Minutes: Minutes of the 5th Meeting of the Hills of Gold Windfarm Community Consultative Committee (CCC) **Wednesday, 6 May 2020**

Held VIA Dial-in Teleconference

Members Present: Jamie Chivers (Wind Energy Partners); Mike Stranger (Wind Energy Partners); Sandra Agudelo (Wind Energy Partners); Bruce Moore; Ian Worley; Michael Chamberlain; Margaret Schofield; Megan Trousdale (Nundle Business Tourism & Marketing Group Representative); John Krsulja (Hills of Gold Preservation Inc Representative); Peter Schofield; Kay Burns (Tamworth Regional Council); Donna Ausling (Liverpool Plains Shire Council); Christine Robinson (Upper Hunter Shire Council)

Apologies: Corinne Culbert

Independent Chair: David Ross

Secretary: Debbie Corlet

Agenda Items		**Who to Present**
1.	Introductions and Apologies	David Ross
2.	Declaration of Pecuniary or Other Interests	David Ross and All
3.	Business Arising from Previous Meeting	David Ross
4.	Previous Minutes	David Ross
5.	Correspondence	All
6.	Update on Proposal	WEP
7.	General Business	All
8.	Next Meeting	All

Agenda Item	Discussion	Action/By Whom
1.	**Introduction and Apologies** Meeting commenced at 6:35 pm. David outlined the ground rules for running the meeting via teleconference. Before asking questions, please pause to prevent unnecessary interruptions. When asking a question, firstly identify yourself.	
2.	**Declaration of Pecuniary or Other Interests** David advised that he was paid a fee to chair the meeting as is Debbie for taking the meeting minutes.	
3.	**Previous Minutes** It was agreed by all in attendance at the 4th meeting that the Previous Minutes were true and correct.	
4.	**Business Arising from Previous Meeting** David observed that all actions had been responded to. Community Member – Action Item 14 – WEP to respond to email dated 11 October 2019 between Jamie and HOGPi about holding a workshop / information session around the EPBC ACT referral. Member felt it was an important meeting and that all members of the community should have been invited to attend. It is not that HOGPi did not want to meet with you but felt it was more valuable for the whole community to meet. WEP have taken on notice. Another community member observed that what was asked for at the last meeting wasn't just the photo montages in the preliminary – they'd like to see a list of all 25. The community would like to see what the montages are. Jamie – Yes, we will be developing 25 photos. We needed to provide you with the locations – which we've now presented. My apologies if you expected the full 25 as we only knew of the 7 locations. Those locations will continue to be worked up as we go through the assessment. We can certainly inform you as they are finalised. Jamie also noted in response to a question that the assessors chose the locations by the specific locations of where the community chose the locations. We will be happy to provide more locations on an ongoing basis and interested to hear more feedback.	DR to attach the previous minutes with the upcoming meeting agenda. WEP to provide more montage locations on an ongoing basis.

Agenda Item	Discussion	Action/By Whom
5.	**Correspondence** Committee agreed to discuss correspondence, tabled by members, in General Business.	
6.	**Update on Proposal – Neighbour Benefit Sharing Program** Jamie noted that the intent of the Program was to ensure that the benefits of the wind farm are to be shared more directly with neighbours. The objective is to engage neighbours in the consultation process to ensure there is a clear way to solve concerns raised. Neighbours who live within 5km of the proposed turbine are eligible. Other Windfarms have in place – are 2.5 to 5 km but we've taken the outer range. Agreements are voluntary and do not include restrictions on objecting. Reimbursements of legal fees incurred by the neighbour up to a reasonable level. We are happy to talk about people's concerns. We've started contacting neighbours and expect that to happen during the month. Community member asked if WEP intended to approach and compensate rural properties that are going to be impacted by the windfarm (agriculture / lifestyle blocks who are going to be in that area). Will you discuss with those landowners a method of compensation and how they work with these tall structures? Jamie responded that it is residential dwellings that are covered and it doesn't pick up rural properties without dwellings. He noted that if there are any concerns however we are open to discussion and understanding concerns to determine whether compensation is appropriate. Not saying that it'll be agreed to but it certainly needs to be discussed and assessed. Community member wanted to know that WEP are going to genuinely talk to landowners who don't have a dwelling on the property including those that may not be within 5 km but will still be impacted? WEP responded that they are open to discussing with anyone in the local community who believe they will be impacted and encourage members of the community to contact WEP. A member noted that it would be great for Nundle to see a map of where the 5km may fall. Agreed to by WEP. **Locations and Photo Montages** An extensive discussion was held on the process for selecting locations for the photo montages. Members questioned some of the locations used as well as some locations that were absent from the montages. Mike noted that many of the locations selected were from the 2018 ARUP Preliminary Visual Impact Assessment. The responses to the recent community survey that were also considered. Specifics from the survey included Hanging Rock Look out, a public viewpoint	WEP to create a map of 5 km radius and upload to their website

Agenda Item	Discussion	Action/By Whom
	near the Dag, southern edge of Nundle as well as a location near the junction of Lindsay Gap and Nundle Roads and, as tourists come into town, that's what they'll see. We are still processing surveys that are being received on an ongoing basis. Cemetery was included but wasn't in the PVIA, as it was requested in community consultation and survey results. It has a viewpoint – greater exposure over other premises. Photos were taken at locations that didn't have vegetation or screening to ensure maximum exposure to the project. Community member mentioned that Moir took shots at Dag Sheep Station. Took image from up the hill. Curious – why the one down the road facing the pub was included? Why not at the southern end of town where the library is and the war memorial. Why not from the turn off from Lindsay Gap Road – New England Highway – where you'll see most of the range? Why only seven? Mike observed that there has been a lot of conjecture re the photo showing the pub and there has been talk as to whether the turbines could be seen from the pub. Visual impact for Nundle was an important area WEP received feedback to provide assessment from. Jamie mentioned that there was a montage taken from the southern end of Jenkins St. Community member understood that but noted that the windfarm isn't actually in Nundle. Residents were angered by this as it isn't just about the village but rather the community that lives within this whole region. Keep reflecting from the pub or the village – it lacks recognition of the community who live outside the village. Jamie observed that the montages have been provided in order to be transparent and trying to create more information and a clearer understanding. These locations have been assessed in accordance with the guidelines as assessed by our consultants, Moir. We want to ensure that they are representatives – we have no problems with challenges to our consultants. We will take those questions and talk to the consultants about that. Jamie noted that, at the moment, we are seeking feedback as part of consultation with the community. The process of creating montages – consulting firstly, where are sensitive areas – then we undertake the photos. There will be another trip up to Nundle and more meetings with landowners. Once photos are taken – wire frame mesh – topography overlay mesh – turbines then brought forward in that image. Sky, colours – we are open to hearing those concerns. Please let us know for future. Community Member asked when they would be providing the photo for the wool shed landing? Also, the landing overlooking the range – so I can get it out and what it'll look like in my business. Jamie advised that they'll get back to him on that. Community member also expressed concern that she's getting emails from people who have communicated with the wind company about the photos and haven't had a response. And there are people on the western side that would like to request a visual assessment. What's the best way to do that – emailing you Mike? There is also a family at Hanging Rock	WEP to provide montages when available for the Dag wool shed landing photo

Agenda Item	Discussion	Action/By Whom
	seeking visual and noise assessments and have had no response. Landholders who have requested and still waiting. A list of four families were provided to WEP to make contact regarding visual consultation. WEP advised they were in contact with some of them already. Mike noted that yes, people can text him. Specific people that you mention may have a perception that they have missed the boat – but that's not the case – there will be at least one more trip by Moir. We've not been able to commit to a date until we have a bit more of an opportunity to travel in future weeks due to COVID 19 restrictions. I've been in communication with a number of people that you mentioned in the list of four families. We will continue to be in contact with them at another time that is suitable. Mike noted that WEP doesn't have contact details for one of the families at Hanging Rock in their records. He was very curious when the family had tried to contact WEP. We've received surveys and would like more detail on that front. A community member observed that the Scottish Natural Heritage Visual document had clear guidelines for montages like the date and time that the photography was taken. Also, the turbines – can we have a number reference – identification matches with the updated turbine layout so we can see which turbines are being referred to. Photos need more interpretation to be fully in line with those guidelines. The range is not in focus – that's disappointing to me as a photographer as I know what's possible. As well as the wire frames as part of the photo montages – I think that would be useful too. David reiterated that Action 5 from Previous Minutes will remain open – while montages are created for other locations. Community members also requested that a montage be created for the junction of Lindsay's Gap and Nundle Roads as well as the southern side of Crawney Range. Jamie accepted that it is important to develop a montage further up Jenkins Street as well as on Crawney Road and for the methodology to be clarified David sought comments from across the committee on the visual impact assessment study. A community member observed that the images of the wind turbines are not particularly visible on the montages like other structures. We have power lines which we've all grown used to of course. Down Jenkins Street – all you can see is power lines carrying electricity. Zoom down to the main buildings – the hills between the DAG and the ridge - there would be no turbines to be seen. I do appreciate some of the negative aspects – especially the people who are closest to the turbines. The position has a negative impact. Another community member observed that people have commented to them that the turbines are not half as bad as the power poles, are majestic looking and add character while another member observed that they generate all their own electricity with wind turbines and solar which blows out to the broader community. They have paid for themselves.	Community member to provide WEP with family's contact details so WEP can make an appointment to see them. WEP to consider Scottish Natural Heritage Guidelines as per community requests. WEP to investigate an additional 8th photomontage from corner of Lindsay Gap Rd and Nundle Rd.

Agenda Item	Discussion	Action/By Whom
	Furthermore, they believed that it reduces greenhouse gases because we don't have to use coal or non-renewal energy. Some of the community see the benefits and are supportive. A community that wants to go forward – with the drought – this is something our local community can get behind. In contrast, another member observed that, looking at the hills, it will be industrial looking and they are sickened by that. A community member asked when an aviation montage can be expected? Mike responded that WEP's expectation is that the remaining montages will be included with the EIS and development application. WEP were asked about the term "Mountain Top Removal". How will the profile of the mountain be changed? How will it impact hydrology and meteorology? Jamie asked if the question could be put in writing and then the WEP consultants can respond.	WEP to respond to "Mountain Top Removal" impacts once member provides explanation in writing
7.	**General Business** Committee member read out an email to Jamie by a member of the wider community. The letter expressed concern with respect to Jamie's interview on ABC radio. In particular, the community member took exception to Jamie's comment about the "vocal minority". The author of the letter observed that more than half the community are absolutely against this project and WEP will alienate them. Jamie noted that he will take the comments on board and appreciates where he's coming from. A community member also mentioned that questions have just been sent through (as the meeting commenced) for tabling. David accepted these questions for tabling but, noting that they had just been received, WEP could respond to them with the other actions. Community member asked what Mike's actual role is and if he's a shareholder? Mike indicated that no, he's not a shareholder. He is the Assistant Development Manager, Land and Community. Sandra is responsible for the environmental side of the proposal although Mike also has environmental qualifications. Community member raised community concerns about current land clearing and that complaints were lodged in March 2018. Requested assurance that no land clearing will occur in the Development corridor in preparation for this proposal – especially the western side. Jamie observed that there has been no land clearing in preparation of this site.	WEP to reply to 11 questions tabled

Agenda Item	Discussion	Action/By Whom
	Community member mentioned at the last meeting there was talk about the site layout and terms of boundaries and that Wind Energy Partners said they will be done after construction. Member expressed concern that the survey should be undertaken prior to the EIS and the DA being lodged – the community could be misled about the number of turbines. The member asked for the survey to be done before the EIS – see how many turbines are physically and legally possible. Jamie responded that WEP can't build turbines if the land doesn't belong to a landowner we have an agreement with. He assured the CCC that WEP can't put turbines where we don't have rights to. We don't have tenure, then we can't use the land, especially if we don't do a survey. Community member asked about the noise monitoring equipment and correspondence from three landowners. Communication is not working out as there have been missed emails – offence taken from the noise monitor installer. This could have been handled better. Mike observed that there had been contact with a number of landowners re hosting loggers. The consultant representative was under a tight schedule – he had the 1 week to do it and then had to go and self-isolate when they returned to South Australian. It appears that the concerned member from the wider community did not received the communications that had been sent in order to coordinate the timing. The consultant and WEP needed to arrange alternatives and make decisions. Essentially there will be more responses from the landowners and provide a bit more explanation. In response to a question, Mike committed that WEP will include an assessment of aviation lighting impacts in the EIS. Furthermore, Mike confirmed that he was aware of some of the Aerial Agricultural Association of Australia (AAAA) policies and protocols that were tabled by a member (particularly, the policy for the association and also the large tower). The community member observed that businesses, including our own, will be impacted negatively by this. AAAA is opposed to all wind farms in agricultural areas. Mike responded that WEP appreciate there may be concerns for fertiliser contractors, for example. Aviation Safety will be assessed in the risk assessment within the EIS in great detail. A community member asked WEP whether they still be around to pay this compensation in the future. If the French company goes belly up – who is going to guarantee to the Nundle community and who will look after the project then? Jamie noted that WEP will be responsible.	Community member to discuss survey with DPIE WEP to discuss survey with ERM and respond
8.	**Next Meeting** General discussion about next date for August. David proposed 24 or 27 August but will come back to the committee to confirm. Need to discuss with Corinne as well. Community member mentioned that the majority of the information will have to come at the next meeting. Jamie responded that there will be a number of meetings – there is public exhibition and submissions can be made.	David to discuss with WEP about the next meeting.

Agenda Item	Discussion	Action/By Whom
	Meeting closed 8.50 pm. *Note after the meeting was completed, it is proposed that the next meeting take place on Monday 24th August.*	

Appendix 1: Actions

Page No	Action No	Description	Date Raised
2	1	DR to attach the previous minutes with the upcoming meeting agenda.	6 May 2020
2	2	WEP to provide more montage locations on an ongoing basis.	6 May 2020
3	3	WEP to create a map of 5 km radius and upload to their website.	6 May 2020
4	4	WEP to provide wool shed landing photo.	6 May 2020
5	5	Community member to provide WEP with family's contact details so WEP can make an appointment to see them.	6 May 2020
5	6	WEP to consider Scottish Natural Heritage Guidelines as per community requests.	6 May 2020
6	7	WEP to respond to "Mountain Top Removal" impacts once member provides explanation in writing.	6 May 2020
6	8	WEP to reply to 11 questions tabled.	6 May 2020
6	9	Community member to discuss survey with DPIE.	6 May 2020
6	10	WEP to discuss survey with ERM and respond.	6 May 2020
7	11	David to discuss with WEP about the next meeting.	6 May 2020

HILLS OF GOLD ENERGY

Community Consultative Committee
May 2020

SOMEVA RENEWABLES

1. Business arising from previous meeting

SOMEVA RENEWABLES

Action No	Description	Date Raised	Status of Action
1	WEP to advise correct Lot numbers as part of EPBC Act Referral.	1 April 2020	Updated Lot numbers provided. List of lot numbers were provided in a separate email as they relate to the transmission line investigation area identified within the EPBC Act Referral. It should be noted that: 1. WEP have not reached an agreement with all landowners of these lots and the lots are part of investigations including social and environmental studies, and; 2. Majority of these lots will not be pursued based on the study outcomes.
2	DR to change agenda template so that numbers 4. & 3. are swapped around.	1 April 2020	TBA
3	DR to attach the previous minutes with the upcoming meeting agenda.	1 April 2020	TBA
4	WEP to respond to letter from HOGPI by this time next week.	1 April 2020	Response provided to HOGP Inc on 14th April and distributed to CCC Members.
5	WEP to advise CCC of list of photo montage locations.	1 April 2020	As per update provided on 30th April, the preliminary photomontages are from the following locations: 1. Nundle Road 2. Jenkins Street 3. Crawney Road 4. Nundle Cemetery 5. Point Street 6. Hanging Rock Lookout 7. Morrisons Gap Road
6	WEP to provide hard copy of future presentations to a member	1 April 2020	Presentation and photomontages provided.
7	WEP to mark-up the site layout where the concrete batching, substations, battery storage facility and transmission line route as well as accommodation will be located.	1 April 2020	The requested amendments relating to Hanging Rock and Crawney map label locations and ancillary infrastructure inclusions have been made and circulated to the CCC. The newest version of the preliminary updated layout is available on the Hills of Gold Website.
8	WEP to extend the survey deadline.	1 April 2020	Survey deadline extended to 30th April 2020. Hills of Gold Website updated 16th April and email notification distributed to subscribers.
9	Further Site Visit to be considered when possible.	1 April 2020	Open for discussion.
10	WEP to review map for accuracy.	1 April 2020	The requested amendments relating to Hanging Rock and Crawney map label locations and ancillary infrastructure inclusions have been made and circulated to the CCC Members. The newest version of the preliminary updated layout is available on the Hills of Gold Website.
11	WEP to review whether the watershed is affected.	1 April 2020	The technical assessment and information related to any impacts to the soil and hydrology of the catchment/watershed will be presented to the CCC meeting in August 2020, for further consultation prior to the lodgment of the EIS.
12	WEP to provide feedback on when surveys were undertaken.	1 April 2020	There may have been a minor misunderstanding here. Land area surveys to delineate land ownership boundaries have not been performed at this stage of the development phase. Land area surveys will be performed prior to construction, to ensure wind farm infrastructure is constructed only on land in which it has a right to under an agreement with a landowner. This will ensure any inconsistencies in where existing fence lines, roads, etc. are located - versus where they were planned to be - are captured prior to construction.
13	WEP to confirm timeline for contact under “Neighbour Program”.	1 April 2020	As per update released on the Hills of Gold website, the Neighbour Benefit Sharing Program has been announced to the community and WEP have commenced consultation with neighbouring landowners eligible for participation in the program.
14	WEP to respond to email dated 11 October 2019 between Jamie and HOPG.	1 April 2020	WEP offered to hold a workshop/information session on the EPBC Act Referral submission. Per the email correspondence, the purpose of this suggested workshop/information session was “to provide further detail to HOGPI members on the EPBC Act Referral, upcoming biodiversity surveys and also to provide a reconciliation of the threatened fauna species list that was presented in the CCC with what is listed in the EPBC Act Referral.” This was a genuine to assist HOGPI members understanding of these subjects and offer an opportunity to take feedback on the submission. No acceptance of the invitation was registered, and therefore a meeting with HOGPI members was not pursued further.
15	David to contact Council’s about alternate options to ensure they have someone in attendance	1 April 2020	TBA

1. Neighbour Benefit Sharing Program

SOMEVA RENEWABLES

The benefits of the wind farm to be shared more directly with Neighbour's

Compensating Neighbour's for their time in helping us understand their concerns

The objective is to engage Neighbour's in the consultation process to ensure there is a clear way to solve concerns raised

Neighbour's who live within 5 km of a proposed turbine are eligible.

The distance is measured from the base of the tower of the wind turbine generator to the nearest wall of the main dwelling

Neighbour benefit programs have become best practice in the renewable energy industry, especially with wind farms

Reports used for reference

- ❑ Neighbour agreements negotiated on basis of proximity to the wind farm
- ❑ The programs can involve direct annual payment or one-off payments to landowners
- ❑ Agreements are voluntary and do not include restrictions on objecting
- ❑ Reimbursements of legal fees incurred by the Neighbour up to a reasonable level
- ❑ Programs should be tailored to the local community surrounding the boundaries of the project.

1. Preliminary Photomontages

Discussion and feedback sought on preliminary photomontages:

Please download preliminary photomontages from:

https://www.hillsofgoldenergy.com/news-and-updates

SOMEVA
RENEWABLES

Questions and Discussion

Attachment A - Email from John Krsulja to David Ross and HoG CCC Members (Dated 5th May)

Attachment B – Scottish Natural Heritage Visual Representation of Wind Farms Guidance

Attachment C - CCC Meeting 06.05.20 Nick Bradford

Attachment D - CCC Meeting Wednesday 06.05.20 Questions

Attachment E - CCC Meeting Wednesday 06.05.20 Questions_WEP Response

Attachment F - AAAA Policy Documents

Attachment G - HOGPI Facebook Comments on Montages

Attachment H - Nundle NSW Facebook Comments on Montages

Attachment I - Land and Environment Court Photomontages Policy

Email from John Krsulja to David Ross and HoG CCC Members (Dated 5th May)

Hi David.

I have a problem with WEP's response to page 6 Action RE: WEP to respond to email dated 11 October 2019 between Jamie and HOPG..

WEP offered to hold a workshop/information session on the EPBC Act Referral submission. Per the email correspondence, the purpose of this suggested workshop/information session was "to provide further detail to HOGPI members on the EPBC Act Referral, upcoming biodiversity surveys and also to provide a reconciliation of the threatened fauna species list that was presented in the CCC with what is listed in the EPBC Act Referral." This was a genuine invitation to assist HOGPI members understanding of these subjects and offer an opportunity to take feedback on the submission. ***No acceptance of the invitation was registered, and therefore a meeting with HOGPI members was not pursued further.***

Please note:

CCC Meeting Tuesday 10th December:-

Page 40-41-42 https://796c1f1b-8d2c-4ac4-8f04-72bdcc88e7e2.filesusr.com/ugd/ddde62_74c3173bf9144f5d972ba654484bead8.pdf

03.11.19 – John Krsulja to Jamie Chivers

From: John Krsulja Sent: Sunday, 3 November 2019 2:00 PM To: Jamie Chivers Cc: Mike Young (DPE-DASP) ; Nicole Brewer ; Anthony Ko ; Mike Stranger ; Sandra Agudelo Subject: Re: Jim Robinson

Hi Jamie, Hills Of Gold Preservation Inc held a General meeting on Thursday 31st October to discuss community concerns, including your email and the matters included, hence the delayed response.

With regard to WEP's invitation to hold a workshop/information session to provide further detail on the EPBC Act Referral.

- HOGP members felt that such an important issue would be better served if ALL members of the Nundle/Hanging Rock community were invited to a Town Hall meeting that offered the chance for discussion.

- HOGP would like to inform WEP that some of our HOGP members wish to remain anonymous due to fear of intimidation.

- As the EPBC Act Referral has been lodged, HOGP members also questioned if the timing was inappropriate or obsolete, given community members have had no chance for genuine input, or to provide valuable input and local knowledge to WEP submission.

Regards John Krsulja

Scottish Natural Heritage

Visual Representation of Wind Farms

Guidance

Version 2.2

February 2017

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

CONTENTS

1 Introduction

1 'Pictures speak louder than words'. Images are a powerful way of conveying information, illustrating options and capturing our imagination. They also form an important part of planning applications and Environmental Statements. The landscape and visual assessment of wind farms, however, involves much more than just looking at visualisations.

2 This guidance is aimed at landscape practitioners, those involved in producing visual representations of wind farms and at planning officers or decision makers involved in the planning process. A condensed version aimed at members of the public is also available on our website. The visualisations described are designed for use by **all** stakeholders within the planning process.

3 Visualisations are very useful in communicating information, but they can never tell the whole story. They cannot replicate the experience of seeing a wind farm in the landscape, whether they are photographs, maps, sketches or computer-generated visualisations, prepared using the highest specification and skill possible. They are an aid to decision making which must be considered alongside further information.

4 Experience gained since this guidance was first published in 2006 has led to a better understanding of how to represent proposed wind farm developments in a more accessible and realistic way. The revised methodology provides visualisations which are easier for both the public and decision makers to use. New sections on offshore wind farms and repowering have also been included, and there are additional points on turbine lighting.

