CLOICH FOREST WIND FARM

EIA Report – Volume 1 – EIA Report Text

Chapter 17

Other Issues

ARCUS

17 OTHER ISSUES

17.1 INTRODUCTION

1. This Chapter of the Environmental Impact Assessment Report (EIA Report) evaluates the effects of Cloich Forest Wind Farm ('the Development') on any remaining topics that are within the scope of the Environmental Impact Assessment (EIA).

2. This assessments within this Chapter were undertaken by Arcus Consultancy Services Limited (Arcus).

3. The topics included within this Chapter include:

   - Shadow Flicker;
   - Telecommunications and Utilities;
   - Human Health & Safety, including Major Accidents and Disasters; and
   - Waste.

4. The assessments within this Chapter largely align with the following elements, as appropriate:

   - Introduction;
   - Legislation, Policy and Guidance;
   - Assessment Methodology and Significance Criteria;
   - Baseline Conditions;
   - Assessment of Potential Effects;
   - Cumulative Effect Assessment;
   - Mitigation and Residual Effects;
   - Summary of Effects; and
   - Statement of Significance.

5. This Chapter of the EIA Report is supported by the following figures provided in Volume 2a Figures excluding LVIA:

   - Figure 17.1: Shadow Flicker Study Area and Casting Map; and
   - Figure 17.2: Borders Online Telecommunication Links.

17.2 SHADOW FLICKER

17.2.1 Introduction

6. This Section evaluates the effects of shadow flicker from the Development on nearby receptors. Under certain combinations of geographical position and time of day, the sun may pass behind the rotors of a wind turbine and cast a shadow over neighbouring properties. Shadow flicker is an effect that can occur when the shadow of a blade passes over a small opening (such as a window), briefly reducing the intensity of light within the room, and causing a flickering to be perceived. Shadow flicker effects only occur inside buildings where the blade casts a shadow across an entire window opening. The likelihood and duration of the effects depends on a range of factors including the direction, distance and aspect of residential dwellings in relation to the turbines, turbine height and rotor diameter, the topography between residential dwellings and turbines, the time of year and day; and the local weather conditions.

7. If significant shadow flicker effects on residential dwellings are identified as part of this assessment, technical solutions to mitigate shadow flicker will be provided.

17.2.2 Legislation, Policy and Guidance

8. The following guidance, legislation and information sources have been considered in carrying out this assessment:

- Scottish Government Onshore Wind Turbines: Planning Advice[1];
- Review of Light and Shadow Effects from Wind Turbines in Scotland[2].
- Scottish Borders Council Supplementary Guidance: Renewable Energy[3]

17.2.2.1 Scottish Government Onshore Wind Turbines: Planning Advice

9. This document provides planning advice for onshore wind developments including consideration of shadow flicker effects. This is the most current Scottish planning advice for Shadow Flicker and has been used to inform the methodology for this assessment. It states:

> *"…where separation is provided between wind turbines and nearby dwellings (as a general rule 10 rotor diameters), "shadow flicker" should not be a problem".*

17.2.2.2 Review of Light and Shadow Flicker Effects from Wind Turbines in Scotland

10. A review of light and shadow effects from wind turbines was commissioned by ClimateXChange to review how light and shadow flicker effects are considered in the development planning process in Scotland.

11. This document includes a review of current UK guidance, along with a review of how the current guidance is applied through the selection and review of case studies.

12. The review provides a number of recommendations regarding the content of guidance on shadow flicker. These include:

- Guidance should not include reference to the occurrence of shadow flicker throw 'within 130 degrees of north';
- Guidance should exclude reference to the 10 rotor diameter distance; and
- There is a need for guidance on the thresholds of exposure to shadow flicker in Scotland.

13. It should be noted that since the publication of this review (2017), shadow flicker guidance in Scotland has not changed, and as such, the guidance in the Scottish Government Onshore Wind Turbines: Planning Advice remains extant.

17.2.2.3 Scottish Borders Council Supplementary Guidance: Renewable Energy

14. The Scottish Borders Council ('the Council') have produced Supplementary Guidance (SG) for renewable energy which supports Policy ED9 – Renewable Energy Development. The SG provides more detailed policy and guidance for developers on the requirements for wind energy and other renewable energy.

15. The SG acknowledges that shadow flicker can be disruptive and create annoyance. It states that recent evidence shows shadow flicker can be experienced at a greater distance than 10 rotor diameter distance.

[1] Scottish Government (2014) Onshore Wind Turbines: Planning Advice [Online]. Available at: https://www.gov.scot/publications/onshore-wind-turbines-planning-advice/ (Accessed on 12/02/21)
[2] LUC (2017) Review of Light and Shadow Effects from Wind Turbines in Scotland [Online] Available at: https://www.climatexchange.org.uk/research/projects/review-of-light-and-shadow-effects-from-wind-turbines-in-scotland/ (Accessed 12/02/21)
[3] Scottish Borders Council (2018) Supplementary Guidance, Renewable Energy [Online] Available at: https://www.scotborders.gov.uk/download/downloads/id/2757/renewable_energy_supplementary_guidance.pdf (Accessed 12/02/21)

16. In relation to assessing potential effects of shadow flicker at nearby properties, the SG states:

> *"Where requested by the Council, the developer will be required to produce shadow flicker assessments modelled to take into account all residential property within 2 km of a wind turbine."*

17.2.3 Assessment Methodology and Significance Criteria

17.2.3.1 Consultation

17. Table 17.1 illustrates the scoping responses from consultees relating to shadow flicker.

Table 17.1: Consultation Responses from Shadow Flicker Consultees

Consultee	Type and Date	Comment	Response
Scottish Borders Council	Scoping Response 15/11/2019	The development's compatibility with current guidance, which refers to a 10 x rotor diameter range within 130 degrees due north, should be considered. The Council's SG also requests assessment for residential properties within 2 km of each turbine.	A shadow flicker assessment has been included in the EIA Report and assesses residential properties within 2 km of each turbine.

