DUNBEG SOUTH WIND FARM

Environmental Statement

Volume 1 - Non-Technical Summary

power for good

Table of Contents

Figures

Preface

This document is Volume 1 of the ES. The ES comprises:

- Volume 1: Non-Technical Summary (NTS)
- Volume 2: Main Report
- Volume 3: Figures (Maps & Illustrations)
- Volume 4: Technical Appendices

The aim of the NTS is to summarise the content and main findings of the ES in a clear and concise manner to assist the public in understanding what the environmental effects of the Dunbeg South Wind Farm are likely to be. The full ES provides a more detailed description of the Development and the findings of the Environmental Impact Assessment (EIA) process.

The ES has been prepared by RES in consultation with Causeway Coast & Glens BC, various consultees and in collaboration with the subject specialists outlined below.

Specialism	**Author**
Introduction & Planning Policy; Proposed Development (including Electromagnetic Interference and aviation); Design Evolution & Alternatives; Noise; Transport and Shadow Flicker;	RES
Landscape and Visual	Shanti McAllister Landscape Planning & Design
Archaeology and Cultural Heritage	Gahan and Long
Ecology	Blackstaff Ecology
Ornithology	David Steele
Fisheries	Paul Johnston Associates
Geology and Water Environment *Peat Slide Risk & Peat Management Plan*	McCloy Consulting *Natural Power*
Socioeconomics	Oxford Economics

Commenting on the ES

The full ES, together with supporting documents submitted as part of the planning application (Design and Access Statement and Pre-Application Community Consultation Report) will be available (and CD copies available free of charge) for viewing during normal opening hours at the address below:

Viewing Location	Address
Limavady Library	5 Connell Street Limavady County Londonderry BT49 0EA Phone: 028 7776 2540

An electronic version of the reports supporting the application, including the ES, will be available to download free of charge from http://www.dunbegsouth-windfarm.co.uk

Copies of the ES can be obtained at a cost of £50 from the address below:

RES Ltd
Willowbank Business Park
Willowbank Road
Millbrook
Larne
BT40 2SF
Email: garth.mcgimpsey@res-group.com
Phone: 028 2844 0580

1. Introduction

1. This Non-Technical Summary (NTS) has been prepared in support of a planning application by RES Ltd for the proposed Dunbeg South Wind Farm, hereinafter referred to as 'the Development', which is located approximately 6 km north east of Limavady, County Derry/Londonderry.

2. A planning application has been submitted to Causeway Coast & Glens BC in accordance with the Planning (Environmental Impact Assessment) Regulations, 2017. The regulations require an Environmental Impact Assessment (EIA) to be carried out and the results of the EIA to be included in an Environmental Statement (ES) to accompany the planning application. The application follows a detailed assessment of the environmental and technical aspects of the site's suitability for development.

3. The Development comprises 9 three-bladed, horizontal axis wind turbines, each up to a maximum of 149.9 m to tip height, with a total installed capacity of up to 29.7 MW. The Development would include a newly created site entrance, access tracks, crane hardstandings, control building and substation compound, electricity transformers, underground cabling, energy storage containers and drainage works. During construction there would be a number of temporary works including a construction compound with car parking, temporary parts of crane hardstandings and welfare facilities. The proposed layout is illustrated in **Figure 2: Infrastructure Layout**.

4. Final wind farm capacity will vary depending on the outcome of planning permission and the turbine type selected. It is estimated that the wind farm could meet the needs of around 23,000 homes[1]. This is equivalent to 41.2 percent of the housing stock in Causeway Coast and Glens District Council area.

The Applicant

5. RES is one of the world's leading independent renewable energy project developers with operations across Europe, the Americas and Asia-Pacific. At the forefront of renewable energy development for over 30 years, RES has developed and/or built almost 12,000 MW of renewable energy capacity worldwide. In the UK alone, RES currently has more than 1,000 MW of projects either constructed, under construction or consented. RES is active in a range of renewable energy technologies including onshore and offshore wind, solar, as well as enabling technologies such as energy storage.

6. RES has developed 16 onshore wind farms in Northern Ireland totalling 229 MW, which equates to 36% of Northern Ireland's onshore wind capacity. RES currently

[1] This has been calculated by taking the predicted annual electricity generation of the site (based on RES assessments has a predicted capacity factor of 36% - based on a 3.3MW turbine) and dividing this by the annual average electricity figures from the Department of Business, Energy and Industrial Strategy (BEIS) showing that the annual UK average household consumption is 3,994 kWh – November 2016.

operates over 83 MW of wind capacity across Northern Ireland, has secured planning permission for a further 112 MW awaiting construction and has 92 MW in the planning system.

The Application Site

7. There are a number of key technical and environmental factors that influence the suitability of a site for a wind farm. The following are key attributes that contribute to a viable site, which the application site possesses:

- Good wind speeds
- A site which complies with planning policy and in particular, avoids unacceptable effects on areas designated by statutory agencies; maintains appropriate distances from dwellings to avoid unduly impacting local amenity and; avoids impeding or interfering with major electromagnetic transmission and airport communication systems
- Sufficient area to accommodate the number of wind turbines required for economic viability
- Adequate vehicular access for wind turbine components (abnormal loads)
- Suitable terrain and topography, which affect wind flow across a site and need to be considered in relation to turbine performance, specification and life-span
- Suitable ground conditions for the construction of wind turbine foundations, erection of the machines and the provision of access tracks and cables.

8. The Site is positioned on a north facing slope below Keady Mountain in the south eastern part of the Binevenagh Area of Outstanding Natural Beauty (AONB). The Site is bounded by Broad Road (A37) to the north which is part of the primary road network linking the towns of Limavady and Coleraine.

9. The Site is currently used for rough sheep and cattle grazing and primarily comprises improved agricultural land, wet marshy grassland with areas of wet heath and blanket bog on the upper slopes. The lands are dissected by several deeply incised water channels. The Site is open and exposed to the west but is bounded to the east by Springwell Forest with further areas of coniferous forestry to the south.

The Need for the Development

10. A key policy driver for the development of renewable energy in Northern Ireland is the need to increase security of supply. There are also potential adverse impacts on local populations and the economy through high volatile fuel costs, contributing to fuel poverty and high energy costs for businesses and industry. In addition, increasing focus on renewable energy can deliver environmental and climate change gains, reductions in carbon emissions, as well as investment and employment opportunities. With a lack of indigenous fossil fuels and no nuclear power stations, Northern Ireland is keen to develop the full range of its available renewable energy resources to optimise the contribution that renewables make to the overall energy mix.

11. Northern Ireland's current renewable energy target is that 40% of electricity consumption should be met from renewable sources by 2020 (DETI 2010). The 40% target is the equivalent of 1600 MW. Wind energy will be the main focus of renewable electricity development on the island of Ireland, and certainly in Northern Ireland, through to 2020.

12. If approved, the Development could account for up to 29.7 MW, a material contribution to achieving the 40% renewable energy target for 2020. This is the equivalent of approximately 23,000 homes.

2. Description of the Development

13. The main elements of the Development are as follows:

- 9 three-bladed horizontal axis wind turbines of up to 149.9 m tip-height
- Turbine foundations
- Hardstanding areas at each turbine location for use by cranes erecting and maintaining the turbines
- Electricity transformers
- Approximately 3.5 km of new access track and 1.1 km of upgraded access track
- Wind farm substation compound containing a control building
- Energy Storage Containers
- On-site electrical and control network of underground (buried) cables
- Connection from the substation to the local grid network
- Temporary construction compound
- Permanent and temporary drainage works
- Associated ancillary works
- New site entrance from the public road.

14. The wind farm layout is shown in **Figure 2: Infrastructure Layout**.

15. The actual area of permanent land take is limited to the control room and substation compound, energy storage area, wind turbine towers, permanent crane hardstandings and on-site access tracks, which collectively account for approximately 4.4 ha, which is approximately 10.3% of the area within the planning application boundary. In addition there will be an estimated 0.7 ha of hardstanding required on a temporary basis during construction.

16. Prior to construction the locations of the proposed wind turbines would be subject to micrositing, which allows for a small degree of flexibility in the exact locations of turbines and routes of tracks and associated infrastructure (50 m deviation in plan from the indicative design). Any repositioning would not encroach into environmentally constrained areas. Therefore, 50 m flexibility in turbine positioning would help mitigate any potential environmental effects: e.g. avoidance of unfavourable ground conditions or archaeological features not apparent from current records. The micrositing allowance has been taken into account in the EIA.

Wind Turbines

17. The wind turbine industry is evolving at a remarkable rate. Designs continue to improve technically and economically. The most suitable turbine model for a particular location can change with time and therefore a final choice of machine

for the Development has not yet been made. The most suitable machine will be selected before construction, with a maximum tip height of 149.9 m.