5 Nonetheless, anyone using visualisations should be aware of their limitations, and these are explained throughout the text and in **Annex A. It is recommended that the standard text in Annex A should be inserted into the Environmental Statement and made available at public exhibitions.**

6 **All wind farm applications requiring a Landscape and Visual Impact Assessment as part of an Environmental Impact Assessment should conform with the requirements set out within this document**. Applications which do not require an EIA should follow a proportionate approach agreed with the determining authority. Different landscapes, types of wind farms and conditions in other countries may require different approaches. SNH cannot offer advice on applications outside Scotland.

7 Smaller scale wind farm proposals (up to 3 turbines) and single turbine applications do not usually require the same level of visual representation. A tailored, proportionate approach is required which is likely to include fewer viewpoints (2-3 will generally be sufficient) and fewer visualisations per viewpoint. This should be determined on a case-by-case basis. Wirelines may be relatively unhelpful in flat landscapes for example, other than during the design stage or in conjunction with other, photographic, visualisations. However, we recommend that the same methodology (camera, lens, image presentation) is used for small scale applications for consistency and ease of understanding by decision makers and members of the public. ✓iewpoints immediately adjacent to small scale proposals tend to less useful than those a few

kilometres away which show more context. Our guidance on assessing small scale wind farms should be referred to.

8 Some aspects of this guidance are **prescriptive and must be complied with**. A summary of these requirements is provided in **Annex B**. Other aspects include options, and it is for the landscape assessor to choose the most appropriate approach for the site in question, agree it with relevant consultees, and justify these choices in the ES.

9 Some planning authorities have also produced specific guidance for wind farms and single turbines. Early engagement with authorities is encouraged to establish their information requirements. SNH will require visualisations which meet the requirements of this guidance for all applications we are consulted on.

Landscape and Visual impact assessment

10 Landscape and visual impact assessment (LVIA) is the method used to identify and assess the effects of, and the significance of, change resulting from development on both the landscape and on people's views and visual amenity (see Guidelines for Landscape and Visual Impact Assessment, 3rd edition, 2013 (GLVIA)). Visual analysis forms just one part of a Visual Impact Assessment (VIA), the process by which the potential significant effects of a proposed development on the visual resource are methodically assessed. In turn, VIA forms just one part of a Landscape and Visual Impact Assessment (LVIA) and the wider process of Environmental Impact Assessment (EIA).

11 It is essential that a wind farm proposal is assessed within its wider landscape and visual context. For those who visit the viewpoints described, the context will be visible in the field. However, many people, including members of planning committees and other decision makers, may not be able to visit all of the viewpoints for themselves. It is therefore essential that visualisations which demonstrate the wider landscape and visual context are provided to all audiences throughout the development process. The combination of images in this guidance seeks to achieve this.

Stages in the planning process

12 Different types of visualisations (plans, maps, wirelines, photographs, photomontages) will be used at different stages in the process. Flexibility is required to provide the right information to the right audiences at each stage in the process. An indication of likely requirements is provided below.

Pre application

13 Prior to the application being submitted, draft wirelines and Zone of Theoretical Visibility (ZTV) maps will be most useful for the designer, assessor, planning authority and consultees such as SNH. Draft photomontages, which comply with the standards set out in section 4, may also be useful for public exhibition. It is important that draft images are clearly labelled as such so that it is clear to everyone that the design of the wind farm is likely to change prior to the submission of the application.

Submission of the planning application

14 A combination of images will be required to support the planning application, and these are described in more detail in section 4. All images submitted alongside the application should conform with this guidance and be as accurate as possible in terms of turbine height and turbine locations, noting that these may alter through the decision-making process.

Decision making

15 Whether the application is determined by the planning authority, or by an appeal or inquiry, or by Scottish Ministers, it is for the decision-maker to determine which images to use to inform their decision. In some cases a detailed examination of all the images may be required, including visits to viewpoints. In others it may be possible to reach a determination on the basis of a selection of images. Either way, the purpose of this guidance is to generate a suite of images that all decision makers, consultees and members of the public can use to inform their judgement. Each individual image serves a different purpose and it is important decision makers use the correct image for the correct purpose. **Annex C** provides a summary of when each of the images should be used.

16 In all cases **it is important that decision makers consider the proposal within the wider landscape and visual context**, ideally by visiting the viewpoint or by viewing suitable panoramas. Zone of Theoretical Visibility maps should also be referred to.

Visiting viewpoints

17 It is important that key viewpoints are visited in order to assess likely effects. **To facilitate this, we now recommend that all visualisations are folded to A3 and provided in a ring binder for ease of use**.

Cumulative Landscape and Visual Impact Assessment (CLVIA)

18 As the number of proposed wind farms increases, cumulative impacts become more prevalent. Separate guidance from SNH describes how to assess cumulative impacts. The methodology in this guidance takes account of the need to illustrate cumulative effects and recommends the use of additional tools to do so.

Scope of this guidance

19 This guidance is focussed on the production of visualisation-related materials to be included within an Environmental Statement (ES) LVIA, made available to the public and to inform decision making. Other methods of visualisation using computer animation and video montage are not covered in this guidance. These methods may be helpful to illustrate the effects of the proposal, in some situations adding value to the decision making process, although the outputs are difficult to verify. These methods are not currently considered appropriate as a replacement for hard copy visualisations in the ES, although advances in technology may facilitate this in the future. This guidance applies to both **onshore and offshore** wind farms. Slight differences in the methodology apply to offshore wind farms and these are described in Section 5.

Glossary of key terms

Cylindrical projection A method used to map a panorama onto a curved surface using software. The arc of curvature in degrees is equal to the overall horizontal field of view.

DTM Digital Terrain Model. A 3D model of the topography within the study area.

Environmental Impact Assessment (EIA) The evaluation of likely significant effects on the environment of development proposals.

Focal Length Refers to the focal length of the lens used to take the photograph(s).

Landscape and Visual Impact Assessment (LVIA) This is the professional and methodical process by which assessment of the effects of a proposed development on the landscape and visual resource is undertaken. It comprises two separate but related parts - Landscape Impact Assessment and Visual Impact Assessment.

Landscape Impact Assessment This is the process by which assessment is undertaken of the effects of a proposed development on the landscape as a resource, including its character and quality; and the significance of the likely effects.

Panorama An image covering a horizontal field of view wider than a single 50mm frame. Wirelines and photomontages may also be produced as panoramas.

Photomontage A visualisation which superimposes an image of a proposed development upon a photograph or series of photographs.

Planar projection A method used to map a panorama onto a flat surface using computer software. The result is the same as the way in which a camera lens creates an image on the flat film or sensor.

Principal distance The perpendicular distance from a printed image at which the exact perspective 'as seen by the camera' is reconstructed.

Scoping The process of identifying the likely significant effects of a development on the environment which are to be the subject of assessment.

Visual impact assessment The professional and methodological process used to identify and asses the visual effects, and their likely significance, of a proposed development. Visual effects are effects on specific views and on the general visual amenity experienced by people.

Visualisation A computer simulation, photomontage or other technique to illustrate the predicted appearance of a development. This includes photographs, wirelines and photomontages, but not Zone of Theoretical Visibility (ZTV) maps.

Wirelines These are also known as **wireframes** and **computer generated line drawings**. These are line diagrams that are based on DTM data and illustrate the three-dimensional shape of the landscape in combination with additional elements such as the components of a proposed wind farm.

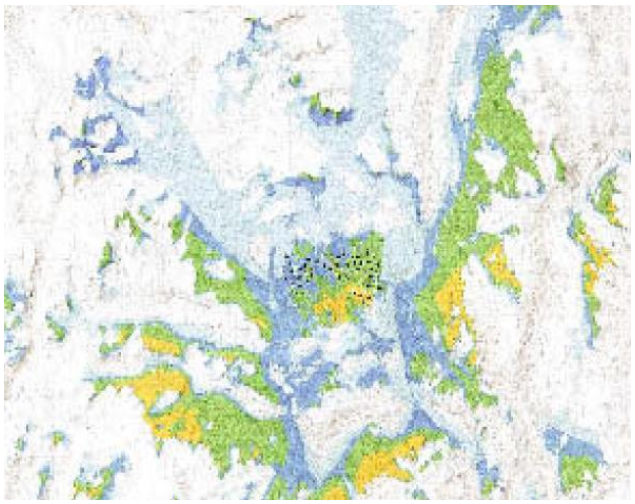
Zone of Theoretical Visibility (ZTV) Previously known as **Zone of Visual Influence (ZVI).** This represents the area over which a development could theoretically be seen, based on a DTM. The ZTV usually presents a 'bare ground' scenario – i.e. a landscape without screening structures or vegetation.

2 Zone of Theoretical Visibility Maps

20 The term 'Zone of Theoretical Visibility' (ZTV) is used to describe the area over which a development can theoretically be seen, based on a Digital Terrain Model (DTM) and overlaid on a map base. This was previously known as a Zone of Visual Influence (ZVI), however the term ZTV is preferred for its emphasis of two key factors:

- the maps indicate **theoretical** visibility only - that is, the areas within which there may be a line of sight, but the proposal may not actually be visible in reality due to localised screening which is not represented by the DTM; and

- they do not convey the **nature or magnitude** of visual effects, for example whether visibility will result in positive or negative effects, and whether these are likely to be significant or not.



21 Production of ZTVs is usually one of the first steps in LVIA, helping to inform the selection of the study area in which impacts will be considered in more detail. ZTVs provide the following information:

- from where wind turbines are most likely to be visible;
- how many of the wind turbines are likely to be visible;
- how much of the wind turbines is theoretically visible (if separate ZTVs are produced showing theoretical visibility to blade tip height, and also theoretical visibility of the hub or nacelle); and
- a means of identifying the extent and pattern of theoretical visibility.

ZTV maps are a powerful tool, but require careful interpretation. The number of ZTV maps should be kept to the minimum required to enable proper assessment of the proposal.

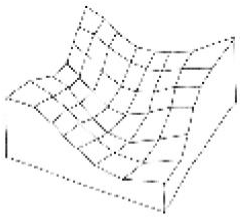
22 In combination with a site visit, possibly with initial wireline diagrams, this information enables the landscape architect or experienced specialist assessor to identify a provisional list of viewpoints (see Section 3). It also allows the determining authority and consultees to judge how representative these are of the range of likely landscape and visual receptors and whether they include particularly sensitive vantage points. Information such as designated landscapes and popular walking / scenic routes can also be included.

23 Importantly, **ZTVs indicate areas from where a wind farm is theoretically visible within the study area, but they cannot show what it would look like, nor indicate the nature or magnitude of landscape or visual impacts**.

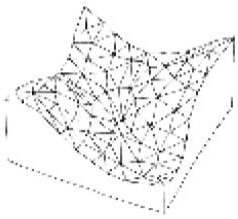
USES OF ZTVs	LIMITATIONS
• A ZTV gives a good indication of the **broad areas** from where wind turbines might be seen and can help identify the LVIA study area • The ZTV can be used to help **identify viewpoints** from where turbines may be visible, enabling an assessment of these with the aid of visualisations • A ZTV is a useful tool for comparing the relative theoretical visibility patterns of different wind farms or different wind turbine layouts and heights	• A ZTV is only as accurate as the data on which it is based and the algorithm used in its calculation • A ZTV alone **cannot indicate the potential visual impacts** of a development, **nor show the likely significance of impacts**. It shows theoretical visibility only • It is not easy to test the accuracy of a ZTV in the field, although some verification will occur during the assessment from viewpoints

ZTV preparation

ZTV height and/or terrain data



Square grid DTM



TIN

24 A ZTV is produced using a specialised software package. Several of these are commercially available and most wind farm design packages, and many Geographical Information System (GIS) packages, have this facility. However, operation of even the most user-friendly package requires a high level of expertise and understanding of all the specific features and assumptions applied by the software. The name and details of software used should be noted in the ES and on the ZTV itself, including the version and the date of the data used.

25 ZTV production begins with a DTM that represents the ground surface as a mesh of points. This may form a regular grid of squares when seen on plan, known as a Square Grid DTM; or an irregular network of triangles, known as a TIN (Triangulated Irregular Network).

26 A Square Grid DTM cannot represent terrain features smaller than the cell size, for example a small knoll or outcrop. Such features are either lost between grid points or represented by one point only. A TIN can, in principle, illustrate finer detail than a Square Grid DTM, as it can represent all the detail shown by contours. However, in practice, a Square Grid DTM with a suitably chosen cell size will represent almost as much detail, and it may also interpolate better between contours on less steeply sloped land.

27 Both formats are acceptable. The choice between them is most likely to depend on the software being used, and the source of the data. It is common practice for a Square Grid DTM to be chosen if OS data is to be used, while a TIN is used when based on independent and/or detailed survey data, enabling high and low points to be better represented.

28 The Ordnance Survey (OS) supplies data in two formats - gridded, which has already been interpolated into a Square Grid DTM, and as contours, which is the usual starting point for constructing a TIN. The OS Square Grid DTM product, 'Terrain 5', uses a 5m cell size and is interpolated from a TIN maintained by Ordnance Survey. 'Terrain 50' (which is part of the OpenData initiative and therefore free) uses a 50m cell size and is derived from the same TIN.

29 The Terrain 5 DTM provides a more precise representation of topography than its Terrain 50 counterpart. Although they are interpolated from the same TIN, the smaller cell size of Terrain 5 allows smaller features of landform to be represented.

30 The recommended preference is for OS Terrain 5 data especially on ridge crests or in "rough" terrain where small-scale undulations have a significant effect on visibility. However, OS Terrain 50 is considered acceptable, especially if the terrain comprises hills or mountains with well-defined slopes. Legacy datasets, such as Landform Profile or Landform Panorama, may also be appropriate depending on the characteristics of the site and the availability of data.

31 Although considered adequate for the purposes of LVIA (given that ZTVs are just one part of the process), the accuracy of most DTMs is limited and they do not include accurate representation of minor topographic features and may not represent areas of recent topographic change, such as opencast coal mines, spoil heaps and road cuttings. Known significant discrepancies between the DTM and the actual landform should be noted in the ES text. If survey information on recent topographic change is available, together with the necessary software to amend the DTM, it may be useful to include it. Any changes to the DTM should also be noted in the text.

32 The OS provides accuracy figures for each of its data products (expressed statistically as root-mean-square error in metres). Where the DTM is obtained from another source, the accuracy can also usually be obtained from the data supplier. These accuracy figures should be stated within the ES.

33 ZTV production also requires accurate data on the locations and heights of the proposed wind turbines. For the purposes of ZTV calculation, it is sufficient to represent each proposed turbine as a single point in space, located directly above the centre of the proposed base of the turbine. The height specified is usually that at either hub or nacelle height, or at a blade tip pointing straight up, but can be at any other point on the turbine depending on the ZTV analysis required.

34 It is recommended that separate ZTV calculations are run for the overall height (to blade tip) and for the height of the turbine to its hub (representing the nacelle that houses the generator on top of the tower). This is a useful comparison that helps to identify areas where turbine blades may be visible, but not the tower. These separate ZTVs will also be helpful for proposals involving turbine lighting, as lights are usually sited on the nacelle.

35 In some cases it may be useful to provide alternative ZTVs showing different turbine heights to enable comparison of the effects on wind farm design. Creating a draft ZTV for different

portions of the wind farm can also aid wind farm design, particularly for large applications on complex terrain.

ZTV calculation

36 Some software packages offer both a standard and 'fast' option for ZTV calculation. 'Fast' implies the use of mathematically approximate methods in order to speed up the computation, which tends to result in a more generalised pattern of visibility. It is recommended that this is only used to obtain a provisional result which will be later superseded by a more comprehensive calculation for presentation in the ES. It is also important that users of ZTV software are clear about the technical limitations inherent in their chosen package.

37 Visibility is affected by earth curvature and the refraction (bending) of light through the atmosphere, particularly at greater distances. The effect of earth curvature should be included in the ZTV calculation as its absence will tend to overestimate visibility. **Annex D** describes this issue in more detail and includes a table of the vertical difference introduced by earth curvature and refraction with distance. At 10km, the vertical difference is enough to hide a single storey house and it increases thereafter.

38 These limitations, inherent in the data and in the method of calculation, should always be acknowledged and, if possible, quantified. Note that these limitations may either over or under-represent visibility. As a general rule, **ZTVs should be generated to err on the side of caution, over-representing visibility**.

39 A ZTV usually represents visibility as if the ground surface were bare. It takes no account of the screening effects of intervening elements such as trees, hedgerows or buildings, or small scale landform or ground surface features. In this way, the ZTV can be said to represent a 'worst case scenario'; that is, where the wind farm could potentially be seen given no intervening obstructions, and in favourable weather conditions (while accepting that the DTM data can sometimes understate visibility at the very local level). To assess how this might be affected by typical visibility conditions within a particular area, Meteorological Office data on visibility conditions can be obtained.

Taking account of surface screening

40 Some software allows the use of more sophisticated datasets, enabling some screening effects to be taken into account. One example is the application of different "thicknesses" to various land uses such as forestry and urban areas. When doing this the results will be closely tied to the specifications used, for example the height of trees; as a consequence, these should be noted within the ES. Another example is the use of digital surface data obtained from laser-based aerial surveys which represent the tops of vegetation and buildings.

41 For most projects these datasets do not make a significant difference to the pattern of visibility and they tend to be quite expensive (though some datasets such as VectorMap are free); therefore, their use should be limited to specific projects and viewpoints where the benefits will be notable. For example, it may be used to examine visibility in detail within a property listed in

the Inventory of Gardens and Designed Landscapes, or other key natural or cultural heritage assets.

42 Care needs to be taken when assessing ZTVs which take screening into account, as their accuracy is limited by data availability and the constant change in landscape conditions. Particular care is required when representing forestry, which will be felled and replanted on varying timescales, and should not be considered a permanent screening feature. If these techniques are used too simplistically they can lead to turbines being indicated as visible from the roofs of buildings, and the top of woodland canopy, which may be correct but is unrealistic for the person on the ground.

43 In some situations, it might be useful to map other characteristics such as the number of wind turbines seen against the skyline, or what proportion of the horizontal field of view is likely to be occupied by the visible part of a wind farm - known as the 'horizontal array angle' or 'horizontal subtended angle'. This information is particularly useful for considering the impact of a very large wind farm, or several wind farms where they would be seen together within panoramic views. However, for most wind farms the width of view can usually be more simply judged by considering the distance to the development in combination with wireline diagrams from specific viewpoints.

44 Any analyses that calculate characteristics other than simple visibility over bare ground should be produced **in addition to bare ground visibility**, not as an alternative to it. Although these currently have various limitations, improvement and development of these kinds of datasets is likely to occur in the future.

Viewer height

45 Viewer height in a ZTV map is generally set at 2m above ground level. This is higher than the camera height recommended for photographic visualisations (1.5m) to compensate for potential inaccuracies in digital terrain data and to ensure that the 'worst case' is represented. There may, however, be specific circumstances when an alternative viewer height is more appropriate (such as a very extensive flat landscape). Where this is the case it should be explained in the ES.

Extent of ZTV

46 A ZTV map illustrates locations within a study area from where a development would potentially be visible. However, just because a development can be seen, it does not automatically follow that this will result in likely significant landscape and visual impacts. This creates a circular process of decision-making. The final distance of a ZTV should extend far enough to include all those areas within which significant visual impacts of a wind farm are likely to occur (LVIA "study area"); yet the significance of these landscape and visual impacts will not be established until the VIA has been completed; and the LVIA process needs to be informed by the ZTV. As part of this cycle of assessment, the distance recommendations given within the table below act as a starting point.

47 The extent of ZTV required may need to be adjusted inwards or outwards according to the specific characteristics of a landscape and/or proposed development. The extent of the final ZTV should be discussed and agreed with the determining authority and consultees. In some situations where cumulative effects are being assessed the ZTV may not be circular in shape, but may be extended to include a specific transport route, for example.

48 The table below recommends the initial ZTV distance for defining the study area based on turbine height. Greater distances may need to be considered for the larger turbines used offshore.

Height of turbines including rotors (m)	Recommended initial ZTV distance from nearest turbine or outer circle of wind farm (km)
up to 50[1]	15
51-70	20
71-85	25
86-100	30
101-130	35
131-150	40
150+	45

49 If a wind farm is very small and concentrated in layout, typically 5 wind turbines or fewer, it may be reasonable to measure the extent of the ZTV from the centre of the site. However this should always be agreed with the determining authority and consultees.

50 The purpose of the ZTV is to illustrate theoretical visibility (within reasonable limits), not significant effects. Wind turbines can be visible at considerably greater distances than 30km and, regardless of likely significance, potential visibility should be illustrated on the ZTV to an agreed radius. The reasons for establishing the eventual radius of a wind farm ZTV for use in an ES should be clearly documented.

Cumulative ZTVs

51 Representing cumulative ZTVs can be difficult when there are large numbers of wind farms involved. A sensible and pragmatic approach is required to focus on the **wind farms with which significant cumulative effects are likely to occur and which are likely to affect decision making**. Reproducing very large numbers of overlapping cumulative ZTVs does little to assist decision making. The selection of ZTVs should therefore be discussed and agreed with the planning authority and consultees at an early stage.

52 Presenting cumulative ZTVs in a sequence of pairs or trios can help avoid confusion. A maximum of three sites per ZTV is recommended. Where there are large numbers of combinations of ZTV it may be helpful to present the various iterations in digital format, enabling users to switch on and switch off the various layers of visibility on screen. It may also be helpful in some locations to treat multiple wind farms which are closely clustered together

[1] See Assessing the impact of small scale wind farms on the natural heritage (2016)

as a single wind farm to reduce the number iterations. If this approach is taken only the main ZTVs need to be provided in hard copy within the ES.

Presentation of ZTV information

Base map

53 A ZTV should be presented on a single piece of A1 paper folded within the ES, using OS 1:50,000 as the base map. For a ZTV to be clear and legible when overlain with colour shading the base map needs to be in greyscale. This is to prevent confusion of overlays: for example a yellow overlay upon blue coloured lochs will appear green, and this could be confused with woodland. To maximise legibility it is also important that the base map is of a high quality resolution and not too light or dark.

54 Feedback suggests that some users find it useful to see the ZTV data beyond the agreed maximum radius shown on the ZTV. We therefore recommend that the ZTV layer is shown on the full A1 page and is not clipped to the agreed radius shown on the map.

55 Each individual wind turbine should be clearly marked upon the ZTV, usually shown as a small circle or dot, depending on the base map against which it has to be distinguished. It is recommended that the ES includes a map that shows individual turbine numbers and their grid coordinates, and that the ZTV should include reference to this map. However, it is better not to include this information on the ZTV itself to keep this map as clear as possible.

56 Numbered viewpoint locations should also be shown on the main ZTV and it is important to label these carefully to avoid obscuring vital ZTV information.

57 For ease of legibility it is recommended that the ZTV shows concentric rings to indicate different distances from the proposed development, for example 10, 20 and 30 km. The areas encircled by these rings should not be shaded or coloured as this may imply a direct relationship between distance and relative visibility or visual impact that would be misleading. To maintain legibility, the number of rings should also be limited.

58 Comparing two ZTVs that separately show visibility at blade tip and hub height will indicate where only the turbine blades, or part-blades, may be visible from. Where this is required, the ZTVs should be clearly labelled:

- Blade tip ZTV; and
- Hub height (or nacelle) ZTV.

Colour Overlays

59 Areas of potential visibility should be illustrated by a colour overlay. This should be transparent so that the detail of the underlying map can be seen clearly. The level of overlay transparency chosen should ensure that the detail of the base map remains clearly discernible and no single colour appears more prominent than another.

60 If a range of colours is to be used, the shades and tones should be chosen carefully. Darker colours tend to read as portraying greater visibility than lighter colours, whilst several colours of similar tone tend to convey information of equal importance. Using different shades of only one colour should generally be avoided, as the distinctions between bandings usually appear merged and this can also imply a gradation of impacts represented by the decreasing shades that is misleading. Legibility of a ZTV map tends to decrease with greater numbers of colours. Seven colours should typically be the maximum used on any one map, and it is recommended that these are bright and strongly contrasting.