17.2.3.2 Study Area/ Survey Area

18. In line with current guidance, a 10 x rotor diameter study area (1,360 m) would ensure that shadow flicker effects are identified at nearby dwellings. However, a distance of 2 km has been identified around each turbine location ('the Study Area') in line with the Council's Supplementary Guidance for Renewable Energy (Section 17.2.2.3.), as shown in Figure 17.1.

19. Potential sensitive receptors in the area around the Development were identified from Ordinance Survey (OS) 1:25,000 scale digital mapping and online aerial imagery. OS AddressBase data was used to confirm the locations and names of permanent dwellings in the Study Area.

20. As shown in Figure 17.1 twelve residential properties are located within the Study Area.

17.2.3.3 Baseline Survey Methodology

21. The assessment of shadow flicker is a desk-based assessment, and as such, no on-site survey specific to shadow flicker has been undertaken, with the exception of more general site visits conducted by the Applicant and other Arcus technical teams verifying the location and nature of surrounding properties.

17.2.3.4 Methodology for the Assessment of Effects

22. A recognised computer software package[4] was used to calculate theoretical specific times and durations of shadow flicker effects at each property located within the Study Area.

23. This software creates a mathematical model of the Development and its surroundings, based on:

- Turbine locations, hub height and rotor diameter (based on candidate turbine V136, 136 m rotor and 81.9 m hub);
- Topography (obtained from OS Land-Form Panorama elevation data on a 50 m horizontal grid);
- Latitude and longitude of the Site (used in calculating the position of the sun in relation to time of day and year); and
- Location of residential dwellings within 2 km of the turbines.

24. It is assumed that if shadow flicker effects experienced at properties within these search areas are not significant, then effects experienced by properties further afield will be reduced and therefore also not significant.

25. Certain worst-case assumptions are made in the calculation, including:

- Weather conditions are such that shadows are always cast during each day of the year, i.e. bright sunshine every day;
- The turbine rotor will always be facing directly towards the property and that the property has a window directly facing the turbines, maximising the size of the shadow and hence the frequency and duration of the effect;
- The turbines will always be rotating; and
- There will not be intervening structures or vegetation (other than topography) that may restrict the visibility of a turbine, preventing or reducing the effect.

26. The following assumptions have been made for all potential receptors in order to identify all potential effects as a worst case:

- All windows have been assumed to measure 1 m by 1 m (for larger windows the intensity of the effect would be reduced), to be situated at a height of 3 m above ground level, to the window's centre (representing an average of ground and first floor levels that may be typically 1.5 m and 4.5 m, respectively);
- Each property is located at the grid reference given in Table 17.2 (as per details from OS AddressBase data); and
- Windows facing towards each of the cardinal compass point directions (North, South, East and West) have been modelled in order to identify effects from all possible directions. In practice, not all of these directions face the Development, and the buildings may not have windows on each facade.

27. The above calculations are intended to investigate a worst-case scenario by indicating a theoretical maximum potential duration of effects and to provide an approximation of the times of day and year that these would occur rather than a precise prediction.

28. For much of a given year, weather conditions will be such that shadows would not be cast or would be weak and thus would not give rise to shadow flicker effects. In 2020, at Peebles, cloud cover typically occurred for 67% of the time, resulting in bright sunshine occurring for around 33% of daylight hours from January 2020 to January 2021[5]. This factor of 33% of daylight hours will be used to calculate the likely hours of shadow flicker occurrence which will then be used as the basis for the assessment of significance effects.

[4] Resoft WindFarm 4.2.1.7
[5] World Weather Online, Peebles [Online] Available at: https://www.worldweatheronline.com/peebles-weather/scottish-borders/gb.aspx (Accessed 18/02/2021)

29. In practice some of this time would be in non-windy conditions when the turbine blades would not be rotating. In windy conditions, the wind direction may not have been aligned with the direction of the sun, such that shadows were not being cast as widely as in the worst-case. In practice, other factors such as the potential for screening by vegetation or intervening structures will also reduce or prevent flicker incidence even further, as compared to the theoretical maximum period or the likely period of effect suggested by the calculations. The actual potential impact is therefore likely to be only a fraction of the theoretical maximum.

17.2.3.5 Significance Criteria

30. No formal guidance is available regarding what levels of shadow flicker may be considered acceptable in the UK. However, 'Wind Energy Development Guidelines' published by the Northern Ireland Department of the Environment, Heritage and Local Government (2009)[6] states that:

"It is recommended that shadow flicker at neighbouring offices and dwellings within 500 m should not exceed 30 hours per year or 30 minutes per day."

31. This assessment predicts the potential maximum effects that occur, and a likely maximum duration for effects once prevailing weather conditions are taken into account. The Northern Irish guidance threshold has been adopted for all residential receptors as a measure of assessing the significant of predicted shadow flicker effects.

