preceding chapters are summarised in Table 12.1

Table 12.1 Summary table of residual effects

Effect	Mitigation	Significance of Residual Effect
Moderate (positive) economic impact for Aviva, and consequently the local economy.		Moderate (positive) significance
Minor (positive) impact on tourism		Minor (positive) significance

12.6 Conclusions

12.6.1 Nationally the importance that has been attached to achievement of significant reductions in CO_2 and a transition to a low carbon economy cannot be overstated. As such the contribution of this development is seen as part of a wider economic and social restructuring of energy supply, business development and security within Scotland and the UK and is of considerable benefit.

12.6.2 Locally there will be a number of impacts from the proposed development primarily introduced by the visual character of the wind turbine and people's attitudes towards this form of development.

12.6.3 The energy generated from the proposed wind turbine would supply over 75 percent of the Aviva current electricity demand, significantly reducing the operating cost of the facility, especially as electricity prices are forecasted to continue to rise, as electricity demand increases with the move towards a decarbonised economy

12.6.4 Perth has an energy use intensity 45% greater than any other building in the Aviva estate which clearly shows the challenge Aviva face with operation of this building. This effectively means that the energy costs Aviva incur in Perth, are 45% more per sqm than other buildings in their estate. Whilst Aviva are proud of their listed building, the design features for which it is celebrated, such as high ceilings and terraced garden/soil rooftops do lead to heat loss and create inefficiencies.

12.6.5 Over the next few years, Aviva are seeking to refocus their operational property portfolio to align with their Environment, Social and Governance agenda and buildings which cannot meet that criterion have questionable longevity. The current energy usage at Perth, presents an operational challenge for Aviva from a cost perspective, particularly considering current global instability and fluctuation in energy prices. The turbine will future proof running costs by stabilising energy prices. The turbine will also enable Aviva's

staff and visitors to use cost effective and green supply EV charge points and allows investment in removing gas from the site.

12.6.6 The reduction and stabilisation of Aviva's energy spend in Perth will not only directly benefit Aviva but will also benefit the local community through the ongoing support and investment Aviva are able to provide.

12.6.7 Whilst there will be an economic saving on electricity costs for Aviva, the overwhelming drive for installing the wind turbine has always been to meet Aviva's operations Net Zero ambition by 2030.

12.6.8 Economic benefits will arise in the local area as a result of this proposed development. Direct benefits could result from the construction and operation of the project, subject to suitable local civil and electrical contractors being identified. In addition, there will be a local community fund linked to the operation of the wind turbine which would provide a minimum of £5,000 per year to support local organisations and charities.

12.6.9 There will be indirect benefits in the local area through the support of investment into a significant local employer. The reduction and stabilisation of Aviva's electricity demand will not only directly benefit Aviva, but will also benefit the local community through the high-quality job opportunities they are able to provide, ongoing support and investment in community projects, along with the benefits to the economy through local sourcing of goods and service.

12.6.10 It has been consistently shown in surveys that support for onshore wind energy is high and importantly for Aviva a recent survey shows that consumers are now more environmentally and socially conscious when making purchasing decisions identifying that 73% of consumers would choose a retailer that uses renewable energy, over one that doesn't and 86% of consumers believe it's worth buying products made using 100% renewable energy, thus aligning with Aviva's ambitions to make the Perth facility 100% supplied by on-site renewable energy.

12.6.11 It has been consistently demonstrated that well sited on-shore wind farms do not have a detrimental impact on tourism. The proposed development has the potential to increase tourism in Perth and Kinross by improving access to the interior of the listed category A listed building, through a series of dedicated cultural heritage and archaeology tours.

12.6.12 It is worth noting that at the local scale the currently observable social and economic impacts of climate change may be difficult to identify, the cost of such changes, over time will inevitably be felt at all scales. The contribution of this scheme towards limiting and offsetting those costs is a significant benefit which should be measured in its favour at all scales.

12.6.13 Overall, it is assessed that the socio-economic considerations observable with regard to this proposal points towards the positive benefits that would occur. There are no

fundamental issues that arise through a review of socio-economic or demographic information available. Public attitudes towards wind turbines are increasingly positive and tend to improve following first-hand experience of living near such developments. An assessment has been completed at a range of scales concluding that the development would have the most significant impacts, both positive and negative, at the local scale but that significant benefits are derived from the proposal at all scales and those benefits significantly outweigh any perceived local harm.

13. Summary of Effects

13.1 Introduction

13.1.1 The identification of potential positive and negative impact of a proposed development is at the heart of the EIA process. The process of reduction of adverse environmental impacts is considered through-out the design process.

13.1.2 In a number of occurrences, it may be appropriate to propose mitigation which would avoid, reduce or off-set any significant environmental effects.