61 When choosing a colour palette, it is also important to consider colour blindness. It is estimated that around 7-8% of males and 0.4-1% of females in Britain have some form of colour blindness. To them, legibility of maps depends on the type of colour blindness they have, the shade and brightness of the colour, and on the contrast and combinations of colours used. This requires careful consideration and is not just about avoiding the juxtaposition of red and green.

62 While it would be useful to specify a standard range of colours consistently legible to colour blind people, it is impossible to develop this without also standardising computer screens and colour printer reproduction. It is recommended that individual maps shown within each ES are checked for colour blind legibility using a quick clarification tool such as Vischeck.

63 One of the most important considerations is how the same colour will be represented differently according to the specification of different computer screens and/or printers. It is recommended that practitioners always print out draft copies to check that any discrepancy between these still produces a clearly legible map, and then print out all the final copies on the same printer.

Visibility bands

64 The theoretical visibility of different numbers of wind turbines (within a single development, or between different wind farms within a cumulative ZTV) is usually distinguished upon a ZTV as different coloured bands. These bands only differentiate between the visibility of different numbers of wind turbines. They are not intended to imply that greater numbers of turbines will necessarily result in higher levels of visual impact. These bands are particularly useful for identifying potential viewpoints where the visibility of the wind farm varies considerably within an area.

65 The number of visibility bands should be high enough for each band to represent just a small range of turbine numbers, but low enough to avoid the need for too many colours which can appear confusing. For example, with 30 turbines, it is better to have 6 bands each covering 5 turbines (1-5, 6-10, etc) rather than 3 bands of 10 turbines which would provide limited resolution, or 10 bands of 3 turbines which would appear confusing. It is recommended that no more than 7 colour bands should be used upon a ZTV.

66 Where equal banding is impossible (for example 11 turbines), then the widest band size chosen should apply to the lower end of the scale – for example 1-3, 4-5, 6-7, 8-9, 10-11, as greatest resolution is then retained where proximity is greatest. In cumulative assessments a single set of bands should be applied consistently to all maps to allow comparison if this is possible.

Recording ZTV information

67 It is vital to include information on all the key assumptions made in ZTV production, and to summarise these within the LVIA. This should include the following information:

1	The DTM data from which the ZTV has been calculated, including date, original cell size and whether this has been "down sampled" (note down sampling is not acceptable for 50m resolution data)
2	Confirmation that it is based on a bare-ground survey; where additional non-bare-ground ZTV(s) are included, provide information on the specifications of further land-use data if this has been incorporated
3	The viewer height used for the ZTV (generally 2m)
4	Confirmation that earth curvature and light refraction has been included
5	The extent of the ZTV overlay as a minimum distance from the development, in addition to the frequency of any distance rings shown
6	The numbers of wind turbines represented for each colour band
7	The height used for the turbine and whether this is to hub or blade tip
8	Confirmation that the ZTV software does not use mathematically approximate methods

3 Viewpoints

68 The term 'viewpoint' is used within VIA to define a place from where a view is gained, and that represents specific conditions or viewers (visual receptors). A number of representative viewpoints are chosen in order to assess:

- the existing visual resource
- the sensitivity of this resource and visual receptors to wind farm development
- the proposed design (incorporating mitigation measures to minimise any adverse impacts); and
- the predicted appearance of the proposed development

This section addresses the selection of viewpoints and the information that should be provided for them.

69 It is important to stress that **viewpoint assessment forms just one part of LVIA**. Because of the powerful nature of viewpoint images and the widespread recognition of some of the locations from where these are taken, there is often over-emphasis of their role. However, LVIA also includes assessment of the following:

- the extent and pattern of visibility throughout the study area (considering those areas from where a wind farm would not be seen, as well as those areas from where it may);
- views of the proposed wind farm from areas of potential visibility other than the selected viewpoints; and
- sequential views.

70 Separate assessment of impacts on residential properties is increasingly common. The production of visual materials for individual properties may be appropriate to assist this, but they will not normally form part of the LVIA.

USES OF VIEWPOINTS	LIMITATIONS
• Carefully chosen viewpoints enable representation of a range of views within a study area • Carefully chosen viewpoints enable representation of a range of viewers who experience the landscape in different ways • Viewpoints enable consultees to assess specific views from important viewpoints, for example settlements, tourist attractions and mountain tops • By considering a range of views at different viewpoints, the designer can consider how the wind farm would vary in appearance, informing design development	• Whilst the choice of viewpoints is very important, the LVIA should also be based on other aspects. Over-emphasis on viewpoint assessment may create the erroneous assumption that this is the only aspect of LVIA • There may be a tendency to focus on the particular characteristics of specific viewpoints, rather than considering these as being broadly representative of a wider area. It is inappropriate to make design modifications to change the visual effects of the proposed wind farm from a single viewpoint because this may have negative 'knock-on' effects from other viewpoints. A more holistic approach considers the wind farm from a range of viewpoints in relation to the design objectives.

• Views from several viewpoints can be assessed to determine sequential effects that occur as one moves through the landscape • By assessing viewpoints in combination with ZTV maps, it is possible to consider the potential pattern of visibility for a wind farm in 3 dimensions • Viewpoints which show no actual visibility of the proposal should not be shown in the ES (unless there is good reason to do so) – the rationale for this should be given in the supporting text of the ES	• A viewpoint is by its very nature static whilst views tend to be experienced on the move as well as when stationary • Some viewpoints are difficult to access and some people might not be able to assess the viewpoint on site. They will therefore rely on the landscape architect or experienced specialist assessor's assessment and visualisations to indicate predicted visual effects. It is therefore essential that sufficient landscape and visual context is provided on visualisations • Due to the limitations of DTM data several provisional viewpoints may need to be visited to find a suitable location • The exact location and conditions of individual viewpoints are required to be able to create accurate visualisations • Some requested viewpoints might be judged inappropriate for formal visualisations due to unacceptable health and safety risks

Selection of viewpoints

71 Viewpoint selection is informed by the ZTV and other maps, fieldwork observations, and information on relevant issues such as access, landscape character, designations and popular views (see GLVIA 3 for more detail). These datasets enable a provisional list of viewpoints that can be later refined through further assessment, consideration of provisional wireline diagrams and discussions with the determining authority and consultees. Interested members of the public, and in particular Community Councils, can also advise on sensitive local vantage points at public meetings and/or exhibitions held by the applicant.

72 Feedback suggests that members of the public do not feel sufficiently engaged in the viewpoint selection process. Applicants should increase their efforts to engage the public, bearing in mind the need to limit the list of viewpoints to a reasonable number. Alternative methods of illustrating the effects at individual properties (where these are required) should be considered to ensure that all local residents feel informed about the impact from their property. These would be for illustrative purposes only and they would not be assessed within the LVIA.

73 A ZTV is very useful in focussing upon those areas with potential visibility of a proposed development, but the ZTV is only one source of information used to inform the selection of viewpoints. Over-reliance on a ZTV to identify viewpoints can result in concentration on open locations with the greatest visibility of a site, which may be far from the proposed development. This may be at the expense of potential viewpoints where visibility is less extensive, but from where views of the site are more typical.

74 During early consultations regarding the provisional list of viewpoints it is essential that the determining authority and consultees are provided with a copy of the draft ZTV at the

appropriate scale and A1 size. A selection of provisional wireline diagrams may also be helpful to give an impression of possible effects from viewpoints.

75 Wirelines are used to inform the design development of the proposed wind farm during the initial stages of the LVIA. Some of the viewpoints will be described and assessed within the main ES report; however, others may ultimately be omitted, for example because they show very similar results to another viewpoint. Details regarding these original viewpoints should be included within the ES appendices if they have informed the design process. Likewise, during the LVIA process, it may be found that some of the original viewpoints will not have a view of the wind farm due to local screening or changes to the wind farm design. These should also be documented within the ES.

76 The range of issues that influence the selection of viewpoints is listed in the table below. The aim is to **choose a range of viewpoints from where there are likely to be significant effects and those which are representative of views within the study area**. Local knowledge will greatly assist this process. It is desirable to choose viewpoints which represent several of the issues described below from the same location as this will reduce the overall number of viewpoints. These issues are discussed in more detail in the GLVIA 3 paragraphs 6.16-23. It is preferable not to include too many viewpoints as this can distract attention from the key significant effects.

View type	•	**Settlements and visual amenity**
	•	**Various landscape character types and areas** (separate and in combination)
	•	**Areas of high landscape, scenic or recreational value** – for example views to and from designated areas; wild land; long distance routes; view points; tourist routes, local amenity spaces
	•	**Various distances** from the proposed development
	•	**Various directions and aspects** (viewpoints from all around the development should be considered; views to the north will result in a different effect to those facing south; for design in particular)
	•	**Various elevations**
	•	**Various extents of wind farm being visible**, including places where all the wind turbines will be visible as well as places where partial views of turbines occur
	•	**Sequential** along specific routes
	•	**Cultural heritage** including the wider setting of the heritage asset
Viewer type	•	**Various activities,** for example those at home, work, travelling in various modes or involved in recreation
	•	**Various modes of transport,** for example those moving through the landscape by road, train, ferry, bicycle or on foot (note, in some cases it may be desirable to choose an alternative camera height to represent typical views. If so, this should be noted in the ES)

77 The assessment of viewpoints should not involve unacceptable risks to health and safety. Examples of these situations include viewpoints from motorways, railway lines, scree slopes or cliffs.

78 Viewpoints within the local area surrounding the wind farm are particularly useful in understanding and developing the wind farm layout and design. They also represent the likely effects on residents living, travelling and working within the nearest area. Local residents will experience the wind farm on a regular basis (often daily) in different weather, lighting and seasonal conditions. It is important that these effects are considered and that the assessment recognises the varying conditions in which residents will experience the wind farm.

79 When identifying viewpoints it is important to consider whether a CLVIA is also required as part of the ES. If it is, the choice of all viewpoints should be informed by the cumulative ZTV as well as the individual ZTV. In most parts of Scotland many of the viewpoints chosen will be used to represent cumulative effects. Although it is possible to add supplementary viewpoints as part of a cumulative LVIA, it is preferable to use the same viewpoints for both the individual and cumulative LVIA to enable direct comparisons to be made.

80 Likewise, it is also useful to choose viewpoints already used for other wind farm LVIAs in the surrounding area. This allows direct comparison and also assists the determining authority, consultees and the general public who are already familiar with these viewpoints. Some planning authorities have standard viewpoint lists and these should be referred to at an early stage.

81 The reasons for selection or omission of viewpoints recommended by consultees should be clearly justified and documented within the ES. **It is essential that a final list is agreed with the determining authority.** Not all viewpoints will require a photomontage. Distant viewpoints and those where there are no significant effects may be better illustrated by wirelines only.

Number of viewpoints

82 The number of viewpoints for different projects will vary depending on the scale of the proposal, the sensitivity of the receiving landscape and / or visual receptors, and how many are required to represent likely significant effects from the range of views and viewers of a development. The initial list of provisional viewpoints will probably be high. This is necessary to enable identification of the required viewpoints during the early stages of the LVIA, and to ensure that no key viewpoints have been omitted.

83 This process will involve the production of wirelines, as one will need to be produced for each layout and design option, including alternative turbine heights where these are being considered. However, these iterations are only likely to be helpful from several ‘design viewpoints’ and it is not necessary to provide these from all of the viewpoints agreed, or to include them in the ES.

84 After reducing the number of viewpoints to those that are required to illustrate the ES, it is common for there to be around 10-25 viewpoints within a LVIA in Scotland. However, this number will vary depending on the specific circumstances of a proposal. Over-provision of viewpoints can be as unhelpful as under-provision. This is because an excessive number of

viewpoints may distract attention from the smaller number of viewpoints where impacts may be significant. **An appropriate balance must be struck through the LVIA consultation process to agree a proportionate number of viewpoints**.

85 Feedback gathered by our research project and steering group suggests that there are still too many viewpoints being represented in applications. **We therefore encourage all applicants and consultees to further scrutinise the list of viewpoints selected and reduce these where possible.** A final list of agreed viewpoints to be illustrated in the ES should be agreed pre submission with the planning authority. Some viewpoints may be dropped during the assessment process if the effects are assessed as not significant, or if two viewpoints illustrate similar effects, with the agreement of the planning authority.

86 Statutory consultees should provide a brief rationale for each viewpoint requested. A summary of the viewpoints considered throughout the process, with the reasoning behind the final viewpoint list, should be included within the ES.

Viewpoint siting

87 Following agreement on the general location of viewpoints through consultation, the selection of the precise viewpoint site should be considered carefully. If, on visiting a potential viewpoint, it is apparent that there will be no view of the proposed development, for example due to localised screening, this location should be amended or withdrawn and the reason recorded in the ES.

88 The siting of viewpoints needs to balance two key factors:

- the likely significance of impacts; and
- how typical or representative the view is.

For example, in choosing a viewpoint along a stretch of main road it may be difficult to choose one location to represent the range of views experienced. It may also be difficult to find a safe location for the viewpoint. Laybys and junctions are often used but may not always represent the 'worst case' views, or the first sight gained of the wind farm. Where this is the case it should be noted in the ES. In all cases, judgement needs to balance these factors, and the decision-making process must be documented.

89 Most importantly, **the location chosen must avoid the view of the wind farm being misrepresented by the inclusion of atypical local features, such as a single tree in the foreground**. Where this has mistakenly occurred, the viewpoint location should be revised and the photographs retaken. Conversely, it is also unacceptable to move too far from the most prominent viewpoint in order to avoid typical foreground objects, for example moving into a neighbouring field when the view is intended to be from a road, in order to avoid typical foreground objects, unless these would obscure views to the wind farm. An alternative location may be required.

90 Viewpoints should be free from any avoidable foreground objects and other obstructions such as fences, walls, gates, roadways, road furniture, summit cairns and unnecessary foreground, trees, shrubs or foliage unless these are typical of the view. It is also important that viewpoints are publicly accessible, for example not within private property.

Recording viewpoint information

91 It is important to record the field conditions in which a viewpoint is photographed, as well as the camera details including the information listed in the table below.

Viewpoint	Specification required
Precise location	12 figure OS grid reference, measured in the field, ideally using GPS or a large-scale map and a photograph of the tripod location.
Viewpoint altitude	Viewpoint altitude in metres Above Ordnance Datum (m AOD) (usually better interpolated from map or DTM than relying on GPS height).
Field of view	Horizontal field of view (in degrees).
Distance to wind farm	Approximate distance (in km) to the nearest turbine
	Compass bearings to distinctive elements in the view that will assist with the placement of the turbines in some circumstances (plus optional sketch of the view with these elements marked if appropriate).
Conditions:	Date
	Time
	Weather conditions and visual range
Camera:	Camera type, Lens focal length and make
	Spacing between the frames

92 This information is essential to allow others to visit precisely the same viewpoint and make on-site checks or assessment. It also helps others to understand the conditions under which professional judgements have been made.

93 All viewpoints should be numbered and their location shown upon separate maps as follows:

- detailed ZTV map(s) based upon a greyscale 1:50,000 OS base and printed at A1. Viewpoints should be marked using symbols and numbering that avoid obscuring or confusing the ZTV information.
- Each visualisation should include a short description to make it easy for members of the public to find the exact viewpoint location.

94 It is recommended that the original viewpoint numbers are retained until all the viewpoints are finalised and agreed and the LVIA has been completed, to keep track of which viewpoints have been added or withdrawn during the LVIA process. At this point they can be re-numbered in a continuous and logical manner. Where material developed during the early stages of the LVIA process information is included this should show both the original and new numbering so these can be easily cross-referenced. If an extension is proposed, using the same numbering of viewpoints as in the original application will allow consultees to compare the impacts of the new proposal more easily. The same applies if different wind farms are proposed concurrently within a district. **Viewpoint numbering needs to be clear**.

4 Visualisations

95 Visualisations are illustrations that aim to represent the appearance of a proposed development. Visualisations of wind farms most commonly comprise photographs, wireline diagrams, photomontages, sketches and diagrams. However, it is important to stress that visualisations represent just one source of information that informs a LVIA.

96 Considerable debate on visualisations in the past has revolved around making them 'true to life'. **Visualisations, whether they are hand drawn sketches, photographs or photomontages can never exactly match what is experienced in reality.** They should, however, provide a representation of the proposal that is accurate enough for the potential impacts to be fully understood.

97 The assessor, consultees, decision-makers and any interested parties or members of the public **should ideally visit the viewpoint(s)** where visualisations can be compared to the 'real life' view. It is acknowledged this is not always possible – time, weather and accessibility will restrict the number of viewpoints which can be visited.

98 Interpretation of visualisations must take account of additional information specific to the proposal, viewpoint and landscape which cannot be shown on a single 2-dimensional image. Factors include variable lighting, movement of turbine blades, seasonal differences and movement of the viewer through the landscape. **Visualisations in themselves can never provide the full picture in terms of potential impacts; they only inform the assessment process by which judgements are made**.

Key issues affecting visualisations

99 In order to see sufficient detail the photograph must have high resolution. Contrast also has a great influence on how well detail can be seen. Against a white background a black line is easier to see than a grey one. A key limitation of photographs in replicating the visual experience is that it is generally impossible to reproduce the full contrast range visible to the human eye.

100 On a bright day outdoors we may experience a brightness ratio of 1000:1 between the brightest and darkest shades, whereas a good quality computer monitor is only likely to achieve a ratio of about 100:1, and a printed image is only likely to manage 10:1. This is one reason why holiday snaps of mountain ranges often look disappointing when viewed on screen or as printed photographs – neither the screen nor the printed image can capture the contrast or depth you see in real life.

101 This has an effect on the representation of both the detail in the scene and the way in which contrast usually decreases with distance ('aerial perspective'). This has been a challenge since the beginning of photography. The methodology set out below seeks to ameliorate the lack of contrast and depth in printed images to ensure that they provide the best representation of the wind farm proposal – but it can never replicate the real life view.

Viewing distance

102 In the previous (2006) version of this guidance it was recommended that images should be viewed at a correct "viewing distance" to recreate the correct perspective geometry of the view. However, viewing printed images at a 'correct viewing distance' is not easy, especially when provided as a cylindrical projection (which should be viewed curved). More importantly, experience has shown that geometrically correct printed images, viewed at a theoretical viewing distance, do not necessarily portray the view as experienced by people in reality[2] .

103 The method described below results in significantly larger images, for which an accurate viewing distance is less important. The images are enlarged and this provides a better representation of the real view, at a comfortable viewing distance.

104 **As a result, it is recommended that photomontages are simply viewed at a comfortable arm's length**. This will vary depending on the length of the viewer's arms and their eyesight. However, the difference in viewing distance which results will have little impact on the impression of scale / depth in the image due to the increased size of the images. An instruction to view images at a 'comfortable arm's length' should be included on all visualisations produced. They should also **be viewed flat** as they are in planar projection.

105 Planar projection has been chosen for the photomontages as it is easier to use both in print and on screen (a computer screen cannot be curved to view a cylindrical image). Both planar and cylindrical projections have limitations. The main limitation of planar projection is that, if viewed incorrectly, it can slightly increase the scale of turbines at the edge of the image[3]. **Ideally the viewer should view the image with their eyes in the centre** – however, in practice the difference in scale in most images will be difficult to perceive.

106 Some technical users of the visualisations may still wish to know the principal distance of the image. This should be included on all images to allow technical comparison if required. It is not necessary, however, for members of the public or decision makers to view the images at this distance and it should **not** be referred to as the viewing distance.

Making visualisations more accessible to the public

107 It is essential that decision-makers and consultees are provided with, and that members of the public have access to, a colour paper copy of the visualisations, printed at the correct size.

Using all the tools available

108 Visualisations are complementary to ZTVs and vice versa, and neither can be interpreted satisfactorily without the other. A visualisation simulates a photograph of the wind farm from a particular location, but gives no indication of whether this is characteristic of views over a

[2] For a detailed discussion of this issue see 'Windfarm visualisation: Perspective or Perception ?' by Alan Macdonald (2012), Whittles Publishing.

[3] Conversely, if a cylindrical projection image is viewed incorrectly the turbines at the edges will appear too small

wider area or is peculiar to a specific location. Used carefully together, a ZTV and a set of visualisations can provide information on all of these aspects.

USES OF VISUALISATIONS	LIMITATIONS
• Visualisations give an impression of a proposed wind farm • Used carefully in the field, a visualisation can be used to inform assessment • Visualisations can aid development and appraisal of the wind farm layout and design • Visualisations can help illustrate the location and nature of a proposed wind farm	• Visualisations provide a tool for assessment that can be compared with an actual view in the field; they should never be considered as a substitute to visiting a viewpoint in the field • Neither photographs nor visualisations can replicate a view as seen in reality by the human eye. • Visualisations are only as accurate as the data used to construct them • Visualisations can only represent the view from a single location at a particular time and in particular weather conditions • Static visualisations cannot convey the effect of turbine blade movement

Photography

Objectives

109 Undertaking photography for visualisations requires high quality specification and skill. This is because the perspective geometry of the resulting photographic image must be known in order to use software to generate an image with exactly matching perspective. This requires considerable care in the selection and use of appropriate photographic equipment.

110 Representing landscape conditions through photography (and thus photomontages) has limitations and, while some of these effects can be ameliorated and/or compensated for by using presentation techniques discussed in the following section, other effects are less easy to counteract. One of the most significant difficulties of photographing wind farms, in contrast to other types of development, is that they often appear on the skyline where there can be little contrast between the light-coloured turbines and a light-coloured sky. **It is therefore essential that all baseline photographs are taken in good visibility**.

111 This will generally mean clear skies, in suitably clear air to allow sufficient contrast between the different elements within the landscape. This is particularly important for long-range views where poor light and atmospheric conditions such as haze or cloud can reduce the clarity of the view, or for views where the turbines are predominantly viewed against the sky. In most circumstances, clear skies are preferred. However, in some locations, especially where the turbines will be predominantly backclothed, photographs taken in cloudy conditions can also be used to illustrate the effects. The key requirement is that the turbines are rendered with sufficient contrast against the backdrop (whether this is the sky or the landform).

Field of view

112 The term ‘field of view’ is used to describe the width and height of a view as represented by an image. These constitute the horizontal field of view and vertical field of view and are expressed as angles in degrees (the terms 'angle of view', 'included angle' and 'view cone angle' are all equivalent, but they can be ambiguous in some contexts).

113 The photomontages to be included in the ES (described further below) have a horizontal field of view of 53.5 degrees and a vertical field of view of 18.2 degrees[4]. In most situations this will capture the whole wind farm and provide sufficient landscape and visual context. In some situations, however, it may be necessary to provide a wider horizontal field of view. These include:

- Viewpoints which are very close to the wind farm;
- Very large wind farms
- Locations where cumulative effects require detailed representation (e.g. two wind farms on the same ridge).

Where these necessitate the use of a wider horizontal field of view which will not fit on an A1 width page, it may be necessary to print on slightly longer paper (folded in the ES), or to print several panoramas on separate sheets (with the wind farm shown on the central sheet) if the paper length becomes unwieldy, or distortion affects the edges of the image. Where separate sheets of paper are required to cover an exceptionally large angle of view, each section should be re-stiched from the baseline photography to avoid distortion effects as the horizontal field of view increases.

114 To ensure that the photographs (which may be taken by someone other than the landscape architect or experienced specialist assessor) can accommodate the required horizontal field of view to assess cumulative effects, a series of photographs should be taken from each viewpoint to include the entire width of view. It is recommended to take 360° at each viewpoint to ensure this can be achieved.