32. Mitigation is proposed to minimise or remove predicted effects, if levels of shadow flicker are deemed to be unacceptable in practice.

17.2.3.6 Assessment Limitations

33. The assumptions made in the assessment process, outlined in Section 17.2.3, are considered to be conservative where assessment results are likely to be worst case.

17.2.4 Baseline Conditions

34. Eleven properties (potential receptor, used as assessment locations) have been identified within the Study Area. Table 17.2 details the properties within the shadow flicker Study Area, as shown in Figure 17.1.

Table 17.2: Shadow Flicker Assessment Locations

Property Name	Easting	Northing	Nearest Turbine	Distance to Nearest Turbine (metres)
Cloich Farm Peebles	321652	649089	T10	1,200 m
Whitelaw Burn	322892	647898	T5	1,900 m
Upper Stewarton	321713	646050	T4	925 m
Nether Stewarton	321912	645628	T4	1,350 m
Stewarton House	321925	645537	T4	1,420 m
Stewarton Toll	322015	645532	T4	1,500 m

[6] Department of the Environment, Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy', 2009

Property Name	Easting	Northing	Nearest Turbine	Distance to Nearest Turbine (metres)
Stewarton Lodge	322140	645514	T4	1,600 m
Harehope Farmhouse	320063	644354	T2	1,600 m
Old Harehope	320049	644248	T2	1,750 m
The Steading	320006	644169	T2	1,800 m
Harehope Cottage	320163	644044	T2	1,900 m

17.2.5 Assessment of Potential Effects

17.2.5.1 Construction Phase

35. Shadow flicker is a phenomenon that only occurs once the turbines are installed and operational and thus no shadow flicker effects are anticipated during the construction phase of the Development.

17.2.5.2 Operational Phase

36. Table 17.3 details the theoretical maximum hours of shadow flicker per annum, based on the worst-case assumptions discussed in Section 17.2.3. It also shows the calculation of the predicted likely number of hours of shadow flicker per annum, assuming 33% per annum bright sunshine.

37. A worst-case approach has been taken, initially, whereby the screening effects provided by trees or other buildings have not been taken into account, nor has any account been taken of which building facades have windows (it has been assumed that all facades have windows). The degree of effect will depend on the precise position of windows facing the proposed turbines, the location of screening, which itself may change over time as vegetation grows or is removed and wind direction / turbine orientation.

38. The theoretical maximum number of hours per annum, as shown in Table 17.3, is for all windows and accounts for any overlap where effects may be experienced at different windows or from different turbines simultaneously.

Table 17.3: Potential Shadow Flicker Effects at Assessed Locations

Name	Window Orientation	Days per year	Maximum minutes per Day	Theoretical Maximum Hours per Annum	Likely Hours per Annum[7]
Cloich Farm Peebles	North	0	0	0	0
	East	0	0	0	0
	South	102	39.6	34.6	11.4
	West	102	40.2	34.8	11.5
Whitelaw Burn	North	0	0	0	0
	East	0	0	0	0
	South	26	18.6	6.1	2

[7] Assumes 33% bright sunshine.

Name	Window Orientation	Days per year	Maximum minutes per Day	Theoretical Maximum Hours per Annum	Likely Hours per Annum[7]
	West	26	18.6	6.1	2
Upper Stewarton	North	55	29.4	13.9	4.6
	East	0	0	0	0
	South	13	19.8	3.1	1.1
	West	68	29.4	17.1	5.6
Nether Stewarton	North	66	24.6	19.3	6.4
	East	0	0	0	0
	South	0	0	0	0
	West	66	24.6	19.4	6.4
Stewarton House	North	75	24.6	21.6	7.1
	East	0	0	0	0
	South	0	0	0	0
	West	75	24.6	21.6	7.1
Stewarton Toll	North	45	22.8	13.5	4.5
	East	0	0	0	0
	South	0	0	0	0
	West	45	22.8	13.5	4.5
Stewarton Lodge	North	40	21.6	11	3.6
	East	0	0	0	0
	South	0	0	0	0
	West	40	21.6	11	3.6
Harehope Farmhouse	North	0	0	0	0
	East	0	0	0	0
	South	0	0	0	0
	West	0	0	0	0
Old Harehope	North	0	0	0	0
	East	0	0	0	0
	South	0	0	0	0
	West	0	0	0	0
The Steading	North	0	0	0	0
	East	0	0	0	0
	South	0	0	0	0
	West	0	0	0	0
Harehope Cottage	North	0	0	0	0
	East	0	0	0	0
	South	0	0	0	0

Name	Window Orientation	Days per year	Maximum minutes per Day	Theoretical Maximum Hours per Annum	Likely Hours per Annum[7]
	West	0	0	0	0

39. It has been calculated that theoretical shadow flicker is likely to occur at eight of the twelve assessed properties (as shown in Figure 17.1). Cloich Farm Peebles is expected to receive the highest levels of shadow flicker effects, calculated as being possible for up to a theoretical maximum of 34.8 hours per annum. No shadow flicker effects were found for Harehope Farmhouse, Old Harehope, The Steading, or Harehope Cottage.

40. Based upon weather conditions required to facilitate shadow flicker occurring for only 33% of the time (as outlined in Section 17.2.3), the likely number of hours per year where shadow flicker could potentially occur is reduced to 11.5 hours per annum at Cloich Farm Peebles. These figures are likely to comprise an over-estimate of actual effects, given the conservative aspects of this assessment as set out in the assessment methodology.