18. For visual and acoustic assessment purposes, the most suitable candidate turbine available in the market place (currently of 3.3 MW nominal capacity and with an overall tip height of 149.9 m) has been assumed. Exact tower and blade dimensions vary marginally between manufacturers. A diagram of a typical 149.9 m tip height turbine is given in **Figure 3: Typical Wind Turbine Elevation**.

19. It is proposed to install infrared lighting on the turbines in a pattern that is acceptable to the Ministry of Defence (MoD) for aviation visibility purposes. Infrared lighting allows military aircraft with night vision capability to detect and avoid wind farms. Infrared lighting cannot be detected with the naked eye, thereby reducing visual impact.

20. Each turbine would have a transformer and switchgear. Depending on the turbine supplier, the transformer and switchgear may be located inside or outside each turbine.

21. The wind turbines would be erected on steel re-enforced concrete foundations. During the erection of the turbines, crane hardstanding areas would be required at each turbine base consisting of both permanent and temporary elements. After construction is complete, the temporary crane pad areas will be reinstated.

Site Tracks

22. A new site entrance is proposed in the central portion of the site on the northern boundary with access off the Broad Road.

23. Approximately 3.5 km of new access tracks and 1.1km of upgraded access tracks are required within the site to enable the turbine components and construction materials to be transported to their locations, and to enable ongoing access during the operational period for maintenance visits.

24. The on-site access track layout has been designed to minimise environmental disturbance by utilising existing track locations and avoiding sensitive habitats where possible whilst keeping the length of track commensurate with the minimum required for operational safety. The track route takes cognisance of the various identified environmental constraints.

25. Seven watercourse crossings will be required as part of the track layout. These crossings would be designed to ensure that fish and mammal movements are not restricted, in addition to ensuring the crossing size is adequate for potential flood flows. Indicative locations are shown on **Figure 2: Infrastructure Layout**.

Electrical Connection, Control Building & Substation and Energy Storage

26. Assuming the use of the currently available models, each wind turbine would generate electricity at 690 V and would have an ancillary transformer located either within or outside the base of the tower to step up the voltage to the

required on-site distribution voltage. Each turbine would be connected to any adjacent turbines by underground cables.

27. The wind farm control building and substation is proposed to be located on the eastern part of the site as shown in **Figure 2: Infrastructure Layout**. All power and control cabling on the wind farm will be buried underground in trenches located, where possible, along the route of site access tracks.

28. The control building will be designed and constructed to the standard required by NIE for the accommodation of substation equipment. Where possible, local building materials and finishes will be used to ensure that the appearance is in keeping with other buildings in the area. The building will be staffed by maintenance personnel on a regular basis.

29. Four permanent containers housing an energy storage device, inverters and other ancillary equipment will be positioned adjacent to the control building and substation compound on hardstanding used originally for the temporary construction compound. These units are a means of storing electrical energy just like a rechargeable battery, cell phone or electric car. These are means by which power can be stored and released. The application is of course of a larger scale but the basic principle is the same.

Construction Management

30. A Construction and Decommissioning Method Statement (CDMS) will be prepared once planning consent has been gained. This will be submitted to Causeway Coast & Glens BC prior to any construction works taking place. This will describe the detailed methods of construction and working practices, work to reinstate the site following completion of construction activities and methods to reinstate the site post operation. The CDMS will:

- provide a mechanism for ensuring that measures to prevent, reduce and where possible offset potentially adverse environmental impacts identified in the ES are implemented;
- ensure that good construction practices are adopted and maintained throughout the construction;
- provide a framework for mitigating unexpected impacts during construction;
- provide a mechanism for ensuring compliance with environmental legislation and statutory consents;
- provide a framework against which to monitor and audit environmental performance.

31. The wind farm drainage system will be designed to mimic natural conditions to mitigate against increased flashiness in water courses and reduced groundwater recharge. The drainage system will protect the status of water courses and ground waters.

32. Construction will be carried out according to Department of Agriculture, Environment & Rural Affairs (DAERA) and Construction Industry Research and Information Association (CIRIA) guidance for site works. Pollution control measures during the construction phase will be included in the CDMS.

33. It is anticipated that the construction would take 18 months. Construction work will take place between the hours of 0700-1900 Monday to Friday and 0700 – 1300 on Saturdays. Outside these hours, work at the site shall be limited to turbine erection, testing/commissioning works and emergency works. Deliveries may occur outside these times to minimise disruption to local residents.

34. A programme of reinstatement would be implemented upon completion of construction. This would relate to the construction compound, temporary areas of the crane hardstandings, cable trenches and track shoulders where appropriate. There remains a potential to use cranes during the operational phase of the Development, therefore the main crane hardstanding will remain uncovered.

Operation

35. The expected operational life of the Development is 30 years from the date of commissioning. Wind turbines and wind farms are designed to operate largely unattended. Each turbine would be fitted with an automatic system designed to supervise and control a number of parameters to ensure proper performance (e.g. start-up, shut-down, rotor direction, blade angles etc.) and to monitor condition (e.g. generator temperature). The control system would automatically shut the turbine down should the need arise. Sometimes the turbines would re-start automatically (if the shut-down had been for high winds, or if the grid voltage had fluctuated out of range), but other shut-downs (e.g. generator over temperature) would require investigation and manual restart.

36. The Development itself would have a sophisticated overall Supervisory Control and Data Acquisition system (SCADA) that would continually interrogate each of the turbines and the high voltage (HV) connection. If a fault were to develop which required an operator to intervene then the SCADA system would make contact with duty staff via a mobile messaging system. The supervisory control system can be interrogated remotely. The SCADA system would have a feature to allow a remote operator to shut down one or all of the wind turbines. This is monitored 24 hours a day, 7 days a week.

37. An operator would be employed to operate and maintain the turbines, largely through remote routine interrogation of the SCADA system. The operator would also look after the day-to-day logistical supervision of the Development and would be on-site intermittently.

38. Routine maintenance of the turbines would be undertaken approximately twice yearly to ensure the turbines are maintained to Industry Standard. This would not involve any large vehicles or machinery.

39. A Habitat Management Plan will be implemented during the construction and operational phases of the Development, working with the site landowners, which will provide for the restoration and enhancement of currently degraded blanket bog and wet heath habitats on site.

Decommissioning

40. One of the main advantages of wind power generation over other forms of energy production is the ease of decommissioning and the simple removal of components from the site. The residual impact on the site is limited to the continued presence of the foundations and access tracks. All above ground structures can be removed from the site.

41. If the Development obtains planning approval it is expected that a planning condition would be set to provide for the decommissioning of the site in accordance with a scheme agreed in writing with Causeway Coast & Glens BC.

42. The Development will be decommissioned in accordance with best practice and/or in compliance with any planning conditions. Current best practice includes the removal of all above ground structures; the removal of all underground structures where required; and reinstatement of disturbed areas all of which will be subject to any necessary consents. Consideration will be given to the retention of wind farm access tracks if they utilise pre-existing farm infrastructure or are not located on sensitive habitats if such continued use could lead to the long term degradation of these habitats.

3. The Environmental Impact Assessment (EIA) Process

43. The purpose of EIA is to provide adequate environmental information to enable stakeholders to understand the potential environmental effects of a project. The EIA identifies and assesses the potential environmental effects associated with the construction, operational and decommissioning of the Development. The assessment and potential effects are recorded in the ES.

Consultation

Public Consultation

44. RES is committed to finding effective and appropriate ways of consulting with all its stakeholders, including local residents and community organisations, and believes that the views of local people are an integral part of the development process. RES began the engagement process with the local community eight months prior to the submission of the planning application, to facilitate a constructive consultation process which helped RES to understand and address any concerns as the project developed.

45. A public exhibition was held in August 2017 which included detailed information about the proposals, including: a map of the proposed layout; photomontages representing how the proposed layout would appear from a range of viewpoints; Zone of Theoretical Visibility (ZTV) drawings. (A ZTV is a map-based diagram of where and how many wind turbines, or wind farms, would theoretically be visible from all parts of a given area.) RES staff were available to answer questions and feedback was encouraged.

46. A Pre-Application Community Consultation (PACC) Report has been produced and is available for viewing at the location listed in Section 1 of this NTS.

EIA Consultation

47. RES and the various chapter authors have undertaken pre-application consultation with relevant consultees, which has informed the EIA process and is detailed in each of the technical chapters within the Volume 2 (Main Report) of the ES.

Wind Farm Design Evolution & Alternatives

48. In accordance with EIA process and best practice the project team employed an iterative approach to the design of the Development. The design evolved throughout the EIA process as different constraints and adverse/ beneficial effects were identified and evaluated. This approach allowed mitigation measures to be integrated into the design in order to alleviate or remove significant effects of the proposed development. It also allowed measures to enhance beneficial effects of the proposed development to be incorporated into the design.