115 Photographs should generally be taken in landscape format. However, in some circumstances, such as a steep sided valley or viewpoints which are very close to the proposal, it may be necessary to use portrait format to capture the full vertical extent of the wind turbines and/or landscape. Where this is necessary an alternative format of image will be required and this should be agreed with consultees.

116 There may be circumstances where it is necessary to illustrate the full 360° view on the baseline panorama. If an obstruction (such as a summit cairn) makes it difficult to capture the full 360° view, it is acceptable to move the camera tripod to an alternative location to capture

[4] NB – this applies to the photomontage, not the baseline panorama which will have a horizontal field of view of 90º, 180º, 270º or 360º as required

the obscured view. This will make the production process more complex, but will result in clear, unobstructed views. Ideally, the alternative tripod location should only be used for one of the 90° segments of the view, with this noted on the visualisations.

Verification

117 In some cases the determining authority may wish to verify the accuracy of the image produced. This is possible using the original image data recorded by the camera (to check camera format and lens used) and a simple template (to check that the image dimensions have been correctly adjusted (by cropping and then enlarging)). This process is described in **annex E**. Camera metadata should be provided by the applicant on request.

Choice of camera and camera height

118 A high quality **digital camera** with a **full frame sensor** is required to produce satisfactory results for ES purposes. Note that full frame sensors can also vary slightly in size – this is discussed in more detail in **Annexes E and F**.

119 A **50mm fixed focal length** camera lens is required. Note – even fixed focal length lenses can vary slightly in their geometry; this and various other technical considerations are discussed in more detail in **Annex F**. Lenses need to be of high quality both in terms of resolving power (the ability to capture detail) and in freedom from excessive distortion.

120 The use of a fixed focal length reduces the scope for error in establishing the perspective geometry of the photographic image and reduces variables in the method used. Such lenses have less distortion than alternatives and are currently used as standard by most practitioners. It also facilitates the verification process set out in **Annex E.**

121 In some circumstances it may be necessary, or beneficial to use an alternative lens or camera. **Where this is the case it should be agreed with the determining authority and a clear justification should be included in the ES**.

122 The camera should be **1.5m** above ground level, unless there are good reasons to adjust this (such as a hedge, tree, summit cairn or similar obstruction). If an alternative camera height is used this should be marked on the visualisation and explained in the ES.

Post-photographic processing

Turbine image

123 The turbines shown on a visualisation should represent reasonably faithfully the shape of the intended turbines for a project. They should, at least, have the correct hub height and rotor diameter. This will allow the proportions of the turbines to be appreciated from the visualisation.

124 Some practitioners prefer to depict all turbines with the rotors set with one blade pointing straight up; whereas others prefer these set at random angles, helping to simulate more realistically the fact that the turbine blades will be moving. The disadvantage of setting blades at random angles is the risk of 'losing' turbines behind the landform because the blade angle happens not to place a tip high enough in its arc to be seen. On the other hand, having all the blades at the same angle can produce a very 'regimented' effect that appears less realistic.

125 It is recommended that, for all wireline diagrams (especially those used by the assessor), turbines are always shown with one blade positioned straight upwards, while photomontages, as illustrations, can show turbines at random positions. All the wind turbines that could potentially be seen from a viewpoint must be shown within the photomontage, even if their highest blades are on the diagonal. The rotors of every turbine in the proposed development should face the same direction, forwards towards the viewpoint (note this may not be necessary on photomontages, see paragraph 162).

Image enhancement

126 Enhancement of images is an inherent part of photographic production. Photographic processing involves judgements - there is no process by which a 'pure' photograph can be produced without the application of human decision-making, from exposure timing to the specification of the camera, and whether this is applied manually or automatically.

127 Although enhancement, for example to maximise clarity, has traditionally occurred within the photographic darkroom, this practice has often raised concern with regards to producing photomontages. This may be because it is difficult to quantify the level of enhancement in a way that is easy to understand, raising the suspicion that an image has been 'enhanced', and is consequently misleading. In reality there is no way to avoid a photograph being enhanced as this is an integral part of photography and photomontage production.

128 Enhancement must be done to acceptable standards and this requires extreme care by a suitably experienced professional. The extent of enhancement must be limited to that which would conventionally occur in a darkroom to improve the clarity of an image, not change its essential character. For example, it is important that any enhancement, such as sharpening elements within a view, is carefully balanced throughout an image, not just the wind turbines, otherwise other features may seem less prominent in comparison.

129 Sharpening an image slightly can also help to make fine details, visible in the field, also be visible on printing. This operation works by identifying areas of high contrast in the image, which correspond to the detail we see, and locally further increasing the contrast so that the detail becomes more apparent. However, this operation must be applied carefully as over-sharpened images can result in a hard dark line that appears at the skyline, with a corresponding light edge to the sky above it, while miniscule details can appear unrealistically prominent. **Overall, there should be a minimum of post-processing image enhancement.**

Other considerations

Information to provide on the visualisations

130 Information provided on the visualisation should be sufficient for the user to understand the basis of the visualisation, but not so much as to be overwhelming. Each image should also include a small thumbnail location map, either located beneath the image or on a fold out at the right hand side of the page. The information provided on the visualisation should include:

Viewing instructions, including standard text in **Annex A**
Figure number and viewpoint number
Information on viewpoint location, altitude and both vertical and horizontal fields of view
Direction to centre of photograph as a bearing
Distance to nearest visible turbine in kilometres
Principal distance (mm), Camera make, Lens, Camera height
Date and time of photograph

Paper and printing

131 There is an extremely wide variety of printers and paper types available. To obtain the best results in relation to the size and type of visualisation, it is recommended that advice is sought from specialist providers.

132 The quality of a printed visualisation will depend significantly on the printing process and set-up. Colour inkjet printers tend to show more detail than other machines because of their higher colour range and resolution. However, it is generally difficult to produce large numbers of pages in this way so colour laser printing may be necessary. Whichever method is used a good quality, photo equivalent finish is essential. A matt finish is preferable and good quality paper should be used.

Constructing the visualisations required in the ES

133 Three visualisations are required as standard within the ES and these are described in turn below:

1) Baseline panorama and matching wireline

Construction of baseline panorama

134 The first image required from each viewpoint is a baseline panorama. This shows the **existing view** and captures the overall landscape and visual context. This information is essential to underpin the LVIA and to provide those who cannot visit the viewpoint with an understanding of the wider context within which the wind farm would sit.

135 In most cases 180° should be sufficient. In some cases (such as a popular Munro summit or viewpoint, or to illustrate cumulative effects) it may be necessary to provide a 360° baseline

panorama. In a few cases (such as a narrow view down a glen) a reduced field of view of 90° may be adequate.

136 To construct the panorama a series of frames should be taken which cover the full 360° from each viewpoint. The decision whether to present 90°, 180°, 270° or 360° can be taken later by the assessor.

137 The images should be stitched together by a competent professional using suitable software. Each 90° image should be presented on a single A1 width page as shown in **figure 1** below. The size of the image will be 820mm by 130mm. To accommodate 90° horizontal field of view the vertical field of view will be 14.2°. Additional images (up to 4 for 360°) should be provided on separate A1 sheets as required.

138 To present images with this wide field of view **cylindrical projection** is required – however, it is not important to view this image in a curve, as they are provided to illustrate the wider landscape and visual context only. **The wind farm proposal should not be represented on this image,** in order to avoid confusion.

139 To facilitate the verification process described in **annex E,** the horizontal extent of the central 50mm frame should be indicated on the image, along with the extent of the 53.5° panorama. An example of these markings is provided in the pdf version of the image available on our website. The following text should be included: "**This image provides landscape and visual context only.**" More detailed guidance on wireline production is provided below.

140 In some locations it may be useful to annotate key features (such as hilltops, key routes and popular destinations) on the baseline panorama where these are not easily identifiable.

Construction of matching wireline

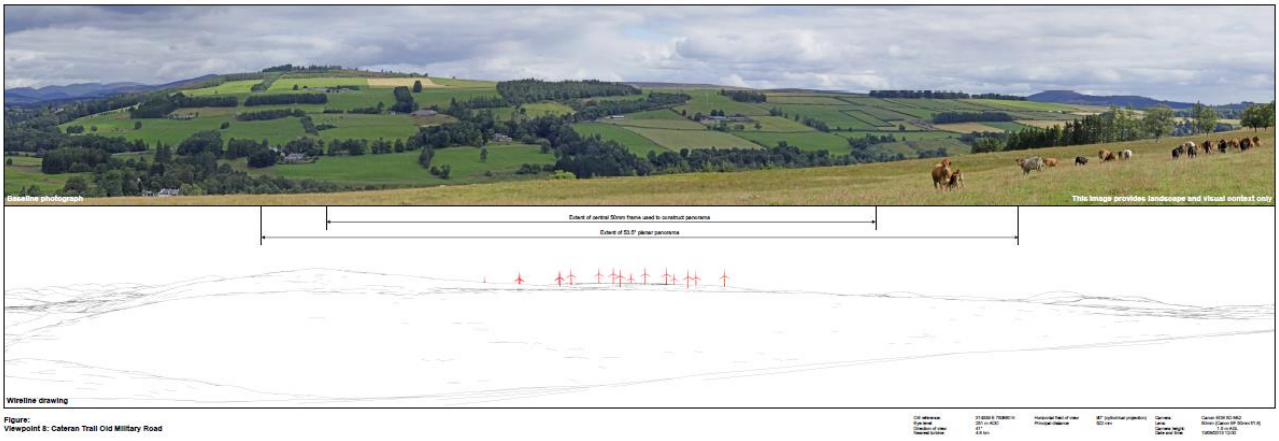
141 A wireline with matching dimensions and geometry should be constructed for either 90°, 180°, 270° or 360° horizontal field of view as required. The resulting vertical field of view will be 14.2°. The image will be 820mm by 130mm. The wireline will be particularly helpful to show cumulative effects, which cannot be captured in the illustration described below. It should also be provided in cylindrical projection, to match the baseline panorama. **The wind farm proposal and all other wind farms included in the cumulative assessment (including existing wind farms) should be illustrated on the wireline** – but not the baseline panorama which is an illustration of the current landscape.

142 Turbines at different stages in the planning process (i.e. existing, consented, proposed) should be shown in different colours to make it clear what the baseline is and what is proposed. Potential scenarios of development, depending on which applications receive approval and are constructed, can therefore be assessed.

143 It can also be helpful to show the horizontal extent of each wind farm with a small bar at the top of the image, particularly when there are multiple wind farms in the same angle of view. In

some cases it will be difficult to annotate the wind farm(s) on the wireline, especially if the viewpoint is close to the proposal and the turbines fill the vertical field of view. In these circumstances, labelling should be included on a separate wireline image or the individual wind farms (or turbines) identified on a key.

Figure 1 90º Baseline panorama and matching wireline



2) Wirelines

Use of wirelines

144 Wirelines are computer generated line drawings, based on a Digital Terrain Model, that indicate the three-dimensional shape of the landscape in combination with additional elements. They are a valuable tool in the wind farm LVIA process as they allow the assessor to compare the position and scale of the turbines to the existing view of a landscape.

145 Wirelines are particularly useful to the landscape architect or experienced specialist assessor as they portray objective data. This means that, by comparing wirelines with the views on site, the assessor can make judgements on the likely visual impacts in a variety of environmental conditions, safe in the knowledge that the wirelines have not been subject to manipulation that cannot be quantified. They can also reveal what would be visible if an existing screening element, for example vegetation or a building, were removed.

Data

146 The accuracy of a wireline depends on the accuracy of the data used to create it. In general, this data will be the same as that used for calculation of the ZTVs, commonly the OS Terrain 50 or Terrain 5 DTM products, or the older 'Landform' products.

147 It is important that sufficient DTM data is used to enable the full landform background to the turbines to be appreciated and thus easily matched to a view on site or photographs of the

existing landscape. For some views, DTM data may need to extend further than the LVIA study area because the distant horizon extends beyond this.

148 In some locations, such as very flat landscapes with few features, achieving a good fit with the digital terrain model will be difficult. The use of artificial features such as a meteorological mast or other infrastructure may be required to position the image.

Geometrical properties

149 To allow direct comparison (and reduce confusion) wirelines should be provided using the same perspective geometry and image height as the photomontage. They should also be presented in **planar projection** to provide a consistent representation of the wind farm.

Drawing style

150 Wirelines consist of little more than simple line-drawings of the DTM and the wind farm. However, there are a range of graphic styles used to depict these which can affect the clarity and legibility of the finished image. A number of options are acceptable; however it is important that the same format is used throughout a single ES.

151 The DTM is most commonly drawn as a mesh seen in perspective. While this is a faithful depiction of the landform as represented by the DTM, it can often result in the more distant parts of the scene becoming unreadable as the grid lines get closer together, eventually merging into solid colour. This is not helpful and in these circumstances **grid lines should, if possible[5], be removed to maintain a simple image**. Only the outline of the topographic features in the scene, approximating to the lines one might draw as a sketch of the scene, should be shown.

152 Colour is useful to highlight the wind turbines in contrast to the landform lines, especially in distant views where the effect of merging lines noted above often occurs, and where some turbines may only just be visible against the landform. There are a number of options, such as those listed below:

- Green turbines on a black DTM
- Red turbines on a black DTM
- Black turbines on a grey DTM
- Blue turbines on a grey DTM
- Grey turbines on a green DTM

The use of pale colours, such as yellow, is not recommended as these have insufficient contrast with the white paper background and cannot be seen clearly.

153 Using the same colour and/or shade for the turbines and DTM is not recommended due to the lack of distinction between them. All the other options listed above are acceptable with the

[5] It is noted that some wind farm visualisation software does not have this function at present, hopefully this will rectified in due course. In the meantime it is accepted that some practitioners may not have the ability to easily remove all grid lines.

caveat that care must be taken to ensure that the type of colouring does not produce an illusion that the turbines are closer (or further away) than the landform on which they are sited.

154 Varying colours of turbines should be used to distinguish different wind farms within a view or existing turbines from proposed turbines planned as an extension.

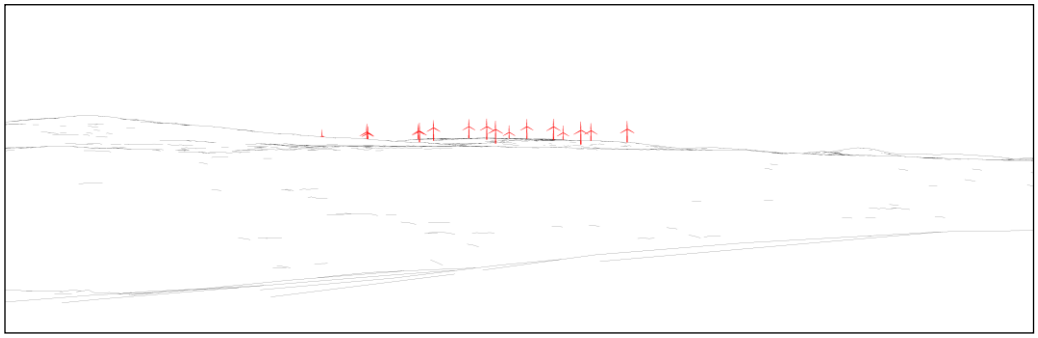
155 Turbines should be numbered so that the individual turbines can be directly referred to a layout plan also showing the turbines numbered[6]. Unless the wind farm comprises a small number of turbines, however, this information will usually take up a large amount of space upon the wireline image and, similar to any other labelling, may distract from the wireline image itself. It is preferable to label duplicate wirelines within an appendix (a selection of key viewpoints may suffice, if agreed during consultation). For cumulative wirelines, only the turbines relating to the proposal need to be numbered.

156 Features other than wind turbines can also be modelled into the wireline, depending on the software being used. Existing landscape features can be shown, such as pylons or distinctive buildings, which will help direct comparison with the photograph of the existing view (as long as these do not obscure the wind turbines). This can be particularly helpful for offshore sites where platforms and other existing infrastructure can be useful. Other elements of the wind farm development can also be shown, such as access tracks and other permanent ancillary infrastructure.

Construction of wireline

157 The production of wireline images is well understood, using standard software, so detailed guidance is not provided here. The key objective is to provide a wireline of the same geometry and image height as described for the photomontage below. **Planar projection** is required. The wireline should be 260mm by 820mm wide. The horizontal field of view should be 53.5° and the vertical field of view should be 18.2°.

Figure 2: Example wireline



[6] NB, not for offshore wind farms as this is likely to be impractical

3) Photomontages

The use of photomontages

158 The basic concept of photomontage is simple: it combines a photograph of an existing view with a computer-rendered image of a proposed development. In this way, **photomontages are used to illustrate the likely view of a proposed development as it would be seen in a photograph (not as it would appear to the human eye in the field)**.

159 **Although photomontages are based on a photograph of the existing landscape, it is important to stress that they are not a substitute to visiting a viewpoint in the field**. They are only one tool to aid assessment. They provide a two-dimensional image that can be compared with an actual view of the landscape to provide information, such as the scale and potential appearance of a proposed development; but they cannot show other qualities of the landscape experience that can only be appreciated in the field.

160 Given the limitations of depicting turbines in photomontages, their production will usually be of most value for views within 20km of a wind farm site, for turbines up to 150 metres high to blade tip[7]. At distances greater than this it can be difficult to represent the turbines well on a photomontage. However, this will depend on issues such as the specific wind farm design and environmental conditions**, so this parameter, and which viewpoints require photomontage, should be discussed and agreed with the determining authority and consultees.**

Rendering of photomontages

161 In order to address the difficulty of representing wind farms clearly within photos, it is common practice to exaggerate the prominence of the turbines to ensure that they stand out in the finished photomontage. When done poorly, this results in a level of predicted visibility unwarranted by the conditions seen in the photograph. However, where done sensitively, this can improve the clarity of an illustration, comparable to the conventional processing of photographs within a darkroom. It is recommended that the rendering of photomontages is carried out extremely carefully by a suitably experienced professional. The nature of any enhancement should also be noted within the ES.

162 Where a project involves an extension to an existing wind farm it is important that the existing wind farm appears clearly in the photographs. If this is not achievable the existing turbines have sometimes been 'painted out' in the baseline photograph and re-montaged back in, so that the images of both existing and proposed turbines match. An accurate representation of the baseline conditions is important and we therefore prefer good photographs of the existing development. However, in some conditions it may be necessary to enhance the depiction of existing turbines if they are not clear in the photographs taken (for example due to weather conditions, or because the rotors are oriented perpendicular to the viewpoint).

[7] For turbines larger than 150m the distances should be discussed with SNH

163 **Enhancement and rendering cannot compensate for photographs that have been taken in poor light or weather conditions**. In these circumstances, the photographs should be retaken.

164 It is important to use turbine locations, dimensions and heights which are as accurate as possible. The location and height of turbines in visualisations can be verified using the process set out in **Annex E.** The production process should be documented within the ES to enable this.

Accuracy of match to photography

165 In order to create a photomontage, the geometry of the overlain rendered image of the wind farm must match as exactly as possible that of the base photography. The viewpoint location, height and direction of the view must be **identical**, as must the horizontal field of view. Both the resulting panoramic photograph and the rendered image must be **planar projections**. In some cases, to achieve an accurate match, the images will need to be produced in cylindrical projection, thus allowing a much wider horizontal field of view and providing more features to achieve a match. Once a good match is achieved, the image should then be converted to planar projection for presentation in the ES.

166 The most reliable method of obtaining an accurate match is to generate a wireline image that matches the photograph. If the wireline can be accurately overlaid onto the photograph, then the fit is good. However, where there are few landform features, this process may require the matching of specific structures identified and mapped on site. A transparency copy of the image can also be used to check this on site.

167 An accurate GPS position, taken when the photography was carried out, is almost always sufficient for wind farm applications. Viewpoint location errors usually manifest as a mismatch in the horizontal position of elements in the photograph and wireline and are always more apparent in closer objects or landscape elements. If it is impossible to obtain a simultaneous match on both near and distant landform features, then the viewpoint position is incorrect and will need to be either re-measured on site or identified through iteration.

168 In certain landscapes, where there are few distinctive topographic features, it is necessary to use man-made features such as masts, pylons or buildings. Even when these types of features are clearly visible in photographs, it is often difficult to identify them accurately on the map. Where there is no view of a distant skyline a hand-level or, better, a surveyor's level, can assist in setting the correct vertical alignment of panorama and wireframe. Without this one may be reliant solely on the leveling of the camera.

169 Adjustments should be made until a satisfactory match between topographic features in the wireline and the photograph are achieved across the whole width of the panorama, to ensure that there are no errors of scale. If this cannot be achieved, then the fields of view do not exactly match and the parameters must be adjusted further. It is often the case that a small rotation needs to be applied to the panorama to compensate for residual errors in levelling the camera.

170 Once a satisfactory match has been achieved, it is possible to use the parameters for the wireline as perspective parameters for rendering the turbines for photomontage. Many packages combine wireline and rendering and some also include the facility to overlay the wireline on the photograph while adjusting parameters. However, the best quality is usually obtained using a separate computer program designed for high-quality rendering. Most rendering programs do not include the effect of the earth's curvature, so it may be necessary to make vertical adjustments to the turbine positions before rendering. The rendered wind farm should be overlaid on the photograph using a matched wireline for reference, to ensure that the position is correct.

Accuracy of lighting

171 The lighting model used to render wind farm images for photomontages should be a reasonably faithful match to the lighting visible in the base photograph. Consequently, the date and time that the photographs were taken should be recorded by the photographer or assessor to enable an exact sun direction to be calculated. In practice, however, as long as the direction of light is correct to within about 10 degrees, a convincing match can be obtained. The effect of light and shade on wind turbines is an important aspect of their visual character and should be represented well.

Associated infrastructure and land use change

172 Wind farm proposals include elements other than wind turbines, such as access tracks; borrow pits, crane pads, site compounds, cabling, and a substation. A wind farm development may also be both directly and indirectly responsible for vegetation and land use change. If these elements are likely to result in permanent significant impacts (for the duration of the consent), either individually and/or collectively, they should be included in photomontages where this is practical.

173 Some of these components may be difficult to model well, particularly changes in vegetation. In these circumstances it may be necessary to "paint" them directly onto the photomontage, guided by a wireline or other computer generated image to ensure that the positioning, perspective and scale of these elements is represented as accurately as possible.

Turbine lighting

174 In some circumstances it may be necessary to provide lighting on turbines if this is required to address military and/or civil aviation requirements. We recommend that where turbines are proposed in excess of 150m SNH are consulted on the requirement for night time visualisations. It is difficult to illustrate turbine lighting well in visualisations, although some recent examples which use photographs taken in low light conditions (just before or after sunrise / sunset) have been more useful. We encourage applicants to explore new techniques to do this, and emphasise the importance of early dialogue.

175 Where an illustration of lighting is required, a basic visualisation showing the existing view alongside an approximation of how the wind farm might look at night with aviation lighting may be useful. This is only likely to be required in particular situations where the wind farm is likely to be regularly viewed at night (eg from a settlement, transport route) or where there is a

particular sensitivity to lighting (eg in or near a Dark Sky Park or Wild Land Area). **Not all viewpoints will need to be illustrated in this way**. The visualisation should use photographs taken in low light conditions[8], preferably when other artificial lighting (such as street lights and lights on buildings) are on, to show how the wind farm lighting will look compared to the existing baseline at night. It is only necessary to illustrate visible lighting, not infrared or other alternative lighting requirements.