41. Similarly, as seen from Table 17.3, all other properties assessed are predicted to receive shadow flicker effects for durations below the guidance threshold of 30 minutes per day or 30 hours per year. As such, shadow flicker due to the Development is therefore considered **not significant** in terms of The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017[8] ('the EIA Regulations'). Shadow flicker effects upon settlements and isolated properties beyond the 2 km zone are likely to be negligible.

42. It is understood that a micro-siting allowance of 50 m is being applied for with this application. Should turbines be fully micro-sited, it is predicted that the likely shadow flicker duration at Cloich Farm Peebles will remain well below the shadow flicker threshold. Therefore, with the implementation of micro-siting, shadow flicker due to the Development is considered to remain not significant at the identified properties. Properties at a greater distance from the Development will therefore also comply with the threshold and will be **not significant** in terms of the EIA Regulations.

17.2.6 Cumulative Effect Assessment

43. The nearest wind farm is Bowbeat Wind Farm, a 24-turbine development located 8.6 km east of the Development. As this distance exceeds the Council's 2 km distance for likely shadow flicker effects, it is considered that shadow flicker impacts from Bowbeat Wind Farm are unlikely to occur in practice, at the assessed properties in Table 17.2. Cumulative shadow flicker effects from Bowbeat Wind Farm have therefore not been considered further.

17.2.7 Mitigation and Residual Effects

44. Shadow flicker effects have been assessed as not significant; therefore, no mitigation is required.

17.2.8 Summary of Effects

45. An assessment of potential shadow flicker effects associated with the Development has been carried out in line with Scottish Government guidance and local guidance from the Council. The theoretical maximum and likely hours of shadow flicker occurrence per year have been calculated for properties located within 2 km of the turbines.

[8] The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 [Online] Available at: https://www.legislation.gov.uk/ssi/2017/101/contents/made (Accessed 11/02/2021)

46. During the operational phase, it has been found that eight properties are expected to experience shadow flicker however at no property shadow flicker effects are predicted to exceed the threshold of 30 hours per annum. Therefore, the effects are **not significant** in terms of the EIA Regulations. With the implementation of micro-siting, shadow flicker due to the Development is considered to remain not significant at the identified properties.

47. The flicker effects are expected to be further reduced in practice due to screening and wind direction impacting on varying orientations of turbines. The potential for shadow flicker effects at distances greater than 2 km from the turbines are not significant.

48. Whilst this assessment shows no significant effects, the Applicant is open to a planning condition requiring a shadow flicker mitigation strategy should it be found that unacceptable shadow flicker effects are experienced by nearby properties.

49. A planning condition would provide an appropriate form of assurance that any complaints would be investigated within a reasonable timescale and that the rectification of any substantiated shadow flicker issue would be implemented promptly and effectively. Statement of Significance

50. No shadow flicker effects will occur during construction or decommissioning.

51. The effect of shadow flicker during the operational period has been assessed using appropriate guidance and it is concluded that any shadow flicker effects caused by the Development are considered **not significant** in terms of the EIA Regulations.

17.3 TELECOMMUNICATION & UTILITIES

17.3.1 Introduction

52. Due to the size and nature of wind turbines, they have the potential to interfere with electromagnetic signals passing above ground during operation. Infrastructure affected can include telecommunication links, microwave links, and television reception.

53. In particular, the tower and rotating blades of wind turbines have the most potential for interference with electromagnetic signals. The degree and nature of the interference will depend on:

- The location of the wind turbines with respect to the receiver and the transmitter;
- Characteristics of the rotor blades;
- Signal frequency; and
- The radio wave propagation in the local atmosphere.

54. In addition, other infrastructure such as buried utilities may be affected by the construction of the Development.

55. This section of the EIA Report details the relevant guidance, consultation that has been undertaken with infrastructure operators, the existing baseline for these elements as relevant to the Development and an assessment of the likely effects as a result of the Development.

17.3.2 Legislation, Policy and Guidance

56. There are a number of documents which provide guidance on telecommunications considerations for wind energy developments. The guidance considered in this assessment are:

- British Wind Energy Association - Best Practice Guidelines of Wind Energy Developments[9];
- The Scottish Government - Onshore Wind Turbine: Planning Advice[10];
- Ofcom (2003) Guidelines for Improving Digital Television and Radio Reception; and
- Ofcom – Tall Structures and Their Impact on Broadcast and Other Wireless Service[11].

57. The potential effects as a result of the Development have been assessed with reference to the above documents.

17.3.3 Scoping Responses and Consultation

58. Telecommunication operators were consulted on an ongoing basis throughout the EIA, from Scoping to final assessment. As detailed within Table 17.4, all relevant consultees were contacted to provide information relating to utilities and telecommunication links which may be affected due to the Development. For those that responded, consultation was then repeated as part of further consultation as the Development's design progressed. On all occasions, turbine co-ordinates and dimensions of the then layouts were provided to consultees. Table 17.4 provides a summary of the consultation undertaken.