49. Following consultation and baseline characterisation of the Site, the following key topics were identified:

- Landscape and visual
- Archaeology and cultural heritage
- Ecology
- Ornithology
- Fisheries
- Geology and water environment
- Noise
- Shadow flicker
- Traffic and transport.

50. The topics listed above were considered through the design with the aim of designing out significant effects. Where it was not possible to mitigate by design, the issues were considered further as part of the EIA.

51. A key tool in this process was the combined constraints drawing, which identifies constraints to development and sensitive features on the site. This drawing was iteratively updated as new information from surveys, site visits and consultation was received.

Turbine Layout Evolution

Landscape & Visual

52. A landscape consultant was involved throughout the design process to provide advice regarding the scale of the development and turbine height.

53. RES began the development process by identifying 21 potentially suitable turbine locations on this site. These locations were chosen by correlating on-site constraints such as hydrology, ecology and ground conditions with off-site constraints such as aviation. Next, a feasibility appraisal was carried out to identify the key landscape and visual issues that would need to be considered if a wind farm were to be proposed on this site. This included a preliminary analysis of the site in its wider landscape context, including its location within the Binevenagh AONB and its proximity to other wind farms, particularly the adjacent cluster of existing, consented and proposed wind farms at Dunbeg and Dunmore.

54. Following the feasibility appraisal a number of potential turbine layouts and dimensions were considered in order to further refine the layout and its potential landscape and visual effects on the Study Area. This included the consideration of variable turbine heights (125 – 149.9m), the relocation of turbines to minimise visibility on the summit of Keady Mountain and to create a good visual relationship between the Development, the adjacent Dunbeg cluster, and other cumulative wind farms in the wider Study Area.

55. The 9-turbine option that is presented in the EIA is the result of this iterative design process. A series of comparative diagrams have been presented as part of this LVIA to illustrate the relocation and reduction in the number of proposed turbines in order to present a Development that is deemed to be acceptable in EIA and LVIA terms.

56. Comparative wirelines illustrate that the discernible difference in visual effects between turbines with 149.9 m and 125 m tip heights would be negligible but the reduction in the overall number of turbines and the wider spacing between the final turbines that are proposed has resulted in a number of benefits, namely:

- There are few instances where 'stacking' of turbines occurs. Stacking is where two or more turbines will appear directly in front of each other in a view and will therefore result in a 'heavier' or more solid, and hence more prominent appearance;
- The turbines can be more evenly spaced in relation to each other and to the site topography which has resulted in a simpler layout with fewer variations in tip heights in relation to contour AOD levels;
- A reduction in the proposed number of turbines means that the Development can remain clear of the summit of Keady whilst also remaining contained in the saddle of land between Keady and Binevenagh, thus minimising visual effects on the AONB and the sequence of views along the Binevenagh range of uplands, particularly when viewed from the west;
- A greater amount of space could be created between the Development and the Dunbeg cluster of wind farms so that differences in turbine heights are less noticeable and are not visually jarring.

57. The comparative ZTV (Figure 4.11) indicates no areas of theoretical visibility of the final 9-turbine layout (149.9 m tip height) beyond any theoretical visibility that would have occurred with the 21 potential turbine locations that were initially considered with 125 m blade tips or with the refined 14-turbine layout using turbines with tip heights of 134.9 m - 149 .9 m. This layout would have resulted in theoretical visibility across 61.1 % of the Study Area whereas the final layout results in theoretical visibility across 58.18 % of the Study Area.

Environmental Constraints & Assessments

58. Following baseline surveys, the combined constraints drawing incorporated the following, which are shown in **Figure 4: Combined Constraints and Infrastructure**:

- The hydrology consultant recommended watercourse buffers of 50 m and 10 m depending on the sensitivity of the watercourse, which were agreed as appropriate by the fisheries consultant. Upstream abstraction constraints were added to identified private water supplies;
- A 50m buffer was applied to Ground Water Dependent Terrestrial Ecosystems, which were identified through the baseline survey;

- A 25 m buffer was applied to badger setts, which was identified through the baseline survey;
- Bat buffers of 36 m and 65 m were added to major watercourses and forestry edge respectively, as advised by the ecological consultant. The 36 m and 65 m distances are in plan, and achieves a 50 m buffer between the blade tip and the habitat feature, in line with Bat Conservation Trust guidance.
- 165 m buffers were applied to nearby public roads in line with the Best Practice Guidance to PPS18 which recommends a set-back distance of at least tip height plus 10% between turbines and roads.

59. In addition, the lower slopes are enclosed by a fence line that runs broadly west to east and contains extensive linear drainage, overgrazing by sheep and cattle, and historic peat harvesting. To the south of this fenceline there are areas of upland blanket bog present with the best examples of this habitat located on the plateau of the site. As this habitat is of greatest conservation value on site, it was considered that these that these areas should be avoided in their entirety as recommended by the ecology consultant.

60. Baseline peat probing indicated that peat depths were predominantly shallow (>80% probes were between 0.0 – 0.5m deep) and areas of peat depth greater than 2 m were avoided to limit excavation and spoil generation.

61. Before the turbine layout could be confirmed, noise and shadow flicker assessments were carried out. Both assessments conclude that there would be no significant effects on any surrounding residential properties.

62. The final turbine layout consists of 9 turbines of 149.9 m tip height.

Infrastructure Design Evolution

63. The infrastructure design evolved through the EIA process. The following principles were taken into consideration when designing the supporting infrastructure:

- Avoidance of environmental and technical constraints;
- Design of the track layout to utilise existing track locations and follow natural contours as far as possible, in order to avoid unnecessary amounts of excavation;
- Minimisation of the overall length of access track;
- Minimisation of the number of watercourse crossings, as far as possible;
- Avoidance of steep slope areas to minimise earthworks;
- Incorporation of measures to improve the visual appearance of the scheme, including reinstatement of temporary infrastructure following the construction period;
- Use of bottomless culverts at two watercourse crossing locations following the advice of the fisheries and water environment consultants.

Environmental Effects

64. The following sections summarise the technical chapters of the ES. The term 'Site' refers to the Preliminary Site Boundary of the wind farm, which is shown in **Figure 1: Site Location**, which is a larger area than the final planning application boundary, which is shown in **Figure 2: Infrastructure Layout**.

Landscape and Visual

65. The Landscape and Visual Impact Assessment (LVIA) methodology was specifically developed for wind farm development in Northern Ireland in accordance with best practice guidance. The LVIA considered a 30 km radius Study Area and involved a combination of existing desktop information (maps, planning policy and existing landscape character assessment documents), detailed site surveys of the Study Area and computer modelling.

66. Potential landscape and visual effects were assessed as separate but linked issues. The magnitude of landscape effects was derived from the extent to which physical changes cause changes in landscape character and value. Visual effects relate to changes in the composition of views and people's perception of/responses to these physical changes. Viewers / visual receptors include local residents, tourists, walkers, farmers, general road users etc.

67. For both landscape and visual effects the Significance of effect was derived from the assessment of Landscape Value, Sensitivity and Magnitude of change and also by using objective professional judgement in relation to site circumstances.

68. An assessment was carried out of the potential cumulative effect arising from the Development in combination with other wind farm developments, including operational, consented and proposed projects. In accordance with GLVIA[2] best practice guidelines existing and consented wind farms are considered to be part of baseline landscape and visual character as well as in the cumulative assessment. The assessment of effects of the Development takes consideration of their presence, or anticipated presence.

69. The Development is located in the south eastern part of the Binevenagh AONB and within the Binevenagh Landscape Character Area (LCA) and a detailed description is included within Chapter 4.

70. Although the Development is not located within the core of the Binevenagh AONB it is recognised that the proposal is within the AONB and that the site has merit in terms of its contribution to the landscape and visual character of the wider AONB. The layout and position of the Development has, therefore been designed to minimise its effect on the AONB as a whole. This has been achieved by locating it

[2] The Landscape Institute and Institute of Environmental Management and Assessment (April 2013) 'Guidelines for Landscape and Visual Impact Assessment 3rd Edition'

away from the core area containing the majority of visitor attractions and iconic landscape features. It is also in a location that is closely related to existing wind turbines, and that is neither highly visible from the rest of the AONB nor from other parts of the Study Area with good views to the core part of the AONB. These are considered to be the summit / escarpment of Binevenagh and the lowlands to the north of this escarpment.