176 We have found that approximately 30 minutes after sunset provides a reasonable balance between visibility of the landform and the apparent brightness of artificial lights, as both should be visible in the image. It is important that the photographs represent the levels of darkness as seen by the naked eye at the time and the camera exposure does not make the image appear artificially brighter than it is in reality. It can also be helpful to note the intensity of other lights in the area to enable comparison (e.g. television transmitters) as this can aid the assessment process. SNH may prepare further guidance on assessment of lighting in due course.

177 The developer should attempt to formally agree the lighting requirements with the aviation authorities in advance of the application. Where this is not possible the visualisations should illustrate the lighting as described in the current legislation.

Image requirements

178 Production of the photomontage requires care to ensure that an accurate image is created. **The section on constructing visualisations is prescriptive and images must comply with these requirements. This will avoid concerns over the 'accuracy' of images or the method by which they have been produced.**

Construction of photomontages

179 The photomontage should be formed from several 50mm photographs stitched together by a competent professional using suitable software. The information that should be included on the photomontage is described in paragraph 130.

180 The panorama should be printed on A1 width paper[9] [10] in **planar projection**. The image size should be 260mm high by 820mm wide. The horizontal field of view should be 53.5° and the vertical field of view should be 18.2° in the centre of the image. The image will have a principle distance of 812.5mm.

181 A clear viewing instruction should be included on the photomontage as follows: "**View flat at a comfortable arm's length**. If viewing this image on a screen, enlarge to full screen height". To address concerns about the viewing instruction not being clear enough, this should be printed in larger font than the example below.

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[8] The health and safety considerations of low light photography should be taken in to account but should not, in themselves, be used as a reason to avoid the production of night time visualisations.
[9] Unless a wider Horizontal Field of View is required
[10] Folded to A3, see paragraph 184

Figure 3: Panoramic photomontage

Presentation of visualisations

182 It will usually be appropriate to present the photograph, wireline and photomontage such that the proposed wind turbines are centred in the horizontal field of view. However, at certain viewpoints it may be appropriate to centre the view on an alternative feature, or part way between two or more foci. These additional foci may or may not be wind farms. In these circumstances, it is important that the proposed wind farm does not appear at the far edge of the image. This is because sufficient context or horizontal field of view needs to be provided for each of the foci.

183 Paper and electronic copies of all ES materials will be required by the Planning Authority and SNH. Where possible, images from each viewpoint should be saved in to one pdf for ease of use, and be clearly named. The number of copies should be agreed for each application. Additional loan copies for members of the public will also need to be provided, and these should be made available at accessible locations throughout the study area. Typical locations include local libraries, Council offices and village halls. The number of loan copies should be agreed with the Planning Authority.

184 The A1 length visualisations **should be folded to A3 size** in the ES. This is to allow ease of use and transport. The visualisations should be provided in a ring binder so that users can remove individual sheets easily and we recommend these are limited to 10 viewpoints per binder to make this easier to transport.

Public Exhibition display

185 Stakeholder engagement is extremely important and exhibitions provide an important opportunity to present visualisations to the public. It is recommended that **the same visualisations**, printed at the same size, should be used for public exhibitions. The limitations of visualisations should be clearly marked on all of the material, and the information in **Annex A** clearly displayed at the exhibition.

Presentation to council planning committee

186 It is for the Planning Authority to determine which images are presented to the committee – but it is important that those who are unable to visit viewpoints are provided with a suitable panorama to provide landscape and visual context. All hard copy images should be printed in colour at the correct size.

187 Projection of a selection of the visualisations on PowerPoint slides, or similar, may be helpful to the planning officer and committee members. However, **it is essential that members are also provided with hard copies of the images, printed at the right size** to aid their decision-making and that they read the supporting text assessment in the ES. Visualisations on their own cannot substitute for the assessment of likely effects.

188 Committee members should ideally **visit a representative selection of viewpoints** as part of the decision-making process, especially where there are differing opinions on the likely effects.

Optional visualisation techniques

Viewpoint pack

189 In some cases the planning authority may find the provision of a viewpoint pack helpful. These should be provided on thicker A3 paper for durability and ease of use in the field. Images contained within the pack should be loose leaf and should have a detailed location map printed on the reverse side to make it easier for users to find the exact viewpoint location. A brief description of how to find the viewpoint should also be included.

190 The pack should contain images from a set of key viewpoints, to be agreed with the determining authority. It may not be necessary to provide them for every ES viewpoint. SNH do not require viewpoint pack images.

191 Each image should be clearly labelled: "**This image is intended only for use at the viewpoint. Further information in the ES should also be referred to**."

Construction of A3 single frame photomontages in the viewpoint pack

192 The images should be prepared from the same baseline photography and using the same process for rendering turbines[11]. The image height should be 260mm by 390mm wide. The horizontal field of view should be 27° and the vertical field of view should be 18.2°. The image will have a Principal Distance of 812.5mm.

Figure 4: A3 single frame for use in viewpoint pack

Using the viewpoint pack

193 The pack holder or title page should be clearly labelled "Images for assessment only at the identified viewpoints" along with the name of the wind farm and supplementary information. It should include a map showing the location of each viewpoint and detailed grid references to help users find the viewpoint location in the field.

194 It is important to get as close to the precise viewpoint location as possible. The viewpoint map, grid reference and photograph of the tripod location can all be used to achieve this. The

viewpoint map should be easy to find and use, showing recognised landmarks, roads or buildings, for example, for the user to identify the viewpoint. A short description of the viewpoint may also be helpful.

195 In poor weather the use of an A3 Perspex holder, or document wallet, can help keep the images dry and reduce the effect of wind. Planning officers and other users who visit viewpoints regularly should consider purchasing a holder for this purpose and in particular for presenting images to the planning committee in the field (when it is often not possible to choose optimal weather conditions). These are widely available at low cost and can also be used to hold folded A1 length images.

196 The Viewpoint Pack should only be used at the viewpoint location, or by those who have previously visited the viewpoint (such as on a Committee site visit). At viewpoints which are very close to the wind farm it may be necessary to take the larger panoramas or wireframes as it is unlikely that the whole wind farm will be captured on the single frame. It is not necessary to produce multiple single frames to cater for this situation – though if turbines are missing this should be clearly noted on the single frame image.

Hand-drawn illustrations

197 Drawings and paintings have been used for centuries to illustrate proposed landscape or architectural changes. However, digital photography has resulted in radical changes to the way images are conventionally presented, with an associated demand for these to be based on technical data for which accuracy can be measured.

198 There are instances when hand-drawn illustrations remain an invaluable tool in the process of visual analysis and the illustration of impacts within an ES. This is because they can offer:

- clarity of image, by omitting some of the distracting details that might be prominent within a photograph but which are overlooked on site;
- an element of interpretation by highlighting prominent focal features; and,
- their limitations are obvious – they are clearly not trying to replicate an exact view as it would be seen.

199 However, for these same reasons, hand-drawn illustrations also have disadvantages, chiefly that their quality is closely linked to the abilities of the illustrator and they may be distrusted for incorporating 'artistic licence'.

Diagrammatic sketches and annotated visualisations

200 Diagrammatic sketches allow the key elements of the composition to be drawn out and highlighted. This may be in relation to the landscape or the wind farm development, highlighting the main characteristics and principles of design. The advantage of using this medium is that important points can be stressed without them being clouded by insignificant details.

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[11] The single frame can be extracted from the panoramic photomontage, as long as it is cropped from the centre of the panorama.

Animation

201 Wind turbines are intrinsically dynamic objects, with large moving parts and variable orientation, so static images are in many ways a poor illustration. Computer animation, videomontage and virtual-reality techniques are being used to some extent to address this issue.

202 To date, most animation and videomontage has been used principally as a means of conveying a general impression of a development to the determining authority and the public, rather than as a tool for carrying out VIA or as part of an ES. However, considerable scope exists for their use in the future as various techniques are developed and presented, and then tested against wind farms once these have been built (similar to the scrutiny applied in the past to wirelines and photomontages). At present, the application of these techniques requires specialist contractors.

203 The provision of animation may assist in the decision making process. However, it cannot replace the need for professionally produced photomontages and wirelines from selected viewpoints. SNH will conduct further research on the use of digital visualisations in 2017-18.

Additional techniques for cumulative assessment

204 Additional guidance on further techniques to illustrate cumulative effects is provided in our guidance on Assessing the Cumulative Impacts of Wind Farms. The presentation of sequential effects as bar charts or on coloured maps is increasingly common. Video and virtual reality simulations of journeys have also been used with varying success. All such approaches should be carefully considered and discussed with the determining authority. Care is required not to use technology for technology's sake, nor to overburden the ES and decision-makers with additional information.

5 Offshore wind farms

205 Offshore wind farm visualisation presents different challenges to onshore situations. As well as having different environmental factors to consider, developments may be significantly larger in turbine size and number.

206 In general terms, given good meteorological conditions, visibility is higher on the coast than inland; periods of exceptional visibility occur in north and west Scotland. However, in the coastal and marine environment, light quality and weather conditions change more rapidly and are more variable than onshore, so it is difficult to represent these varying conditions in a single image. Practitioners should aim to prepare visualisations representing the specific time of day and season when there is optimum visibility and clarity. The reasoning and background to choosing this seasonal or diurnal 'window' should be explained, for example by supporting Meteorological Office data. Note that there may be some additional requirements for visualisations to illustrate other light conditions such as sunrise or sunset.

Specific photographic requirements

207 It is difficult to judge the distance of an object when it is out at sea. It can also be difficult to judge the scale of a single turbine, or of a wind farm, where there is no scale indicator giving a familiar, comparative size. Thus, it is essential to include local landmarks or familiar features within a photograph where at all possible[12]. Where existing offshore features, such as oil platforms, existing turbines or lighthouses are present, they may aid in estimating the scale of the turbines, as well as the overall size and extent of the wind farm.

208 Most requirements will be for visualisations from onshore viewpoints looking out to sea but in some instances there may be a need for photography at sea to illustrate views back to shore, for example from ferry routes. Such photography can be difficult to undertake because of wave action, so in some instances relaxation of photographic standards to reflect this may be appropriate, provided they are supported by wirelines. In some locations, especially those which are difficult to access, wirelines may be the only feasible approach.

209 Scotland's east and west coasts differ in terms of their light, aspect, weather and coastal character. This needs to be considered when planning photography and visualisations. The direction of sunset and sunrise are also a key consideration from sensitive viewpoints and should be illustrated in some circumstances.

210 There is limited evidence to support an alternative 'focal length' for offshore wind farms. A report by the DTI[13] recommended using a 70 or 80mm 'focal length'. **To maintain consistency with the approach used onshore, the same methodology and image specification is recommended for offshore wind visualisations.** Note – as for the images described in section 4 above, this should be cropped and enlarged from a photograph taken

[12] Longer than A1 paper lengths may be required
[13] Guidance on the assessment of the impact of offshore wind farms: Seascape and Visual Impact Report, DTI, (2005)

with a **50mm fixed focal length lens**. This will be kept under review and determining authorities may chose an alternative focal length if circumstances support this.

Use of design envelopes

211 To date, most offshore wind farm applications have been submitted on the basis of a design (or "Rochdale") envelope, with assessment carried out on the basis of a realistic "worst case" scenario, with the final design not confirmed until after consent. SNH has provided guidance on the landscape and visual aspects of this process[14].

Viewpoint choice for offshore wind farms

212 Viewpoint selection will depend on factors including the size and scale of the wind farm, its distance from shore, proximity to other development or projects, and the extent of visibility (particularly on land). Viewpoints will be agreed between Marine Scotland, the relevant planning authority and SNH. If a design envelope is used, key "design viewpoints" will also be identified, from which a range of design options will need to be illustrated.

213 Factors affecting viewpoint choice include, but are not limited to:

- Choosing key viewpoints to illustrate design options and evolution adequately
- Use of inland viewpoints to see offshore proposals in the context of onshore foreground
- Inclusion of appropriate features or foreground to help the location and scale of the wind farm to be appreciated
- Choosing viewpoints that represent recognised circulation routes, such as ferry routes (reflecting the type of boat and therefore viewing height from which the view will be seen), beaches, onshore roads and footpaths, cruising routes, popular sailing competition areas and other sea users, even if these may not be the most easily accessible points
- Including a range of elevations of viewpoints, where relevant
- Importance of representing land to sea, sea to land, and sea to sea views, including the coastal, sea and land interfaces
- Representing a variety of lighting conditions, e.g. side-lit, back-lit and front-lit
- There may also be a need to choose viewpoints to show tidal differences if inshore locations are proposed for development.

In all cases it remains essential that the number of viewpoints remains proportionate to the assessment.

Elevation of viewpoint

214 The horizon is the most distant point seen on the sea surface – this distance increases with the elevation of the viewpoint, and decreases the lower your position (because of the curvature of the earth). Under special weather conditions, on many days of the year from high

[14] Offshore Renewables – guidance on assessing the impact on coastal landscape and seascape; please refer to Annexe 2

points, it is possible to see the horizon up to 80+km distance[15]. On a clear day, viewed from a beach, the horizon is of the order of three nautical miles (approximately six km) distant. This means that the nature of views of offshore wind farms will vary significantly according to the elevation of the viewer, and any visual assessment should examine a range of viewpoints from different elevations.

Photomontage for offshore wind farms

215 In the production of offshore wind farm photomontages:

- It is important to recognise that the greater distances involved are a technical challenge. There may be a need to 'zoom in' for detailed design assessment.
- It is often difficult to represent turbines on the horizon in photomontages as this zone is generally hazy. The horizon may need to be rendered back in to the image in such situations, and wireframes will be particularly helpful.
- A key factor is achieving sufficient contrast between the sky and the sea so that the horizon is clear.
- It may be necessary to prepare images wider than 180^{o} to capture landscape and visual context.
- It will be necessary to show the visual impacts of any ancillary infrastructure (including offsite implications), such as offshore substation platforms, on-shore grid connections, converter stations, associated tracks, access routes or buildings, fencing, car parks, lighting, borrow pits and service platforms. Additional colouring on the turbines (such as coloured foundation jackets) should be represented on the photomontage where possible.

Wirelines for offshore wind farms

216 The use of wirelines is especially useful in offshore visualisation where producing photomontages may be very difficult, and these will replace photomontages in some instances.

Turbine lighting

217 All offshore and inshore wind energy development will require lights for marine navigation and aviation safety. It is often one of the major visual issues relating to this type of development. Generally, the turbines are proposed in areas currently characterised by their darkness. Reflection of lights on the water surface can also increase the effects of lighting in some conditions.

218 Precise lighting requirements are not known at pre-application stage and are only agreed post-consent via a "Lighting and Marking Plan". This is due to the wide spectrum of different design variations (the use of the 'Rochdale Envelope' in planning schemes) which make it difficult to finalise CAA, MoD and Northern Lighthouse Board requirements. Nevertheless, it is important to assess and illustrate likely lighting effects. Paragraphs 174-177 provide further guidance on this.

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[15] *An assessment of the sensitivity and capacity of the Scottish seascape in relation to wind farms.* SNH Commissioned Report 103 (2005), p 12

6 Repowering

219 Repowering involves the replacement of the old turbines with new ones and a new planning application. In most cases this will require a new LVIA and new visualisations.

220 Our guidance on assessing repowering applications is in preparation and we will consult on this later in 2017. In the meantime, we are scoping the assessment of repowering applications on a case by case basis. As a starting point we advise that visualisations for repowering schemes are prepared as follows:

- The baseline panorama should show the baseline landscape with the existing wind turbines removed
- An additional visualisation which compares the existing wind farm with the proposed new one should be provided. This should follow the same format as recommended for the baseline panorama, with the existing wind farm at the top of the image and the new proposal below.

Annex A Information on limitations of visualisations.

Visualisations of wind farms have a number of limitations which you should be aware of when using them to form a judgement on a wind farm proposal. These include:

- A visualisation can **never show exactly** what the wind farm will look like in reality due to factors such as: different lighting, weather and seasonal conditions which vary through time and the resolution of the image;

- The images provided give a reasonable impression of the scale of the turbines and the distance to the turbines, but **can never be 100% accurate**;

- A static image cannot convey turbine movement, or flicker or reflection from the sun on the turbine blades as they move;

- The viewpoints illustrated are representative of views in the area, but cannot represent visibility at all locations;

- To form the best impression of the impacts of the wind farm proposal these images **are best viewed at the viewpoint location shown**;

- The images **must** be printed at the right size to be viewed properly (260mm by 820mm);

- You should hold the images **flat at a comfortable arm's length**. If viewing these images on a wall or board at an exhibition, you should stand at arm's length from the image presented to gain the best impression.

- It is preferable to view printed images rather than view images on screen. If you do view images on screen you should do so using a normal PC screen with the image enlarged to the full screen height to give a realistic impression. Do not use a tablet or other device with a smaller screen to view the visualisations described in this guidance.

Viewing instruction to be provided on every image

To minimise the risk of images being viewed incorrectly on screen, every photomontage should contain the following instruction: "**View flat at a comfortable arm's length. If viewing this image on a screen, enlarge to full screen height**". The correct paper size and image size should also be provided.

Annex B Standard requirements which all visualisations should comply with

Checklist

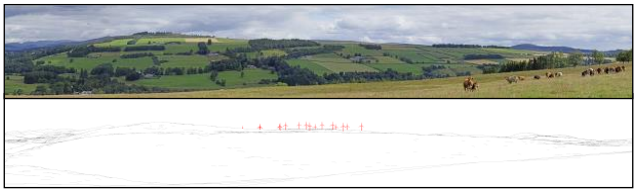
Photography	**Camera**	Full Frame Sensor Size	
	Lens	50mm fixed focal length	
	Camera height	1.5m (unless alternative height can be justified, in agreement with planning authority)	
	Location	Grid reference, relevant location map, and photograph of tripod location provided	
Photomontage	**Image**	Clear of foreground objects	
	Conditions	Visibility sufficiently good	
	Baseline panorama and wireline	Cylindrical projection 90, 180, 270 or 360 degrees printed on A1 length sheet(s). Image size for both the baseline panorama and wireline should be 820mm by 130mm	
	Wireline	Planar projection, image size 260 by 820mm on A1 sheet. HFOV 53.5° and VFOV 18.2°	
	Panorama	Planar projection, image size 260 by 820mm on A1 sheet. HFOV 53.5° and VFOV 18.2°	
	Principal Distance	Printed on visualisations	
Maps	**Viewpoint map**	To include overall viewpoint location map (combined with ZTV). Thumbnail location map provided on each panorama	
Methodology		Statement of methodologies used to produce visualisations including ZTVs and software used	

HFOV = Horizontal field of view
VFOV = Vertical field of view

Annex C Summary of visualisation requirements[16].

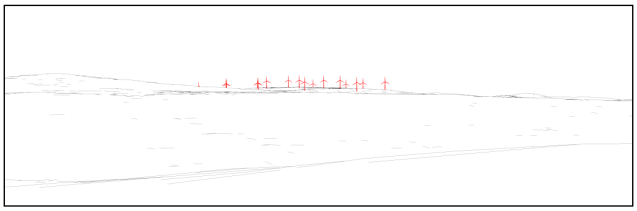
Baseline panorama and wireline

The purpose of the baseline panorama and wireline is to provide wider landscape and visual context to help the viewer understand where development sits within the wider landscape. The wireline also illustrates cumulative effects and provides the viewer with the full cumulative context. The baseline panorama is not intended to represent how large or small the turbines will appear in reality or how close they will appear to the viewer.



Wireline

Wirelines are very useful in the design stages and can used to illustrated changes to the proposal quickly and effectively. They illustrate 'bare ground' visibility and a provide a clear view of the wind farm to inform the assessment.



A1 Panorama

The A1 panorama is intended to provide the best impression of the apparent size of the turbines and the distance to the development from the viewpoint location. Only images at this scale[17], held at a comfortable arms length, should be used when trying to understand the size of the development and its distance from the viewpoint.

[16] Note – it is not always necessary to produce all 3 images. In some cases a wireline may suffice, for example, if agreed by the determining authority and consultees

[17] The horizontal and vertical fields of view define the scale of this image which is equivalent to the image which would be captured with camera lens of a focal length of 75mm on a full frame camera. Images produced which have an equivalent focal length of less than 75mm will make the development appear smaller and further away than it would in reality, regardless of viewing distance.

Annex D Earth Curvature and Refraction of Light

Ordnance Survey co-ordinates are not fully 3-dimensional. The northing and easting define a point on a plane corresponding to the OS transverse Mercator map projection, and the altitude above OS datum is measured above an equipotential surface passing through the OS datum point at Newlyn. In reality, the earth is curved so a correction has to be made in order to position geographical features correctly in three dimensions for ZTV calculation and for visualisations.

If it were not for the presence of the Earth's atmosphere, a simple allowance for curvature would be sufficient. The formula for this can be worked out quite easily from Pythagoras' theorem:

$$c^2 + r^2 = (r+h)^2$$
$$c^2 + r^2 = r^2 + 2rh + h^2$$
$$c^2 = 2rh + h^2$$
$$= 2(r+h)h$$
$$c = \sqrt{2(r+h)h}$$

h is very small in comparison with ***r***, so the formula can be approximated with:

$$c = \sqrt{2rh}$$

Rearranging for ***h***, we get:

$$\sqrt{2rh} = c$$
$$2rh = c^2$$
$$h = \frac{c^2}{2r}$$

In practice, rays of light representing sightlines over long distances are also curved downwards as a result of refraction of light through the atmosphere, allowing one to see slightly beyond the expected horizon. (The atmosphere reduces the vertical correction due to curvature alone by about 15%.) The standard formula used in surveying work is modified from the one derived above as follows:

$$h = \frac{c^2(1-2k)}{2r}$$

Where:

h is the height correction in metres
c is the distance to the object in metres
k is the refraction coefficient
r is the radius of the Earth in metres

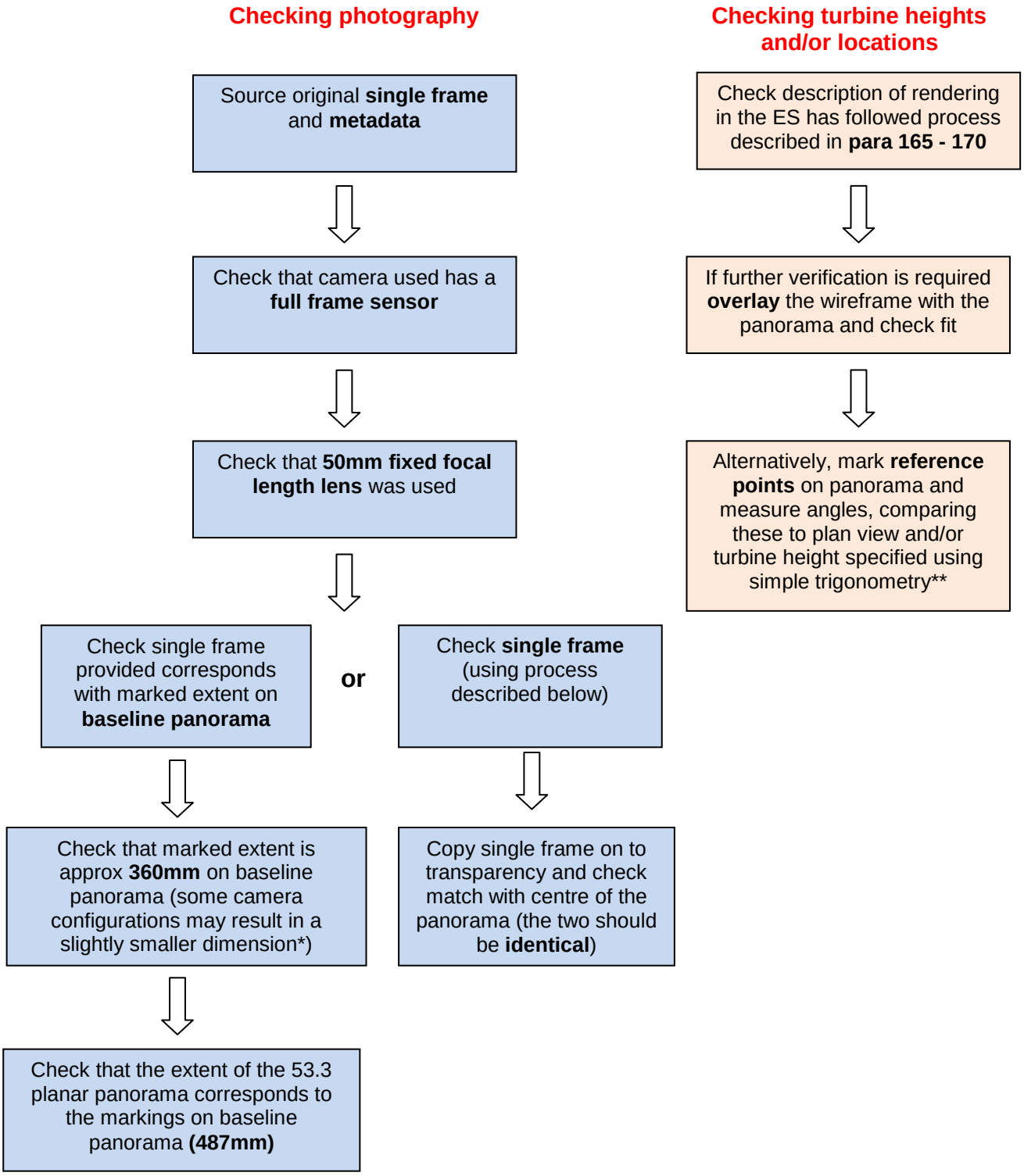
The parameter ***k*** is not constant but varies with temperature and barometric pressure (and therefore also with altitude). For precise geodetic surveying work both these quantities would have to be measured at both ends of a line of sight. Visualisation and visibility analysis do not require such precision; therefore a representative value may be used. 0.075 is a reasonable average for inland upland observations, but very slightly different values may be found quoted in surveying or navigation textbooks. (***k*** is a numerical coefficient and therefore has no units.) Taking ***k*** = 0.075 and ***r*** = 6,367,000m (a representative radius for the UK), the following example values are obtained:

Distance c	Vertical correction for Earth curvature and atmospheric refraction h
5 km	1.7m
10 km	6.7m
15 km	15.0m
20 km	26.7m
25 km	41.7m
30 km	60.1m

Annex E Verification of images

Some users of visualisations may wish to 'verify' the images provided. The following methods can be used. The first is provided to check that the photographs have been taken on the correct camera and lens and then enlarged appropriately. The second is to test that the turbines have been placed in the correct locations and at the correct size.