[9] (BWEA), (1994) Best Practice Guidelines of Wind Energy Developments [Online] Available at: https://www.thenbs.com/PublicationIndex/documents/details?Pub=BWEA&DocID=258180 (Accessed 23/02/2021).
[10] Scottish Government (2014) Onshore wind turbines: planning advice [online] Available at: https://www.gov.scot/publications/onshore-wind-turbines-planning-advice/ (Accessed 11/02/21)
[11] Ofcom (2009) Tall Structures and Their Impact on Broadcast and Other Wireless Service [online] Available at: https://www.ofcom.org.uk/__data/assets/pdf_file/0026/63494/tall_structures.pdf (Accessed 11/02/21)

Table 17.4: Telecommunication Consultation

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Arqiva	N/A	No response	N/A
Atkins	Scoping Response 24/01/2020	No objection to the Development.	Noted.
	Tip Height Increase Consultation 24/01/2020	No objection to the Development.	Noted.
	Further Consultation on Application Layout 28/02/2021	No objection to the Development.	Noted.
British Telecommunications Plc (BT)	28/01/2020 Scoping Response	The Development should not cause interference to BT's current and presently planned radio network.	Noted.
	Tip Height Increase Consultation 28/01/2020	The Development should not cause interference to BT's current and presently planned radio network.	Noted.
	Further Consultation on Application Layout 09/03/2021	The Development should not cause interference to BT's current and presently planned radio network.	Noted.
Joint Radio Company Limited (JRC)	Scoping Response 21/01/2020	This proposal is cleared with respect to radio link infrastructure operated by Scottish Power and Scotia Gas Networks.	Noted.
	Tip Height Increase Consultation 21/01/2020	This proposal is cleared with respect to radio link infrastructure operated by Scottish Power and Scotia Gas Networks.	Noted.
	Further Consultation on Application Layout 25/02/2021	This proposal is cleared with respect to radio link infrastructure operated by Scottish Power and Scotia Gas Networks.	Noted.
Manor, Stobo and Lyne Community Council	21/11/2019 Scoping Response	Ensure consultation with Borders Online is undertaken before finalising the proposed siting for the turbines.	Noted. Further consultation with Borders Online has been undertaken (as below).
Ofcom	20/01/2020 Scoping Response	No Response.	N/A
Borders Online	16/03/2020 Further Consultation following public exhibition discussions.	Borders Online provided infrastructure coordinates.	Borders Online infrastructure was mapped and it was confirmed that the Development was not located within close proximity to any

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
			Borders Online telecommunication links. Infrastructure was mapped, considered and avoided throughout the iterative design process.
Scottish Water	15/10/2019 Scoping Response	According to Scottish Water records there is no public Scottish Water, Water or Waste Water infrastructure within the vicinity of the Development.	Noted.

17.3.4 Baseline and Assessment of Effects

17.3.4.1 Telecommunications

59. Should the construction and operation of the Development materially affect the operation of telecommunication links, such as through degradation of signal quality to the extent that it warrants an objection from the link operator, this would be considered a significant effect. Mitigation is generally available either through rerouting of any affected links or upgrades to the transmitting and / or receiving apparatus.

60. Consultation with the relevant organisations was initiated during the initial and advanced stages of the EIA to identify any potential microwave or telecommunication links that could be affected by the Development. Ofcom monitors the fixed microwave links throughout the UK, whereas JRC manages the radio spectrum used by the UK Fuel and Power Industry. Atkins undertakes a similar role for the water industry. Arqiva operates the Freeview terrestrial transmission network including BBC and ITV. Borders Online is a local provider of community broadband within the Scottish Borders, and within close proximity to the Development.

61. The search for existing telecommunication and microwave links was undertaken by providing consultees with turbine coordinates in order for the consultees to model the Development. This ensures all telecommunication and microwave links potentially affected are identified.

62. BT and JRC identified no links associated with the Development and have raised no objection to the Development. In addition, and as noted within Table 17.4, consultation was undertaken with Borders Online. Borders Online provided coordinates of their infrastructure which were subsequently mapped and taken into account during the iterative EIA design process. As shown on Figure 17.2, the proposed turbine locations are not near Borders Online telecommunication infrastructure, and are out with the applied 250 m telecommunication buffer.

63. Digital television signals are rarely affected by the operation of wind turbines; however, in some cases interference can be caused by blocking or reflections. A minimum signal strength is required for digital television to operate effectively, if a property already receiving a weak digital signal experiences additional blocking or reflections from wind turbines, the signal level may drop, causing the television to pixelate or cut out intermittently. Reflections and blocking from other objects (such as trees) close to a

receptor can cause similar effects. Simple measures to boost the signal through an improved receiver are usually sufficient to correct the issue.

64. The nearest property (Upper Stewarton) to the Development is located approximately 925 m from the nearest turbine (T4). The area surrounding the Site receives television signals that were made exclusively digital after the digital switchover was completed, and hence no analogue TV signals are broadcast in the area. As a result, and considering the intervening distance between the turbines and property, television reception received by the nearest properties to the Site will not be affected, and no effects are predicted to occur.

65. Notwithstanding this, in the event that interference which is directly attributable to the Development is experienced, the Applicant will endeavour to implement a suitable mitigation solution via an appropriately worded condition which outlines an investigative process of establishing whether or not the Development is responsible. Examples of technical solutions include: changing the receptor height, re-orientating the receptor to receive signals from an alternative transmitter, upgrading the receptor system or installation of satellite television. As consultation has indicated that TV interference is unlikely to arise from the Development, unforeseen specific issues would be investigated following a complaint to establish whether the wind farm gave rise to the interference and suitable corrective action would be implemented (depending on the nature of the issue) when the Development is operational. Any interference experienced before the wind farm is operational is unlikely to relate to the Development.