71. The Development reinforces the existing character of the site and immediately adjacent landscape and is less detrimental to the overall landscape character of the AONB than forestry or quarrying because it will not have permanent presence. Whilst forestry and quarry both leave permanent marks on the landscape, wind farms are considered to be long term temporary rather than permanent developments which will ultimately be removed and the sites reinstated back to their previous uses.

72. The site of the Development does not contribute significantly to the iconic value attributed to the summits and escarpments in the Binevenagh AONB. Neither does it contain significant visitor amenity facilities that are likely to attract the most sensitive receptors – the main tourist attractions and scenic routes are generally located to the north overlooking the coast.

73. The overall conclusion of the LVIA is that the landscape effects on the Binevenagh LCA, in which the Development is located are Not Significant due to the Development's location within the same part of the landscape as the Dunbeg cluster of wind farms, and the presence of other human factors that strongly influence the landscape character.

74. The ZTV diagrams indicate that, within a 30 km radius, theoretical visibility of the Development would cover less than 59% of the Study Area. This percentage does not take into account the screening effects of trees and buildings etc. Therefore actual visibility would be lower.

75. The effect of the drumlin topography in farmland in the eastern part of the Study Area is indicated by patchy areas of visibility. The largest and most uninterrupted areas of theoretical visibility occur around the flat coastal areas to the west of the Development – Magilligan and the Roe Valley, and in the sea and Lough Foyle estuary to the north and north-west. However, detailed site assessment indicates that built development and vegetation cover in these parts of the Study Area are likely to screen many low-lying views. The Development is also likely to be difficult to discern with the naked eye in long distance views particular from low level viewpoints where its scale will be diminished by the scale of wider views. There will be very few visual receptors present on the sea and their distance from the Development, combined with their low elevation in relation to the land, is likely to mean that the Development will not be a clearly discernible feature in their views.

76. The ZTV diagrams indicate that there are very few parts of the Causeway Coast and Sperrin AONBs that are likely to have view of the Development and the northern

half of the Binevenagh AONB, including the summit of Binevenagh, will either have no views or views of the Development that are limited in their extent.

77. Of a total of 27 viewpoints representing typical levels of visibility throughout the study area, three viewpoints, which are all close range viewpoints, were assessed as being significantly affected. The remaining 24 viewpoints were assessed as experiencing No Significant visual effects.

78. In terms of cumulative landscape effects the Development was not deemed to have a significant effect on the receiving landscape. Clusters of wind farms located on these upland areas are a relatively common landscape characteristic but there are sufficient separation distances between these clusters to ensure they are not the dominant characteristic. This is in accordance with general advice provided in the SPG that elevated upland landscapes can accommodate larger turbines and the broader the upland the greater the capacity. Larger horizons tend to diminish the perception of height. In this Study Area the fact that many viewpoints are elevated in nature means that very broad panoramic views occur frequently and, from certain directions / in certain viewpoints, often incorporate both simultaneous and sequential views of several clusters of wind farms. The Development would increase the size of the Dunbeg cluster of wind farms but would not decrease its separation distances with other clusters of wind farms in the Study Area. Neither would it encroach onto elements of the landscape that are not already characterised by wind farm development or other man-made features.

79. Of the 27 viewpoints only one is judged to experience significant cumulative visual effects on views. This is a close range view on a tertiary road where the primary visual receptors would be residents of properties and where views towards the existing Dunbeg cluster are screened by woodland along the Curly River corridor. The remaining 26 viewpoints are deemed to experience no significant cumulative visual effects.

80. All policy documents (the SPPS, PPS 18 and its best practice and supplementary guidance) recognise that wind farms may be prominent elements in close range views but that this does not necessarily equate to unacceptable development. Taking into account that only three of the 27 viewpoints assessed as part of the LVIA are deemed to experience significant visual effects, and that no significant landscape effects have been identified, the LVIA concludes that the Development is acceptable in landscape and visual terms.

Archaeology and Cultural Heritage

81. An Archaeological & Cultural Heritage impact assessment was conducted for the Development. The purpose of this was to identify the archaeological potential of the Site, assess the impact of the Development upon this and to assess the impact on known archaeological monuments in the wider landscape.

82. Following consultation with the Department for Communities: Historic Environment Division (DfC: HED), it was agreed that a 5 km search radius for the desktop survey would be adequate to provide a comprehensive assessment of the Development.

83. Further to this, it was agreed to consider all state care/scheduled monuments and historic gardens within 10 km for potential visual analysis. Preliminary analysis of potential inter-visibility between regionally important monuments and the Development identified a number of monuments which may require further in-depth analysis. Further discussions with DFC:HED established the scope of this analysis.

84. The desk top survey and site inspection identified 6 known monuments within the area of land ownership and an additional 80 known archaeological monuments within the 5 km search radius. Of the monuments located within the Site, only LDY 10:21 will be directly affected by the Development. This monument consists of a number of early field systems and hut circles which extend over a relatively large area in the north western section of the Site. The full extent of this monument is not known but it is believed to cover approximately 900m x 800m. It is likely that the infrastructure for turbines T1, T2 and T3 and possibly the turbine bases themselves will come into some contact with elements of this monument. Should this occur, the construction of the proposed development would result in a partial or minor loss of some elements of the baseline conditions of the monument. Any effect this would have on the monument would be significantly reduced through the implementation of the recommended mitigation strategy.

85. A site inspection of the wind farm Site was also conducted. This identified no evidence of any previously unknown archaeological monuments within the Site.

Visual Impact Analysis

86. For visual impact analysis, a 10 km search radius was used to identify monuments of regional importance and listed buildings. A total of 40 regionally important monuments, 4 historic gardens and 15 historic buildings were identified. Through the use of ZTV mapping, wireframe production and site inspections it was established that only twelve monuments and one historic garden would be potentially inter-visible with the Development.

87. Consultation with DFC:HED was conducted to establish which of these would require further analysis. The assessment found that the introduction of the Development into the local landscape will have a negligible-slight effect upon their setting.

88. Given the presence of the known monuments within the proposed application boundary and the extent of archaeological sites within the wider area, a mitigation strategy was recommended for the construction phase. The aim of this is to identify any potential archaeological deposits uncovered during the construction phase of the project.

89. An assessment of cumulative impacts on the archaeology and cultural heritage of the area was undertaken, and it was concluded that there will be no significant effects.

Ecology

90. The study methodology for the Ecological Impact Assessment included both desktop and field survey methods in order to assess the potential impact on local ecological and nature conservation interest. The purpose of an ecological survey is to identify 'valued ecological receptors', those species and habitats that are valued in some way for their ecological function, their contribution to biodiversity or are protected by specific legislation. The following specialist surveys were undertaken during 2016/2017 on the site including suitable buffer zones:

- Habitats
- Bat survey
- Otter survey
- Badger survey
- Common Lizard survey
- Smooth Newt habitat survey
- Marsh Fritillary butterfly habitat survey
- Argent & Sable moth habitat survey

91. Features of conservation interest and importance were recorded and their locations were one of the key criteria that affected the wind farm layout. The location of the wind farm infrastructure avoids habitats and species of conservation interest where possible, and where this was not possible, mitigation and/or enhancement measures have been incorporated into the design to balance any detrimental impact.

92. The principal habitats on the site are extensive areas of purple moor-grass and rush pasture within a mosaic of semi-improved grassland, wet heath and poor fen. Upland blanket bog is also present within the (preliminary) site boundary (on the southern plateau) but none lies within the Planning Application Boundary. Overall, the habitat of greatest conservation value, the blanket bog, has been avoided.

93. Ecological constraints determined from extensive site surveys have been used to evolve the layout and design of the Development. The impact assessment is therefore based on a wind farm design that already includes a number of important mitigation measures.

94. A series of generic and specific mitigation measures including a Peat Management Plan and a Habitat Management Plan have been proposed to mitigate effects on wet heath vegetation.

95. The Development will result in permanent habitat loss of 6.9 hectares (ha) and temporary habitat loss of 3.3ha, largely comprising purple moor-grass & rush pasture (PMGRP) and wet (dwarf shrub) heath, although small areas of other

habitats will also be lost, such as acid grassland mosaic and poor semi-improved grassland.

96. The extent of habitat loss has been used to inform the prescriptions detailed in the Habitat Management Plan, including a commitment to establish at least twice the area lost for PMGRP and five times for wet heath (an NI Priority Habitat).

97. After implementation of the mitigation measures proposed in this chapter it is assessed that there would be no significant residual adverse effects on Northern Ireland priority habitats (wet heathland) as a result of the Development. Indeed, it is assessed that the Habitat Management Plan would deliver a net beneficial effect during operation by enhancing currently degraded wet heath habitats.