13.1.3 It should be noted that by definition all EIA projects are likely to have significant environmental effects, and this does not mean that the impact of the proposed development, as a whole, is significant in the context of the EIA regulations.

13.1.4 Schedule 4 of the Regulations requires an environmental statement to include "a description of the likely significant effects of the development on the environment", however it provides no advice as to how to derive significance or what level of significance is significant.

13.1.5 Guidance and best practice are beginning to move away from the use of a significance matrix standardised across topic areas, towards methods specifically tailored to each topic. The drawback to not using the standardised matrix approach is that there may be some inconsistency across topic areas in a single environmental statement, however the benefit of this approach is that one size does not always fit all. EIA topics can differ widely in nature and in the way they are assessed, and an attempt to provide a consistent approach to the assessment of significance across all topic areas inevitably leads to compromise, which can sacrifice accuracy and ultimately affect the reliability of the EIA.

13.1.6 The professional consultants that have contributed to this Environmental Statement have set out a clear methodology explaining how they have approached this assessment.

13.1.7 The methodologies in this Environmental Statement explain how the assessor deems whether or not a significant effect will occur and considers all appropriate guidance in reaching judgements

13.2 Schedule of Environmental Effects

13.2.1 Residual effects of greater than minor significance are summarised in Table 13.1 below:

Table 13.1 – Schedule of Residual Effects

Topic Area	Effect (without mitigation)	Mitigation	Significance of residual effect
Landscape Character	Moderate significance:		Not significant

	Landscape Character effects on Urban Character Type		
Landscape Character	Moderate effect: landscape Character effects on Lowland Hills Character Type		Not significant
Landscape Character	Moderate/minor effect: landscape Character effects on Igneous Hills Character Type		Not significant
Landscape Visual Amenity (Settlements)	Major effect: visual effects at Perth Urban Area Close range (VP1) - Pitheavlis	Mitigation planting would comprise a belt of semi-mature conifer planting to infill an approximate 20m long gap near the main access. Planting would result in a Moderate effect.	Significant (Adverse) – Should planting be implemented the significance would be reduced to not significant
Landscape Visual Amenity (Settlements)	Major/moderate effect: visual effects at Perth Urban Area Medium range (VP5) – Cherrybank		Significant (Adverse)
Landscape Visual Amenity (Settlements)	Moderate effect: visual effects at Perth Urban Area Medium range – Woodland and Burghmuir		Not significant
Landscape Visual Amenity (Settlements)	Moderate effect: visual effects at Perth Urban Area Medium range – City Centre		Not significant
Landscape Visual Amenity (Settlements)	Moderate effect: visual effects at Perth Urban Area Medium range – Bridgend/Barnhill		Not significant
Landscape Visual Amenity (Settlements)	Moderate effect: visual effects at Perth Urban Area Medium range – Craigie		Not significant
Landscape Visual Amenity (Settlements)	Moderate effect: visual effects at Scone (VP10) and Tarsappie (VP9) Long range.		Not significant
Landscape Visual Amenity (Settlements)	Moderate/minor effect: visual effects at Bertha Park (VP14) Long range.		Not significant
Landscape Visual Amenity	Moderate/minor effect: visual effects at		Not significant

(Settlements)	Moncrieiffe / Upper Craigie - Long range.		
Landscape Visual Amenity (Transport)	Major/moderate effect: visual effects on M90 at Close range (VP2, 7 & 9)		Significant (Adverse)
Landscape Visual Amenity (Transport)	Major/moderate effect: visual effects on B9112 at Close range (VP1)	Mitigation planting would comprise a belt of semi-mature conifer planting to infill an approximate 20m long gap near the main access. Planting would result in a Moderate effect.	Significant (Adverse) - Should planting be implemented the significance would be reduced to not significant
Landscape Visual Amenity (Transport)	Moderate/minor effect: visual effects on A9 at Medium range		Not significant
Landscape Visual Amenity (Transport)	Moderate/minor effect: visual effects on A93 at Medium range		Not significant
Landscape Visual Amenity (Recreation)	Major/moderate effect: visual effects on core paths at Close to Medium range (VP 2, 3, 4, 6 & 7)	There may be potential for increased public access and recreational use of the grounds. Aviva would welcome the opportunity to provide information boards visible from the core paths to explain Aviva's journey to Net Zero.	Significant (Adverse)
Landscape Visual Amenity (Recreation)	Moderate effect: visual effects on Kinnoull Hill Summit (VP8)		Not significant
Landscape Visual Amenity (Recreation)	Moderate effect: visual effects on Moncreiffe Hill Summit (VP8)		Not significant
Landscape Visual Amenity (Recreation)	Major/moderate effect: visual effects on Craigie Hill Golf Course at Close/Medium range (VP3)	Craigie Hill Golf Course has recently approached Aviva regarding increasing access and recreation opportunities with the golf course. There is a willingness to discuss options between both parties.	Significant (Adverse)
Landscape Visual Amenity (Recreation)	Moderate/minor effect: visual effects on Scone Park		Not significant
Cultural Heritage	A Slight/Moderate adverse effect:	The turbine has been re-sited 200 east of the building (since the	Significant (Elements that are Adverse and Beneficial)