There are two ways to check the A1 panorama, both are described below. The verification of single frame images (for the optional viewpoint pack) is described separately on page 51.



Single frame images

The single frame image provided in the viewpoint pack (if this is requested by the Planning Authority) can be verified using a similar process. A simple template can be used to check that the correct portion of the 50mm image has been cropped and then enlarged*. To check this:

- Obtain original 50mm photograph with **metadata**. Check full frame sensor camera and 50mm fixed focal length lens used
- print the original **50mm** photograph on A3 at **390mm** wide by **260mm** in height
- overlay a **template** to check that the correct proportion of the image has been cropped (an example is available on our website). The template should include two rectangles, one at 390mm by 260mm, and one at 260mm by 174mm as shown on the example.
- the cropped area should then be printed at **390mm** wide by **260mm** in height and this can be measured on the image submitted.

*** Note** – not all full frame sensors are exactly the same size. Very slight variations in sensor size and lens focal length may affect this measurement / comparison by a few mm. However, the difference is small enough that the horizontal field of view can be verified with sufficient confidence.

** **Note** – if measuring turbines on the image, make sure that you measure the full height of the turbine – i.e. check that the base of the turbine is not obscured either by vegetation, screening or topography.

Annex F Taking Good Photographs

This appendix is not intended to be a general manual of photography, there are plenty of good books available on that subject. It sets out briefly the main issues relating to photography aimed at constructing panoramas suitable for photomontages and ES work.

Camera and lens

A good quality camera is essential. A digital camera with **full frame sensor** is required to capture sufficient information and produce a verifiable image. A **fixed focal length 50mm** lens should be used to produce photomontages. A fixed focal length a) reduces the risk of inaccuracies and b) enables easy verification of the image should this be required. A full frame sensor also provides a verifiable reference point and a higher resolution than most alternative sensor sizes (depending on the camera).

Note, however, that sensor size varies slightly on most 'full frame sensor' cameras and that even high quality fixed focal length lenses can vary in their geometry. The precise sensor size and geometry of the lens should be recorded, where available. Any significant variation from 36x24mm sensor size or 50mm focal length should be recorded and, if significant, corrected for.

Tripod

A stable tripod is essential. As a minimum, a head with independent tilt adjustments for both pitch and roll should be used (ball-head tripods are more difficult to level satisfactorily). A panoramic head should be used, allowing a single adjustment to be made for an entire panorama. Camera height should be 1.5m (unless an alternative height is required). A photograph of the tripod in situ should be taken.

Levelling

In order to obtain photographs which will splice together satisfactorily to form the baseline panorama, it is essential that the camera is levelled accurately. A simple, cheap spirit level will do this quite satisfactorily and, with care, can produce images levelled to an accuracy of about 0.2°. A tripod head with a built-in sprit level and adjusting screws is better.

Focus

The camera lens should always be focussed on infinity. On auto-focus lenses, the focussing should be set to manual or locked on infinity.

Aperture and Exposure

If at all possible, the exposure should be metered once for a complete panorama and then used for all frames either by using a manual setting or by locking the exposure.

For greatest depth of field in the images, the aperture should be set to the minimum available on the lens (typically f/16 or f/22). If it is necessary to obtain slightly more resolution, it may help to use a slightly wider aperture: f/5.6 or f/8 are often the optimum settings. However, the photographer should use professional judgement to achieve the best results.

Shutter speed should be selected to obtain the correct exposure consistent with the aperture selected. If there are existing wind turbines in the view, the shutter speed will affect the degree of blurring seen in the photograph due to the movement of the blades.

From: Nick Bradford - Nundle Woollen Mill [mailto:nick@nundle.com]
Sent: Wednesday, 6 May 2020 9:21 AM
To: 'Jamie Chivers' <jamie.c@someva.com.au>
Subject: ABC Interview

Hi Jamie,

I just had a listen to your interview on ABC radio. While most of your response was expected from a developer point of view, I really take exception to your comment about the “vocal minority”. You pride yourself on being factual and balanced but this is a blatant lie. You know that more than half the community are absolutely against this project. This information has been tabled at a CCC meeting in the form of a petition. At our first meeting with John Wilcox, he said if the majority of the community don’t want this project, it won’t go ahead. The majority of the community don’t want this.

Can I please suggest that in future interviews, you don’t refer to those who speak against this project as the “vocal minority”. You know this is not the case. You tell us that you are trying to engage with the community in a meaningful way, this is not the way to do it. You alienate those who are against the project further, maybe that it is your end game.

Kind regards,
Nick

Nundle Woollen Mill
nundle.com
nundle.store
35 Oakenville St
Nundle, NSW, 2340
AUSTRALIA

Tel: 1300 N-U-N-D-L-E (1300 686 353)
Tel: + 61 2 6769 3330
Mob: 0409 239 665

CCC Meeting Wednesday 06.05.20

Correspondence:

- Letter to WEP by Nick Bradford.

Questions by community

1. What is Mike Strangers current role within Someva?
2. Is Mike Stranger a Share Holder of either Someva or Wind Energy Partners?
3. Is Mike Stranger the Development Officer or Environment Representative?
4. Regarding Audio & Visual Assessments, when will Someva respond to Community members requests to be included in Noise & Visual Assessments?
5. Wind Energy Partners has mentioned on several occasions that any community member can request to be included to have their property assessed for a Visual Impact Montage, members would like to know when this will happen and how can they register?
6. Wind Energy Partners have stated two Wind Monitoring Masts were commissioned in July 2019, members of the community have asked what is the date the first Wind Monitoring Mast was installed on site before these two?
7. What is the date when was the first Wind Monitoring Mast removed?
8. Regarding Aviation Lighting requirements, a member of the community has asked, Do the lights flicker in sequence or offset?
9. Would the Turbines be visible at night due to reflection from light from the moon?
10. The movement of the wind turbine blades can cause serious degradation in the reception of television signals. These effects are almost permanent, declining only in periods when turbines do not work. **When can the community members expect to know if their TV reception will be interfered with due to radio line of sight and transmitter interference?**
11. Community members are concerned there is an open investigation into alleged illegal Land Clearing of State Forest and Ben Halls Gap Nature Reserve, several members of the community have now come forth to advise they have lodged complaints in March 2018. AS no information or result has come forth to date from the Department investigating, members want assurance that no land clearing will occur in the Development corridor in preparation for this proposal. Can Wind Energy Partners and Someva ensure that a Moratorium to land clearing in preparation for this development be adhered to within the development corridor, especially the Western end of the proposal and all lands they wish to Lease?

CCC Meeting Wednesday 06.05.20

Correspondence:

Letter to WEP by Nick Bradford. Jamie Chivers provided the below response to Nick Bradford on 7th May 2020.

"Hi Nick

Thank you for your feedback. This was discussed at the CCC last night by a member of the CCC and it was acknowledged by Wind Energy Partners.

If you have any comments on the Preliminary Photomontages or any other aspect of the project, please feel free to contact me.

Jamie"

Questions by community

1. What is Mike Stranger's current role within Someva?

   Mike Stranger is the Assistant Development Manager – Land and Community for Someva and on the Hills of Gold Wind Farm project

2. Is Mike Stranger a Share Holder of either Someva or Wind Energy Partners?

   No, Mike Stranger is not a shareholder of either Someva or Wind Energy Partners.

3. Is Mike Stranger the Development Officer or Environment Representative?

   As discussed in the CCC meeting, Sandra Agudelo is the Senior Development Manager for the Hills of Gold Project and responsible for delivering the Environmental Impact Statement and is the environmental representative on the CCC. This notwithstanding, Mike Stranger has environmental qualifications and is responsible for liaising with community members and their concerns on the project, including those related to environmental management.

4. Regarding Audio & Visual Assessments, when will Someva respond to Community members requests to be included in Noise & Visual Assessments?

   Responses have been and continue to be provided to community members on the subject of noise and visual assessments. As the noise and visual assessments are being undertaken by technical consultants, it is important to consult with these technical consultants prior to providing responses to community members due to the nature of advice. This can take a little longer depending on the nature of the question.

5. Wind Energy Partners has mentioned on several occasions that any community member can request to be included to have their property assessed for a Visual Impact Montage, members would like to know when this will happen and how can they register?

Any community member is welcome and encouraged to discuss with us the visual impact concerns of the project and register their interest in having a visual assessment completed from their private residence. WEP will liaise and consult with individual members of the community who are interested in an assessment at their property. Community members can contact Mike Stranger, or email info@hillsofgoldenergy.com to express their interest in a home visit.

6. Wind Energy Partners have stated two Wind Monitoring Masts were commissioned in July 2019, members of the community have asked what is the date the first Wind Monitoring Mast was installed on site before these two?

   The first meteorological mast was installed in the wind farm development corridor for the Hills of Gold Wind Farm project in November 2010.

7. What is the date when was the first Wind Monitoring Mast removed?

   The original met mast was decommissioned in May 2015.

8. Regarding Aviation Lighting requirements, a member of the community has asked, Do the lights flicker in sequence or offset?

   Typically, per guidance provided by the Civil Aviation Safety Authority and the Department of Planning, Industry and Environment (DPIE), and where lighting has been recommended by CASA to reduce risk to aviation safety, lighting installed on wind turbines should flash simultaneously and be turned on and off simultaneously [1]. However, the requirement and design of obstacle aviation lightning is still to be determined for the project and will completed as part of the Hazard and Risk assessment component and in accordance with the Secretaries Environmental Assessment Requirements (SEAR's). This will be provided as part of the Environmental Impact Statement at the time of lodgement of a Development Application, and we will continue to consult with the community during the design phase of the project on their concerns with regards to aviation lighting.

9. Would the Turbines be visible at night due to reflection from light from the moon?

   Wind turbine generators may be visible at night insofar as other features of the landscape are visible at night when light reflected from the moon enables features of the landscape to be visible. The landscape and visual assessment component of the EIS will include further detail on the likelihood of visibility of the wind turbines at night.

10. The movement of the wind turbine blades can cause serious degradation in the reception of television signals. These effects are almost permanent, declining only in periods when turbines do not work. **When can the community members expect to know if their TV reception will be interfered with due to radio line of sight and transmitter interference?**

---

[1] National Airports
Safeguarding Framework Principles and Guidelines, Guideline D -
Guideline D: Managing the Risk of Wind Turbine Farms as Physical
Obstacles to Air Navigation.
https://www.infrastructure.gov.au/aviation/environmental/airport_safeguarding/nasf/nasf_principles_guidelines.aspx

Effects to telecommunications systems, including radio and television signals and reception, must be assessed as part of the communications assessment and Hazard/Risk assessment process, including identifying measures to avoid any disruption to these systems if there is determined to be a potential impact. This will be detailed in the Environmental Impact Statement, scheduled for lodgement with the DPIE at the end of 2020.

11. Community members are concerned there is an open investigation into alleged illegal Land Clearing of State Forest and Ben Halls Gap Nature Reserve, several members of the community have now come forth to advise they have lodged complaints in March 2018. AS no information or result has come forth to date from the Department investigating, members want assurance that no land clearing will occur in the Development corridor in preparation for this proposal. Can Wind Energy Partners and Someva ensure that a Moratorium to land clearing in preparation for this development be adhered to within the development corridor, especially the Western end of the proposal and all lands they wish to Lease?

    As per discussion in the May CCC meeting and as the minutes record, no land clearing has been performed by Wind Energy Partners in preparation for the project.

AAAA Tall Structures Policy

Last Revised: February 2017

Introduction

Tall structures—such as radio masts—are a direct threat to aviation safety – and especially aerial application. In an already hazardous low-level environment, tall structures impose additional operational costs onto aerial applicators in addition to increased risk.

AAAA has developed this policy so as to inform regulators, tall structure developers and operators alike of the need for action on their part to fulfill their duty of care to Australia's aerial applicators.

AAAA Tall Structures Policy

As a result of the potential safety and economic impact of tall structures and supporting infrastructure on the sector, AAAA **opposes all tall structure developments** in areas of agricultural production or elevated bushfire risk unless the developer is able to clearly demonstrate they have:

1. consulted honestly and in detail with local aerial application operators
2. sought and received an independent aerial application expert opinion on the safety and economic impacts of the proposed development that is acceptable to local operators
3. clearly and fairly identified that there will be no impact on the aerial application industry from either safety or economic perspectives and
4. if there is an identified impact on local aerial application operators, provided a legally binding agreement for compensation over a fair period of years for loss of income to the aerial operators affected.
5. Adequately marked any tall structures and related infrastructure and advised pilots and operators of its presence.

AAAA believes that the above processes should also apply for all tall structures that have already been approved or erected.

While it is not AAAA policy to provide specific comment on particular development proposals due to resource limitations, AAAA notes that tall structures can have far-reaching footprints that can remove significant amounts of land from treatment for a considerable distance from the tall structure vicinity.

Operational implications of each development will vary enormously depending on the site, the positioning of the tall structure, orientation of affected paddocks relative to the tall structure, the type of aerial application taking place, the aircraft used, the pilot's experience, the meteorological conditions, the site elevation, the position of any airstrip relative to the tall structure and a range of other variables.

However, it is clearly unacceptable that one industry can impose significant safety threats on another industry.

AAAA believes that:

- All tall structures—including guy wires and infrastructure—must be clearly marked to assist pilots to see them
- All tall structures and associated infrastructure must be required to be removed when no longer in use.
- The Commonwealth Government should establish and maintain a mandatory Tall Structures Reporting and Advice System, based on a real-time GIS system available on the internet to all bona-fide low level airspace users.

Recommendations to Government

Land Planning

AAAA recommends that the Commonwealth, States and Territories cooperate so as to make the NASAG processes binding on all government jurisdictions when they consider development applications for tall structures.

AAAA recommends that the Commonwealth expand its work under the NASAG process to include a new Guideline for the development of tall structures away from airports, including considerations of existing land use, known aerial application activity, notification and marking of tall structures.

The aim of such a Guideline, in addition to enhancing aviation safety, should be to ensure that tall structure developments do not adversely affect known aviation activities or aviation safety, and are compatible with existing land-use patterns.

AAAA recommends that the Commonwealth provide coordinated and comprehensive information to all tall structures developers on their responsibilities for aviation safety, including raising the duty of care requirements established under *Sheather v Country Energy* (NSW Court of Appeals) for owners of assets that pose a known threat to aviation activities to provide for suitable marking and other safety initiatives.

The Commonwealth should establish a head of power to regulate tall structure developments away from airports to protect aviation safety. This should include mandatory marking and notification of tall structures and the power to veto proposed developments where they interfere with aviation safety.

The Commonwealth should develop a national tall structures web-based database that is accessible in real time by all low-level aviation pilots and which captures all tall structures. The database should also capture other threats to low-level aviation including wind monitoring towers and powerline mapping systems.

CASA should set a much lower than previously used height trigger for notification of tall structure developments - down to 50 feet in an area of known aerial application activity—or use a risk assessment based approach.

CASA should work with Airservices Australia and any other relevant agencies to ensure that tall structures are included on suitable aviation mapping including WAC charts and topographic maps in a more timely manner.

Legal Responsibilities of Developers

AAAA's view is that the case of *Sheather v Country Energy* (NSW Court of Appeals) clearly established that anyone with infrastructure posing a threat to aviation must consider the risks that infrastructure poses to aviation safety and respond appropriately through marking or other measures to safeguard aviation operations.

While the requirement of marking of towers and notification to the RAAF Tall Structures Database is covered to some degree by the CASA regulations, this is based on what AAAA believes is a flawed approach to risk management and some towers may be excluded from the requirements because of the height threshold.

The Federal and State governments have undertaken significant work in this area through the National Safeguarding of Airports Working Group - http://www.infrastructure.gov.au/aviation/environmental/airport_safeguarding/nasf/index.aspx - AAAA believes the Commonwealth should make compliance with these guidelines mandatory as a first step in improving aviation safety.

In particular, AAAA have identified unmarked and un-notified wind monitoring towers as a safety threat to legitimate low level aviation—one that significantly increases the liability of developers should an accident occur. AAAA suggests tall structure developers should consider AAAA evidence to the Senate Windfarm inquiry and the death of an agricultural pilot in the US from hitting an unmarked, unnotified tower which has since resulted in significant legal and legislative action in the US - http://www.aph.gov.au/hansard/senate/commttee/S13670.pdf

Powerline Mapping and Marking

No pilot goes to work intending to hit a wire, so we must assume that pilots are doing their best to manage an extremely difficult operational task that would be significantly supported by mandatory national requirements for the provision of electricity network mapping information to pilots and operators and the visual marking of 'high risk' powerline spans - such as those that have already been hit and those assessed by pilots and operators as posing a significant risk.

Safety awareness in the aerial application industry is already extremely high and backed by a range of strong risk management systems and AAAA education and training initiatives.

AAAA has a long history of working positively with Essential Energy in NSW (formerly Country Energy) and this has led to the provision of mapping of networks to low level airspace users, and the placement of over 1200 markers on dangerous powerlines throughout NSW.

The key issue with marking systems is that they must be able to be fitted 'live line' by qualified electricity company staff. This brings the cost down from the traditional $2-3000+ for a single large orange ball marker (as the line must be isolated / turned off for fitting and several crews are involved) to about $100 per modern marker supplied and fitted. This puts the costs of marking well within the reach of electricity companies, landholders and others.

Essential Energy also works cooperatively with AAAA on information campaigns - see for example:

https://www.essentialenergy.com.au/asset/cms/pdf/safety/AerialSafety.pdf

AAAA has also sought to work with other electricity companies in other States. Unfortunately, that work has not resulted in mapping or marking systems being widely adopted, mainly due to the way information can be provided, but also a lack of interest in engaging on this critical safety issue.

AAAA is hopeful of improved software removing this current impediment to the national availability of powerline mapping.

However, the power of a national mandatory requirement for the provision of this already existing data should not be underestimated in terms of ensuring powerline companies contribute to safer aviation.

Review of Australian standard AS 3891 - Air Navigation - Cables and their supporting Structures - Safety and Marking Requirements - Part 2

The Australian Standard AS3891 on wire marking is currently being reviewed and both AAAA and CASA have been asked to participate on that review committee.

AAAA chaired the previous review of the standard some years ago and was frustrated in achieving any substantive changes to marking thresholds by concerted resistance from electricity network owners.

However, the previous review of the Standard did permit the use of new types of markers that are able to be placed during live-line work and are consequently far cheaper to install and even more visually effective than the traditional large 'ball' markers.

AAAA hopes that the upcoming review will similarly improve the Standard in terms of being less restrictive on innovative marker types (of which several are now available but which have difficulty conforming to the current Standard).

AAAA is also hopeful that the current hard triggers for marking of powerlines with significantly long spans (up to 1500 metres) and very high clearances above ambient vegetation (up to 90 metres) will eventually be addressed to be set at more realistic and safer - ie shorter and lower - distances.

AAAA notes that the Australian Standard does not appear to be binding or mandatory for electricity network owners and would strongly support its mandating by regulation.

Operational Impacts

The following potential impacts on aerial application should be considered by all tall structure developers:

- positioning of tall structures may affect local aerial application operations, depending on the particular site.
- impacts could vary from affecting flight lines to treatment height and accuracy, maneuvering areas and possibly take-off and landing splays if an airfield is nearby (see for example, CASA CAAP 92-1 for agricultural airstrips – www.casa.gov.au – search for CAAP 92-1.)
- it may not be the land or farm that the tall structure is to be situated on that will be affected. Neighboring farms, especially any with borders close to the tall structure site, may suffer significant impacts by imposed limits on the maneuvering areas of aerial application aircraft.
- a key impact may not be the tall structure itself, but the positioning of any powerline that would lead from the tall structure. Any supporting powerline should be put underground. If this is not possible, any above-ground cable must be adequately marked.

AAAA Activities to date

AAAA has done a lot of work to make it easier to mark tall structures, guy wires and powerlines through amendment of the national standard on marking of wires so as to use a marker developed by Essential Energy (NSW) with the cooperation of AAAA.

There is now little practical reason why tall structures and guy wires should not to be clearly marked.

AAAA also passes on information to members that has been provided to it by developers on the physical location of some tall structures. However, only a few developers provide this information and again there is little doubt that many tall structures are going up unmarked and unknown until hopefully spotted by pilots during pre-application planning and inspections.

More comprehensive safeguards must include a mandatory national system of communication of the position of all tall structures towers and the inclusion of this on a national database accessible by low level pilots.

AAAA Windfarm and Tall Structures Notification Process

Despite extremely limited resources, AAAA tries to assist aviation safety by advising those of our members on our email lists of the position of tall structures if advised by developers.

While AAAA has very limited resources, tall structure developers are encouraged to provide these details by email to AAAA.

AAAA will pass that information on to our members in that State on the basis of no assumed liability.

AAAA points out clearly that this in no way absolves the tall structure developer from the need to mark the masts so as to contribute to a discharge of their due diligence and duty of care to pilots.

AAAA provides this facility on the basis of it being information of a general nature only and the understanding that the information, for a range of reasons (including email failure, not all members being covered by email, or non-use by members, or operational shortcomings) will not provide any guarantees of aviation safety.