66. Broadcast radio (FM, AM and DAB digital radio) are transmitted on lower frequencies than those used by analogue TV signals. Lower frequency signals tend to pass through obstructions more easily than the higher frequency TV signals, and diffraction effects also become more pronounced at lower frequencies. Both of these factors will tend to lessen the impact of wind turbines on radio reception. Should interference to radio signals be experienced as a result of the Development, the technical solutions described in the above paragraph are also able to provide suitable mitigation.

17.3.4.2 Utilities

67. Other below ground infrastructure, such as utilities, could be affected during construction; however, implementation of best practice would ensure that these are not adversely affected during construction or operation. Scottish Water did not raise concerns to the Development via the Scoping Opinion.

68. **Chapter 10: Hydrology and Hydrogeology** provides a full assessment of potential impacts on public and private hydrology related utilities.

69. A linesearch[12] utility search was undertaken during the EIA process which found that no utility links are located within or around the Site, however, prior to construction, a more detailed linesearch for undergrounded utilities would be undertaken and any services located and any adverse effects would be avoided through the implementation of safe systems of work. During construction, there may be construction traffic passing beneath electricity lines along the transportation route, although, it is very unlikely that any damage to this infrastructure will occur; appropriate management measures will be put in place to ensure that electricity lines are not affected by the Development, and that the Development is constructed in accordance with relevant health and safety legislation as appropriate. Additionally, as a result of turbine delivery to the Site there will be telecommunication poles which will be required to be relocated in order to allow safe delivery of abnormal loads to the Site. The relocation of telecommunication infrastructure will be conducted safely, ahead of abnormal load delivery, and in consultation with key stakeholders. Following the implementation of such measures, if necessary, there will be

[12] Linesearch Online Tool [Online] Available at: http://www.linesearchbeforeudig.co.uk/# (Search undertaken 03/03/2020)

no effect on utility infrastructure as a result of the Development, and it is not considered further.

17.3.5 Statement of Significance

70. Consultation undertaken with the telecommunications consultees has confirmed that there are no fixed communication links operating across proposed turbine locations. Therefore, the Development will not interfere with telecommunications and electromagnetic signals. Effects on television reception are unlikely, and technical solutions are readily available as suitable mitigation measures should unexpected adverse effects arise. Adverse effects on infrastructure such as utilities would be avoided through safe systems of work. Therefore, there are **no significant** effects predicted upon telecommunications and utilities as a result of the Development.

17.4 HUMAN HEALTH & SAFETY, INCLUDING MAJOR ACCIDENTS & DISASTERS

17.4.1 Introduction

71. The EIA Regulations state than an EIA must identify, describe and assess in an appropriate manner, the expected effects deriving from the vulnerability of the Development to Major Accidents and Disasters (MADS) that are relevant to the Development, as well as upon human health and safety.

17.4.2 Assessment Methodology

72. In identifying relevant major accidents or disasters, the following definitions are used to guide this assessment which are informed by the Institute of Environmental Management and Assessment (IEMA) EIA Quality Mark Article:

- Major Accident – uncontrolled occurrence in the course of the construction or operation of the Development, leading to serious danger to the environment, which may be either immediate or delayed;
- Disaster - An event not directly caused by the Development, leading to serious danger to the environment, which may be either immediate or delayed. It may result from natural sources, such as flooding, adverse weather, ground movement, or from man-made sources (e.g., escalation of a fire from an adjacent facility); and
- Relevance – a relevant major accident or disaster is defined as follows:
  - Caused by the Development;
  - Having the potential to impact upon the Development; and
  - Would be exacerbated or mitigated by the Development.

17.4.3 Vulnerability of the Development to Disasters

73. The land upon which the Development is proposed within the application boundary (the Site) is not located within an area known for natural disasters such as floods, hurricanes, tornadoes, volcanic eruptions, earthquakes or tsunamis.

74. As stated in **Chapter 16: Climate Change and Carbon Balance** of this EIA Report, none of the identified climate change trends listed will affect the Development with the exception of the potential for increased high wind speed conditions. Due to the exposed nature of wind farm sites, wind turbines are designed to withstand extreme weather conditions. Brake mechanisms installed on turbines allow them to be operated only under specific wind speeds and, should severe wind speeds be experienced, the turbines automatically feather the blades and shut down. Although an unlikely event for Scotland, the brake mechanism could also apply to a hurricane scenario.

75. Other disasters (natural or manmade) that could affect the Development include forest fires and floods. Fires within woodland form a small proportion of "primary outdoor fires" in Scotland[13] and are uncommon[14], and the risk of a forest fire affecting the Development is therefore low. In the rare event that a forest fire does occur, standard operating procedures for emergency operations at wind turbine sites would be followed.

76. Flooding and ground saturation/landslips on slopes are the most probable natural disaster that could affect the Development. Flood risk is assessed within Section 10.6.1.8 of **Chapter 10: Hydrology and Hydrogeology**. The Development has been designed to minimise the impact of flooding by incorporating a 50 m buffer zone between watercourses and turbine bases and crane hardstandings. Measures, including SuDS, to

[13] Scottish Fire & Rescue Service (2020). Fire and Rescue Incident Statistics2019-20 [Online] Available at: https://www.firescotland.gov.uk/about-us/fire-and-rescue-statistics.aspx (Accessed 13/02/2021)
[14] Davies, G. and Legg, C. (2016). Regional Variation in Fire Weather Controls the Reported Occurrence of Scottish wildfires. PeerJ, 4, p.e2649.

attenuate run-off and intercept sediment prior to run-off entering watercourses are described in Appendix A10.1 and are embedded as part of the Development design. Additionally, on the watercourse crossing which occurs over Courhope Burn, a bridge is proposed rather than a standard culvert due to the larger nature of Courhope Burn. During high precipitation events, for example, the proposed bridge will help to reduce the probability of Courhope Burn flooding where the watercourse crossing is proposed, as a bridge will result in less constriction to flow compared to a standard culvert. Although no turbines, construction compounds, or substations are located within areas described as having a 0.5% (fluvial flooding) or greater annual risk of flooding, emergency response plans appropriate for the individual phases of the Development would be in place and implemented to deal with any occurrences. These would ensure the health and safety of employees and the protection of critical infrastructure.