	elements of the setting of the Aviva Building	previous application) substantially reducing the previously assessed magnitude of impact on the setting of the listed building such that the overall effect might now reasonably be categorised as Slight/Moderate adverse. Taken in conjunction with the resultant improvement to the prospects for the long-term future use of the building, on balance, the benefits that will be derived from the revised proposal will outweigh the substantially reduced impact on the setting of the listed building, such that the magnitude of impact on the cultural significance of the listed building might reasonably be adjusted to Slight/Moderate beneficial. Programme of enhancement measures to offset adverse impact including – Improving access to the interior of the Aviva building to allow appreciation of the qualities for which the building was listed. This will be facilitated through a number of guided tours specific to the cultural heritage and architecture of the building. In addition, an annual fund of £1000 to support archaeological research in Perth and Kinross.	

Ecology	The Proposed Development is considered to represent a Medium level impact, which represents a Major adverse effect on a receptor of regional value (bat species) and therefore potentially significant in EIA terms	Mitigation is proposed following the methodology detailed in NatureScot guidance (2021), which states that there is evidence that bat casualties at wind farms are reduced by pitching the blades out of the wind ("feathering") to reduce rotation speeds below 2 rpm while idling.	Not significant
Shadow Flicker	Two buildings (Aviva and the Sports Centre, currently vacant) have the potential to be exposed to more than 8 hours of shadow flicker per year.	If required a shadow flicker delimiter can be installed to reduce the level of shadow flicker at the receptors.	Not significant
Infrastructure	There is potential to affect microwave links operated by Arqiva and the JRC.	Discussion is ongoing regarding potential mitigation	Not significant
Socio-economic	Moderate (beneficial) economic impact for Aviva, and consequently the local economy.		Significant (Beneficial)

13.3 Schedule of Commitments

13.3.1 The following commitments have been made should the proposal be granted planning permission.

Table 13.2 – Schedule of Commitments

Topic Area	Commitment
Construction	Construction Method Statement – to contain details of the proposed and agreed working practice to be adopted on site for all construction activities.
Construction	Construction Environment Management Plan - to incorporate detailed pollution prevention and mitigation measures for all construction elements potentially capable of giving rise to pollution during all phases of construction and reinstatement after construction.
Landscape	Landscape Plan – Landscape screening proposal to minimise close range visual effects.
Cultural Heritage	Programme of enhancement measures, including specific cultural heritage/archaeology tours and an annual fund for archaeological research.
Ecology	If deemed appropriate feathering of the blades will be undertaken whilst idling to reduce any impact on bats.
Shadow Flicker	If deemed appropriate a shadow flicker delimited will be installed.

Infrastructure	If deemed appropriate a mitigation solution will be agreed with the JRC regarding any potentially affected microwave links.
Socio-economic	A community fund is provided that will equate to a minimum of £5,000 per annum for the lifetime of the proposed development.

13.3.2 Aviva is proposing a community benefits package linked to the wind turbine which will provide at least £5,000 per year over the 25 year lifetime of the proposed development. The proposed community fund is a voluntary contribution and not a material planning consideration, it is a factor that is taken into account in the EIA and has been assessed to have a minor/moderate (positive) significant effect depending on how the local community decides the fund can best serve their area.

13.4 Summary and Conclusion

13.4.1 The identification of potential positive and negative impact of a proposed development is at the heart of the EIA process. The process of reduction of adverse environmental impacts is considered through-out the design process.

13.4.2 It should be noted that by definition all EIA projects are likely to have significant environmental effects, and this does not mean that the impact of the proposed development, as a whole, is significant in the context of the EIA regulations.

13.4.3 The proposed development will give rise to significant benefits, both in terms of supporting measures to tackle climate change, implementing Scottish Government Policy and in terms of the local economy. Significant weight should be applied to these benefits in the determination of the planning application.

13.4.4 The proposed development would give rise to some localised significant effects, in EIA terms, upon the setting of the listed building and improving the prospects for the long-term future use of the building. In addition, there will be an opportunity to improve access to the Aviva Building to allow appreciation of the internal qualities for which the building was listed.

13.4.5 The proposed development as a whole will only give rise to localised significant effects upon the receiving environment, in close proximity to the turbine. It is clear from this assessment therefore that the proposal, subject to certain mitigation measures which can be secured by planning conditions, will comply with the provisions of the development plan.