98. There is no recorded usage of the area by otter, marsh fritillary or argent & sable moth, therefore no impacts to these species is likely. Mitigation for the herpetofauna found on site (smooth newt and common lizard) is proposed. This involves the provision of artificial refugia and habitat management, as well as drift fencing and mowing/hand clearance during the construction phase. Badger setts found during survey have all been buffered by 25m. Ground Water Dependent Terrestrial Ecosystems (GWDTEs) have all been buffered by 50m.

99. The layout of the Development, in terms of the separation distance between the wind turbines and relevant features, and the maintenance of this throughout the lifetime of the wind farm, will ensure that any potential impacts to bats will be neutral. In conclusion, and based on current knowledge, this would appear to be a Site posing little risk to bats or bat populations, however a BMP has been recommended as a precaution.

100. Therefore, the potential effects of the Development on ecological receptors have been assessed and it is concluded that with the implementation of appropriate mitigation measures the effects would be reduced to a minor adverse or neutral effect that would not adversely affect the ecological integrity of the site and the wider area.

101. An assessment of cumulative impacts on the habitats and fauna of the area was also undertaken, and it was concluded that there will be no significant effects.

Ornithology

102. The ornithology impact assessment considered the potential effects of construction, operation and decommissioning of the Development on the following key bird communities:

- Breeding birds
- Wintering and migrating birds
- Raptors (birds of prey).

Vantage point surveys, breeding bird surveys and wintering bird surveys were carried out in the period 2015-2017.

103. The assessment was carried out with reference to published Scottish Natural Heritage (SNH) guidance on assessing the effects of on-shore wind farms on birds out-with conservation designated areas. All wild birds are subject to a general level of protection through the Wildlife and Countryside Act (Wildlife Order in Northern Ireland) and the EU Birds Directive but only some species should normally be of concern in relation to wind farms:

- Birds listed under Annex 1 of the EU Birds Directive
- Regularly occurring migratory species
- Birds listed under Schedule 1 of the Wildlife and Countryside Act (Wildlife Order)
- Birds listed under non-statutory lists of high conservation concern (red-listed birds).

104. Wind farms can potentially affect birds in two main ways: (1) by direct mortality of individual birds due to collisions, or (2) by indirect habitat loss due to displacement of birds from a zone around the turbines and other related infrastructure. Direct habitat loss from wind farms is usually relatively small scale compared to other types of developments and in most cases is unlikely to be significant.

105. For red grouse and for all passerine species it is extremely unlikely that any adverse effects would occur. For snipe, displacement of two breeding pairs is probable but the effect falls well short of being significant at the regional (Northern Ireland) level.

106. Collision risk for all raptor species which use the site on a regular basis has been estimated using the SNH Collision Risk Model. For hen harrier collision risk is predicted to be negligible. For kestrel and buzzard a small number of collisions is predicted to occur during the expected 30 year operational life of the wind farm, however when placed in the context of the very widespread distributions of both these species and also other relevant factors (discussed in the assessment) then it is extremely unlikely that the predicted collisions would have a significant adverse effect on the distribution and abundance of these species at the regional (Northern Ireland) level.

107. Current evidence also suggests that adverse effects of wind farms on birds are likely to be greatest during construction and that wind farm operation may have no significant effects on local bird populations. It is proposed that pre-construction bird surveys and an Ornithological Mitigation Strategy would be implemented by the Developer in order to avoid or mitigate any possible adverse effects due to construction.

108. In view of these key points, and assuming implementation of the proposed mitigation measures, it is concluded that the Development would not have any significant adverse effects on local bird populations or on the distribution and abundance of sensitive species at the regional (Northern Ireland) level.

Fisheries

109. The fisheries impact assessment outlines the potential effects of the Development on the fish stocks and fish habitats of the receiving watercourses in the Curly River and wider Roe catchment. It provides relevant baseline information on fisheries, gathered through desktop and field survey, enabling the potential effects to be identified and evaluated.

110. The survey has shown that the principal drainage stream (Stream C) is populated by brown trout throughout its course within the Site Boundary and downstream of the site to the Curly River. In addition, the connected section of the Curly River, approximately 1km downstream of the Site, is an important spawning and nursery area for Atlantic salmon and is also included as part of the Special Area of Conservation (SAC).

111. It has been determined that potential effects are primarily related to the sediment run-off to the receiving watercourses with related effects on fish stocks and their habitats. Although these impacts have the potential to be significant, a series of specific mitigation measures have been designed to avoid adverse effects on fisheries with regard to both the construction and operational phases of the project, including buffer zones around watercourses; good construction practice; the implementation of a Sustainable Drainage System (SuDS) and the use of bottomless culverts at the two most sensitive watercourse crossings.

112. It is concluded that, provided the mitigation measures are implemented as specified, construction and operation of the Development will have a neutral impact on the fish stocks and aquatic biology of the Curly River and the wider River Roe catchment. It follows that the Development will have no effect on the Atlantic salmon as the primary feature of the River Roe and Tributaries ASSI/SAC.

113. An assessment of cumulative impacts on fisheries interests of the area was also undertaken, and it was concluded that there will be no significant effects.

Geology and Water Environment

114. The impact assessment involved a combination of desk study, site visits and consultation with various bodies including Causeway Coast & Glens BC, Departments of Agriculture, Environment & Rural Affairs (DAERA), the Department of Cultural Arts and Learning (DCAL), Department of Infrastructure (DOI) and the Department for Economy (DOE). The impact assessment identifies the potential impacts on geology, hydrology and hydrogeology, including surface water, groundwater, abstractions, the potential for pollution of watercourses and flooding. It summarises the relevant legislation and guidance and provides appropriate baseline information, enabling the potential effects to be identified.

115. All on site water features drain into the Curly River. The Curly River is a sub-catchment of the designated River Roe and Tributaries SAC[3] and ASSI[4]. The Curly River joins the main branch of the River Roe 5.2 km to the west of the Site. The Roe River discharges into Lough Foyle 8.2 km to the north-west of the Site.

116. Aspects of the design, construction and operation of the proposed Development that may potentially impact on the receiving geological and water environment have been identified and the pathways for effects assessed. It has been determined that without mitigation the Development would be likely to cause adverse impacts of moderate significance primarily driven by the sensitivity of fisheries interests on and shortly downstream of the Site. As such, informed by the baseline assessment and pathways identified, mitigation integrated as part of outline design and proposed during construction phase includes:

- Avoidance of water features based on baseline constraints mapping;
- Design of site elements to minimise impact on the geological and water environment;
- Implementation of a comprehensive surface water management plan comprising the use of SuDS (drainage) and silt management in order to prevent pathways for pollution;
- Construction phase pollution prevention procedures in accordance with NIEA requirements and guidance.

117. Monitoring of the effect of the Development on the water environment and fisheries habitat will be provided through physicochemical and biological water quality monitoring. Implementation of the mitigation proposed eliminates or reduces the potential significance of effects to all receptors to “not significant”.

118. There is no likelihood of significant cumulative impacts over and above any pre-existing effect caused by existing or consented wind development.

Peat

119. A Peat Slide Risk Assessment (PSRA) was undertaken for the Development. The peat depths across the site are predominantly shallow (<1m) with areas of deeper peat avoided. Limited cover of superficial deposits highlights a low risk of mass movement. This is supported by British Geological Survey which does not highlight any mass movement across the site.

[3] Joint Nature Conservation Committee. (2015). Natura 2000 Standard Data Form - River Roe and Tributaries. Available from: http://jncc.defra.gov.uk/ProtectedSites/SACselection/n2kforms/UK0030360.pdf. [Accessed: 14/8/2017].

[4] Department of the Environment. (2005). Declaration of Area of Special Scientific interest at River Roe and Tributaries, County Londonderry. Article 28 of the Environment (Northern Ireland) Order 2002. Available from: https://www.daera-ni.gov.uk/sites/default/files/publications/doe/River-Roe-and-Tributaries-ASSI-citation-documents-and-map.pdf. [Accessed: 14/8/2017].

Noise

120. An assessment of the acoustic impact from both the construction and operation of the Development, was undertaken taking into account the identified nearest residential properties.

121. The operational noise impact was assessed according to the guidance described in the 'The Assessment and Rating of Noise from Wind Farms', referred to as 'ETSU-R-97', as recommended for use in relevant planning policy. The methodology described in this document was developed by a working group comprised of a cross section of interested persons including environmental health officers, wind farm operators and independent acoustic experts. It provides a robust basis for assessing the noise impact of a wind farm and has been applied at the vast majority of wind farms currently operating in the UK.

122. ETSU-R-97 makes clear that any noise restrictions placed on a wind farm must balance the environmental impact of the wind farm against the national and global benefits that would arise through the development of renewable energy sources. The assessment also adopts the latest recommendations of the Institute of Acoustics 'Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'.