77. No other natural or man-made disasters are considered to have the realistic potential to occur and therefore are not considered further within this Chapter.

78. Where the Development has the potential to exacerbate or mitigate effects of disasters this is assessed in other chapters within the EIA Report as relevant, particularly within the hydrological assessment in **Chapter 10: Hydrology and Hydrogeology** of this EIA Report (in relation to flooding), geological assessment within **Chapter 9: Geology, Ground Conditions, and Peat**, and in relation to offsetting of greenhouse gas emissions and related climate change impacts in **Chapter 16: Climate Change and Carbon Balance**.

17.4.4 Potential for the Development to Cause Major Accidents

79. The risk of environmental accidents is covered, where relevant, in individual technical chapters. For example, the potential for accidents, like spillages, are considered in **Chapter 10: Hydrology and Hydrogeology** of this EIA Report, whilst aviation safety issues are assessed within **Chapter 14: Aviation & Radar** of this EIA Report. Other general construction health and safety measures would be implemented by the development contractor in line with best practice prior to the commencement of construction, as discussed in Section 17.4.4.1.

80. The introduction of the Development, namely the turbines, associated electrical infrastructure, and the Battery Energy Storage System (BESS) facility, introduces the potential for forest fire events to occur as the Development is located within an area of commercial forestry. Additionally, borrow pit workings also have the potential to cause harm during construction. These considerations are dealt with in the below sections.

81. No other major accidents are considered likely to occur. On-site accidents during construction and operation are assessed in the following subsections of this Chapter.

17.4.4.1 Construction Phase

82. Effects upon health and safety are managed through risk assessments, pursuant to legislation of the United Kingdom such as the Control of Major Accident Hazards Regulations 201515 (as amended by the Health and Safety (Amendment) (EU Exit) Regulations 2018[16]) and the Planning (Hazardous Substances) Regulations 201517. The aforementioned legislation lays down rules for the prevention of major accidents which might result from certain industrial activities and the limitation of their consequences for human health and the environment. The aforementioned legislation requires the

[15] The Control of Major Accident Hazards Regulations 2015 [Online] Available at: https://www.legislation.gov.uk/uksi/2015/483/contents/made (Accessed 14/04/2021)
[16] The Health and Safety (Amendment) (EU Exit) Regulations 2018 [Online] Available at: https://www.legislation.gov.uk/uksi/2018/1370/contents/made (Accessed 14/04/2021)
[17] The Planning (Hazardous Substances) Regulations 2015 [Online] Available at: https://www.legislation.gov.uk/uksi/2015/627/contents/made (Accessed 14/04/2021)

preparation of emergency plans and response measures which will be covered under equivalent documents relevant to the nature of the Development.

83. The Construction (Design and Management) Regulations 2015[18] (CDM Regulations) are intended to ensure that health and safety issues are properly considered during development to reduce the risk of harm. In accordance with the CDM Regulations, a Principal Designer and Principal Contractor would be appointed.

84. The Principal Designer would have responsibility for coordination of health and safety during the pre-construction phase. Guidance published by the Health and Safety Executive in January 2015, defines principal designers as *"…designers appointed by the client in projects involving more than one contractor. They can be an organisation or an individual with sufficient knowledge, experience and ability to carry out the role."*

85. Principal contractors are defined in the 2015 CDM Regulations as *"contractors appointed by the client to coordinate the construction phase of a project where it involves more than one contractor …They … must possess the skills, knowledge, and experience, and (if an organisation) the organisational capability necessary to carry out their role effectively given the scale and complexity of the project and the nature of the health and safety risks involved."*

86. Throughout all phases of the Development, cognisance would be made of the following guidance documents produced by RenewableUK, and updated by SafetyOn:

- Wind Turbine Safety Rules Third Edition[19]; and
- Guidance & Supporting Procedures on the Application of Wind Turbine Safety Rules Third Edition[20].

87. The remoteness and the type of the Development will reduce the severity of accidents occurring and major accidents occurring as a result of construction are highly unlikely. In the event that such an event was to occur during construction, emergency response plans would be available and implemented to deal with any occurrences.

88. The risk of construction accidents as they relate to human health and safety would be covered in Construction Method Statements (CMS), a Construction Environmental Management Pan (CEMP), and specific risk assessment method statements, prepared in response to conditions attached to the deemed planning permission; such conditions would not be a requirement of the consent.. These would include identifying site-specific risks and preparing assessments to minimise and manage the risk such as equipment safe handling, personal protection equipment, amongst others.

89. The Development will require considerable areas of early felling, albeit within a managed forest which is periodically felled and replanted as part of its normal management. Felling makes use of high-powered machinery which carries a risk of accidents occurring. Additionally, the Development will require rock quarrying from one or two borrow pit locations; as an activity which makes use of high-powered machinery there is a risk of accidents. The risk of forestry fires, felling and rock quarrying accidents would be reduced through adhering to health and safety measures which would be implemented in line with best practice.

