Appendix 13-3- Route Screening Analysis (RSA) Methodology

Appendix 13.3

Methodology Statement for Route Screening Analysis (RSA)

Route Screening Analysis (RSA)

Basis for Route Screening Analysis (RSA)

Because ZTV and TVI maps are computer generated in respect of terrain only, they do not account for screening of views by the likes of vegetation, which can be a key factor in rural, lowland landscapes. These theoretical maps can, therefore, grossly overestimate the level of visibility in these landscapes. For this reason, yet another layer of analysis is considered necessary in such instances, and this is termed Route Screening Analysis (RSA). This is an internationally recognised form of visual analysis that has been used in the Irish context on several previous occasions. There are no particular guidelines for undertaking RSA so the degree of accuracy and reliability is strongly dependant on the rigour employed by the landscape and visualisation specialist and these needs to be set out for each particular study.

Description of RSA

Route Screening Analysis, as its name suggests, considers actual visibility of the proposed wind farm from surrounding roads using current imagery captured in the field then subsequently reviewed in the context of a digital model of the development. Route Screening Analysis bridges the gap for the assessor between the computer generated, theoretical visibility modelling (ZTV and TVI maps) and the actual nature of visibility in a given area.

RSA Methodology

For the proposed Derryadd Wind Farm, RSA was undertaken for public roads within a 5 km radius of turbines. This utilises 360° photography captured at one second intervals. Each frame is then presented in conjunction with a synchronised three-dimensional model of the proposed farm wind within a digital terrain context. Back in the office a quick and relatively accurate estimate can then be made for each

frame (14,000 in this instance) as to which of three possible visibility scenarios the viewpoint falls into. These categories include; open visibility; partial visibility; and fully screened. In this instance 'open visibility' is conservatively judged to occur if the view of a full blade rotation of a single turbine is afforded. 'Partial visibility' is the most ambiguous of the three categories and can occur in three possible ways. These include the clear view of less than a full blade rotation of any particular turbine, the veiled view of turbines through light vegetation (typically winter vegetation) or a fleeting open view of a turbine/s such as might be experienced passing a gateway.

Figure M2.5: 'Screengrab' Example of an 'Open View' Scenario from the RSA process (14,000 such images)

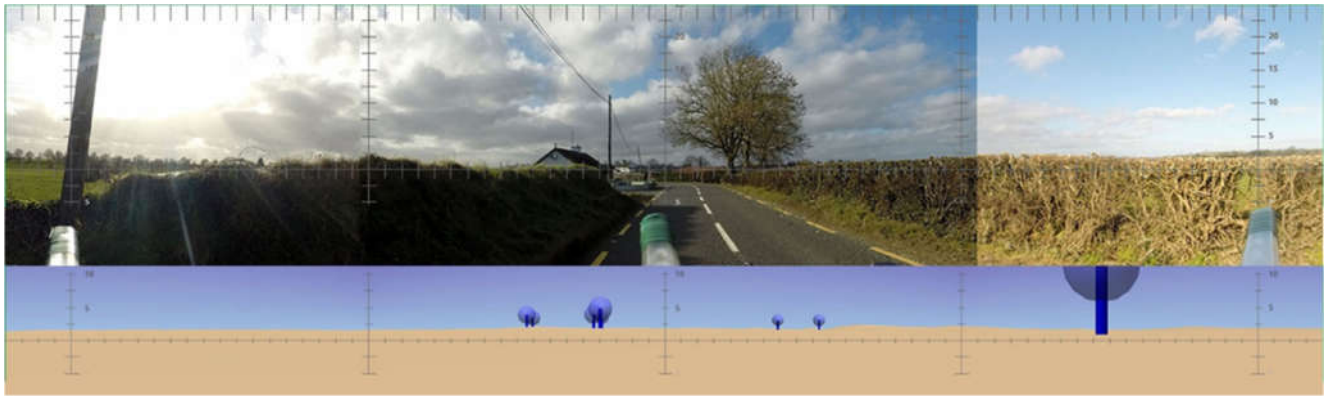


Figure M2.6: 'Screengrab' Example of a 'Partial View' Scenario from the RSA process