123. Representative baseline conditions (the "background noise level") at nearby residential properties were established by undertaking noise surveys. These measured levels were then used to infer the background noise levels at other nearby residential properties as the ETSU-R-97 document recommends. As background noise levels depend upon wind speed, as indeed do wind turbine noise emissions, the measurement of background noise levels at the survey locations were made concurrent with measurements of the wind speed and wind direction. These wind measurements are made at the wind turbine site rather than at the survey locations, since it is this wind speed that will subsequently govern the wind farm's noise generation.

124. A sound propagation model was used to predict the noise levels due to the Development at nearby residential properties over a range of wind speeds, taking into account the position of the proposed wind turbines, the nearest residential properties, and the candidate wind turbine type. The model employed (which considered downwind conditions at all times) took account of attenuation due to geometric spreading, atmospheric absorption, ground effects and barriers. It has been shown by measurement based verification studies that this model tends to slightly overestimate noise levels at nearby residential properties.

125. The relevant noise limits were then determined through analysis of baseline conditions and the criteria specified by the ETSU-R-97 guidelines. The general principle regarding the setting of noise criteria is that limits should be based relative to existing background noise levels, except for very low background noise levels, in which case a fixed limit may be applied. This approach has the advantage

that the limits can directly reflect the existing noise environment at the nearest residential properties and the impact that the wind farm may have on this environment. Different limits are applicable depending upon the time of day. The daytime limits are intended to preserve outdoor amenity, whilst the night-time limits are intended to prevent sleep disturbance.

126. The predicted operational noise levels are within noise limits at nearby residential properties at all considered wind speeds. The Development therefore complies with the relevant guidance on wind farm noise and the impact on the amenity of all nearby properties would be regarded as acceptable.

127. A cumulative operational noise assessment has also been undertaken. Considering the mitigation measures identified the predicted cumulative noise levels are within noise limits at nearby residential properties. Compliance with relevant guidance implies that the cumulative impact on the amenity of nearby properties would be regarded as acceptable.

128. A construction noise assessment, incorporating the impact due to increased traffic noise and considering the mitigation measures identified, indicates that predicted noise levels likely to be experienced at the nearest residential properties are below relevant construction noise criteria at all residential properties.

129. An acoustic assessment of the proposed energy storage facility in accordance with BS 4142: 2014 shows that the impact would be low and the levels insignificant in comparison to the cumulative wind farm noise, which as mentioned above, is in compliance with relevant guidance.

Traffic & Transport

130. An assessment of the potential impact of the Development on traffic and transport was undertaken, involving consultation with Department of Infrastructure (DfI) Roads.

131. The proposed access route for abnormal loads (turbine components) is from Lisahally Port, which has been used previously for wind farm construction accessing from the Broad Road (A37). From Lisahally, the route will travel onto the Maydown Road and turn east onto the Clooney Road and travel east for approximately 28km via both Greysteel and Ballykelly before bypassing Limavady town on the Ballykelly Road travelling south east onto the Broad Road. The site entrance is located on the Broad Road where an existing access is provided to an unoccupied building and associated agricultural enclosures.

132. DfI Roads have a proposal for a climbing lane at this location (NAP 2016 – Proposal TRA 1). DfI Roads - Strategic Routes Improvement Team advised that whilst there is currently no allocated budget for the climbing lane scheme, the proposed site entrance is unlikely to effect the climbing lane proposal. The site entrance's

position does not conflict with the proposed location of the climbing lane or associated earthworks.

133. It is proposed that Normal HGV load delivery routes (including stone and concrete) will travel to the site entrance on the Broad Road (A37). Consideration was given to the effect of increased HGV traffic flow on Severance, Driver Delay, Pedestrian Delay, Pedestrian Amenity, Fear and Intimidation, Accidents and Safety and Cumulative Impacts.

134. The abnormal load route and the HGV routes have been assessed as acceptable in the ES. Taking into account the existing vehicle movements on the affected roads, and the proposed type and frequency of vehicle numbers, it is considered that with the appropriate mitigation measures, there will be no significant effects.

Shadow Flicker

135. A shadow flicker analysis of the Development was performed. Under certain combinations of geographical position, time of day, time of year and meteorological conditions, the sun may pass behind the turbine rotor and cast a shadow over neighbouring buildings' openings (i.e. windows and doors) where the contrast between light and shade is most noticeable. To a person within that room the shadow, depending on its intensity, may appear to flick on and off, giving rise to an effect referred to as shadow flicker.

136. The Best Practice Guidance to Planning Policy Statement 18 (PPS18) states that at distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low.

137. An analysis of shadow flicker throughout the year from Development was carried out, taking into account the behaviour of the sun, the local topography and the turbine layout and dimensions[5]. The analysis was performed using a turbine layout consisting of 9 turbines, each with maximum tip heights of 149.9 m and maximum rotor diameters of 99.8 m.

138. There are no inhabited houses within ten rotor diameters of any of the proposed turbines.

139. Due to both the distance of the nearest residential properties to the Development, and the recommendations pertaining to ten rotor diameter proximity, and proposed mitigation if required, it is concluded that the Development should not cause a material reduction to residential amenity owing to shadow flicker.

Socioeconomics

140. A socioeconomic assessment of the Development was carried out. It concluded that should the Development go ahead, it will deliver substantial benefits to the

[5] Turbine ref 03219D0001-06, house ref 03219D0201-01

economies of Northern Ireland and the Causeway Coast & Glens BC area, in economic and environmental terms. It will provide significant job creation and activity in the construction sector (with a commitment to use local labour where possible); increase tax and rates revenue for local and central government; contribute to renewable energy targets; and has the potential to transfer the knowledge, expertise and skills gained and developed to other wind farms, possibly acting as a catalyst for further investment in the area.

141. The Development is estimated to involve a capital spend of £26.02 million. Of this total, £7.87 million (nominal prices) will be realised within the Northern Ireland economy. The projected 18-month construction phase is estimated to create or sustain 128-167 total (direct, indirect and induced) job years[6] of employment, £3.51-£4.54 million of wages and £4.72-£6.12 million (£2013 prices) of GVA[7] to the Northern Ireland economy.

142. The estimated total (direct, indirect and induced) benefits from the operational phase of the proposed Development includes 71 job years within Northern Ireland, with associated wages of £2.4 million and £7.3 million (£2013 prices) in GVA over the 30-year operating period.

143. Over the Development's construction phase the UK Exchequer is estimated to benefit from increased tax revenue and benefits saving of £1.59-£2.55 million. In addition to this, each year of operation is likely to yield a further £0.03-£0.04 million of increased tax revenue and benefit savings (in constant prices). Over the 30-year project life, we estimate that £2.6-£3.8 million would be realised in raised revenue and benefits savings[8].

144. Based on rateable values of £27,500 per MW we calculate that the Development will increase rateable value by £816,750 each year, or by £24.5m over the project horizon. From these values business rates are calculated and collected for local Councils and the Northern Ireland Assembly. By applying Causeway Coast and Glens BC non-domestic poundage rates, we estimate additional business rates of £468,795 each year and £14.0m over the 30-year lifetime of the project.

145. Over the lifetime of the project, rates, taxes and land rental will collectively amount to approximately £30.5 million.

[6] **Job years**: For the construction phase 'job years' refers to the amount of activity that is required. E.g. two people could be employed for six months – this would equate to two jobs, but would actually only mean activity would take one job year of work to complete. Alternatively one person could be employed for two years - this would only equate to one job, but is actually two job years of employment.

[7] **Gross value added** (GVA) measures the value of goods & services produced in an area, industry or sector of an economy and is equal to output minus intermediate consumption.

[8] This analysis relates to results from Method 1 – see Chapter 13 of ES for full details.