[18] The Construction (Design and Management) regulations 2015 (2015) [Online] Available at: https://www.legislation.gov.uk/uksi/2015/51/contents/made (Accessed 10/03/2021)
[19] SafetyOn (2019) Wind Turbine Safety Rules, Third Edition - Issue 2 [Online] Available at: https://safetyon.com/__data/assets/pdf_file/0005/662729/Wind-Turbine-Safety-Rules-Edition-3-2015-Issue-2-December-2019.pdf (Accessed on 10/03/2021)
[20] SafetyOn (2019) Guidance on the Application of Wind Turbine Safety Rules, Third Edition – Issue 3 [Online] Available at: https://safetyon.com/__data/assets/pdf_file/0006/662730/Wind-Turbine-Safety-Rules-Guidance-Edition-3-2015-Issue-3-Dec-2019.pdf (Accessed on 10/03/2021)

90. In addition to the above measures outlined on health and safety which will play a role in also reducing the likelihood and severity of both borrow pit accidents and forest fires, the risk of forest fires during the construction phase of the Development is further reduced through there being no brash and other flammable materials being left in an uncontrolled manner. Machinery used during the construction which may, during operation of such machinery, carry risk of fire would be operated in line with health and safety guidance and bets practice. Activities during construction relating to the felling of trees and borrowing of rock will also be conducted in line with standard operating procedures and in compliance with health and safety measures and regulations outlined above.

91. As a result of the above measures, which reduce the likelihood and severity of construction accidents, construction accidents are not considered further within this Chapter.

17.4.4.2 Operational Phase

92. Electrical infrastructure will be located across the Development in the form of an electrical substation and battery energy storage system (BESS) which will be subject to routine maintenance such that it is not considered to pose a significant risk of creating an accident, such as forest fires. Additionally, a felling buffer has been applied to all infrastructure, further reducing the risk of fire spreading into forestry during the operation of the Development. Elements of the Development which may pose a risk of catching fire will be regularly inspected by wind farm management and maintained by specialist teams, further reducing the risk of fire incidents. Additionally, effects upon population and human health are unlikely due to the remoteness of the Development, the low population density, and adherence to required safety clearances around turbines.

93. A possible but rare source of danger to human or animal life from a wind turbine would be the loss of a piece of the blade or, in the most exceptional circumstances, of the whole blade from an operational turbine. Many blades are composite structures with no bolts or other separate components. Even for blades with separate control surfaces on or comprising the tips of the blade, separation is highly unlikely. Wind turbines have an exemplary safety record with no recorded instances of fatalities to any member of the public anywhere in the world. The turbines are also designed to shut down automatically during high wind speed conditions, typically in excess of 60 miles per hour (mph).

94. There is a risk of ice accumulation on turbine blades, nacelles and towers under certain conditions such as periods of very cold weather with high humidity. In those instances where icing of blades occurs, fragments of ice might be released from blades, particularly when the machine is started. The wind turbines would be fitted with vibration sensors to detect any imbalance which might be caused by icing of the blades. This enables the operation of machines with iced blades to be inhibited to eliminate the risk of ice throw.

95. The possibility of attracting lightning strikes applies to all tall structures, and wind turbines are no different. Appropriate lightning protection measures are incorporated in wind turbines to ensure that lightning is conducted harmlessly past the sensitive parts of the nacelle and down into the ground.

96. The Scottish Government Online Advice (2014) states *"although wind turbines erected in accordance with best engineering practice should be stable structures, it may be advisable to achieve a set-back from roads and railways of at least the height of the turbine proposed, to assure safety"*.

97. The distance between the nearest proposed turbines and public roads/footpaths is in excess of tip height, with the nearest receptor, the Cross Borders Drove Road, over 160 m from the closest turbine.

17.4.5 Statement of Significance

98. Due to its location, the Site is not prone to natural disasters. Whilst adverse weather conditions, most notably high wind speed events, ice producing conditions and lightning strikes, do occur within Scotland, wind turbines are designed to withstand extreme weather conditions. Brake mechanisms, vibration sensors and lightning protection measures are installed on turbines allowing them to be operated under optimal conditions and inhibited during extreme weather events.

99. The risk of construction accidents as they relate to human health and safety are detailed and managed through the CDM Regulations and in a CEMP through specific construction risk assessment method statements, which will be prepared in accordance with conditions attached to any consent of the Development.

100. Therefore, the overall risk of health and safety including major accidents and disasters is considered negligible and **not significant** in terms of the EIA Regulations.

17.5 WASTE

101. Exact quantities and types of waste are unknown at this stage of the Development. It is expected that they could include:

- Excavated material;
- Forestry Residues;
- Welfare facility waste;
- Packaging;
- Waste chemicals, fuels and oils;
- Waste metals;
- Waste water from dewatering;
- Waste water from cleaning activities; and
- General construction waste (paper, wood, etc.).

102. A Site Waste Management Plan (SWMP) will detail how waste streams are to be managed, following the Waste Hierarchy of prevention, reuse, recycle, recover and as a last resort, disposal to landfill. The SWMP will be agreed and implemented prior to construction commencing on Site.

103. Therefore, it is not considered necessary for waste to be assessed further within this EIA Report and is scoped out for further assessment.