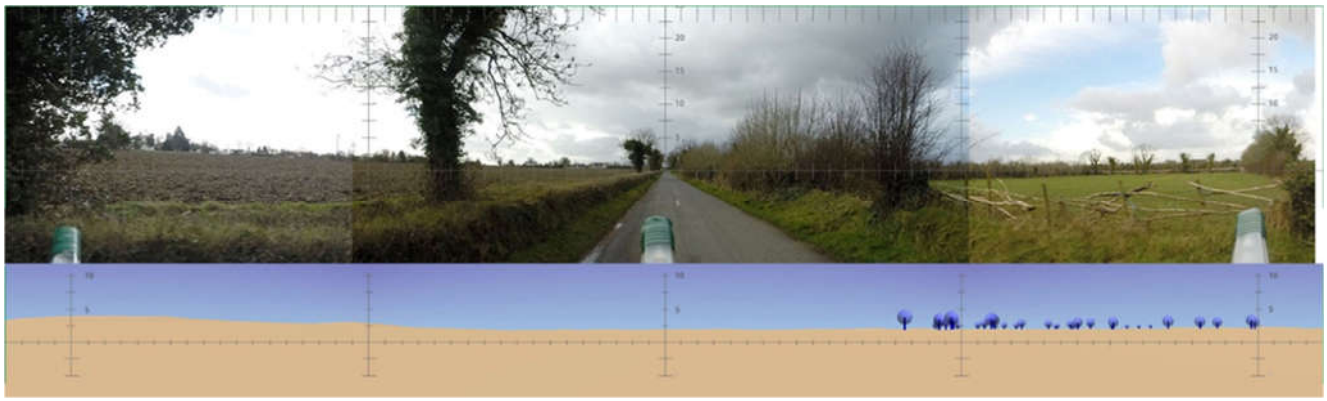
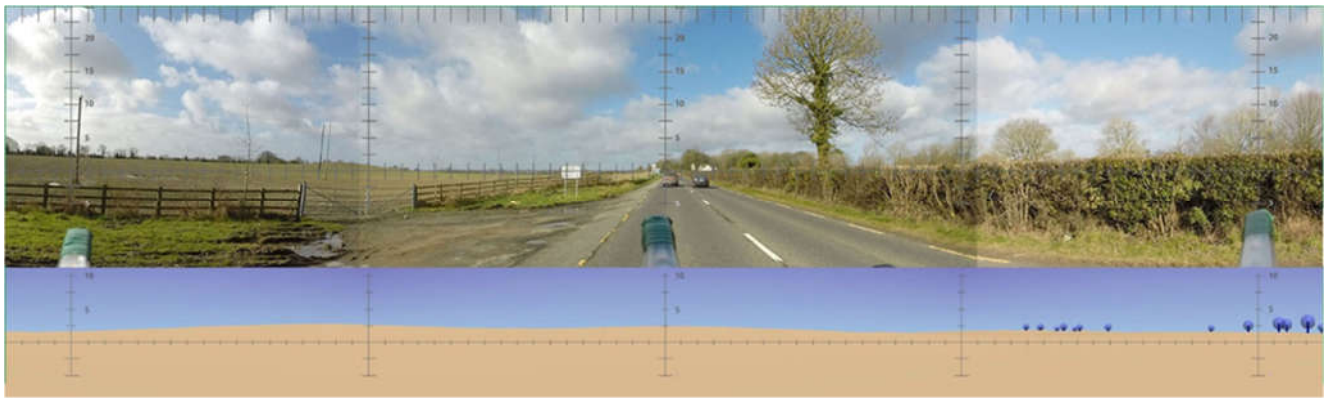


Figure M2.7: 'Screengrab' Example of a 'Screened view' Scenario from the RSA process



Not only is the study conservative in its categorisation of open visibility (a single blade rotation), it was also carried out during winter months when deciduous trees offer the lowest degree of screening. Although it only represents the view from roads, in the rural context of the central study area most dwellings are located adjacent to the road network. The degree of screening at the roadside is considered to be no greater, and in most cases less, than those surrounding rural dwellings. This is on the basis that shelter vegetation is commonly planted in close proximity to the dwelling on at least two sides. For these reasons it is felt that the RSA is a strongly representative and not overemphasised analysis of views experienced at all forms of receptor location within the central study area.

The mapped output of the RSA process can indicate the spatial distribution of visibility, which usually relates closely to the landform and land cover patterns in an area as well as distance from turbines. The pattern of visibility can also give a clear indication of the typical distance at which turbines of a particular height tend to become screened by the vegetation structure in that area. This is a function of turbine height versus the typical height of, and distance to, nearest hedgerows. The visibility data can also be compared with the theoretical visibility indicted in the initial ZTV map, which tends to highlight the inadequacy of the latter in lowland landscapes.

Capture of Imagery

Several options for the analysis of the screening were considered including using Google Streetview or using georeferenced video footage. Streetview imagery was deemed not fit for purpose for a few reasons - principally that it is captured at a height of 2.5 m+ which doesn't represent what a person would normally witness on site; the imagery is out of date; it would be too difficult to analyse. Georeferenced video footage was deemed too difficult to handle and would be very difficult to replicate the motion and view in a 3D environment.