AAAA accepts no liability in terms of the accuracy of information provided, and makes no representations as to the use of the information provided or the likely actions of members.

Tall structure notifications to AAAA should include, in the following order:

- State
- Distance and direction relative to the nearest significant town (eg 10 miles SE of xxxx)
- Latitude and longitude
- Location—eg top of hill
- Height to top
- Type—eg lattice tower / monopole and guys
- Footprint - eg guys 45 metres from pole
- Date of erection
- Marking—eg painted orange/white / strobe
- Any other relevant information

FURTHER INFORMATION

If you would like more information on the vital and responsible role the aerial application industry plays:

www.aerialag.com.au
Ph: 02 6241 2100
Email: phil@aerialag.com.au

PO BOX 353
Mitchell ACT 2911

AERIAL APPLICATION ASSOCIATION OF AUSTRALIA LTD.

Aerial Agricultural Association of Australia

Windfarm Policy

March 2011

Introduction

Windfarms and their pre-construction wind monitoring towers are a direct threat to aviation safety – and especially aerial application. They also pose an economic threat to the industry where the costs of windfarm development—including those of compensation for loss of income—are externalized onto other sectors such as aerial application.

AAAA has developed this policy so as to inform regulators, asset developers and operators alike of the need for action on their part to fulfill their duty of care to Australia's aerial applicators.

AAAA Windfarm Policy

As a result of the overwhelming safety and economic impact of windfarms and supporting infrastructure on the sector, AAAA **opposes all windfarm developments** in areas of agricultural production or elevated bushfire risk.

In other areas, AAAA is also opposed to windfarm developments unless the developer is able to clearly demonstrate they have:

1. consulted honestly and in detail with local aerial application operators
2. sought and received an independent aerial application expert opinion on the safety and economic impacts of the proposed development
3. clearly and fairly identified that there will be no short or long term impact on the aerial application industry from either safety or economic perspectives and
4. if there is an identified impact on local aerial application operators, provided a legally binding agreement for compensation over a fair period of years for loss of income to the aerial operators affected.
5. Adequately marked any wind infrastructure and advised pilots of its presence .

AAAA believes that the above processes should also apply for all windfarms that have already been approved or erected, especially the establishment of long-term (for the life of the windfarm or until it is removed, whichever is the longest) binding compensation arrangements for affected aerial application companies.

While it is not AAAA policy to provide specific comment on particular development proposals due to resource limitations, AAAA notes that windfarms can have far-reaching footprints that can remove significant amounts of land from treatment for a considerable distance from the windfarm boundary.

Operational implications of each development will vary enormously depending on the site, the positioning of the turbines, orientation of affected paddocks relative to the turbines, the type of aerial application taking place, the aircraft used, the pilot's experience, the meteorological conditions, the site elevation, the position of any airstrip relative to the turbines and a range of other variables.

However, it is clearly unacceptable that one industry can impose significant safety threats on another, longer established industry with impunity.

AAAA believes that:

- All wind monitoring towers—including guy wires—must be clearly marked to assist pilots to see them
- All wind turbines, wind monitoring towers and associated infrastructure must be required to be removed when no longer in use. A mandatory bond should be levied on all developments to ensure the site can be remediated.

Recommendations to Government

Moratorium & National Policy
AAAA recommends to all Governments the establishment of a moratorium on windfarm developments until a national COAG policy on windfarms is established that requires the following to be considered before approval:

- Competing land uses for the particular site.
- Priority for existing long-term land-uses.
- Economic and safety impacts on contracting industries such as aerial application, including the broader implications for thresholds of sustainability for contractors.
- Independent life cycle analysis of windfarms and their overall environmental impact.
- Impact on aviation safety.
- Impact on bushfire preparedness and aerial firefighting.
- Impact on visual pollution / amenity/ tourism.
- Other sources of sustainable energy.

Transparency
AAAA recommends that any 'special' or 'fast-track' planning processes established for windfarm developments be removed. All windfarm developments should be subject to the full planning processes and community consultation in each State and Territory, including appeal of decisions.

Governments should require public disclosure on a register of payments to landholders made before approval of the windfarm. This will allow other landholders and contractors to be aware of developments.

Aviation Safety
AAAA recommends that government provide better information to all windfarm developers on their responsibilities for aviation safety, including raising the duty of care requirements established under *Sheather v Country Energy* (NSW Court of Appeals) for owners of assets that pose a known threat to aviation activities to provide for suitable marking and other safety initiatives.

The Commonwealth should establish a head of power to consider and regulate windfarm developments to protect aviation safety. This should include mandatory marking and notification of wind infrastructure and the power to veto proposed developments where they interfere with aviation safety.

CASA should set a much lower than previously used height trigger for notification of tall structure developments - down to 50 feet in an area of known aerial application activity—or by using a risk assessment based approach.

CASA should work with Airservices Australia and any other relevant agencies to ensure that completed windfarms are included on suitable aviation mapping including WAC charts and topographic maps.

CASA should develop a national tall structures web database that is accessible in real time by all low-level aviation pilots and which captures all wind-monitoring towers as well as completed windfarms. The database should also capture other tall structures such as radio masts etc.

Background

CASA does not have a clear head of power or a pathway for windfarm developers to ensure the risks their developments are posing are appropriately managed so as to protect legitimate activities of low-level aviation operators.

In particular, previous CASA efforts to address this issue by requiring marking and lighting of certain towers above a certain height and within a certain distance of an airport misses the main risk to aviation and this is the wind monitoring towers as they are frequently lower than the height trigger, but still a threat to legitimate low-level aviation.

Wind monitoring towers are very tall in relation to aerial application operations, are erected within very short timeframes, are extremely difficult for any pilot to identify from the aircraft and are often not notified to aviation users because of the lack of a Government-mandated notification system and the desire of the developers to keep their positions a secret because of commercial issues.

There are two quite distinct issues arising from windfarms that affect aerial application:

- safety of the aircraft and pilot and
- economic impact on aerial applicators.

Safety Impacts

AAAA's view is that the case of *Sheather v Country Energy* (NSW Court of Appeals) clearly established that anyone with infrastructure posing a threat to aviation must consider the risks that infrastructure poses to aviation safety and respond appropriately through marking or other measures to safeguard aviation operations.

This precedent is of critical relevance to windfarm developers although not apparently widely known to them or acted upon.

Economic Impacts

Safety is not the only consideration that is imposing additional risk and consequences on the aerial application industry.

The placement of wind farms in areas of highly productive agricultural land is leading to reductions in treatment areas of aerial application companies with no compensation for this externalization of costs by wind farm developers.

For example, placement of a wind farm may affect flight lines and application height or even whether the application can be conducted at all - leading directly to either an increase in cost or a reduction in income - and sometimes both - for aerial application operators.

As windfarm developments increase in number and scale of footprints, the threshold of non-viability of aerial application in an area may be reached where it is simply not economic to base an aircraft there. In a highly seasonal industry such as aerial application, operations may already be close to this threshold and windfarm footprints may compromise the availability of a critical service.

The need to manage spray applications to ensure they are safe may mean that pest outbreaks such as locusts may not be able to be effectively controlled. Windfarms may create significant gaps in large scale treatment plans—leading to a breakdown of an overall campaign against locusts, cereal rust, noxious weeds or other pests with massive economic implications for farmers and the economy.

In particular, AAAA is concerned that not enough consideration is being given through the State planning approval processes to the impacts of windfarms on productive agricultural land and the aerial application industry, remembering that it may not only be the land footprint where the windfarm is sited, but also land surrounding that for some kilometers where aircraft may have to maneuver to conduct aerial application.

At the very least, windfarm developers should be required to pay compensation to aerial applicators where it can be reasonably established that there will be an economic impact imposed on the aerial application company by the wind farm developer.

Operational Impacts

The following potential impacts on aerial application should be considered by all windfarm developers:

- positioning of wind farms may affect local aerial application operations, depending on the particular site.
- impacts could vary from affecting flight lines to treatment height and accuracy, maneuvering areas and possibly take-off and landing splays if an airfield is nearby (see for example, CASA CAAP 92-1 for agricultural airstrips – www.casa.gov.au – search for CAAP 92-1.)
- it may not be the land or farm that the wind farm is to be situated on that will be affected. Neigbouring farms, especially any with borders close to the windfarm site, may suffer significant impacts by imposed limits on the manouvering areas of aerial application aircraft.
- a key impact may not be the turbines themselves, but the positioning of any powerline that would lead from the windfarm substation back to the grid, or any other above ground powerline that would be put in to support the development. Any sections of above ground cable should be adequately marked.
- economic impacts could include increased costs due to longer flight times required to manouver heavily laden aircraft around wind towers, a loss of accuracy due to being required to fly higher for safety reasons, an increase in liability due to the reduction in accuracy, or the complete loss of application jobs due to the landholder not wanting the area covered by windfarms to be treated.

AAAA Activities to date

AAAA has done a lot of work to make it easier to mark guy wires and powerlines – including on wind monitoring towers – through amendment of the national standard on marking of wires so as to use a marker developed by Country Energy (NSW) with the cooperation of AAAA.

There is now little practical reason why wind towers and especially wind monitoring towers should not to be clearly marked.

In addition, AAAA has attempted to provide relevant information to developers through the Wind Energy Association, but this process/ advice is voluntary and consequently will not provide coverage of all developers.

AAAA also passes on information to members that has been provided to it by wind farm developers on the physical location of wind monitoring towers. However, only a few developers provide this information and again there is little doubt that many towers are going up unmarked and unknown until hopefully spotted by pilots during pre-application inspections.

More comprehensive safeguards must include a mandatory national system of communication of the position of all wind monitoring towers and the inclusion of this on a national database accessible by low level pilots.

This is a very real issue for topdressing and firebombing operations - as wind monitoring increases, so does the threat to legal aviation activities.

AAAA Windfarm Notification Process

AAAA tries to assist aviation safety by advising those of our members on our email lists of the position of wind monitoring towers and also wind turbines when they are under construction and finally constructed, if advised by windfarm developers.

Windfarm developers are encouraged to provide these details (in lats and longs by email to AAAA) so that AAAA can pass them on to those members.

AAAA provides this facility on the basis of it being information of a general nature only and the understanding that the information, for a range of reasons (including email failure, not all members being covered by email, or non-use by members, or operational shortcomings) will not provide any guarantees of aviation safety.

AERIAL AGRICULTURAL ASSOCIATION OF AUSTRALIA

FURTHER INFORMATION

If you would like more information on the vital and responsible role the aerial application industry plays:

www.aerialag.com.au

Or contact us on:
02 6241 2100 ph.

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Aerial Agricultural Association of Australia

National Windfarm Operating Protocols

Adopted May 2014

Introduction

Windfarms and their pre-construction wind monitoring towers are a direct threat to aviation safety – and especially aerial application. They also pose an economic threat to the industry where the costs of windfarm development—including those of compensation for loss of income—are externalized onto other sectors such as aerial application.

There are two distinct phases in the relationship between aerial applicators and wind farms:

1. Development approval
2. Operation once built

AAAA has a detailed policy available from its website – **www.aerialag.com.au/resourcecentre/policy** – that covers its views and the safety risks inherent in windfarm operations and the costs that are likely to be externalised onto the aerial application industry by the windfarm industry.

At the development stage, AAAA remains **strongly opposed** to all windfarms that are proposed to be built on agricultural land or land that is likely to be affected by bushfire. These areas are of critical safety importance to legitimate and legal low-level operations, such as those encountered during crop protection, pasture fertilisation or firebombing operations.

However, AAAA realises that some wind farm proposals may be approved in areas where aerial application takes place. In those circumstances, AAAA has developed the following national operational protocols to support a consistent approach to aerial application where windfarms are in the operational vicinity.

Developer's Design/Build Considerations

Where possible, the developer should commit to:

- placement of turbines in straight lines
- setback of turbines at least 100 metres from any boundary
- all powerlines to be underground
- all MET towers are marked in accordance with NASAG Guidelines and notified to the local aerial applicators – see Appendix I to these Protocols

Developer's Operational Considerations

- Wind farm locations, including any attendant MET towers, have been notified to local aerial applicators.
- The wind farm developer/operator is to develop an agreed set of protocols with the local aerial applicators for all relevant operational issues, including notification of applications.
- Wind farm operators are to stop blades during application operations and align them as required by the aerial operator.
- MET towers are marked in accordance with NASAG guidelines and notified to local aerial applicators.

Pilot/Aircraft Operator's Operational Considerations

Once a wind farm has been built, the following protocols are to apply:

- The operator or pilot will conduct a risk assessment of the block to be treated as per usual – considering tower hazards / placement etc – including for operations that require treatment within the wind farm area – with operating at normal spray height underneath the blades to be acceptable.
- The risk assessment is to result in an aerial application management plan in accordance with the principles of an application management plan as outlined in the AAAA publication, the Aerial Application Pilots Manual. An overview of an aerial application plan is to be found at Appendix II.
- The aerial applicator is to notify the windfarm operator of application operations at least by 9 pm the night before via an agreed notification method.

Economic compensation

The following national protocols are suggested by AAAA as a starting point for the payment of economic compensation to aerial applicators:

- Should a wind farm result in additional operational costs to the aerial applicator for treatment of an area that either neighbours or is the host property for the windfarm, then the windfarm company will compensate the aerial applicator directly for reasonably calculated additional costs.
- Such costs would include, but not be limited to:
  - Additional administration required for notification, liaison, planning
  - Additional treatment costs (additional flying time calculated at the normal charge out rate of the aircraft to be used) due to flight lines that are not the 'normal' or most efficient treatment.
  - Costs related to additional product to be applied to compensate for any increase in height or loss of accuracy of the application to avoid towers.

Appendix I – National Airports Safeguarding Advisory Group - NASAG - Guidelines for Marking of Wind Turbines

See—http://www.infrastructure.gov.au/aviation/environmental/airport_safeguarding/nasf/

Appendix II – AAAA Aerial Application Pilots Manual – excerpts on planning.

Appendix I

NASAG Guideline D

NATIONAL AIRPORTS SAFE-GUARDING FRAMEWORK

Wind Turbine Guidelines

Purpose of Guideline

This document provides guidance to State/ Territory and local government decision makers, airport operators and developers of wind farms to jointly address the risk to civil aviation arising from the development, presence and use of wind farms and wind monitoring towers.

Why it is important

The *Principles for a National Airports Safeguarding Framework* acknowledge the importance of airports to national, state/territory and local economics, transport networks and social capital.

Wind farms can be hazardous to aviation as they are tall structures with the potential to come into conflict with low flying aircraft. Temporary and permanent wind monitoring towers can be erected in anticipation of, or in association with, wind farms and can also be hazardous to aviation, particularly given their low visibility. These structures can also affect the performance of Communications, Navigation and Surveillance equipment operated by Airservices Australia (Airservices) and the Department of Defence (Defence).

How it should be used

Some States/Territories already have planning guidelines or polices in place and this document provides guidance for review. For those without policies in place, these Guidelines (in addition to the associated Safeguarding Framework) will provide input to new polices.

These guidelines provide general information and advice to:

- proponents of wind farms (including single wind turbines); and
- planning authorities with jurisdiction over the approval of such structures.

These guidelines also provide specific advice on measures to reduce hazards to aviation, and how to implement them.

The guidelines are intended to provide information to proponents of wind farms and planning authorities to help identify any potential safety risks posed by wind turbine and wind monitoring installations from an aviation perspective.

The guidelines rely on an approach of risk identification and management to ensure risks to aviation are minimised in the most effective and efficient manner possible. It is not the intention to adopt an overly restrictive approach to wind farm development, rather to ensure risks are identified early and mitigation measures are able to be planned and implemented at an early stage.

Roles and Responsibilities

State/Territory and local governments are primarily responsible for land use planning in the vicinity of all airports.

Australia's 19 major airports are under Australian Government planning control and are administered under the Airports Act 1996 (the Airports Act). Planning on other airports is undertaken by State, Territory Governments and Local Governments or private operators.

Commonwealth airports are protected from tall structures in the vicinity of airports based on standards established by the International Civil Aviation Organization (ICAO). These standards have been implemented in Australia by the Airports Act 1996 and the Airports (Protection of Airspace) Regulations 1996 which apply at leased Commonwealth airports, and by the Defence (Areas Control) Regulations 1989 which apply at Defence airports.

This legislation can be used to ensure wind farms hazardous to aviation are not erected in the vicinity of Commonwealth airports. The implementation of these guidelines will have the outcome of conferring a similar level of protection to non-Commonwealth airports.

Australia is a signatory to the Convention on International Civil Aviation. Signatories are obliged to implement ICAO Standards unless they lodge a formal difference. ICAO Annex 14 specifically addresses the issue of wind turbines. In summary,

ICAO has recommended the need for lighting of wind turbines if determined to be an obstacle.

Annex 14 includes a provision for an aeronautical study as to the need, or otherwise, for marking and/or lighting. This is consistent with provisions in Australia for risk-based assessments of potential hazards to aviation safety. These guidelines are consistent with ICAO Annex 14.

Key considerations for managing risks to aviation safety of wind turbine installations (wind farms)/wind monitoring towers

The guidelines apply to:

(a) a single wind turbine;

(b) a group of wind turbines, referred to as a wind farm, which may be spread over a relatively large area; and

(c) wind monitoring towers.

The height of a wind turbine is defined as the maximum height reached by the tip of the turbine blades at their highest point above ground level. The marking and lighting described in this document addresses aviation requirements only. For offshore wind farms, in addition to these requirements, separate lighting and marking may be required for the safety of marine navigation.

Implementation of the guidelines will have the additional benefit of being applicable in areas away from airports to address the risk posed by wind farms to air navigation in those areas.

Adoption of the guidelines will ensure that aviation safety agencies can examine and address the risk to aviation safety from proposed wind turbine farms at the planning stage. This will enable the use of wind energy to continue to grow, while protecting aviation safety.

Wind farm operators should check if proposed wind turbines and wind monitoring towers will be located near areas where low flying operations are likely to be conducted, and if so, consider their duty of care to such activities.

GUIDELINES FOR LAND USE PLANNERS AND DEVELOPERS TO MANAGE THE RISK TO AVIATION SAFETY OF WIND TURBINE INSTALLATIONS (WIND FARMS) /WIND MONITORING TOWERS

When wind turbines over 150 metres above ground level are to be built within 30 kms of a certified or registered aerodrome, the proponent should notify the Civil Aviation Safety Authority (CASA) and Airservices. If the wind farm is within 30km of a military aerodrome, Defence should be notified.

CASA should be notified through the nearest CASA Regional or Field Office. Location and contact details of CASA Aerodrome Inspectors may be obtained by calling CASA on 131 757. Airservices should be notified through the Airports Relations Team on 02-6268-4111. Defence should be notified through the Defence Support Group on 02-6266-8191.

The Aeronautical Information Service of the Royal Australian Air Force (RAAF AIS) maintains a database of tall structures in the country. The RAAF AIS should be notified of all tall structures meeting the following criteria:

30 metres or more above ground level for structures within 30km of an aerodrome; or

45 metres or more above ground level for structures located elsewhere.

The contact details for the RAAF AIS are: Tel- 03-9282-5750; ais.charting@defence.gov.au.

Operators of certified aerodromes are required to notify CASA if they become aware of any development or proposed construction near the aerodrome that is likely to create an obstacle to aviation, or if an object will infringe the Obstacle Limitation Surfaces (OLS) or Procedures for Air Navigation Services –Operations (PANS-OPS) surfaces of an aerodrome. Operators of registered aerodromes should advise CASA if the proposal will infringe the OLS; CASA will ask Airservices to determine if there is an impact on published flight procedures for the aerodrome.

Note: *Obstacle Limitation Surfaces are a complex of virtual surfaces associated with an aerodrome. They are designed to protect aircraft flying in good weather conditions from colliding with tall structures. PANS-OPS surfaces are designed to protect aircraft flying in poor weather conditions from colliding with tall structures. Aerodrome operators can provide details for their particular aerodrome.*

Consultation

Consultation with aviation stakeholders is strongly encouraged in the early stages of planning for wind turbine developments. This should include:

- early identification of any nearby certified or registered aerodromes;
- immediate consultation with any nearby aerodrome owners;
- preliminary assessment by an aviation consultant of potential issues;
- confirmation of the extent of the OLS for any nearby aerodromes;
- registration of all wind monitoring towers on the RAAF AIS database;
- consultation with local agricultural pilots and nearby unlicensed airstrip owners; and
- consultation with CASA and Airservices.

Risk assessment

Following preliminary assessment by an aviation consultant of potential issues, proponents should expect to commission a formal assessment of any risks to aviation safety posed by the proposed development. This assessment should address any issues identified during stakeholder consultation.

The risk assessment should address the merits of installing obstacle marking or lighting. The risk assessment should determine whether or not a proposed structure will be a hazardous object. CASA may determine, and subsequently advise a proponent and relevant planning authorities that the structure(s) have been determined as:

(a) hazardous, but that the risks to aircraft safety would be reduced by the provision of approved lighting and/or marking; or

(b) hazardous and should not be built, either in the location and/or to the height proposed as an unacceptable risk to aircraft safety will be created; or

(c) not a hazard to aircraft safety.

If CASA advice is that the proposal is hazardous and should not be built, planning authorities should not approve the proposal. If a wind turbine will penetrate a PANS-OPS surface, CASA will object to the proposal. Planning decision makers should not approve a wind turbine to which CASA has objected.

In the case of military aerodromes, Defence will conduct a similar assessment to the process described above if required. Airservices or in the case of military aerodromes, Defence, may object to a proposal if it will adversely impact Communications, Navigations or Surveillance (CNS) infrastructure. Airservices /Defence will provide detailed advice to proponents on request regarding the requirements that a risk assessment process must meet from the CNS perspective.

Marking of wind turbines in the vicinity of an aerodrome

During the day, large wind turbines are sufficiently conspicuous due to their shape and size, provided the colour of the turbine is of a contrasting colour to the background. Rotor blades, nacelle and upper 2/3 of the supporting mast of wind turbines should be painted white, unless otherwise indicated by an aeronautical study. Other colours are also acceptable, unless the colour of the turbine is likely to blend in with the background.

Lighting of wind turbines in the vicinity of an aerodrome

Siting of wind turbines in the vicinity of an aerodrome is strongly discouraged, as these tall structures can pose serious hazards to aircraft taking-off and landing. Where a wind turbine is proposed that will penetrate the OLS of an aerodrome, the proponent should conduct an aeronautical risk assessment. The risk assessment, to be conducted by a suitably qualified person(s), should examine the effect of the proposed wind turbines on the operation of aircraft. The study should be made available to CASA to assist assessment of any potential risk to aviation safety.

CASA may determine that the proposal is:

(a) hazardous and should not be built, either in the location and/or to the height proposed,

as an unacceptable risk to aircraft safety will be created; or

(b) hazardous, but that the risks to aircraft safety would be reduced by the provision of approved lighting and/or marking.

Lighting of wind turbines not in the vicinity of an aerodrome, with a height of 150m or more

Where a wind turbine 150m or taller in height is proposed away from aerodromes, the proponent should conduct an aeronautical risk assessment.

The risk assessment, to be conducted by a suitably qualified person(s), should examine the effect of the proposed wind turbines on the operation of aircraft. The study must be submitted to CASA to enable an assessment of any potential risk to aviation safety. CASA may determine that the proposal is:

(a) hazardous, but that the risks to aircraft safety would be reduced by the provision of approved lighting and/or marking; or

(b) not a hazard to aircraft safety.