4. Conclusion

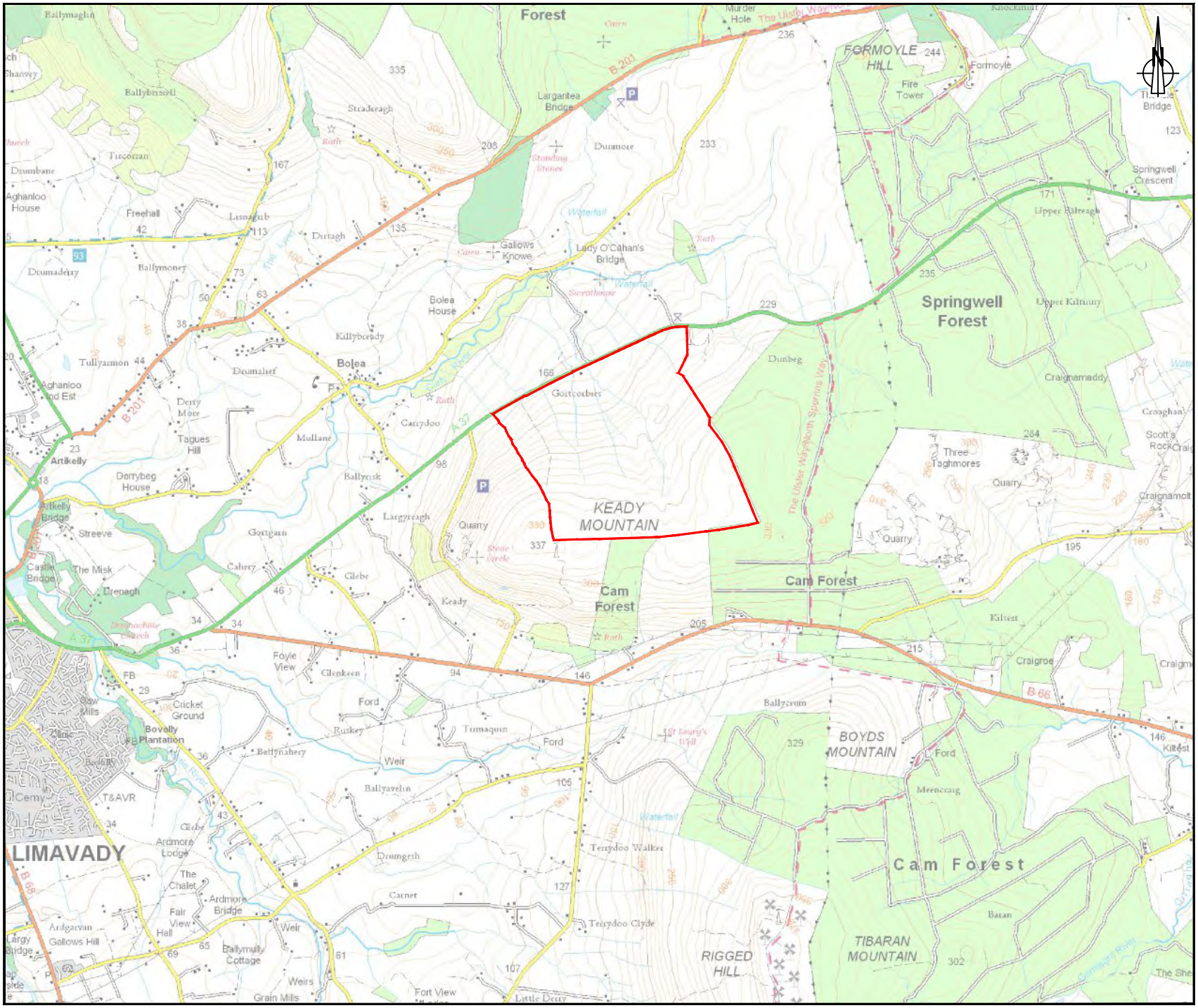
146. The potential effects of the Development have been assessed in accordance with regulatory requirements and good practice. The ES incorporates technical assessments of the Development based on the requisite legislation and the relevant planning policy framework. The ES has demonstrated that significant environmental effects associated with the construction, operation and decommissioning of the Development have been avoided or minimised through the use of the iterative design process and with the application of mitigation measures.

147. Final wind farm capacity will vary depending on the outcome of planning permission and the turbine type selected. It is estimated that the wind farm could meet the needs of around 23,000 homes[9]. This is equivalent to 41.2 percent of the housing stock in Causeway Coast and Glens Borough area. In addition, the Development is also estimated to reduce CO_2 emissions by 40,800 tonnes each year. This equivalent to 30,100 newly registered cars.[10]

148. The Development will result in a reduction in greenhouse gas emissions from the electricity generating industry by harnessing wind as an alternative to the burning of fossil fuels, in line with the government's energy goals. It will also make a significant contribution to the Northern Ireland government target that 40% of electricity consumed should be sourced from renewable energy by 2020 (DETI).

[9] This has been calculated by taking the predicted annual electricity generation of the site (based on RES assessments has a predicted capacity factor of 36% - based on a 3.3MW turbine) and dividing this by the annual average electricity figures from the Department of Business, Energy and Industrial Strategy (BEIS) showing that the annual UK average household consumption is 3,994 kWh – November 2016.

[10] https://www.gov.uk/government/publications/new-car-carbon-dioxide-emissions



KEY:

SITE LOCATION

DUNBEG SOUTH WIND FARM

FIGURE 1

SITE LOCATION MAP

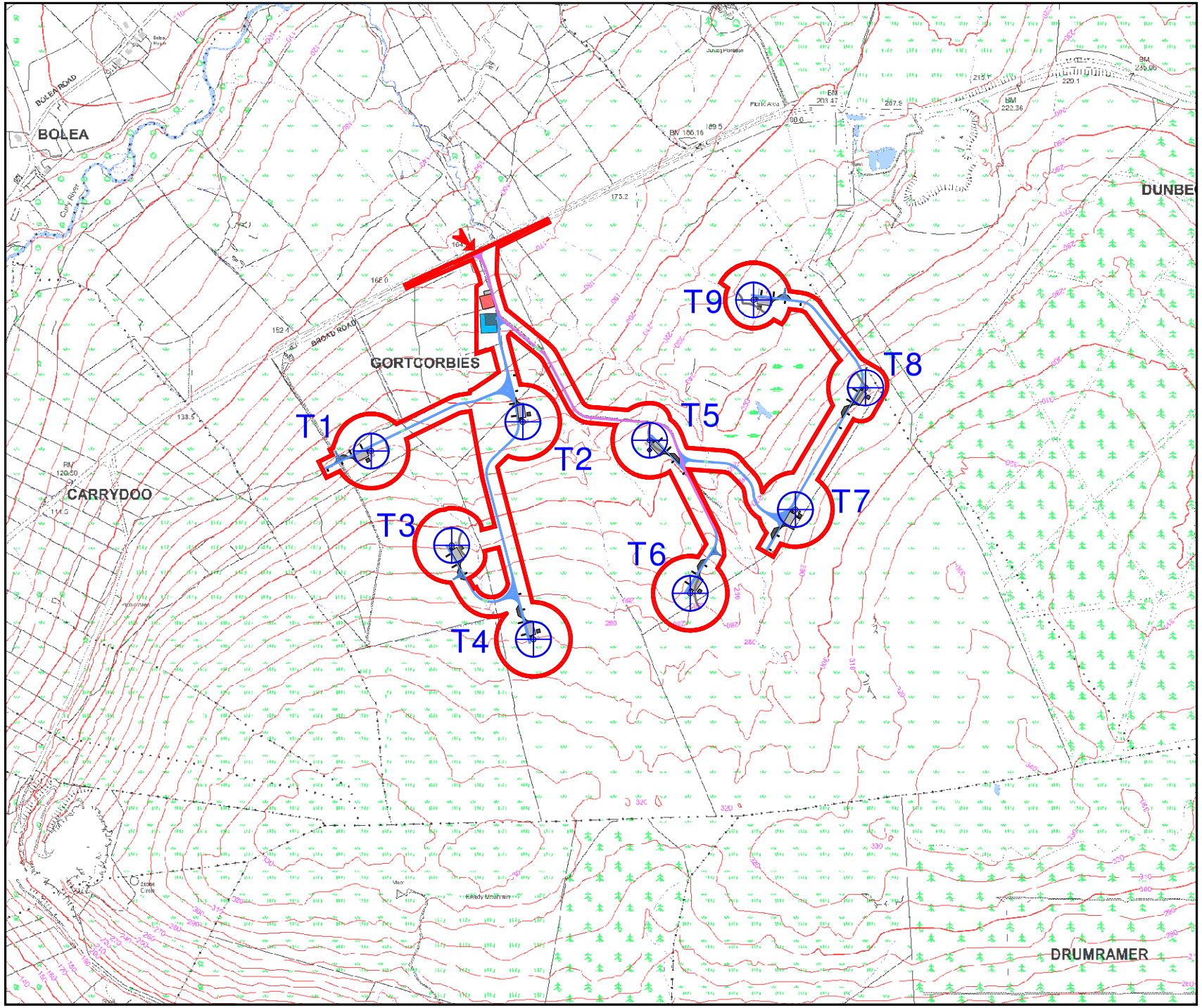
LAYOUT DWG	N/A	T-LAYOUT NO.	N/A

DRAWING NUMBER

03219D1001-02

SCALE - 1:50,000 @ A4

NON-TECHNICAL SUMMARY



DUNBEG SOUTH WIND FARM

FIGURE 2

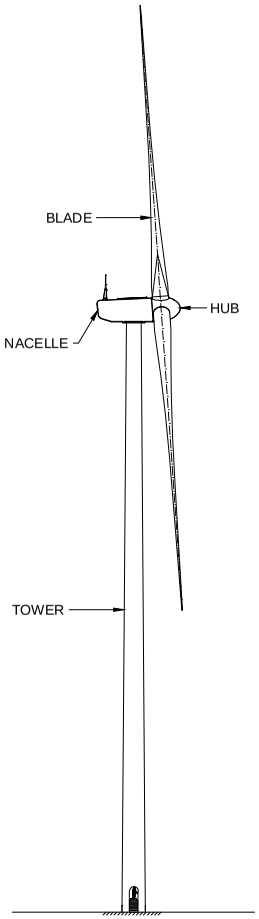
INFRASTRUCTURE LAYOUT

KEY

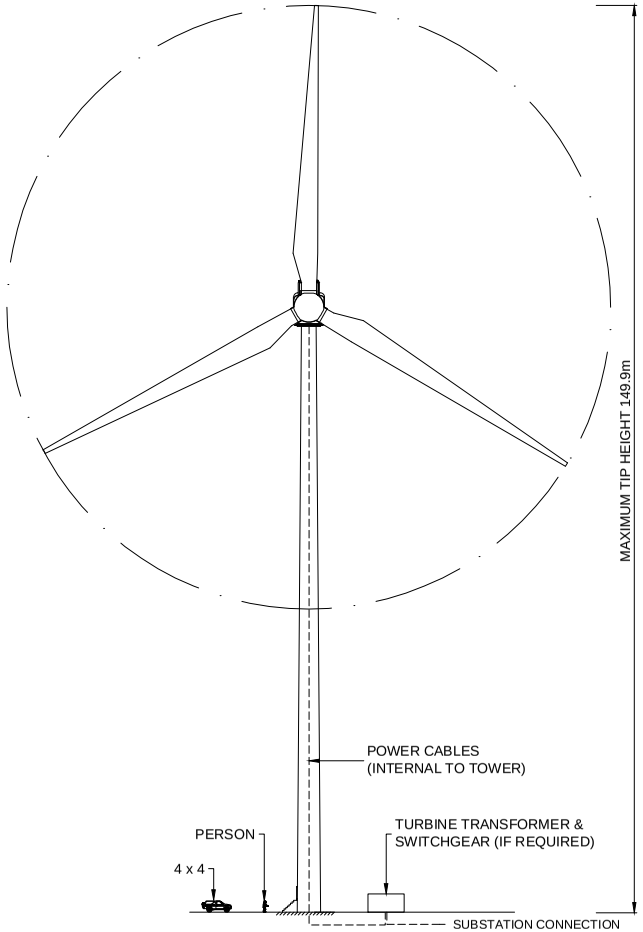
- PLANNING APPLICATION BOUNDARY (INSIDE OF LINE DENOTES BOUNDARY)
- WIND TURBINE LOCATION
- TURBINE MICROSITING
- NEW SITE TRACKS
- UPGRADED SITE TRACKS
- WATERCOURSE CROSSING
- CRANE HARDSTANDING AREA
  - PERMANENT
  - TEMPORARY
- TEMPORARY CONSTRUCTION COMPOUND
- ENERGY STORAGE AREA
- CONTROL BUILDING & SUBSTATION COMPOUND WITH PERMENANT HARDSTANDING AREA
- SITE ENTRANCE LOCATION

LAYOUT DWG	03219D0001-06
T-LAYOUT NO.	PNIRdbx028
DRAWING NUMBER	03219D1001-02
SCALE -	1:15,000 @ A4

NON-TECHNICAL SUMMARY



SIDE VIEW



FRONT VIEW

PHOTOGRAPH OF TYPICAL TURBINE

DUNBEG SOUTH
WIND FARM

FIGURE 3

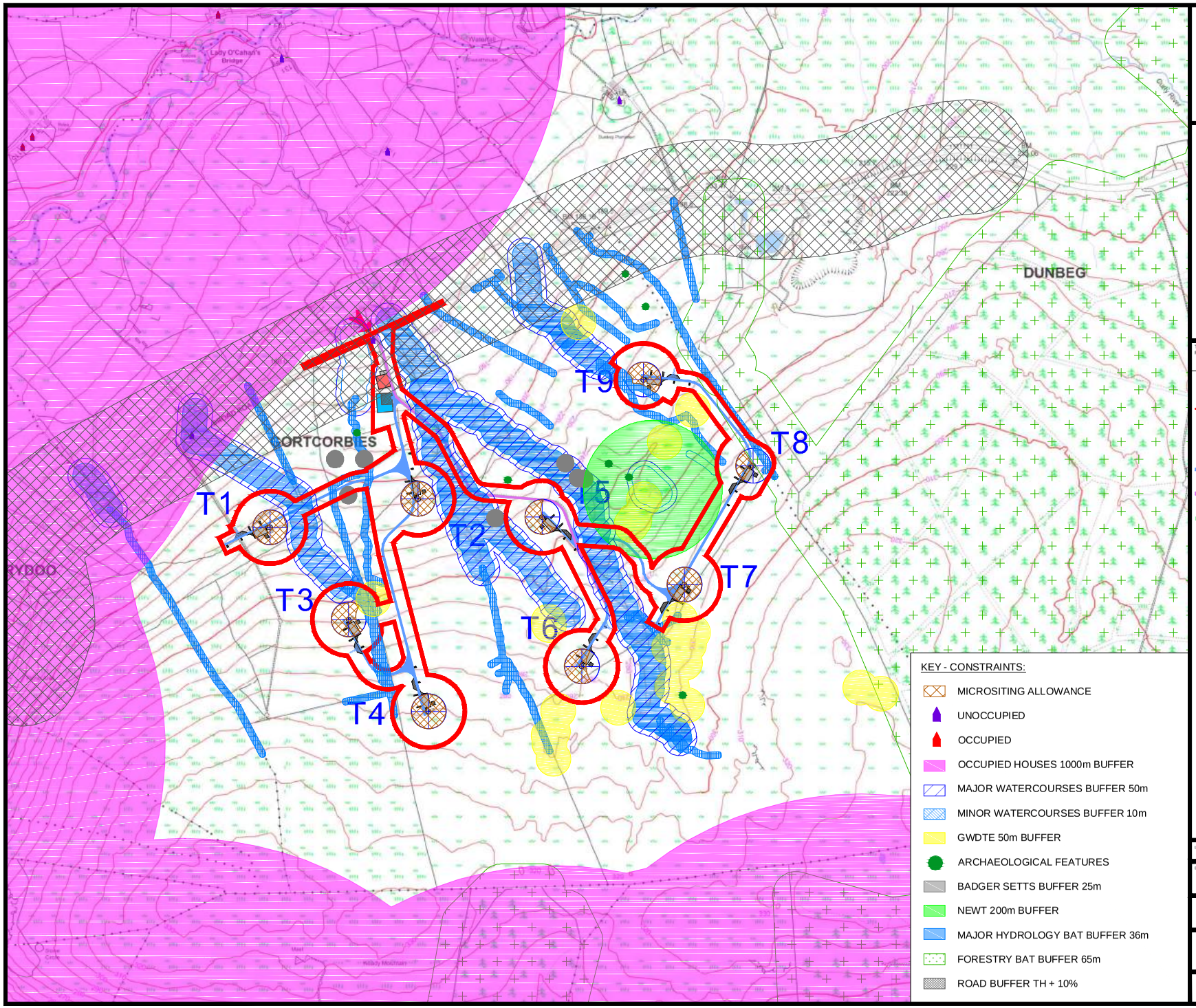
TURBINE ELEVATION

LAYOUT DWG	N/A
T-LAYOUT NO.	N/A

DRAWING NUMBER
03219D2901-01

SCALE - 1:1250 @ A4

NON TECHNICAL SUMMARY



DUNBEG SOUTH WIND FARM

FIGURE 4

COMBINED CONSTRAINTS & INFRASTRUCUTRE

KEY - INFRASTRUCTURE:

- PLANNING APPLICATION BOUNDARY (INSIDE OF LINE DENOTES BOUNDARY)
- WIND TURBINE LOCATION
- NEW SITE TRACKS
- UPGRADED SITE TRACKS
- WATERCOURSE CROSSING
- CRANE HARDSTANDING AREA
  - PERMANENT
  - TEMPORARY
- TEMPORARY CONSTRUCTION COMPOUND
  - ENERGY STORAGE AREA
- CONTROL BUILDING & SUBSTATION COMPOUND WITH PERMENANT HARDSTANDING AREA
- SITE ENTRANCE LOCATION

LAYOUT DWG	03219D0001-06
T-LAYOUT NO.	PNIRdbx028

DRAWING NUMBER

03219D2237-01

SCALE - 1:15,000 @ A4

NON TECHNICAL SUMMARY