In the end a photographic unit was designed and constructed by Macro Works Ltd for the purpose of collecting 360-degree imagery on the move. This unit housed 4 synchronised cameras capable of wide-angle views, an anti-log NMEA reader for collecting a continuous stream of GPS data, and a high precision Trimble GPS beacon receiver capable of maintaining lock in taxing conditions and when under canopy. The unit was calibrated for viewing angles and level-mounted on top of a vehicle such that the camera height was equivalent to average eye-level height at 1.7 m. With photo capture programmed for 1 second

intervals and a car speed maintained less than 50 kmph, this resulted in 360-degree imagery captured approximately every 15 metres.

Routing for the entire area was coordinated prior to going on site using detailed sat-nav functionality. This enabled the route to be driven in the most efficient manner with the minimum of overlap and time wastage. All Regional routes, National routes and Motorways were driven in both directions as there was sufficient separation between both sides of the road to result in different visibility results. Third class and local roads were driven in one direction (analysis in both directions). Access routes and tracks were not driven.

Figure M2.6: Image capture type per route type

Route Type	Direction of Driving	Analysis of Panoramic Imagery
Motorway	Bi-directional	Forward facing imagery only
National Primary	Bi-directional	Forward facing imagery only
National Secondary	Bi-directional	Forward facing imagery only
Regional	Bi-directional	Forward facing imagery only
Third Class	Uni-directional	Forward and Rear facing imagery
Access Routes / no-thru roads	N/A	N/A

Processing of Imagery

All imagery and data were downloaded at the end of each day (9 site visits resulting in 7.5 full days of imagery and a total of 350K+ images) and geo-tagged for position using the GPS data collected. Once geotagged each image was put through a custom action to correct for barrel distortion (inherent in wide angle imagery) and crop it to perfectly align with the imagery on either side of it. The images were subsequently aligned and resized to 200 degrees depending on the direction of view required. These images were carefully calibrated to match with regular panoramas captured with a 50mm lens and output to cylindrical projection.

A full digital model of the site (terrain and turbines) was prepared in 3D using DTM data procured from the Ordnance Survey of Ireland. This was the same model used to output wireframe renders for the photomontage output, so it is of a high accuracy with regard to dimensions and positioning. This was used to output a 200-degree rendered view of the turbines from each point at which a panorama was captured.

Both the panoramic photographic composite and the panoramic render were compiled into a single image per viewpoint for analysis complete with an overlay of 2.5-degree graduations.

It should be noted that the camera unit was fixed rigidly to the vehicle and did not have the benefit of an IMU to counter changes to the pitch and roll of the vehicle resulting from hills and camber. The model on the other hand was set to level for each point. Analysis was carried out with this in mind and a series of automated actions were programmed to quickly overlay and test imagery where there was any ambiguity surrounding visibility.

Analysing Imagery

Analysis was carried out through a series of progressive filters. Images that displayed no view of the turbines were identified and classified first. These were the removed from the data set. Images that displayed clear open views were identified next and removed from the data set, and so on. This meant that the remaining dataset became progressively smaller and easier to manage with each pass. The first stage filtering and classification identified 3 classes of visibility:

1. Clear open views – where at least 1 full rotation of a turbine's blades would be visible.
2: Partially open views – (a) identified as 'veiled' views interrupted by thin vegetation
(b) views where less than a full rotor rotation would be visible (above treetops, for example).
(c) fleeting views of turbines possibly with no more than a single frame
3: Screened views – where turbines are completely screened by vegetation.

An additional stage of analysis and filtering of the 'Open' class of visibility concentrated on the numbers of turbines that would potentially be visible.

Statement of Accuracy

Aspects of the limitations of this type of analysis have been discussed at points in the above methodology, however, it needs to be clearly emphasised that this study is designed to offer a general statement on the level of screening inherent through vegetation and/or buildings in the area surrounding the proposed Derryadd Wind Farm turbines. We have taken every precaution possible to present a conservative estimate of the true levels of visibility on site including carrying out the assessment when the screening foliage is at its minimum.

By effectively post-processing and analysing the data at 2 second intervals (every 2nd captured viewpoint) there may be gaps in the screening up to 30 m long that could potentially be missed in this assessment. Equally, however, there may be a frequency of open views that hides the reality of intermittent screening along a route. Overall, we are confident that the analysis is balanced and offers a realistic sense of the screening levels as they would be experienced on site.

It should be noted that many of the route sections that fall into the 'Partial View' category have been so classified based on veiled screening by hedgerow vegetation. It is this screening type which is likely to change in favour of being fully screened in summer months as foliage becomes thicker and less permeable to views.