Obstacle lighting standards for wind turbines

When lighting has been recommended by CASA to reduce risk to aviation safety, medium-intensity obstacle lights should be used. Where used, lighting on wind farms should be installed:

(a) to identify the perimeter of the wind farm;

(b) respecting a maximum spacing of 900m between lights along the perimeter, unless an aeronautical study shows that a greater spacing can be used;

(c) where flashing lights are used, they flash simultaneously; and

(d) within a wind farm, any wind turbines of significantly higher elevation are identified wherever located.

To minimise the visual impact on the environment, obstacle lights may be partially shielded, provided it does not compromise their operational effectiveness. Where obstacle lighting is provided, lights should operate at night, and at times of reduced visibility. All obstacle lights on a wind farm should be turned on simultaneously and off simultaneously.

Where obstacle lighting is provided, proponents should establish a monitoring, reporting and maintenance procedure to ensure outages, including loss of synchronisation, are detected, reported and rectified. This would include making an arrangement for a recognised responsible person from the wind farm to notify the relevant CASA office, so that CASA can advise pilots of light outages.

Alternatives to fixed obstacle lighting

In some circumstances, it may be feasible to install obstacle lights that are activated by aircraft in the vicinity. This involves the use of radar to detect aircraft within a defined distance that may be at risk of colliding with the wind farm. When such an aircraft is detected, the wind farm lighting is activated. This option may allow aviation safety risks to be mitigated where obstacle lighting is recommended while minimising the visual impact of the wind farm at night.

Marking and lighting of wind monitoring towers

Before developing a wind farm, it is common for wind monitoring towers to be erected for anemometers and other meteorological sensing instruments to evaluate the suitability or otherwise of a site. These towers are often retained after the wind farm commences operations to provide the relevant meteorological readings. These structures are very difficult to see from the air due to their slender construction and guy wires. This is a particular problem for low flying aircraft including aerial agricultural operations. Wind farm proponents should take appropriate steps to minimise such hazards, particularly in areas where aerial agricultural operations occur. Measures to be considered should include:

- the top 1/3 of wind monitoring towers to painted in alternating contrasting bands of colour. Examples of effective measures can be found in the Manual of Standards for Part 139 of the Civil Aviation Safety Regulations 1998. In areas where aerial agriculture operations take place, marker balls or high visibility flags can be used to increase the visibility of the towers;
- marker balls or high visibility flags or high visibility sleeves placed on the outside guy wires;
- ensuring the guy wire ground attachment points have contrasting colours to the surrounding ground/vegetation; or

- a flashing strobe light during daylight hours.

Reporting of structures less than 150m in height
There is no requirement for CASA to be notified if a proposed wind turbine or wind monitoring tower is less than 150m in height and does not infringe the OLS of an aerodrome. However, they should still be reported for inclusion in the national database of tall structures maintained by the Royal Australian Air Force (RAAF). Information on reporting of tall structures may be found in an advisory circular issued by CASA 'AC 139-08(0) Reporting of Tall Structures'.

Voluntary provision of obstacle lights
CASA's regulatory regime for obstacle lighting provides an appropriate level of safety for normal aircraft operations. Certain flying operations, by their nature, involve lower than normal flying, for example aerial agricultural spraying, aerial mustering, power line inspection, helicopter operations including search and rescue, some sports aviation, and some military training. Pilots conducting such operations require special training and are required to take obstacles into account when planning and conducting low flying operations.

In making decisions regarding the marking and lighting of wind farms and wind monitoring towers, wind farm operators should take into account their duty of care to pilots and owners of low flying aircraft.

Turbulence
Wind farm operators should be aware that wind turbines may create turbulence which noticeable up to 16 rotor diameters from the turbine. In the case of one of the larger wind turbines with a diameter of 125 metres, turbulence may be present two kilometres downstream. At this time, the effect of this level of turbulence on aircraft in the vicinity is not known with certainty. However, wind farm operators should be conscious of their duty of care to communicate this risk to aviation operators in the vicinity of the wind farm. CASA will also raise awareness of this risk with representatives of aerial agriculture, sport aviation and general aviation.

Appendix II

Aerial Application Plan Guide

AERIAL APPLICATION MANAGEMENT TOOLS

Application Management Plan (AMP)
An application management plan provides the aerial applicator with a generic application management tool.

Some application management plans are developed by the client in consultation with the applicator and agronomist before the season commences. This is the case with those growers who participate in Cotton Australia's 'Best Management Practice Program'.

In some situations a pre-season meeting with each regular client will be the best way of developing such a plan.

In other cases, especially top-dressing, this may simply be impractical or unachievable, but nonetheless, every application should have a plan.

Planning an application
The key components of an AMP are:

a. recent confirmed map, with special attention paid to power lines, other hazards, dwellings, public roads, environmentally sensitive areas and susceptible crops downwind.

b. the map is checked against the standard application order form.

c. contingencies for different wind directions.

d. chemical label or product advice checked to ensure the application is legal and can be carried out in the current conditions.

e. equipment required (droplet size needed) to ensure control of drift.

f. other considerations such as the possibility of workers in the field, neighbours etc.

Operational planning then follows. This includes the safety issues raised in this manual, such as potential 'escape' routes, position of the sun etc.

Establish an awareness zone around every paddock – potential problems can often be some distance away.

There are CASA requirements, as well as laws in many states and on some labels, regarding mandatory buffers, no-spray zones and neighbour notification, especially around schools and dwellings.

The AMP is used in conjunction with the agricultural chemical label, the completed standard spray order form and a detailed map to ensure the application can take place safely, legally and effectively.

An accurate map is essential
The importance of an accurate and up-to-date map cannot be over-emphasised.

Prior warning of the existence of hazards and all other relevant information pertinent to the application is the lynch-pin of sound planning and risk management.

If, for whatever reason, you are operating without a good map you are really leaving your future to chance. Maps must be as comprehensive as possible and must be checked before each application to ensure they are a true reflection of what really exists. This can only be achieved by interrogating the client or their representative as to any changes that might affect the application.

Pilots should also consider other tools now available, such as GIS information or Google Earth to help them create a mental picture of the job and build situational awareness.

Pre-Application Aerial Inspection
The last opportunity to ensure safe operations is the pre-application aerial inspection, conducted from a safe height.

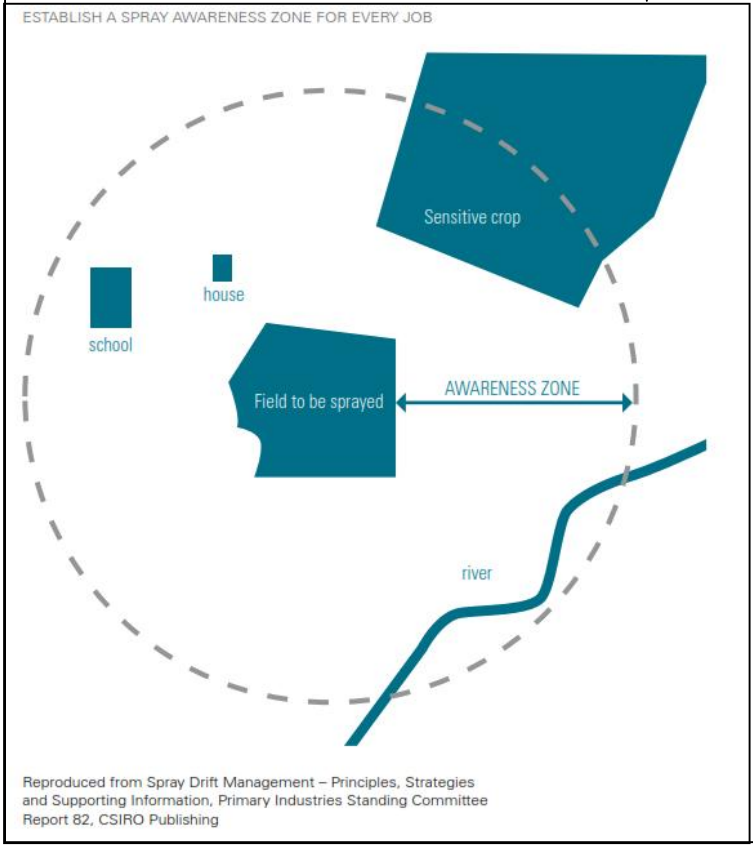
The pilot conducting the aerial inspection should confirm all hazards on the map, and then look for any additional hazards or relevant issues that did not make it onto the map. Only by constantly checking and rechecking can the conscientious application pilot be comfortable that they have taken all the necessary precautions to ensure a safe job.

Your Key Aerial Application Checklist
The following key aerial application checklist has been used for many years and incorporates the issues you must check before proceeding with an application task, during an application, and when returning to an application after reloading, refuelling or some other break, no matter how short.

Many of the items in 'WISHSTANDE' can be completed at the planning stage of an application, in order to free up maximum attention by the pilot. If you have already dealt with many of these issues at the planning stage, you will be better able to focus on the matters that are critical to safety during the execution phase of an application.

W wind direction and strength
I Identification of treatment area
S sun position and possibility of glare
H hazards, wires, obstruction, turbulence
S susceptible crops
T terrain, surface, slope, contour banks
A application equipment, alignment (gps)
N nuisance to stock and occupied buildings
D direction of treatment
E emergency landing areas

EXTRA the extra treatment area safety inspection after refuelling or reloading.



Reproduced from Spray Drift Management – Principles, Strategies and Supporting Information, Primary Industries Standing Committee Report 82, CSIRO Publishing

FURTHER INFORMATION
If you would like more information on the vital and responsible role the aerial application industry plays:

www.aerialag.com.au

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AERIAL AGRICULTURAL ASSOCIATION OF AUSTRALIA LTD.

Aerial Agricultural Association of Australia

Powerlines Policy

March 2011

Introduction

Powerlines present a threat to legal low-level aviation including aerial application—one that has caused the majority of aerial application accidents and the deaths of many pilots.

AAAA has developed this policy so as to inform regulators, asset developers and operators alike of the need for action on their part to fulfill their duty of care to Australia's aerial applicators.

AAAA Powerlines Policy

AAAA recommends:

- **The Commonwealth mandate a powerline safety program for all owners and operators of powerlines that would minimize the risks to legitimate low-level aviation and which would feature:**
- **The mandatory marking of powerlines in areas of aerial application and firebombing activity**
- **A national web-based database and mapping system, accessible by pilots, that would accurately identify the position of all powerlines and relevant infrastructure.**
- **The placement either underground, or aligned with paddock boundaries or road easements, of all new powerlines and powerlines being repaired in areas of aerial application and firebombing activity.**
- **Electricity network owners and operators should not be able to refuse the aerial agricultural industry permission to operate around powerlines, including flying under them where appropriate, as this is often the safer option.**
- **Electricity network owners and operators should be required by legislation to consult with landholders and aerial operators when proposing to construct a new powerline in farming areas, and to pay compensation to the farmer where this results in increased costs of aerial application as a result of forcing changes to flight paths.**
- If unable to put powerlines underground, electricity network owners and operators should be required to mark powerlines in farming areas so as to make them more easily identifiable to pilots..

Background

Most agricultural land in Australia is criss-crossed with powerlines and aerial application companies and pilots put enormous effort into managing these hazards safely, generally using a risk identification, assessment and management process in line with Australian Standard AS4360/ISO 30000.

The agricultural pilot curriculum mandated by CASA includes training for the safe management of powerlines and AAAA has been active in providing ongoing professional development for application pilots that includes a focus on planning, risk management and a knowledge of human factors relevant to managing powerlines in a low-level aviation environment.

AAAA runs a specific training course for aerial application pilots entitled *'Wire Risk Management'* to address these issues.

Every aerial application mission is planned to take account of the threat of powerlines and to manage then as safely as possible while still applying the essential chemicals to protect the crop.

In terms of due diligence, the aerial application industry is doing everything it can to reduce the risk of hitting powerlines.

This is in stark comparison to the very lax, on occasions hostile attitude of powerline companies to the threat their powerlines pose to aviation operations being conducted legally and under the regulation of CASA.

In some cases, the powerline companies' ongoing refusal to provide to aerial application companies the detailed mapping of the position of their network or to mark their wires to make them easier to see, is negligent.

Certainly, the courts (*Sheather v Country Energy*, NSW Court of Appeals) have found that powerline companies do owe a duty of care to all pilots and should mark their powerlines where they are an obvious threat to aviation safety.

AAAA has worked very successfully with one powerline company with coverage of most of NSW - Country Energy - on the development of a cheap and simple powerline marker that can help pilots keep visual contact with the position of powerlines in and around treatment areas.

Unfortunately, these markers are not used in other States, although AAAA notes that Ergon Energy, with coverage of much of Queensland, has recently introduced the same markers and this may improve safety, although take-up rates are still very low.

AAAA's was involved in the Australian Standards Committee for the review of AS 3891 - Marking of Cables and their Supporting Structures.

Unfortunately, it was not possible to secure a significantly improved approach to the marking of powerlines, especially in relation to low level aviation and lowering any thresholds for the mandatory marking of powerlines, such as long spans across valleys etc that have previously caused fatalities. However, a useful risk management approach was included in the standard to encourage landowners to consider the marking of wires in areas of known low level aviation activity. The key aim of the review was achieved however, and that was to permit the markers developed by Country Energy to be use legitimately under the Australian Standard which previously had no provision for them.

Agricultural areas and areas of probable bushfire activity would be two obvious places where powerline companies should be exercising their court-defined duty of care and marking powerlines so as to assist aerial agricultural and fire-bombing pilots manage another risk in an already hostile aviation environment.

FURTHER INFORMATION

If you would like more information on the vital and responsible role the aerial application industry plays:

www.aerialag.com.au

Or contact us on:
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Hills Of Gold Preservation Facebook Page – May 1st 2020

I am so disturbed by seeing these images - our ridgeline is home to so many rare and protected species, not to mention a precious water catchment and heritage sites. These photomontages do not depict the land clearing that would be involved in constructing these turbines - meaning it's only going to look worse!

From day 1 I have been able to visualise wind turbines on the range, but this is worse than anything I imagined. Please help us protect this environment.

For such a significant proposal, these are such poor quality!! And how much can you lighten the sky and fade the detail to try to make the turbines look less imposing? Unfortunately, the community won't be able to edit looking at them in real life

The DAG Sheep Station is saddened and sickened at the thought of the desecration of this magnificent range.
Renewable Energy Developments need to be sensitively placed, the anger and hurt to our wonderful community continues to cut deep.

Please watch Planet of the Humans. Michael Moore's new documentary, it blows the lid off "green renewables" as the biggest scam of the 21st century. It is an absolute must and it will give Nundle people some ammunition to send these a/holes packing back to the city.

The impact is even greater than I expected, even with these washed out images! "You won't see them from Nundle" the supporters said. Well, Nundle is more than a few streets and Hanging Rock is more than a few hectares.

How badly out of focus can you make a picture to still be one??

How pathetic the portrayal of how many trees will still be left standing around the turbines. 😠😠😠 take a look at Crookwell NSW

Yep, straight out of a 1970,1980 photo album. You know, the ones with the cellophane leaves and the sticky white mounting cardboard backing.

Oh no!.we'll be looking straight at them.

Horrendous!

Devastating

Disgraceful

why in the hell are they going to ruin this area!

Photos produced by Dodgy Bros Inc if the quality/clarity is anything to go by.

Thank you for the information. We are about to start building our home in Nundle and want to start understanding and becoming involved in the community. Though we will be coming and going over the next few months.

Wind Farms kill birds.

Nundle NSW (Nundle Business Tourism and Marketing Group Inc) Facebook comments on Preliminary Visual Montages 5.5.20

To be added to

The DAG Sheep Station is saddened and sickened at the thought of the desecration of this magnificent range.
Renewable Energy Developments need to be sensitively placed, the anger and hurt to our wonderful community continues to cut deep.

my humble view is that this will spoil a beautiful area even more than the bickering already has..Years of animosity and division then years of noisy construction and dangerous traffic to complement the logging trucks and the noisy saw mill . Therefore my feedback for the developers record is that the badly presented photos and the comments from supporting hosts do not persuade me that this is a great idea....

People will know how small a village Nundle is. The route these turbines with the accompanied heavy vehicle concrete carriers etc etc will be constantly moving through the crossroad right in the centre of town. The noise and pollution will be unbearable. How will retirees in their wheelchairs cope? Children will no longer have the freedom to skateboard or cycle in the street. The school will suffer from the fumes. Tourists won't want to sit out having their lunch or a quiet drink. This for an estimated two years. Is it any wonder most residents are against it? It would be catastrophic in my opinion. The people that would benefit from this project don't take that scenario into account.

Wrong place, have them along the highway! I can hear a car approaching a good ten minutes before it arrives, quad bikes echo throughout the valley, at least that noise stops. The noise from the wind farm will be constant, this will destroy the peace and sanctuary that many have enjoyed for generations

I am all for renewable energy generation and don't object to turbines in general, in fact I'm a fan of them. But there's no way they should be plastered all over the hills in view of Nundle and visible from the hanging rock lookout. It would spoil the natural beauty and damage tourism. The intrinsic value of nature and economic benefits of tourism have to be considered. Fight your hardest Nundle, there are better places to put a wind farm.

I am all for renewable energy and it's generation... but...

Why can we not value what we can not replace or create (beautiful natural country) over grotesque man made structures... that could be built anywhere...

The almighty $ driving shortsighted planning and supposed progress again...

why not use solar? Why these ugly towers that stop fire fighting? Oh it's the yearly bank account top up hey?

would be a lot more sensible to just not have them at all .

Looking forward to this project going ahead and entering the next phase. I've no doubt that all environmental concerns will be tightly handled and overcome. Great opportunity for the establishment of sustainable, long term employment for the area. Small towns need diversified employment and industrial opportunities - can't rely on tourism alone.

Disgusting outlook if this goes ahead destroying a natural habitat let alone the amount of our high flying birds birds like eagles, kites etc being chopped up by the blades. This has to be stopped at all cost before it's too late. The developer/s don't care about the environment, it's all about money to them.

Nundle receives many visitors every year, people who visit for a myriad of reasons. Maybe they are bush walkers, bird watchers, fossickers, bike riders, car club members, maybe they just want a break away from the hustle & bustle of daily life. They choose Nundle, Hanging Rock and the Hills of Gold because it is a step back in time, a reminder of their youth, a reminder where they grew up. Converting the Hills of Gold to an industrial landscape of wind turbines, along some of the most sensitive ridge line of the Great Dividing Range is so sad. I hope it doesn't happen.

Myself and my family absolutely love Nundle. It's a beautiful town not too far away but still offers an escape from the fast paced life in the bigger cities. I have always had plans to one day buy property in the area, although I definately would not if this goes ahead. Please don't ruin the picturesque views from both the town of Nundle and Hanging Rock.

Bob Brown once said that flooding the Franklin River for a hydroelectric dam would be like putting a scratch across the Mona Lisa. Hanging Rock and the surrounding mountains may not be as significant nationally but for me it seems that once built you cant unsee them. Our family were born, lived and died in those lovely pristine mountains. We no longer own any property there so arent a direct stakeholder but it is sad that this maybe the future view that residents and visitors will have. What price for progress. Is this a scratch across your (van Gogh's) Starry Night ?

We come to Nundle for the peaceful beauty of the area and friendly people. The destruction which will happen to have these installed along with the maintenance they require not only the ugliness on the beautiful hills. Sad that such ugly installations could even be contemplated. We are regular visitors to the area.

I wonder how they would go trying to put wind towers in a national park. I think not very far. This are of Nundle may not be national park area. But it is unique beauty part of the world that doesn't need that eyesore.

We recently traveled from Tamworth to Perth. These things are everywhere and if you think they look awful in a photo wait until you see a real wind farm. Incidentally probably half of them were shut down because the grid couldn't handle the power fluctuations.

I'm all for renewable energy. However when it comes at the cost of losing that old world country town feel I am completely against it. Surely there are many other places they can be placed out of sight of such an historical town.
Please reconsider this decision.

So much energy goes into creating turbines, they’re not efficient and they can’t be recycled. Yes it will be a terrible eye sore on the area

Does everyone get free power after this sad violation of OUR POSSIBLY UNIQUE world In the ENTIRE UNIVERSE?

I was physically shaking with shock and nauseous with anxiety to see these images. The photomontages are worse than expected. It is an unacceptable impost to the environment and the majority of the Nundle/Hanging Rock/Crawney community. Timor has barely been consulted, yet will be impacted from the southern side. I understand that some families will gain significantly financially from this proposal, and that they support the project. Compensation has been offered in a Community Enhancement Fund and payment to neighbours within 5km. I would rather our family's existing enjoyment of our modest house, land, and community of 21 years, which is priceless, and will be destroyed by this proposal. Just because humans and machines can conquer the landscape it doesn't mean they should. Not all wind farms are needed, and not all should be built. I look forward to this wind farm being rejected by the State Government.

When the trees are bent from the wind they get a lot between willow tree and merriwa on the mountain a better spot but no money comes into play get real go todal no to noisy turbines Nundle and hanging rock are geat places and money is going to stuff it up

Would be awesome to see all those turbines with snow on them

almost like the old modeling days to soften the picture's edges they put vaseline on the lens. Ask them is this what they did to achieve this look or did another Indian company produce the pictures to save on money?

So good bye to what once was a beautiful landmark of the pioneers who worked with the land, sadly to go down in history as yet another political blunder, to the greedy politicians.

Nundle is such a rare and magnificent place. Destroying these beautiful hills for a wind farm would be an absolute tragedy. I want my children and grandchildren to enjoy exploring those beautiful hills and enjoy the timelessness of the quiet little town, just as we frequently do. It's a big NO from us!!

Would love to move there permanently

Oh dear, I don't like the thought of this happening to the village of Nundle. Haven't lived there for years. I wouldn't want the beautiful hills and valleys destroyed by the sight of a wind farm.

They look majestic and no pubs are being removed to facilitate their installation, even better

You don’t want it, it doesn’t work

Dont do it Nundle.....They are bigger and noisier than you will be told

Doesn't show all the trees knocked down to get the parts in either

I think it’s good

Ew

Best way to destroy the very essence of what nundle is about . Disgusting outlook

geez i guess we should all go back to burning coal so you can stop complaining about how the view is spoiled by all those terrible windmills, meanwhile rest of planet goes down the gurgler. get a grip

Use of photomontages

The following requirements for photomontages proposed to be relied on as or as part of expert evidence in Class 1 appeals will apply for proceedings commenced on or after 1 October 2013. The following directions will apply to photomontages from that date:

Requirements for photomontages

1. Any photomontage proposed to be relied on in an expert report or as demonstrating an expert opinion as an accurate depiction of some intended future change to the present physical position concerning an identified location is to be accompanied by:

   Existing Photograph.
   a) A photograph showing the current, unchanged view of the location depicted in the photomontage from the same viewing point as that of the photomontage (the existing photograph);
   b) A copy of the existing photograph with the wire frame lines depicted so as to demonstrate the data from which the photomontage has been constructed. The wire frame overlay represents the existing surveyed elements which correspond with the same elements in the existing photograph; and
   c) A 2D plan showing the location of the camera and target point that corresponds to the same location the existing photograph was taken.

   Survey data.
   d) Confirmation that accurate 2D/3D survey data has been used to prepare the Photomontages. This is to include confirmation that survey data was used:
      i. for depiction of existing buildings or existing elements as shown in the wire frame; and
      ii. to establish an accurate camera location and RL of the camera.

2. Any expert statement or other document demonstrating an expert opinion that proposes to rely on a photomontage is to include details of:
   a) The name and qualifications of the surveyor who prepared the survey information from which the underlying data for the wire frame from which the photomontage was derived was obtained; and
   b) The camera type and field of view of the lens used for the purpose of the photograph in (1)(a) from which the photomontage has been derived.